Chapter 5—Environmental Consequences

5.1 Introduction and Methodology

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Section 5.1.3 - Added discussion of a deferred SR 37 interchange.
- Section 5.1.4 – Added discussion of the Refined Preferred Alternative 2.

5.1.1 Overview of Tier 1 Methodology

This section summarizes the methodology used for evaluating environmental impacts in the Tier 1 Final Environmental Impact Statement (FEIS). This information is included in this document in order to provide context for the evaluation of environmental impacts in Tier 2.

The Tier 1 EIS had a 26-county Study Area, encompassing approximately one-quarter of the State of Indiana, and involved the consideration of alternatives approximately 141 to 156 miles in length. The alternatives under consideration were geographically widespread, resulting in the need to consider environmental issues across a broad area.

5.1.1.1 Key Concepts Used in Tier 1: Study Bands, Corridors, and Working Alignments

In the Tier 1 EIS, five major alternatives (1 through 5) were carried forward for detailed analysis. Several of these had multiple "options" for connecting to Indianapolis; each option was labeled with a letter (A, B, or C). Including these Options, there were a total of 12 distinct alternatives considered in the EIS. These 12 alternatives were: 1, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 4C, 5A, and 5B. **Figure 5.1-1** (p. 5-2) shows these 12 alternatives, along with the 26-county Study Area. To provide a set of tools for analyzing environmental impacts of these alternatives, FHWA and INDOT defined each alternative in Tier 1 as a set of three overlapping bands (see **Figure 5.1-2**, p. 5-3).

- **Study Band:** The "study band" referred to a <u>two-mile-wide</u> band within which the environmental data-gathering efforts were focused for each alternative.

- **Corridor**: The "corridor" was <u>generally 2,000 feet wide</u>, but its width was narrower in some places and broader in others.

- **Working Alignment:** The "working alignment" was a potential location for a highway right-of-way within the 2,000-foot-wide corridor. The working alignments ranged in width from 240 to 470 feet. (See Tier 1 FEIS, Appendix E, "Typical Sections," for detailed information on the widths of each working alignment.)

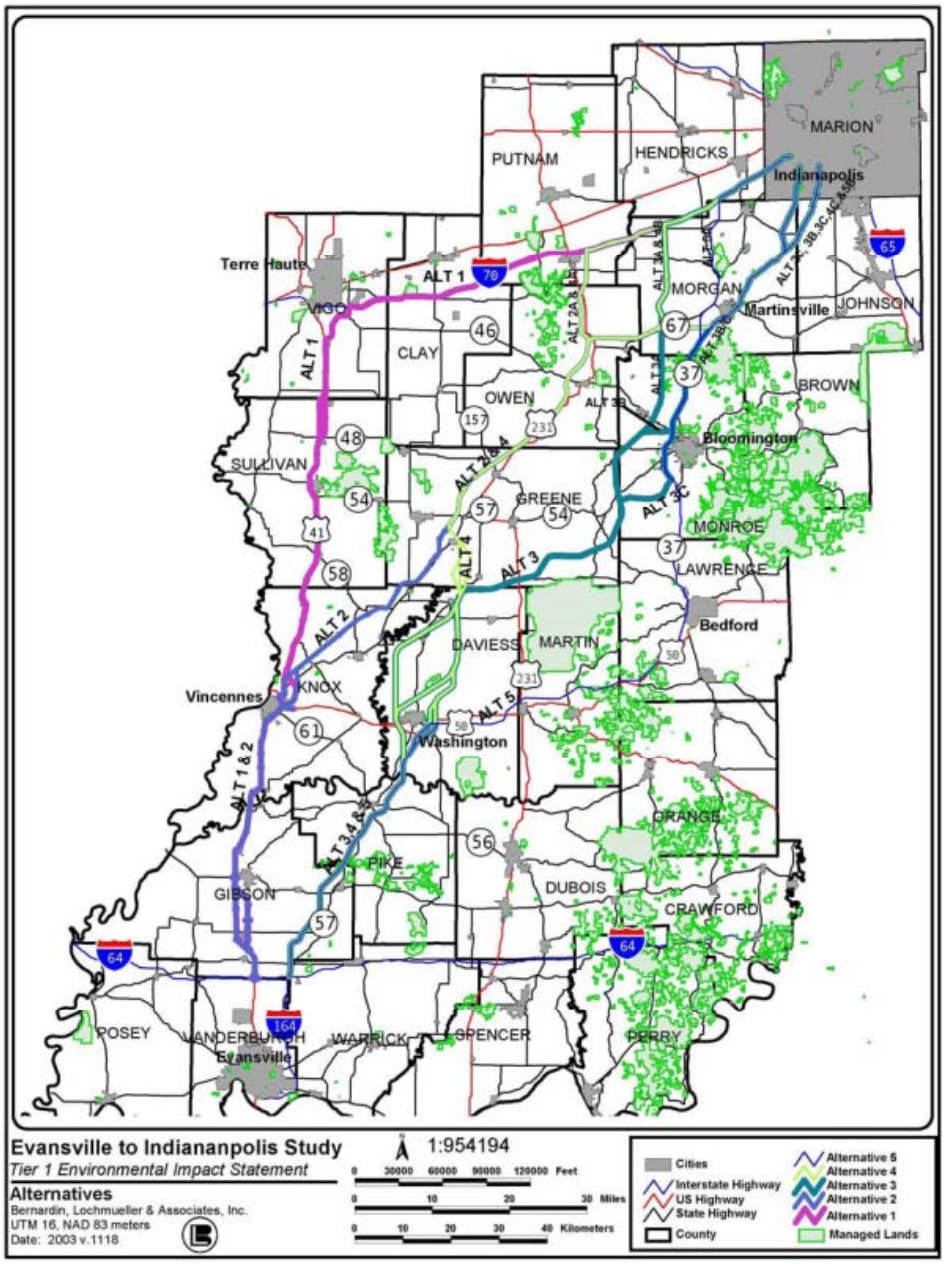


Figure 5.1-1: Tier 1 FEIS Alternatives, with Study Area

5.1.1.2 Calculation of Environmental Impacts in Tier 1

<u>Use of GIS in Tier 1</u>

The basic tool used for estimating the environmental impacts of each alternative in Tier 1 was the project's Geographic Information System (GIS). A GIS is an electronic database that consists of a series of data layers. The Tier 1 GIS database included layers containing each of the study bands, corridors, and working alignments, as well as more than 170 layers containing the locations of various environmental resources and other features.

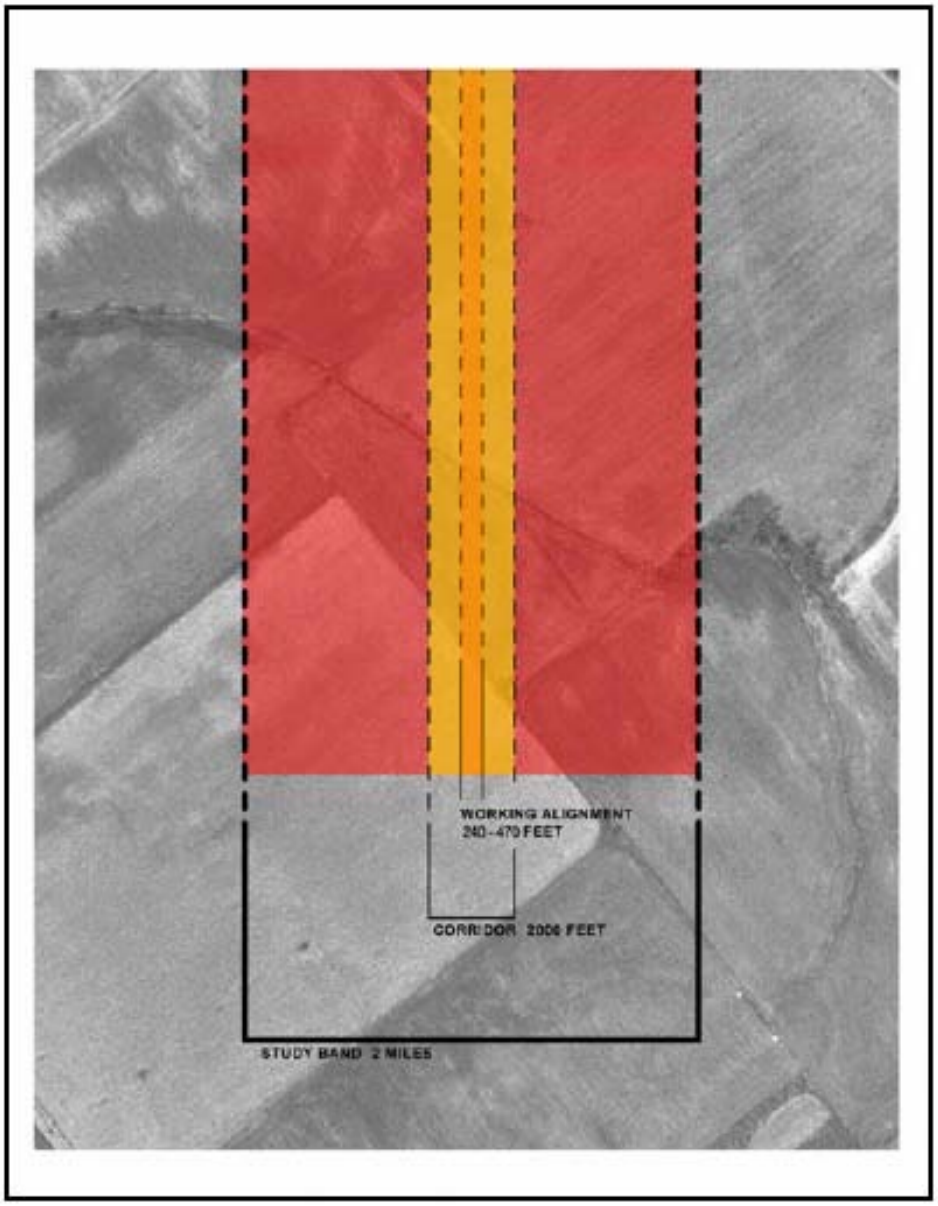


Figure 5.1-2: Illustration of Study Band Corridor and Working Alignment

The Tier 1 GIS database was used to generate maps showing the relationship between each alternative and specific environmental resources and other features. Some of these maps were contained in Chapter 5 of the Tier 1 FEIS, *Environmental Consequences*; additional maps were included in the Environmental Atlas, which is contained in a separate volume but also is part of the Tier 1 FEIS. The Tier 1 GIS also was used to calculate the impacts of each of the working alignments. The impact calculations were given in the tables contained in Chapter 5 of the Tier 1 FEIS and elsewhere in that document.

Methodology for Calculating Impacts in Tier 1

The direct impact calculations shown in the Tier 1 FEIS reflect the impacts *within the footprint of the working alignment of each alternative*, subject to the following qualifications:

- **Impacts of I-70 Widening and SR 641 (Terre Haute Bypass) Projects**. The impacts associated with the planned widening of I-70 and the completion of SR 641 were not counted as part of the impacts for the alternatives presented in Tier 1. Instead, the impact calculations were based on the impacts of each alternative from its southern terminus at I-64 near Evansville to the point at which the alternative connected with I-70 or SR 641 (or I-465 in the case of those alternatives that do not use any portion of I-70 or SR 641). This approach was followed because the completion of SR 641 (Terre Haute bypass) and the widening of I-70 were expected to occur without regard to whether I-69 is completed.
- **Use of Existing SR 37 and US 41 Right-of-Way.** Several alternatives incorporated portions of existing SR 37 and US 41. Both of these routes are four-lane, divided highways with at-grade access points (partial access control, with signalized and unsignalized intersections). Upgrading these routes to meet freeway standards (which do not allow for at-grade access) would require additional right-of-way for interchanges, local service (frontage) roads, and other improvements. For sections of alternatives that followed these routes, the impact estimates in Tier 1 reflected only the additional right-of-way that would be needed beyond the existing SR 37 or US 41 right-of-way.
- **Corridors with Multiple Variations**. In the Tier 1 FEIS, some of the corridors included multiple variations.[1] Each variation had slightly different impacts. Consequently, the impact totals for these alternatives were presented as ranges in the FEIS. The ranges reflected the different levels of impacts associated with the various working alignments that were developed in these areas.
- **Interchanges.** The Tier 1 FEIS assumed potential interchange locations. Interchange locations and access issues are being refined in this and other Tier 2 NEPA documents. These potential locations were determined using the following criteria:
    - The functional classification of intersecting roadways
    - The traffic volumes on intersecting roadways
    - Service to significant communities which otherwise would be isolated
    - Distance between interchanges
    - Ability to relocate/consolidate state highways which are close to each other
    - The number of interchanges serving particular communities
    - The presence of sensitive resources (such as karst) and thus the desire to minimize potential indirect impacts in those areas

[1] Along US 41 there were several alternatives with multiple corridor variations. Locations were near Fort Branch (Alternatives 1, 2A, 2B, and 2C); near Vincennes (Alternatives 1, 2A, 2B, and 2C); and near Sullivan (Alternative 1).

The Tier 1 FEIS noted that, during Tier 2, some interchange locations could be discarded and new locations could be added.

The Tier 1 FEIS assumed right-of-way needs of approximately 10 acres for each potential interchange, but noted that the actual amount of land could be greater than or less than 10 acres depending upon the interchange configuration. The Tier 1 FEIS also noted that the 10-acre estimate of land for an interchange included only the land needed for the interchange; impacts from indirect development as a result of the interchange were incorporated into the Cumulative Impacts analysis in Section 5.26 of the Tier 1 FEIS.

- **Rest Areas.** Specific rest area locations were not identified in the Tier 1 FEIS. Rest areas will be identified and located in these Tier 2 National Environmental Policy Act (NEPA) studies. However, to avoid underestimating the right-of-way needs for the I-69 alternatives, the acreage for four potential rest areas (two northbound and two southbound) were included in the total right-of-way needs for each alternative in the Tier 1 FEIS. The Tier 1 FEIS assumed that approximately 40 acres would be needed for each rest area, for a total of 160 acres. The land acquired for the rest areas was assumed to be agricultural land. In addition, solely for the purposes of calculating impacts, the land for rest areas was assumed to be prime farmland.

5.1.2 Overview of Tier 2 Methodology

Tier 2 Environmental Impact Statements are being completed for six different sections of I-69 between Evansville to Indianapolis. They are as follows:

- Section 1 (I-64 near Elberfeld to SR 64 near Oakland City). The Tier 2 Final EIS for Section 1 was approved on October 17, 2007, and the FHWA Record of Decision was approved on December 12, 2007.
- Section 2 (SR 64 near Oakland City to US 50 east of Washington). The Tier 2 Final EIS for Section 2 was approved on February 25, 2010, and the FHWA Record of Decision was approved on April 30, 2010.
- Section 3 (US 50 east of Washington to US 231 near Scotland). The Tier 2 Final EIS for Section 3 was approved on December 1, 2009, and the FHWA Record of Decision (ROD) was approved on January 28, 2010.
- Section 4 (US 231 near Scotland to SR 37 south of Bloomington)
- Section 5 (SR 37 south of Bloomington to SR 39 in Martinsville)
- Section 6 (SR 37 - SR 39 in Martinsville to I-465 in Indianapolis)

The purpose of Tier 2 studies is to develop a range of alternatives within the approved Tier 1 corridor. These Tier 2 studies will include preliminary engineering. Alternatives may go outside of the corridor, if necessary, to avoid significant impacts. In Tier 2 studies, aerial photographs have been field-verified to map and delineate resource locations and boundaries. Also, field surveys have been conducted to determine the presence of and potential for resources. The Tier 2 studies will develop final alternatives within the corridor and determine detailed mitigation measures.

There are specific methodological differences between the analyses in Tier 1 and Tier 2 studies, consistent with the relative scope of each analysis. Following are some of the key methodological differences between the impacts analysis in Tier 1 and Tier 2 studies:

- ***Resource Impact Analysis.*** The I-69 Evansville to Indianapolis Tier 1 EIS identified environmental resources and estimated impacts based on Geographic Information System (GIS) data layers. These layers varied in level of detail and accuracy depending on the original data source. The data sources used constituted the best available source for resource information covering the entire 26-county Tier 1 study area. Limited field checks were conducted during Tier 1 to verify these GIS data layers. In Tier 2, however, resource data have been developed and/or refined for the project corridor based on a complete field reconnaissance of the corridor as well as with the aid of high resolution aerial photography. For example, Tier 1 Land Use/Land Cover data used USGS Land Cover based on satellite imagery with 30 meter resolution. In contrast, Tier 2 Land Use/Land Cover data used high resolution aerial photography produced specifically for the project corridor (0.5-foot resolution), and included a complete field reconnaissance to verify the data.

- ***Aerial Mapping.*** Tier 1 mapping utilized statewide mapping that was flown in 1998 with revisions flown in 1999. This mapping was provided with a resolution of 1 foot. Mapping for Tier 2 was flown in the winter of 2003-2004. This mapping was flown with ground control to create digital topographic mapping and generation of Digital Terrain Models (DTM). The Tier 1 evaluation documented impacts within a 2-mile corridor and ultimately developed a preferred corridor of 2,000-foot width (varying in width at select locations). The Tier 2 mapping was confined to the 2,000 foot corridor selected in Tier 1, but was provided at a higher resolution of six inches.

- ***Design of Alternatives.*** Tier 1 was constrained to a two-dimensional plan view of the "potential" footprint of the corridor. As documented in Appendix E of the Tier 1 FEIS, typical sections for impact analysis were established based upon the number of lanes and the physiographic region. Typical footprints of interchanges were developed. A standard construction length of one-half mile was used to estimate the cost for each potential overpass; for purpose of impact calculations, it was assumed that the overpasses had no new footprint beyond the mainline typical section. These standard/typical footprints were then overlaid with environmental GIS layers to perform the impact analysis. Field verification of environmental resources was performed on a limited basis. The finished product (preferred alternative) in Tier 1 was a corridor, generally 2,000 feet wide. A geometrically defined alignment was not part of the preferred alternative.

  Tier 2 used controlled aerial mapping to define geometrics for the mainline, over-passing roadways, and frontage/access roads. Site specific traffic volumes were used to develop detailed interchange configurations (diamond, cloverleaf, etc.). These interchange configurations/designs were then modified to avoid/minimize impacts to environmentally sensitive features. The DTM from the aerial mapping was used to generate vertical profiles and cross sections of the various alignments. Assumptions about the design profiles and typical sections for the screening of alternatives are documented in Section 3.2.2.3, and are based on INDOT's Design Manual (IDM).

Refinement of the alternatives identified for detailed analysis (in Chapter 5 and 6 of this document) was conducted and additional design details were developed. Further detailed engineering development was also completed for the interchanges at SR 45, Greene/Monroe County Line (with South Connector Road), and SR 37. These interchanges are described in Section 5.6 along with grade separations (overpasses), road relocations, road closures, and access roads, all of which are integral design elements of the alternatives.

During the refinement of the detailed alternatives, the overall engineering design criteria specified for the I-69 project were refined. These refinements considered variations in design criteria in order to better estimate the possible range of construction costs. These refinements resulted in specifying both initial design criteria and low-cost design criteria.

Additional refinements to the design criteria were also identified in Section 4 for incorporation into the low-cost design criteria that were not used by Sections 2 and 3. Many of these measures focused on minimizing the effects of the topography within Section 4, which differs significantly from Section 1 through 3. The cost savings measures identified were fully examined and evaluated for their safety implications. **Appendix GG**, *Low-Cost Design Criteria Memo*, is a technical memo summarizing the additional cost savings measures that were studied in Section 4. After careful consideration of the potential cost savings and safety implications, several of the measures identified have been incorporated into the Section 4 low-cost design criteria as discussed below.

On-going development and studies performed for Sections 2 and 3 showed that there is no evidence that there are any meaningful differences in safety between rural freeways with 60-foot and 84-foot medians (see **Appendix V**, *Median Width and Safety*). An 84-foot median would permit the addition of a future 12-foot-wide travel lane (on the inside shoulder) in each direction while still maintaining a 60-foot-wide median. However, the Level of Service (LOS) for I-69 Section 4 between US 231 and SR 37 in the design year of 2030 is LOS A (See 5.6.3.1 *Traffic Conditions*,). With a LOS of A, there is no reasonably foreseeable need for future added travel lanes. Therefore, the Section 4 typical section under the initial design criteria used in the development and analysis of alternatives incorporates the 60-foot median that is used for the low-cost design criteria in the Section 2 and 3 FEISs.

The typical cross section for the initial design criteria, used in the development and analysis of the Section 4 alternatives, has two 12-foot wide lanes in each direction separated by a 60-foot wide depressed median. The median includes two 5-foot wide usable inside shoulders (4-feet paved) which are another element from the low-cost typical sections of Sections 2 and 3. To the outside of each pair of travel lanes there is a minimum 35-foot wide outside clear zone[2] containing 11-foot wide usable shoulders (10-feet paved). These design elements satisfy and, in some cases, exceed IDM requirements. In addition to this footprint required for the roadway, median, and shoulders, sufficient land is needed to provide for cut and fill

[2] A clear zone is the unobstructed, relatively flat area provided beyond the edge of the traveled way. The clear zone is intended to allow errant vehicles to stop or maneuver without striking any fixed objects. The clear zone includes any shoulders and auxiliary lanes.

slopes, right-of-way maintenance (maneuverability of equipment for mowing, shrub clearing, etc.), drainage, and right-of-way fencing. Safety also is a consideration; there must be sufficient distance from freeway travel lanes so that, should a tree or structure outside the right-of-way fall into the right-of-way toward the freeway, it would not cause a significant risk to motorists. The average right-of-way width for the initial design criteria is approximately 500 feet; however, the right-of-way widths will vary from about 300 feet to over 800 feet depending on terrain and accessibility. The typical cross sections for the initial design criteria are shown in **Figure 5.1-3** (p. 5-15). **Figure 5.1-4** (p. 5-16) shows the typical sections used for the state and county roads in Section 4.

The low-cost design criteria under consideration for I-69 satisfy (but do not exceed) IDM requirements and provide a mainline typical cross section similar to the initial design criteria, including a 60-foot median and 5-foot wide usable inside shoulders (4-feet paved). The most notable cross-sectional difference between the initial design criteria and low-cost design criteria is the 30-foot wide outside clear zone containing 11-foot wide usable shoulders (10-feet paved). The low-cost design criteria will also consider alternative length of grade criteria; rock cut slope treatments; fill slope treatments, and different pavement materials (See **Appendix D**, *Cost Estimation Methodology*). As with the initial design criteria cross section, additional right-of-way is required beyond this footprint for cut and fill slopes, right-of-way maintenance, drainage, and right-of-way fencing. Safety also is a consideration; there must be sufficient distance from freeway travel lanes so that, should a tree or structure outside the right-of-way fall into the right-of-way toward the freeway, it would not cause significant risk to motorists. The right-of-way width for the low-cost design criteria varies from about 270 feet to 700 feet depending on terrain and accessibility with an average width of approximately 380 feet. The typical cross sections for the low-cost design criteria are shown in **Figure 5.1-5** (p. 5-19)

Right-of-way width continuously varies along the Section 4 Alternatives depending on terrain, accessibility, and interchange footprints. Variations in the width also occur for both sets of design criteria. Impacts in this EIS (Chapters 5 and 6) were determined using the right-of-ways used for both the initial design criteria and the low-cost design criteria. Right-of-way for the Section 4 Alternatives (both sets of design criteria) are shown in **Figure 5.1-6** (p. 5-20).

- ***Range of Impacts and Costs.*** Due to the different physical characteristics of most of Section 4 (as compared with Sections 1 through 3), the design criteria used in Section 4 ***differ*** from those applied in Sections 2 and 3. As is described in the *Cost Estimation Methodology* (**Appendix D**) several design criteria are used in Section 4 which were not applicable in Sections 2 and 3. These criteria include critical length of grade for maximum truck speed reduction on upgrades; rock cut slope treatments; and fill slope treatments. Application of this range of criteria leads to a significant variation in the horizontal footprints of alternatives, between 25 – 40% (150 to 250 feet) in various locations in Section 4.

  In this EIS, a range of both costs and impacts (associated with the range of design criteria) are shown. However, it would not be correct to treat the initial and low-cost design criteria for a particular alternative as distinct alternatives for purposes of NEPA evaluation. As

Appendix GG describes, post-NEPA geotechnical investigations are required to identify whether some of the design criteria can be used in specific areas.

The ranges of costs and impacts illustrate what the actual costs and impacts will be after design and construction occur. The selection of a preferred NEPA alternative will be made by comparing the range of impacts and costs for alternatives.

- ***Access Roads.*** Tier 1 included access roads only at locations where it was determined that an existing roadway was physically isolated from the surrounding road network. An analysis of access roads to individual properties was not performed. Tier 2 will investigate the logistical impacts and the economic feasibility of providing/maintaining access to individual properties. The impacts of drive time/distance (user costs) and the preliminary value of the affected properties determine the potential need for a given access road. Access roads for the build alternatives are identified in Section 5.6. Post-Tier 2 design efforts will be required to make a final determination on providing access roads. Some access roads identified in this EIS may not be provided in final design, if the determination is made that it is more cost-effective to purchase a property than to provide access to it.

- ***Rest Areas.*** Specific locations for rest areas were not identified in Tier 1. A total of two rest areas were assumed in each direction, and the costs and impacts for these were included for Tier 1 alternatives. It was assumed that the four rest areas would have construction costs totaling $28,600,000 (in year 2001 costs) and that each would impact 40 acres of agricultural land (160 acres, total). In Tier 2, specific rest area locations are being considered in Section 3 and Section 6; the costs and impacts of these rest areas will be presented in the DEIS documents for those sections. There are no rest areas proposed for Section 4.

Table 5.1-1 through **Table 5.1-14** compare methodologies for the Tier 1 and Tier 2 analyses of the major impact categories, including the following: wetlands, cultural resources, threatened and endangered species, farmland and agriculture, land use, water quality and floodplains, air quality, economic, social, cumulative, noise, visual, traffic, and forests.

Table 5.1-1 Methodology for Analysis of Wetland Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify wetlands within study bands using NWI wetland maps. Identify high value and sensitive wetlands through previous studies and resource agency coordination. Conduct field studies, as needed.	Conduct field studies to identify wetlands impacted by each alternative. Wetland boundaries will be estimated within the corridor. Delineate wetlands impacted by preferred alternative.
Estimate NWI wetland impacts of working alignments.	Complete INWRAP analysis for wetlands impacted for all alternatives carried forward for detailed study. Use construction limits to determine wetland impacts, as per Corps requirements for Section 404 permits.
Define buffer zones around high quality and sensitive wetland complexes.	Obtain Army Corps of Engineers' and the Indiana Department of Environmental Management's approval of wetland surveys.

Table 5.1-2: Methodology for Analysis of Cultural Resource Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify known sites within study bands.	Conduct full assessments of effects on individual resources.
Consult with SHPO and local historians to identify unrecorded historic sites potentially affected by working alignments (APE = 2-mile-wide study band).	Resolve adverse effects, as appropriate.
Identify reported archaeological sites and High Probability Areas.	Conduct archaeological field survey in areas potentially impacted by preferred alternative.
Define buffers around significant resources.	

Table 5.1-3: Methodology for Analysis of Threatened and Endangered Species (T/E) Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify potential habitat and resident T/E species within study bands using IDNR database and identify possible areas for wildlife impacts.	Conduct comprehensive field surveys, including sampling, trapping and capturing.
Team of specialists reviewed the probability of occurrence for listed species in and near the corridor.	Analyze specific impacts based on the final preferred alternative.

Table 5.1-4: Methodology for Analysis of Farmland and Agriculture Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify farmland, including prime farmland, within study bands.	Map and delineate farmland in and around alternatives.
Estimate farmland (including prime farmland) acres potentially affected by working alignments.	Determine total farmland (including prime) acres potentially impacted by alternatives.
Coordinated with NRCS in order to develop a methodology using existing GIS data to assess farmland impacts for each alternative.	Prepare form CPA 106 for coordination with NRCS.

Table 5.1-5: Methodology for Analysis of Land Use Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify major land uses or land cover within study bands (GAP analysis, e.g., forests, croplands, wetlands, quarries, residential).	Field verify land use depicted on aerial photographs.
Identify areas with comprehensive land use plans and evaluate project consistency with plans.	Update review of comprehensive land use plans and evaluate project consistency with plans.
Estimate range of converted acres.	Determine acres converted by alternatives.

Table 5.1-6: Methodology for Analysis of Water Quality and Floodplain Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify water bodies, impaired water bodies, general floodplains, and karst within study bands.	Conduct field studies to evaluate biodiversity and water quality.
Review baseline water quality information and literature.	Conduct QHEI and HHEI surveys to quantify existing water quality. Conduct field studies to identify karst features within alternatives.
Estimate acres of water bodies, physiographic karst areas, and general floodplains impacted by working alignments.	Determine acres of water bodies and FEMA floodplains impacted by walking the alternatives. Determine number of karst features impacted by alternatives, by identifying karst features within the corridor and areas hydrologically linked to the corridor. Project development in accordance with the Karst MOU. Procedural steps 1-4 of the Karst MOU will be implemented during NEPA phase.

Table 5.1-7: Methodology for Analysis of Air Quality Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify nonattainment and maintenance areas within 26-county Study Area.	Analyze air quality along alternatives.
	Determine air quality dispersion impacts among alternates.
Coordinate with MPOs to satisfy conformity requirements.	Coordinate with MPOs and INDOT to satisfy conformity requirements.

Table 5.1-8: Methodology for Analysis of Economic Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify impacts to personal income, businesses, tourism, industry, and employment for Study Area and all Indiana using REMI[3] model.	Assess economic impacts on localized basis.
Identify regional breakdown of impacts within 26- county Study Area.	Consult with local and county economic officials to determine economic development plans.
Identify impacts to businesses along SR 37 and US 41 due to changes in drive-by traffic.	Identify impacts to businesses along SR 37 due to changes in drive-by traffic.

Table 5.1-9: Methodology for Analysis of Social Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify residences and communities, including minority and low-income communities, within study bands.	Identify parcels to be impacted and land owners to be relocated by alternatives.
Estimate range of possible relocations.	Identify relocation issues.
Adjust working alignment to minimize relocations.	Provide more precise estimates of number of relocations.

[3] REMI (Regional Economic Models, Inc.) is an economic forecasting and policy analysis model which evaluates the economic effects of transportation improvements.

Table 5.1-10: Methodology for Analysis of Cumulative Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify effects of major planned projects upon existing land use development trends in 26-county Study Area.	Refine assessment of other impacts based upon more current information about development trends (i.e., consultation with local and county officials).
Model effects of these projects to estimate cumulative impacts over 26-county Study Area.	
Identify potential mitigation measures.	Refine mitigation measures, e.g., support for local land use planning.
Indirect and other impacts estimated for Year 2025.	Indirect and other impacts estimated for Year 2030.

Table 5.1-11: Methodology for Analysis of Noise Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify existing activities, land use, and levels of truck and car traffic with study bands.	Conduct field studies to determine actual noise levels along proposed alternates.
Estimate noise levels in bands radiating from working alignment using existing traffic data.	Determine noise levels resulting from alternatives and develop mitigation measures, if necessary (e.g., noise barriers).

Table 5.1-12: Methodology for Analysis of Visual Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify type of setting crossed by working alignment.	Refine assessment of visual impacts by walking the alternates.
Estimate views of and from working alignments to determine impacts.	
Evaluate potential for context-sensitive design elements.	Identify specific elements of working alignment appropriate for context-sensitive design.

Table 5.1-13: Methodology for Analysis of Traffic and Traffic Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Traffic forecasts provided by Indiana Statewide Travel Demand Model (ISTDM) Version 3. Base year for ISTDM is 1998 and forecast year is 2025.	Traffic forecasts provided by more detailed corridor model, which uses as input forecasts provided by ISTDM Version 4. For both ISTDM Version 4 and corridor model, base forecasts are for year 2000, and forecast year is 2030.
Traffic forecasts based upon land use forecasts for Year 2025. Land use forecasts were extrapolated from a 1998 base year.	Traffic forecasts based upon land use forecasts for Year 2030. These forecasts were extrapolated from a 2000 base year, and incorporated results of Year 2000 Census.
Traffic model forecasts traffic flows on state highways and limited number of major local roads.	Traffic model forecasts traffic flows on local roads throughout study corridor. Generally, traffic flows are forecasted for all roads of functional classification of major collector and higher.
Traffic forecasts suitable for evaluating performance on Purpose and Need throughout 26-county study area. Traffic forecasts also suitable for evaluating capacity requirements and level-of-service on major state highways.	Traffic forecasts suitable for evaluating performance on local Purpose and Need in several-county study area. Traffic forecasts also suitable for evaluating access treatment alternatives, such as grade separations and access roads.

Table 5.1-14: Methodology for Analysis of Forest Impacts in Tier 1 and Tier 2

Tier 1	Tier 2
Identify forest impacts using United States Geological Survey (USGS) Land Cover Geographic Information Systems (GIS) data, which is a subset of the National Land Cover Data (NLCD). The NLCD was developed by the USGS with the United States Environmental Protection Agency (USEPA) to produce a consistent, land cover data layer for the continental U.S. The land cover layer is based on satellite imagery with 30-meter resolution. This data is current through 1992.	Identify forest impacts through photo interpretation of 2003 aerial photographs supplemented by field reconnaissance. It includes groups of trees larger than 1 acre and wider than 120 feet. Forest was grouped into USDA Forest Classifications (Cherry-Ash-Yellow Poplar, Oak-Hickory, etc.) based upon field reconnaissance.
Estimate the acreage of possible forest impacts within the working alignment.	Identify acreage of forest impacts, type of forest to be impacted (USDA Forest Classifications), acreage of core forest impacts, and indirect forest impacts.

5.1.3 Phased Construction

The impacts for Section 4 of I-69 Tier 2 studies are calculated from a point just north of Section 3's US 231 interchange to and including the SR 37 interchange. INDOT may consider phased construction for some elements of this project. The elements considered for construction some time after the initial construction of Section 4 include the full build-out of the SR 37 interchange and the connector roadways and access features associated with it. An interim configuration and recommended improvements on SR 37 are discussed in **Appendix PP**, *Interim SR 37 Interchange Design*. These full build out improvements would be constructed when Section 5 is constructed. Chapter 5 provides the impacts for the total footprint of the project, including any elements that may be considered for phased construction. In the event that the construction of some elements of the overall project is deferred to a later time, impacts from the project in the short term would be lower than those shown in this document.

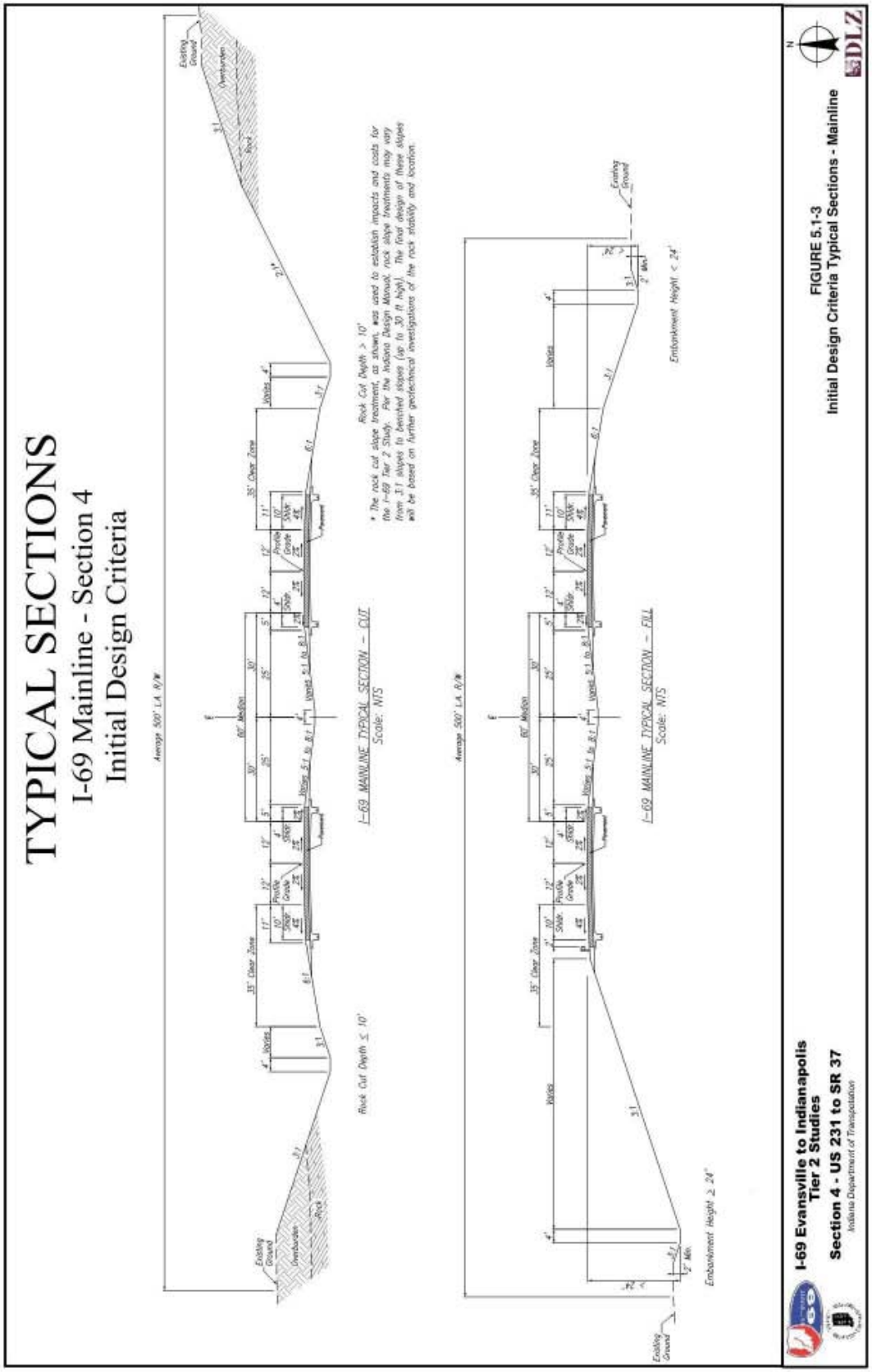
5.1.4 Refined Preferred Alternative 2

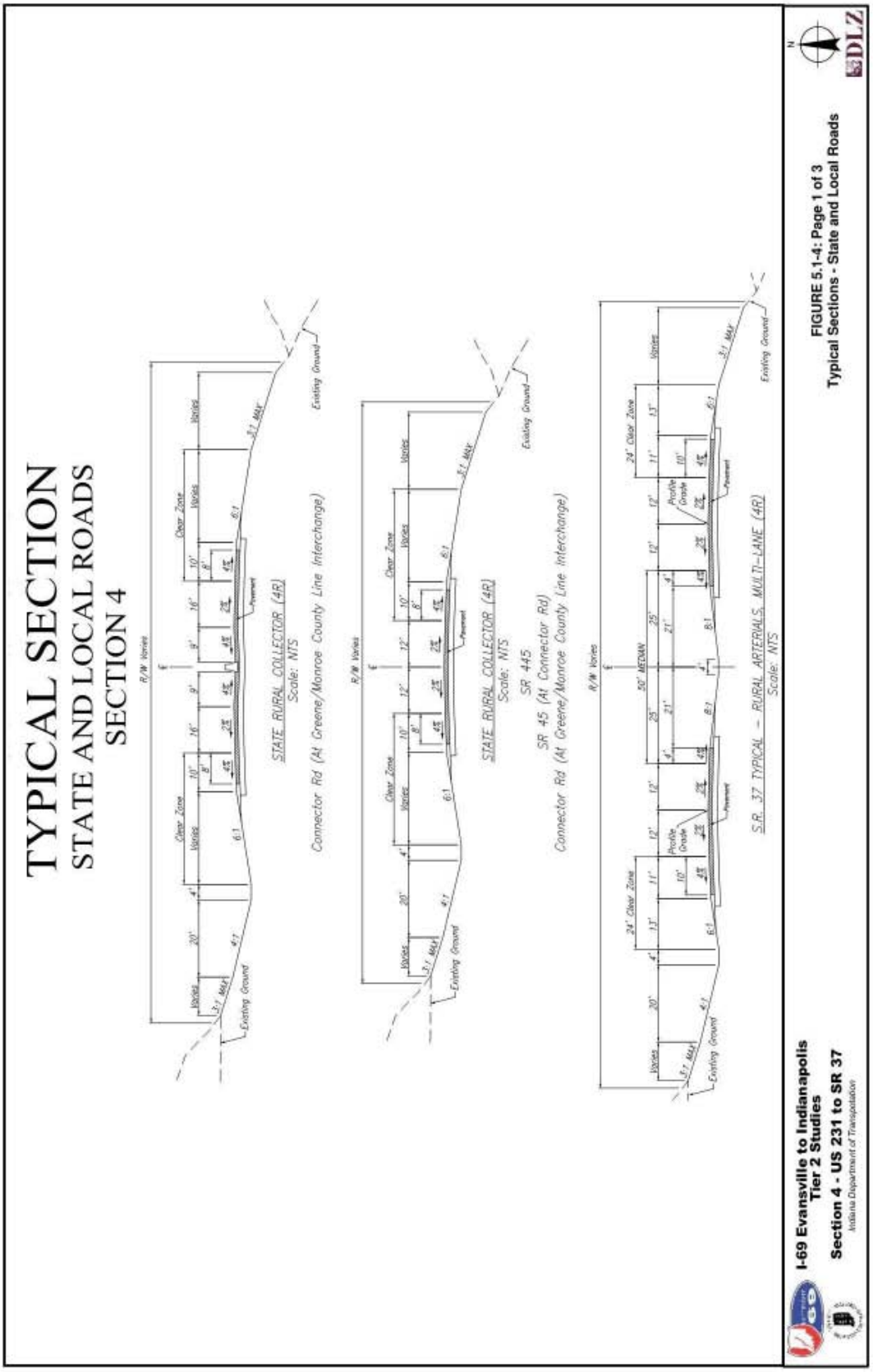
As provided in the INDOT/FHWA *Streamlined Environmental Impact Statement Procedures* (September 2007; p. 13), the preferred alternative (which was identified in the DEIS) is developed to a higher level of detail in this FEIS. The Refined Preferred Alternative 2 is the preferred alternative in Section 4. The impact comparisons shown in Chapter 5 provide the impacts for Refined Preferred Alternative 2 developed to the same level of detail as for Alternatives 1, 2, 3, and 4. The Refined Preferred Alternative 2 (shown as a 5th alternative in the impact tables in Chapter 5) is Alternative 2 refined to a higher level of design.

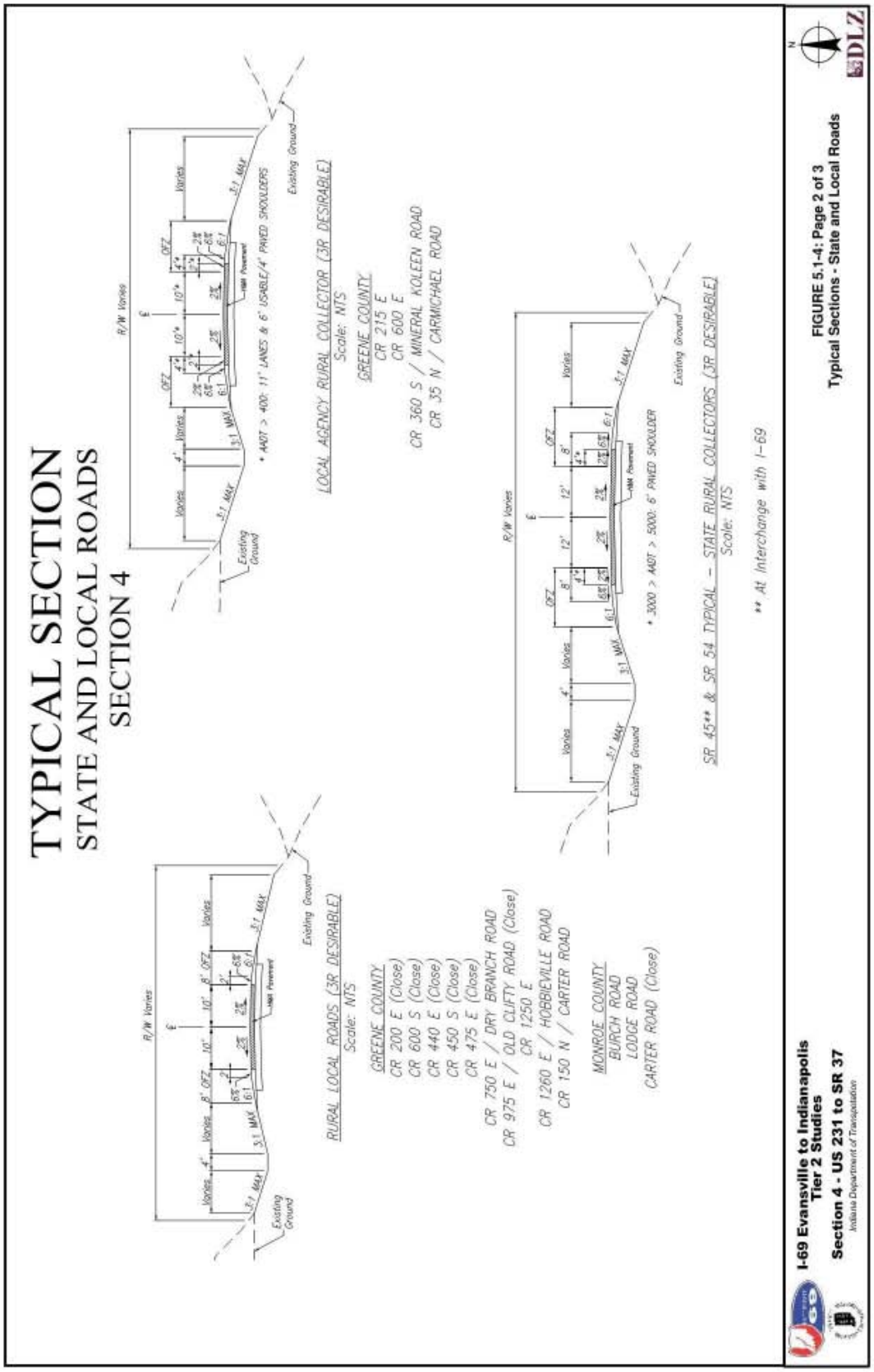
Note that the horizontal location of the proposed roadway for the Refined Preferred Alternative 2 is unchanged from that of the preferred alternative presented in the DEIS document. Refinements to the design made since the DEIS have consisted principally of minor changes to the vertical profile of the I-69 roadway, minor changes and additions to access roads, and minor shifts in the proposed right-of-way lines. These refinements have been made to further reduce costs and to minimize impacts of the preferred alternative. In addition, since the publication of the DEIS, there have been some minor localized changes to structures data. This updated information has come from a variety of sources, including comments on the DEIS document,

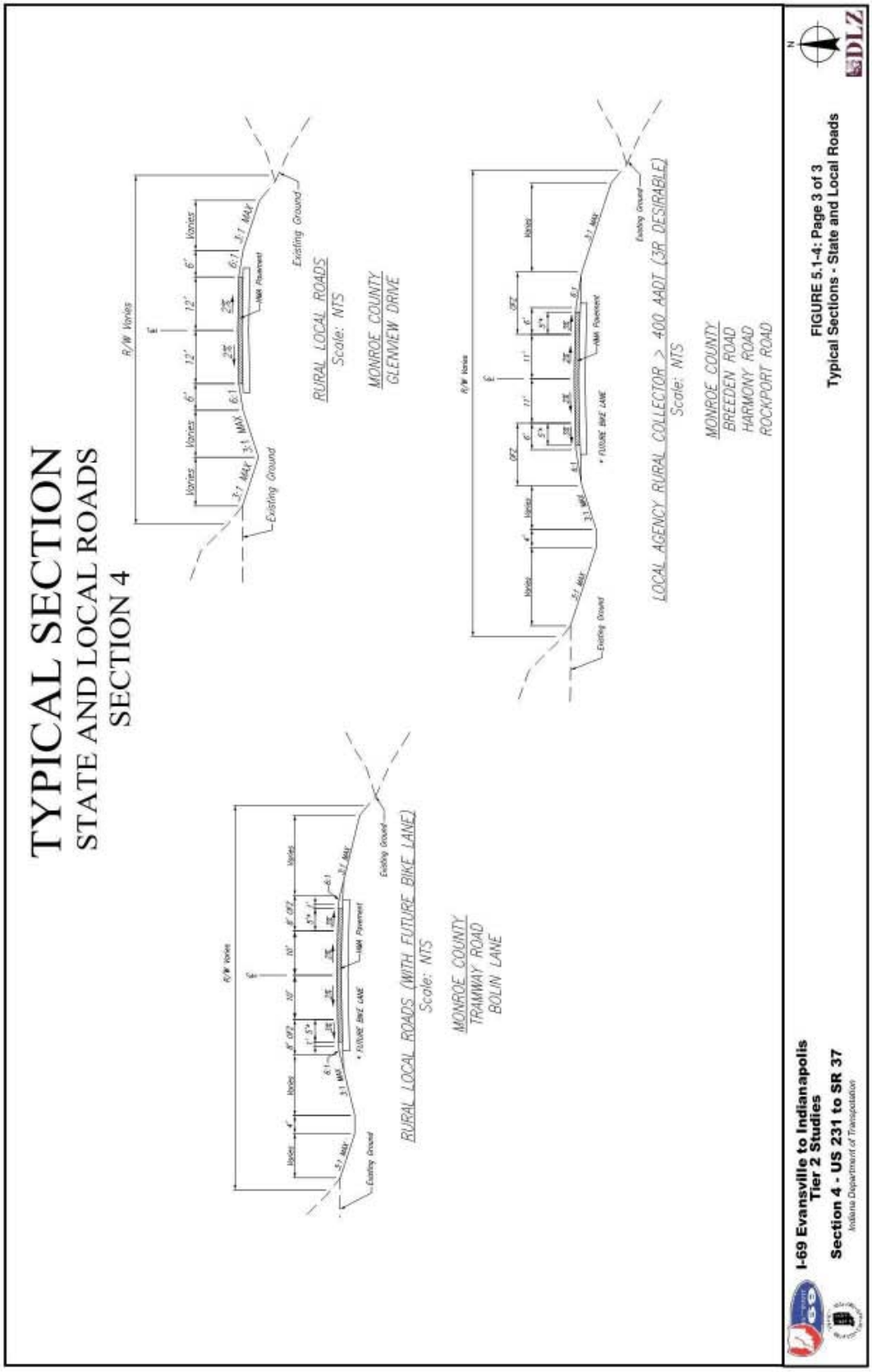
information provided by visitors to the project office, additional field reviews, and reviews of more recent aerial photography. As a result there have been some minor changes in relocation impacts in the FEIS.

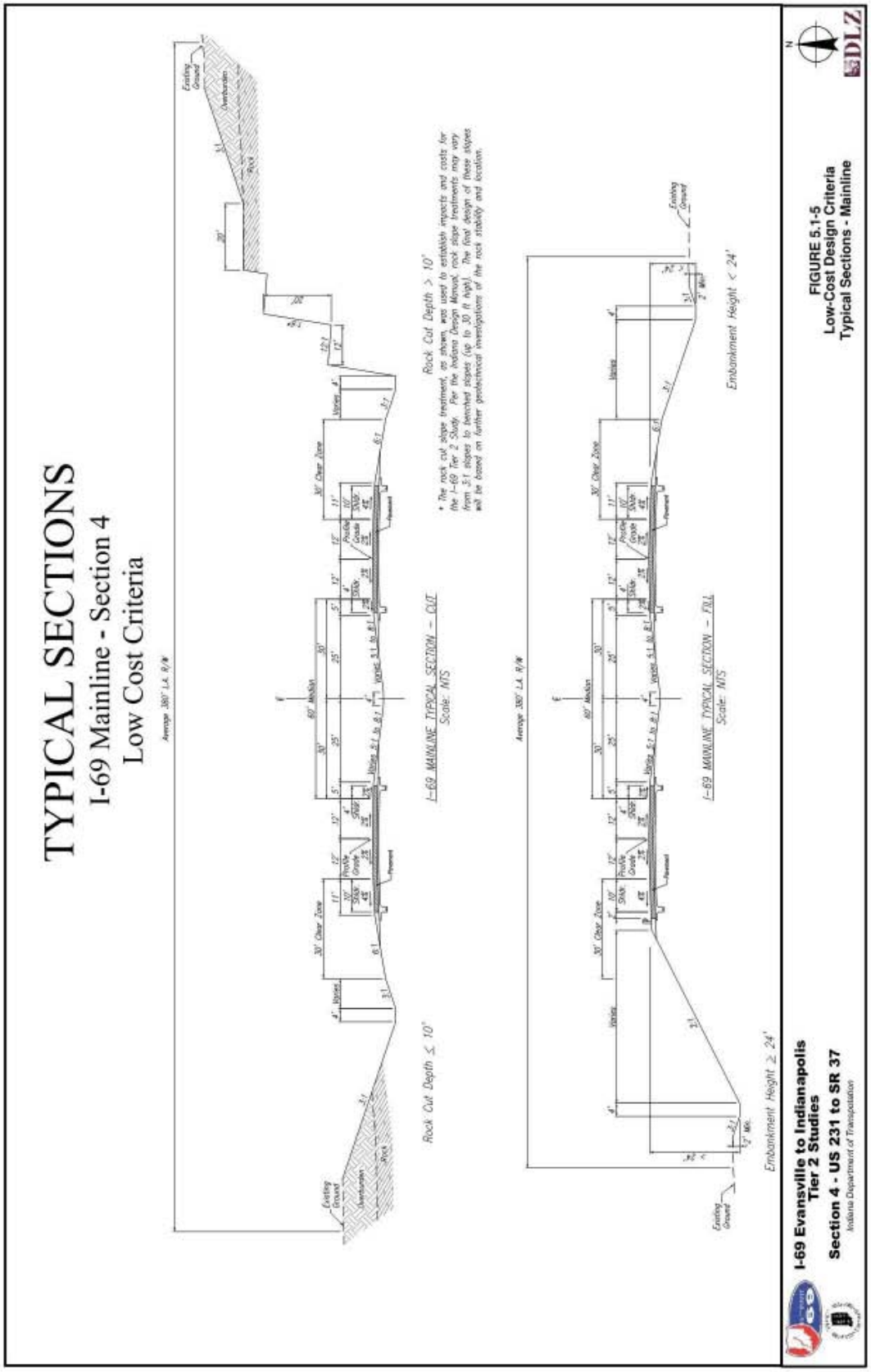
The Refined Preferred Alternative 2 is shown in **Appendix R**, *Preferred Alternative Plan and Profile Drawings*.

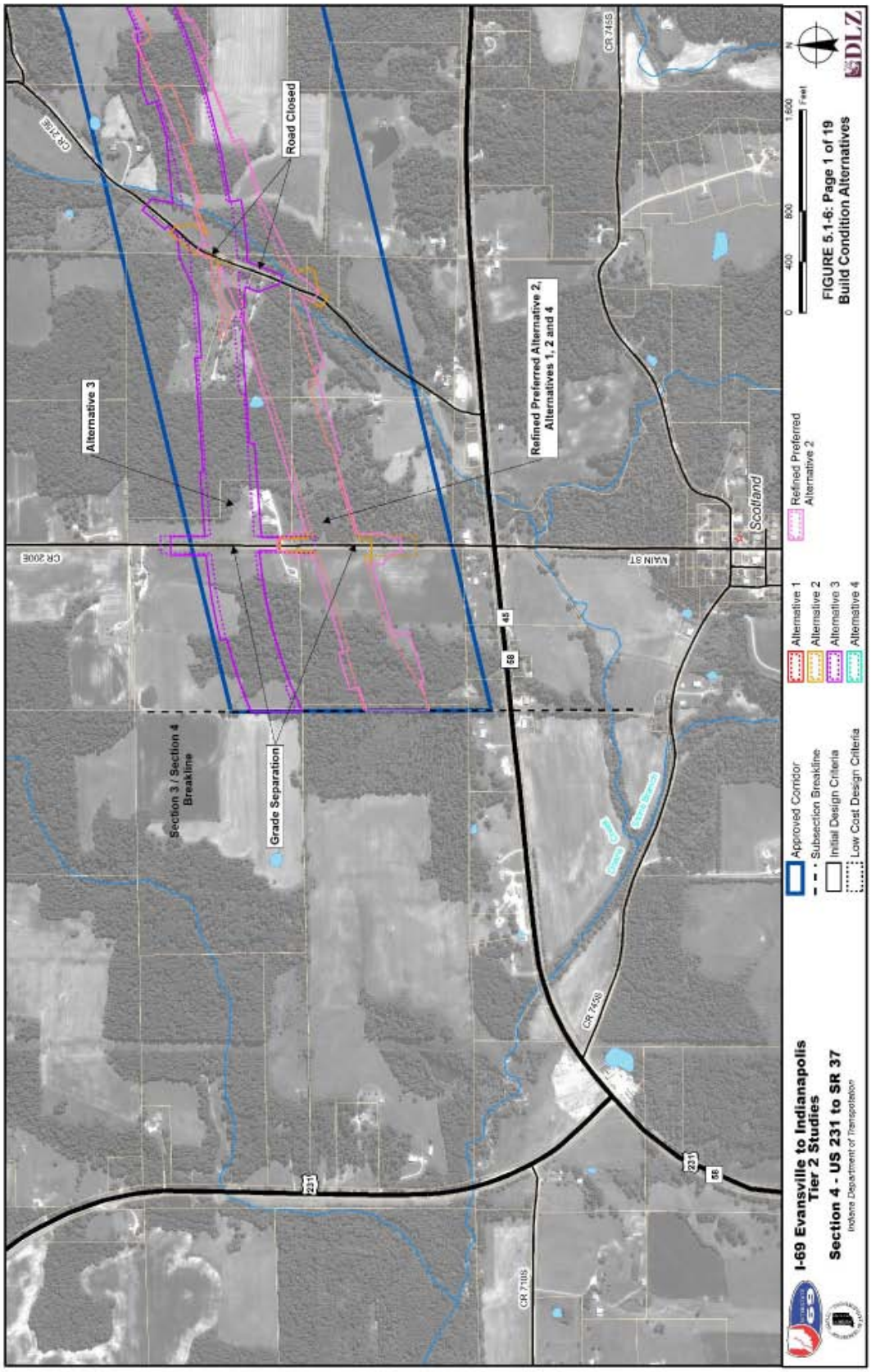

TYPICAL SECTIONS
I-69 Mainline - Section 4
Initial Design Criteria
I-69 MAINLINE TYPICAL SECTION – CUT
Scale: NTS
I-69 MAINLINE TYPICAL SECTION – FILL
Scale: NTS
Rock Cut Depth ≤ 10'
Rock Cut Depth > 10'
* The rock cut slope treatment, as shown, was used to establish impacts and costs for the I-69 Tier 2 Study. Per the Indiana Design Manual, rock slope treatments may vary from 3:1 slopes to benched slopes (up to 30 ft high). The final design of these slopes will be based on further geotechnical investigations of the rock stability and location.
Embankment Height ≥ 24'
Embankment Height < 24'
Average 500' L.A. R/W
Existing Ground
Overburden
Rock
Ditches
Slopes
35' Clear Zone
Shoulder
Pavement
Provide Grade
60' Median
FIGURE 5.1-3
Initial Design Criteria Typical Sections - Mainline
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ

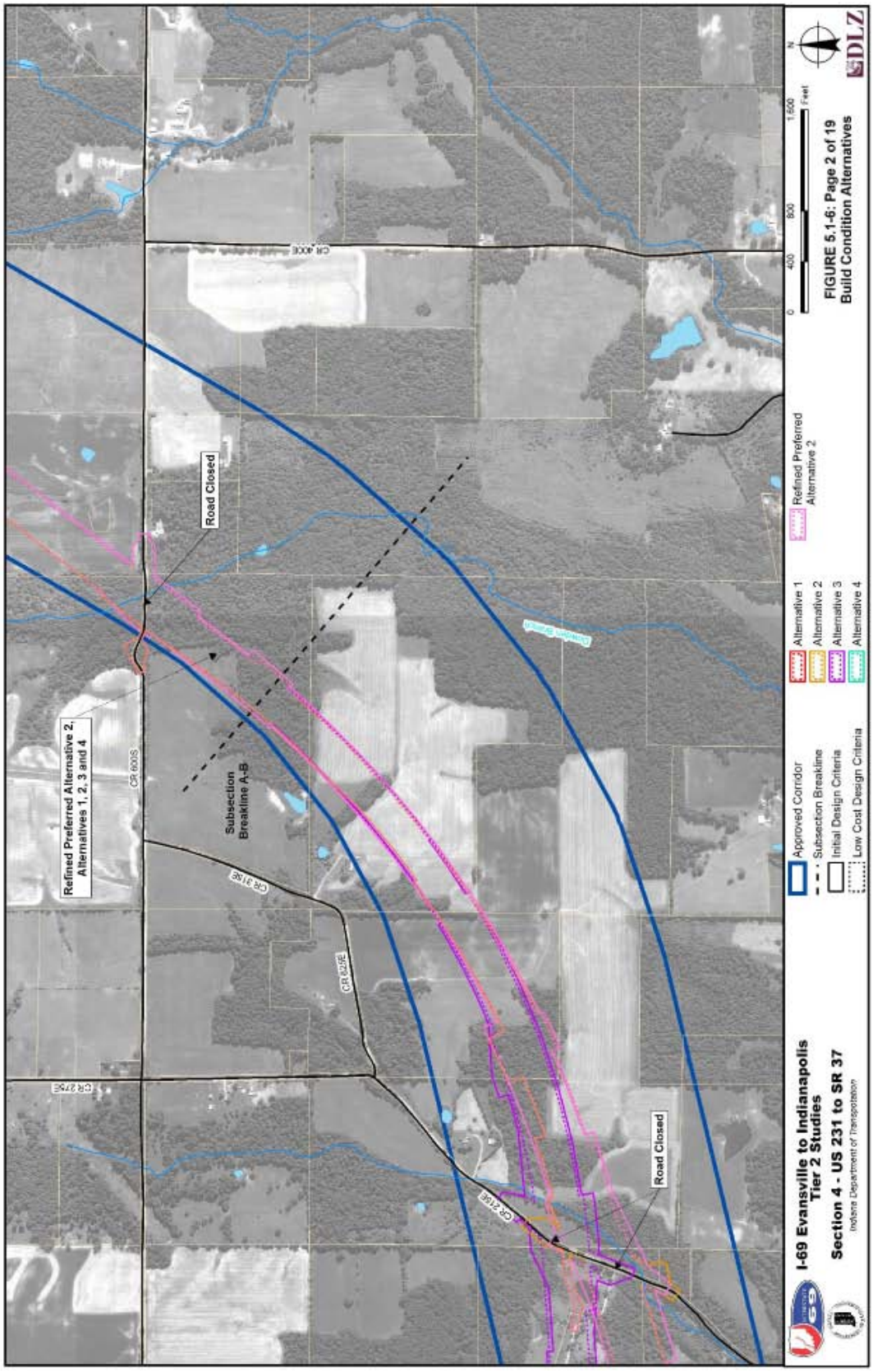

TYPICAL SECTION
STATE AND LOCAL ROADS
SECTION 4
STATE RURAL COLLECTOR (4R)
Scale: NTS
Connector Rd (At Greene/Monroe County Line Interchange)
STATE RURAL COLLECTOR (4R)
Scale: NTS
SR 445
SR 45 (At Connector Rd)
Connector Rd (At Greene/Monroe County Line Interchange)
S.R. 37 TYPICAL - RURAL ARTERIALS, MULTI-LANE (4R)
Scale: NTS
Existing Ground
Clear Zone
Pavement
Profile Grade
R/W Varies
FIGURE 5.1-4: Page 1 of 3
Typical Sections - State and Local Roads
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


TYPICAL SECTION
STATE AND LOCAL ROADS
SECTION 4
R/W Varies
Varies
4'
8' OFZ
10'
2%
6:1
3:1 MAX
Existing Ground
HMA Pavement
* AADT > 400: 11' LANES & 6' USABLE/4' PAVED SHOULDERS
LOCAL AGENCY RURAL COLLECTOR (3R DESIRABLE)
Scale: NTS
GREENE COUNTY
CR 215 E
CR 600 E
CR 360 S / MINERAL KOLEEN ROAD
CR 35 N / CARMICHAEL ROAD
RURAL LOCAL ROADS (3R DESIRABLE)
Scale: NTS
GREENE COUNTY
CR 200 E (Close)
CR 600 S (Close)
CR 440 E (Close)
CR 450 S (Close)
CR 475 E (Close)
CR 750 E / DRY BRANCH ROAD
CR 975 E / OLD CLIFTY ROAD (Close)
CR 1250 E
CR 1260 E / HOBBIEVILLE ROAD
CR 150 N / CARTER ROAD
MONROE COUNTY
BURCH ROAD
LODGE ROAD
CARTER ROAD (Close)
12'
8'
* 3000 > AADT > 5000: 6' PAVED SHOULDER
SR 45** & SR 54 TYPICAL – STATE RURAL COLLECTORS (3R DESIRABLE)
Scale: NTS
** At Interchange with I-69
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-4: Page 2 of 3
Typical Sections - State and Local Roads
DLZ


TYPICAL SECTION
STATE AND LOCAL ROADS
SECTION 4
RURAL LOCAL ROADS
Scale: NTS
MONROE COUNTY
GLENVIEW DRIVE
LOCAL AGENCY RURAL COLLECTOR > 400 AADT (3R DESIRABLE)
Scale: NTS
MONROE COUNTY
BREEDEN ROAD
HARMONY ROAD
ROCKPORT ROAD
RURAL LOCAL ROADS (WITH FUTURE BIKE LANE)
Scale: NTS
MONROE COUNTY
TRAMWAY ROAD
BOLIN LANE
FIGURE 5.1-4: Page 3 of 3
Typical Sections - State and Local Roads
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


TYPICAL SECTIONS
I-69 Mainline - Section 4
Low Cost Criteria
Rock Cut Depth ≤ 10'
Rock Cut Depth > 10'
I-69 MAINLINE TYPICAL SECTION – CUT
Scale: NTS
I-69 MAINLINE TYPICAL SECTION – FILL
Scale: NTS
Embankment Height ≥ 24'
Embankment Height < 24'
FIGURE 5.1-5
Low-Cost Design Criteria
Typical Sections - Mainline
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


Alternative 3
Road Closed
Refined Preferred Alternative 2, Alternatives 1, 2 and 4
Section 3 / Section 4 Breakline
Grade Separation
CR 2006
CR 2100E
CR 7455
CR 7450
CR 7105
WAIN ST
Scotland
231
45
58
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 1 of 19
Build Condition Alternatives
DLZ


Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
CR 600S
Road Closed
Subsection Breakline A-B
CR 300E
CR 275E
CR 275E
CR 275E
Road Closed
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 2 of 19
Build Condition Alternatives
DLZ

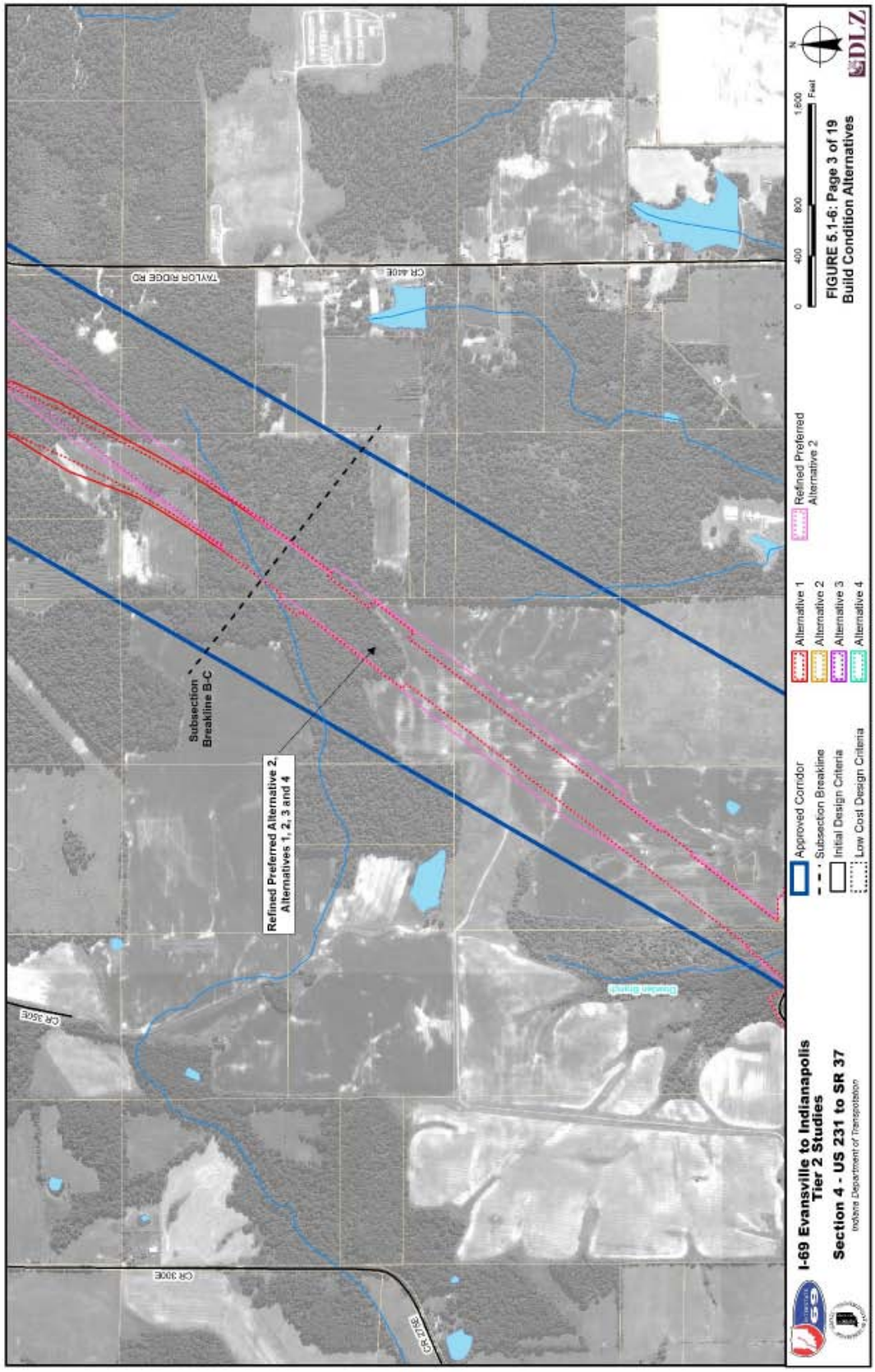
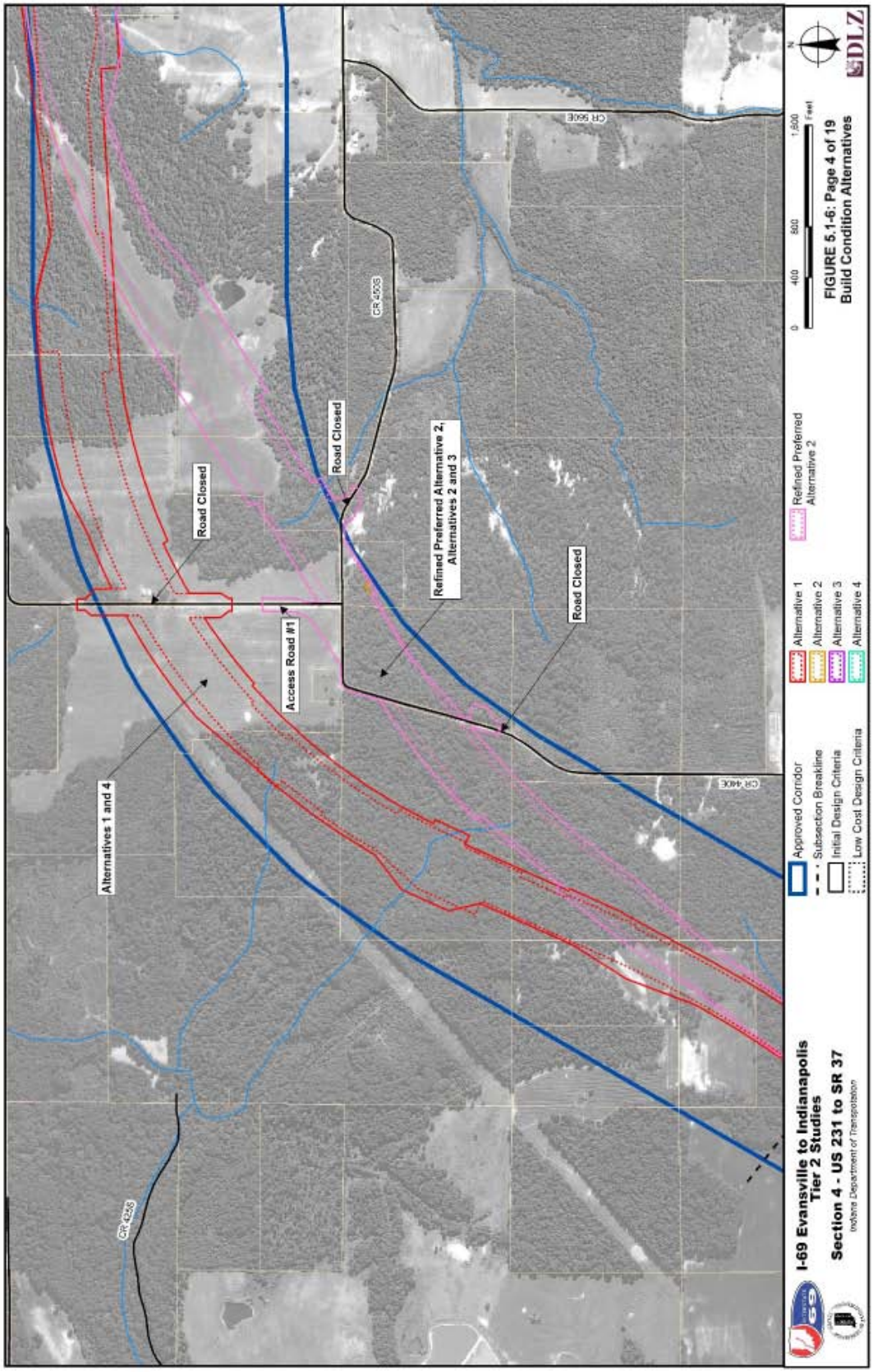
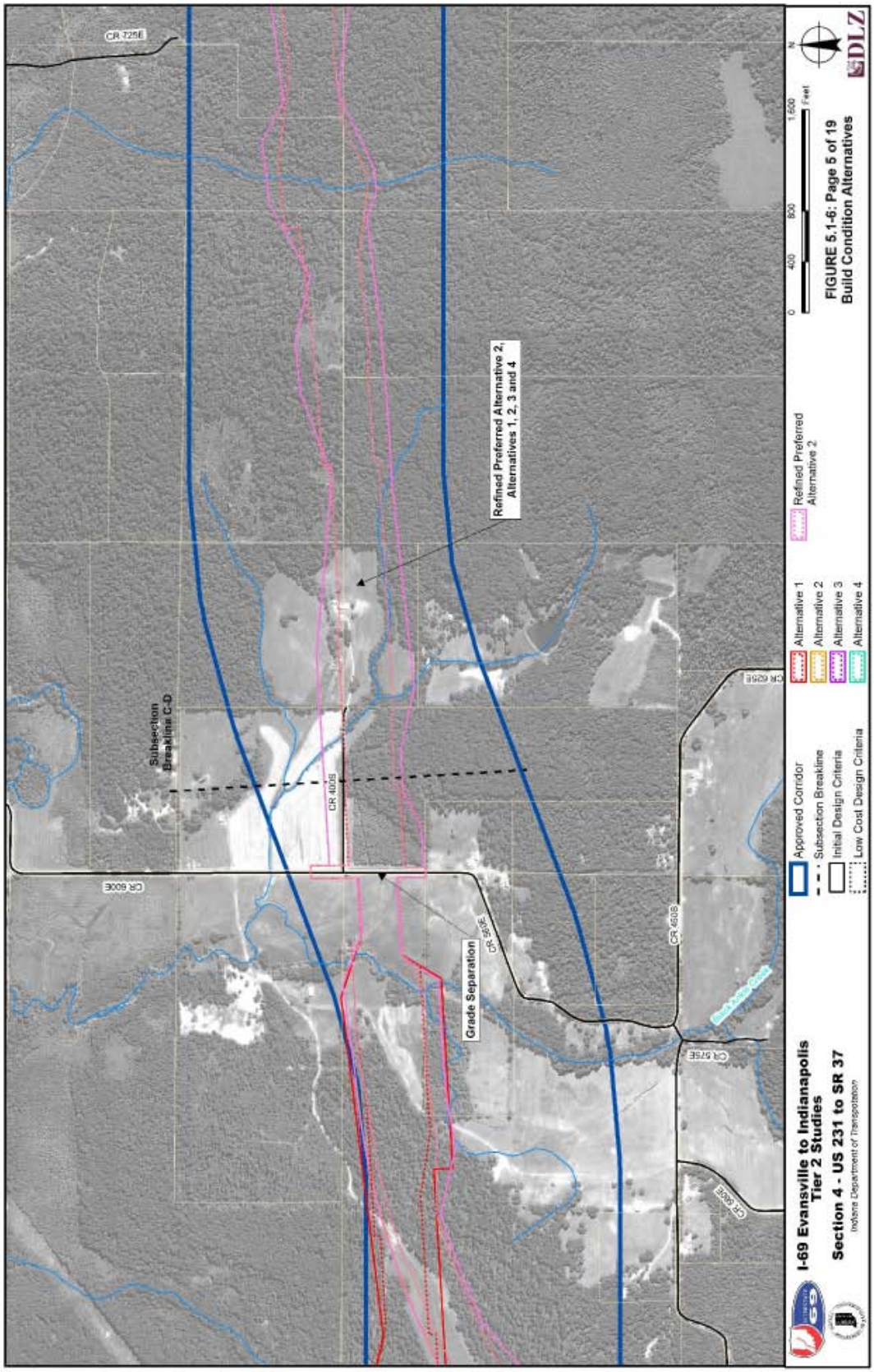


FIGURE 5.1-6: Page 3 of 19
Build Condition Alternatives


Alternatives 1 and 4
Road Closed
Access Road #1
Road Closed
Refined Preferred Alternative 2, Alternatives 2 and 3
Road Closed
CR 400E
CR 450S
CR 560E
CR 425S
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
DLZ
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 4 of 19
Build Condition Alternatives


CR 725E
CR 600E
CR 400S
CR 625E
CR 575E
CR 500E
Subsection Breakline C-D
Grade Separation
Refined Preferred Alternative 2; Alternatives 1, 2, 3 and 4
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
DLZ
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 5 of 19
Build Condition Alternatives

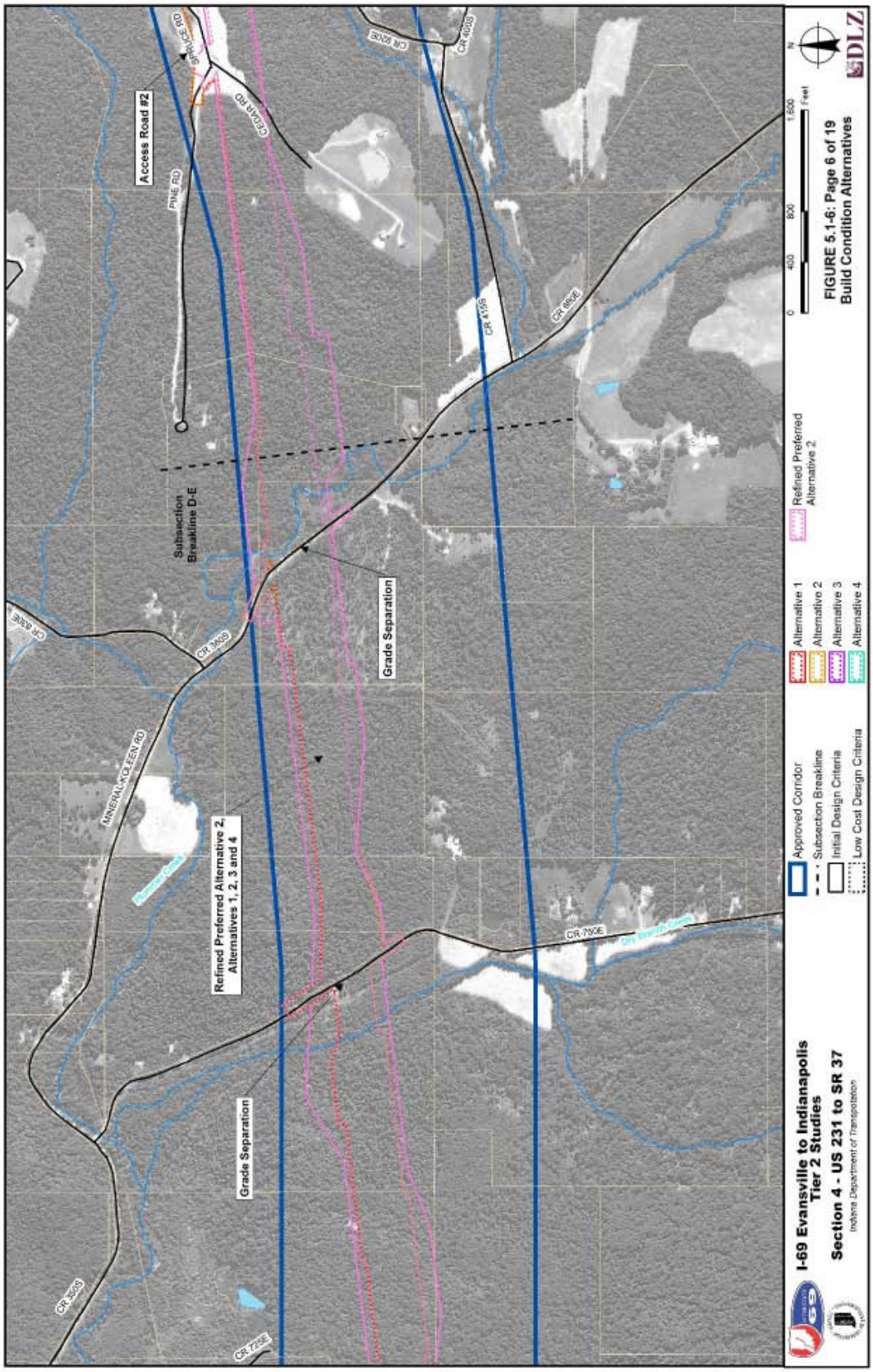


FIGURE 5.1-6: Page 6 of 19
Build Condition Alternatives

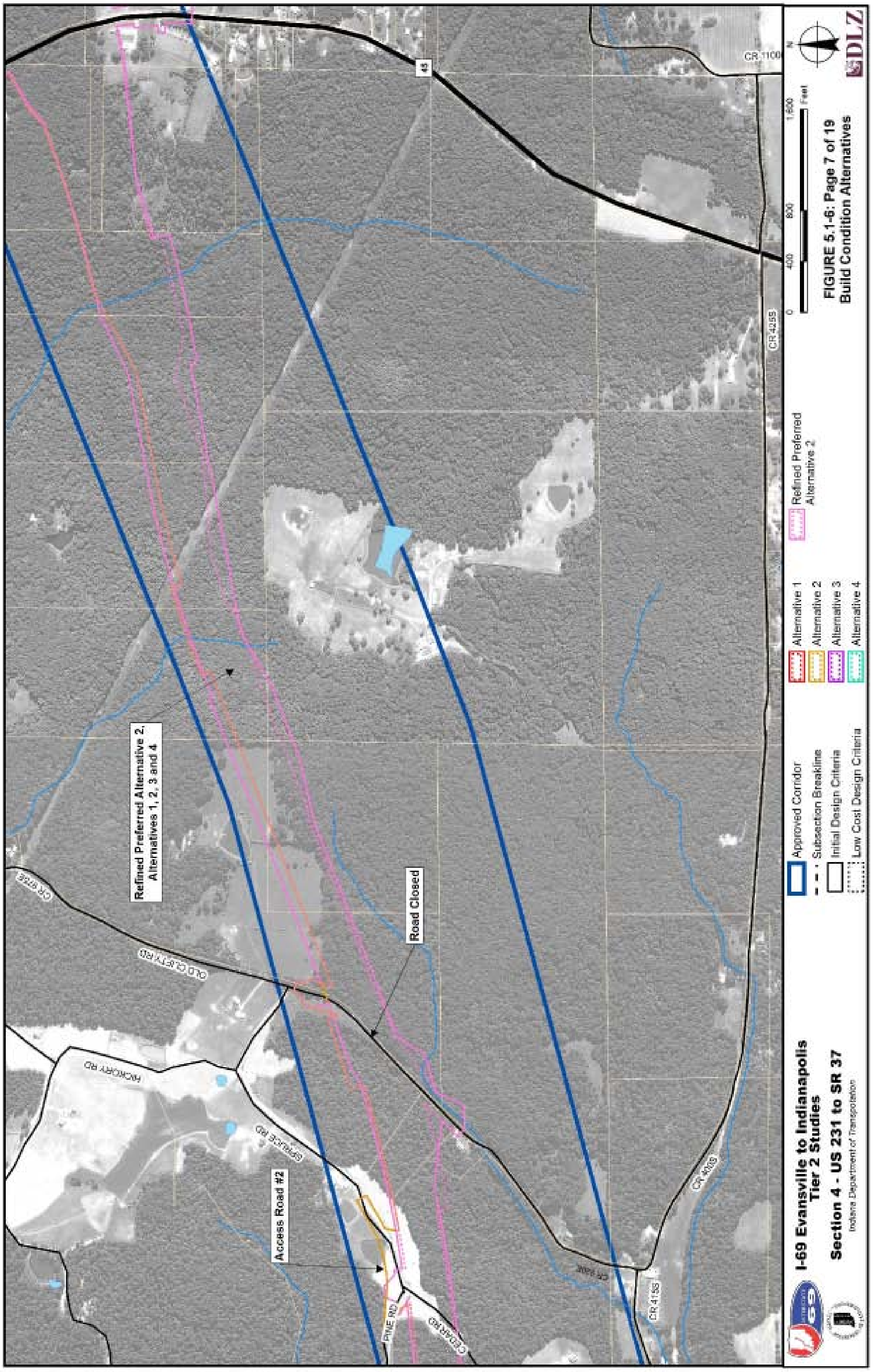


FIGURE 5.1-6: Page 7 of 19
Build Condition Alternatives
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred
Alternative 2
Refined Preferred Alternative 2,
Alternatives 1, 2, 3 and 4
Road Closed
Access Road #2
OLD CLIFTY RD
HICKORY RD
SPRUCE RD
PINE RD
CEDAR RD
CR 425S
CR 400S
CR 415S
CR 1100
45
DLZ

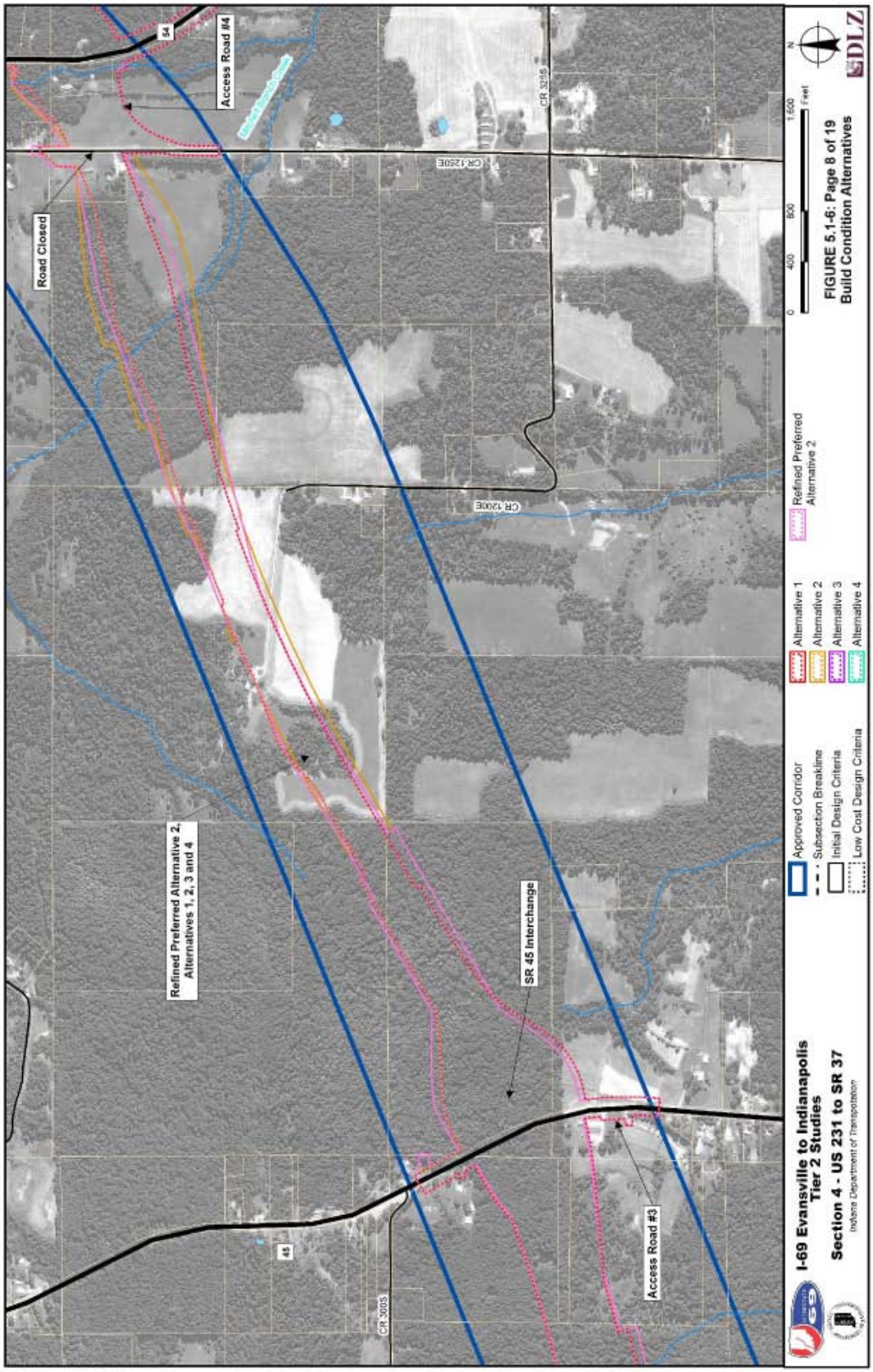


FIGURE 5.1-6: Page 8 of 19
Build Condition Alternatives

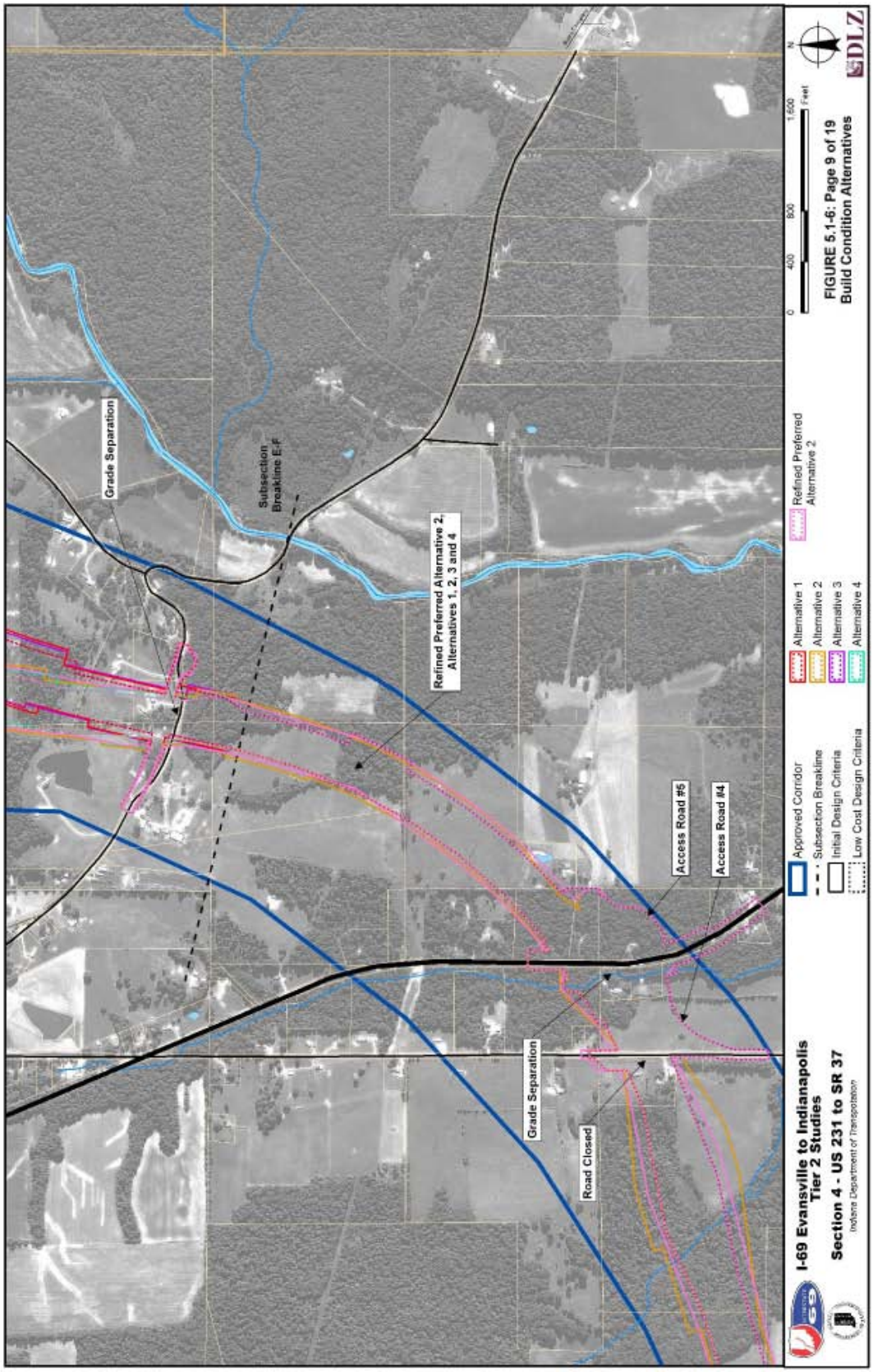
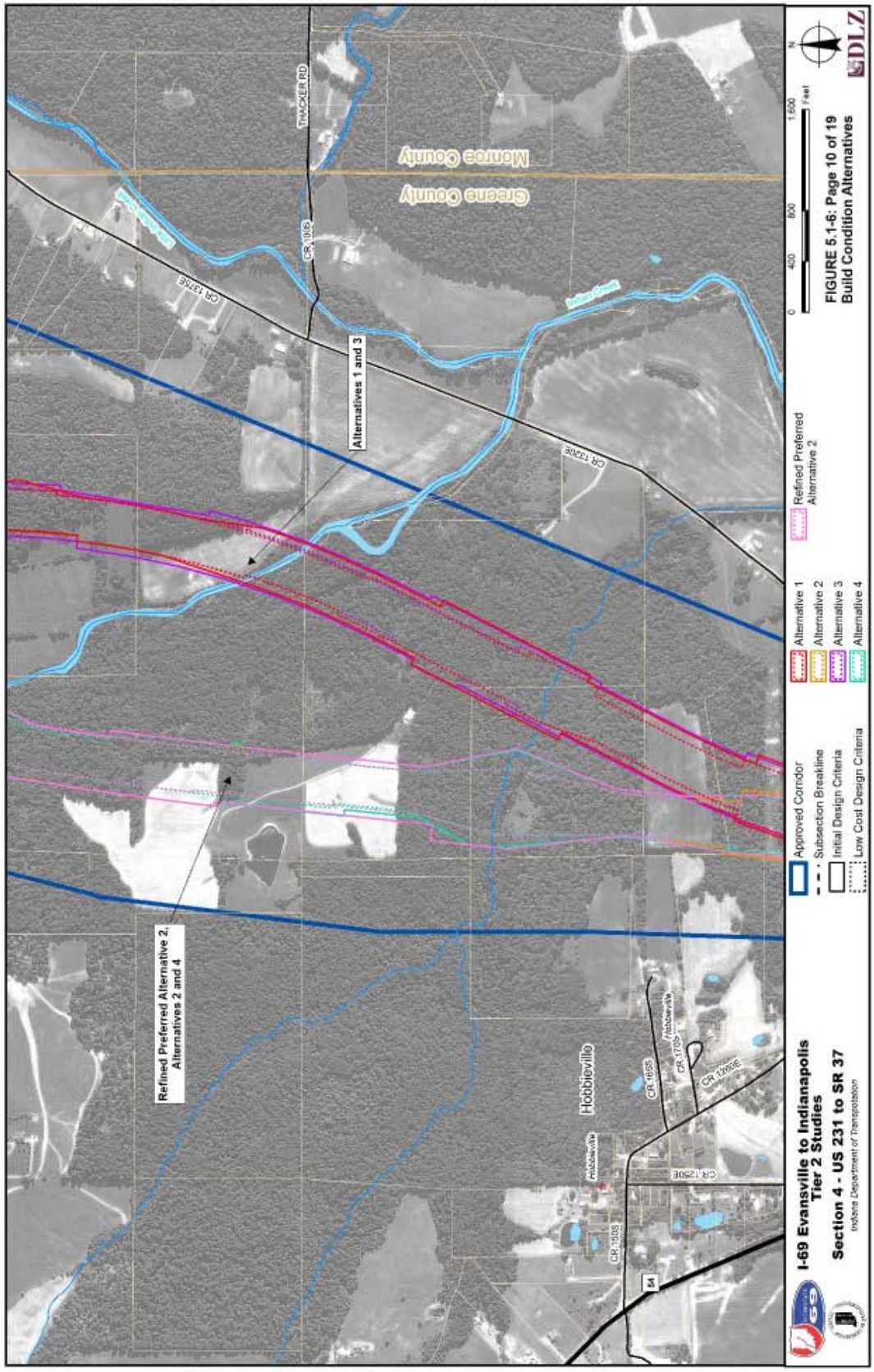
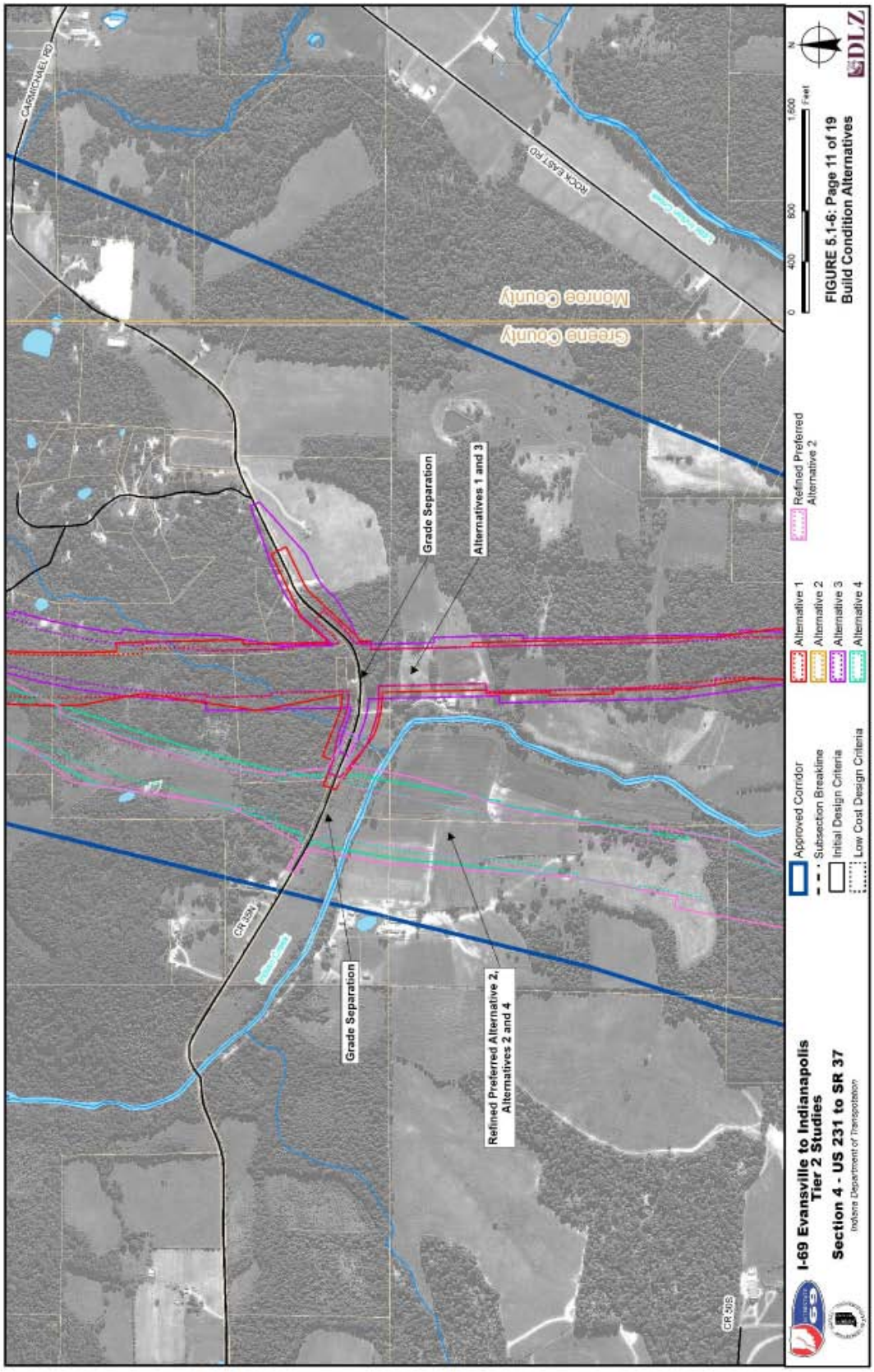
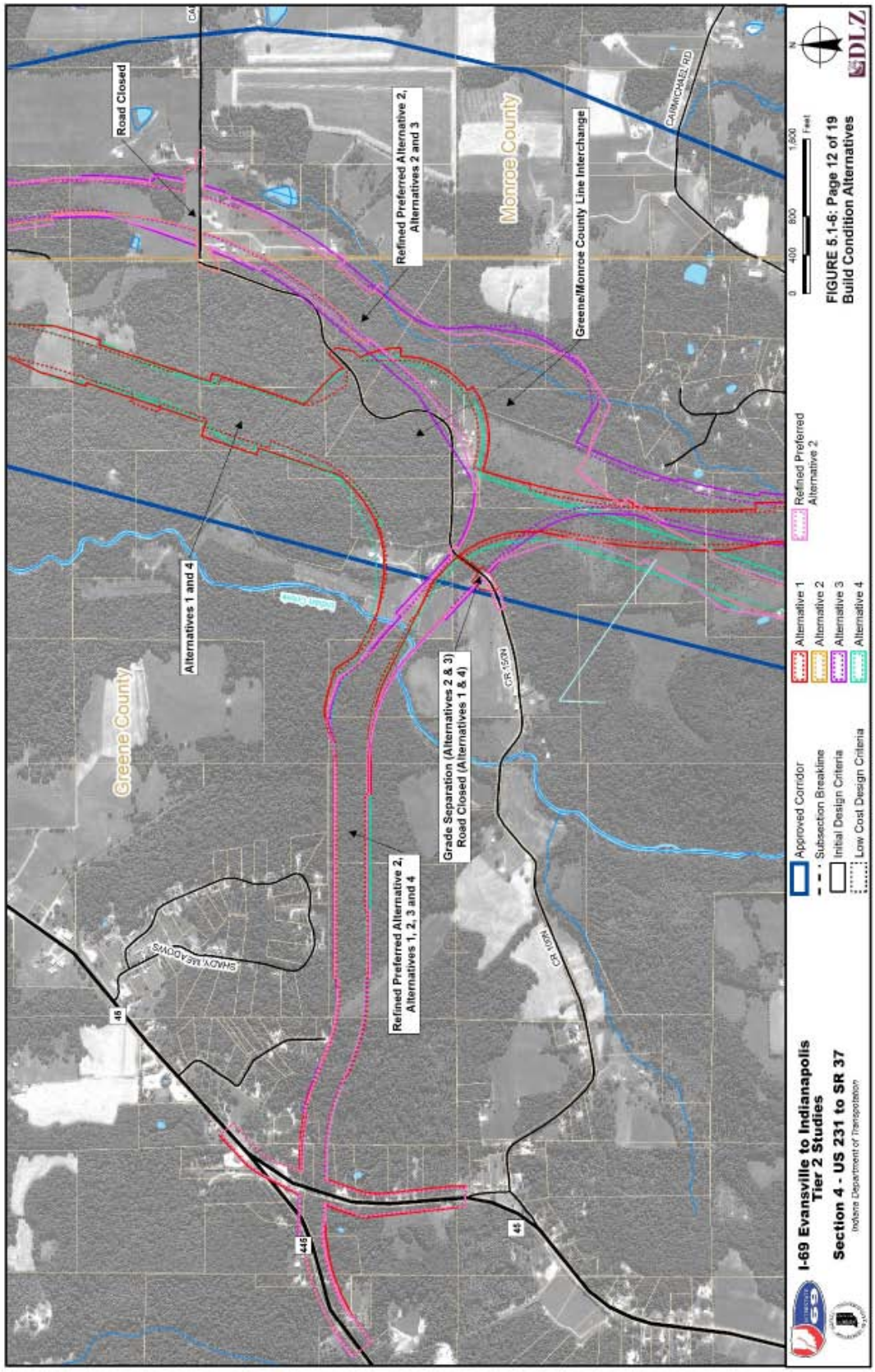


FIGURE 5.1-6: Page 9 of 19
Build Condition Alternatives


Refined Preferred Alternative 2, Alternatives 2 and 4
Alternatives 1 and 3
Hobbieville
Greene County
Monroe County
THACKER RD
CR 1000S
CR 1275E
CR 1250E
CR 1100E
CR 1050E
CR 1000S
CR 1100S
CR 1150S
CR 1175S
CR 1200E
54
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 10 of 19
Build Condition Alternatives
DLZ


CARMICHAEL RD
ROCK EAST RD
Monroe County
Greene County
Grade Separation
Alternatives 1 and 3
Grade Separation
Refined Preferred Alternative 2, Alternatives 2 and 4
CR 13N
CR 50S
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 11 of 19
Build Condition Alternatives
DLZ


Road Closed
Refined Preferred Alternative 2, Alternatives 2 and 3
Monroe County
Greene/Monroe County Line Interchange
CARMICHAEL RD
Alternatives 1 and 4
Greene County
Grade Separation (Alternatives 2 & 3)
Road Closed (Alternatives 1 & 4)
CR 150N
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
SANDY MEADOWS
CR 100N
48
46
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 12 of 19
Build Condition Alternatives
DLZ

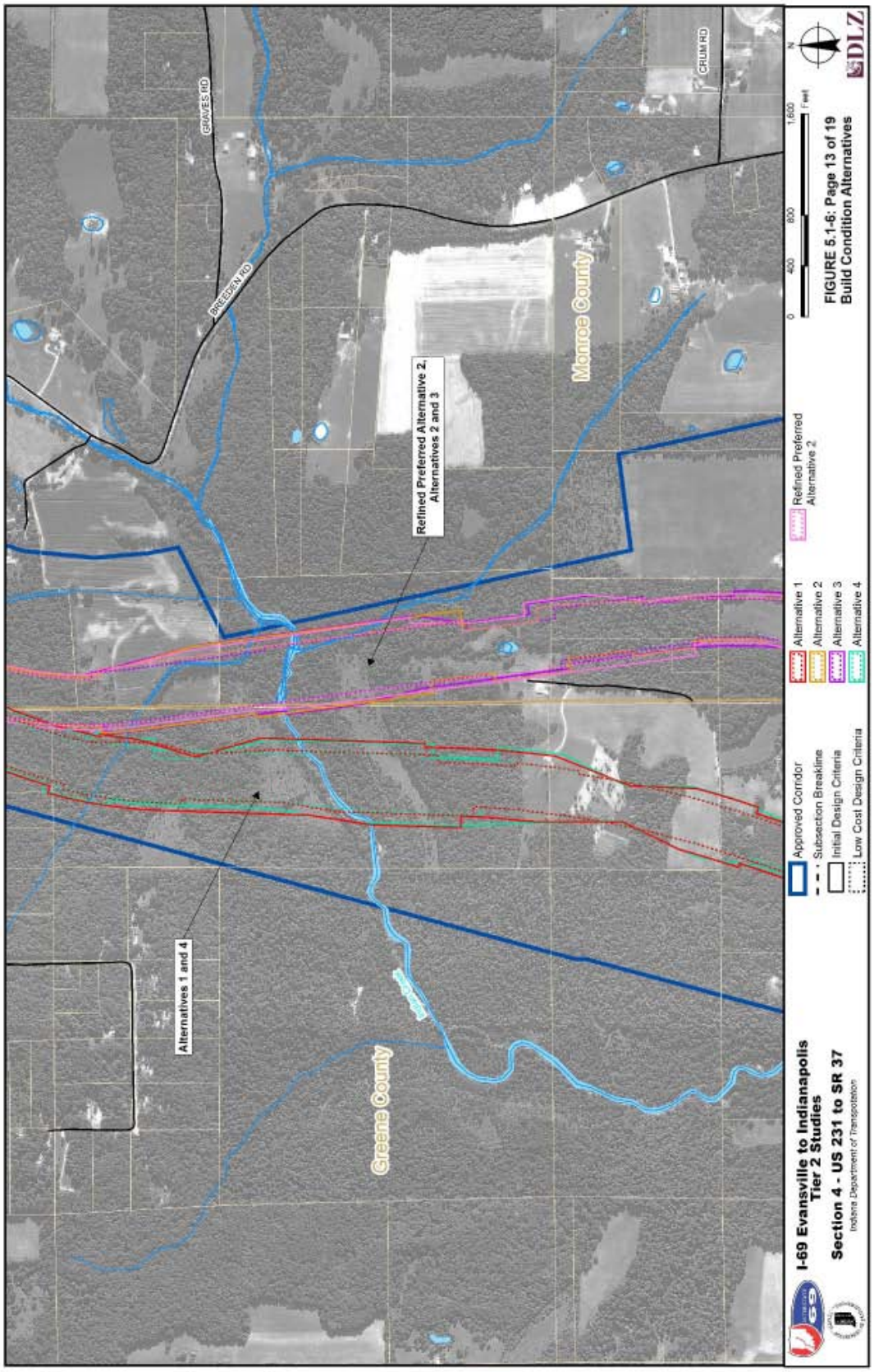
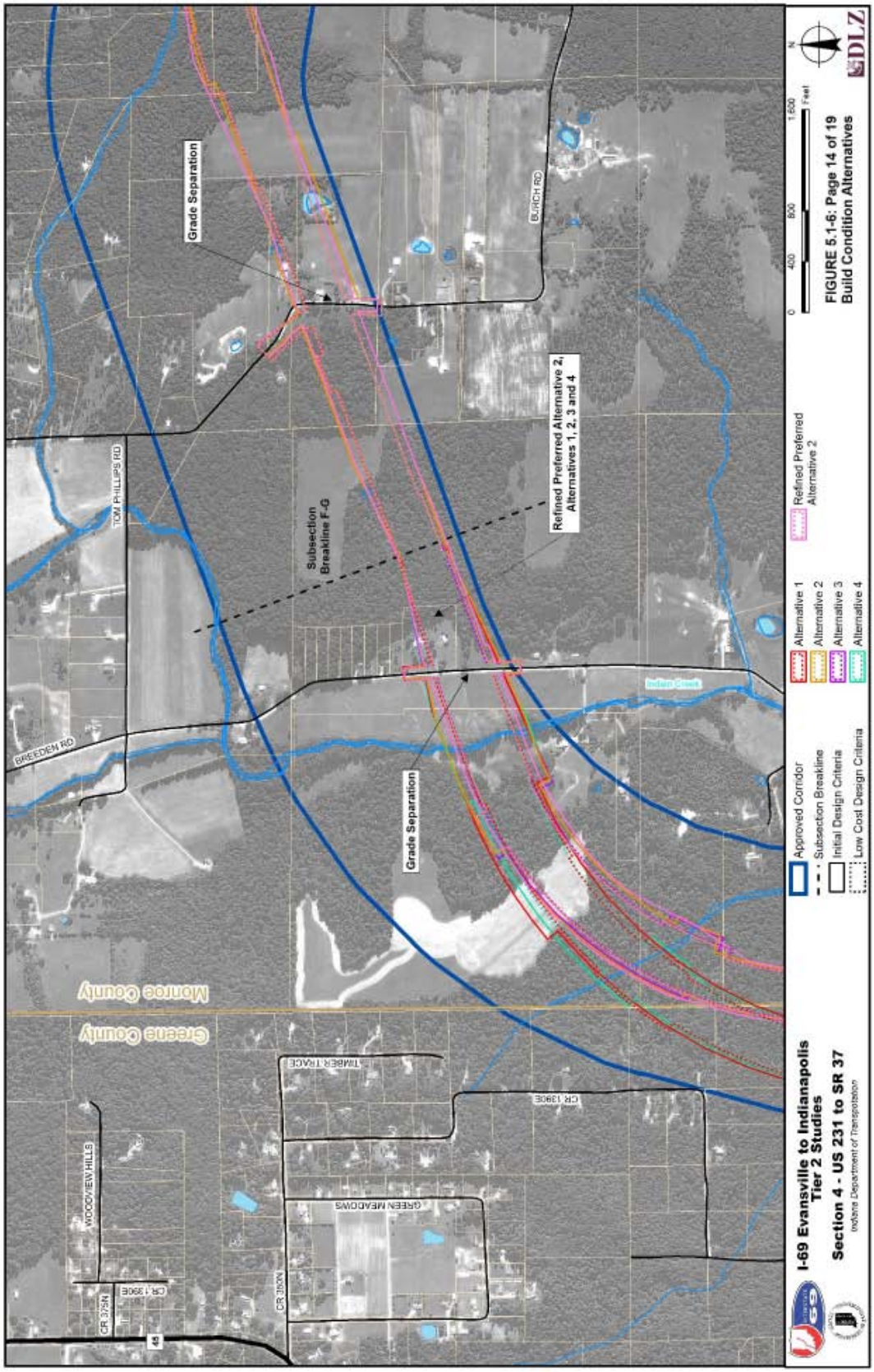


FIGURE 5.1-6: Page 13 of 19
Build Condition Alternatives


Grade Separation
Grade Separation
Grade Separation
Subsection Breakline F-G
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
BUNCH RD
TOM PHILLIPS RD
BREEDEN RD
Indian Creek
Monroe County
Greene County
TIMBER TRACE
CR 1390E
GREEN MEADOWS
WOODVIEW HILLS
CR 375N
CR 1390E
CR 370N
48
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 14 of 19
Build Condition Alternatives
DLZ

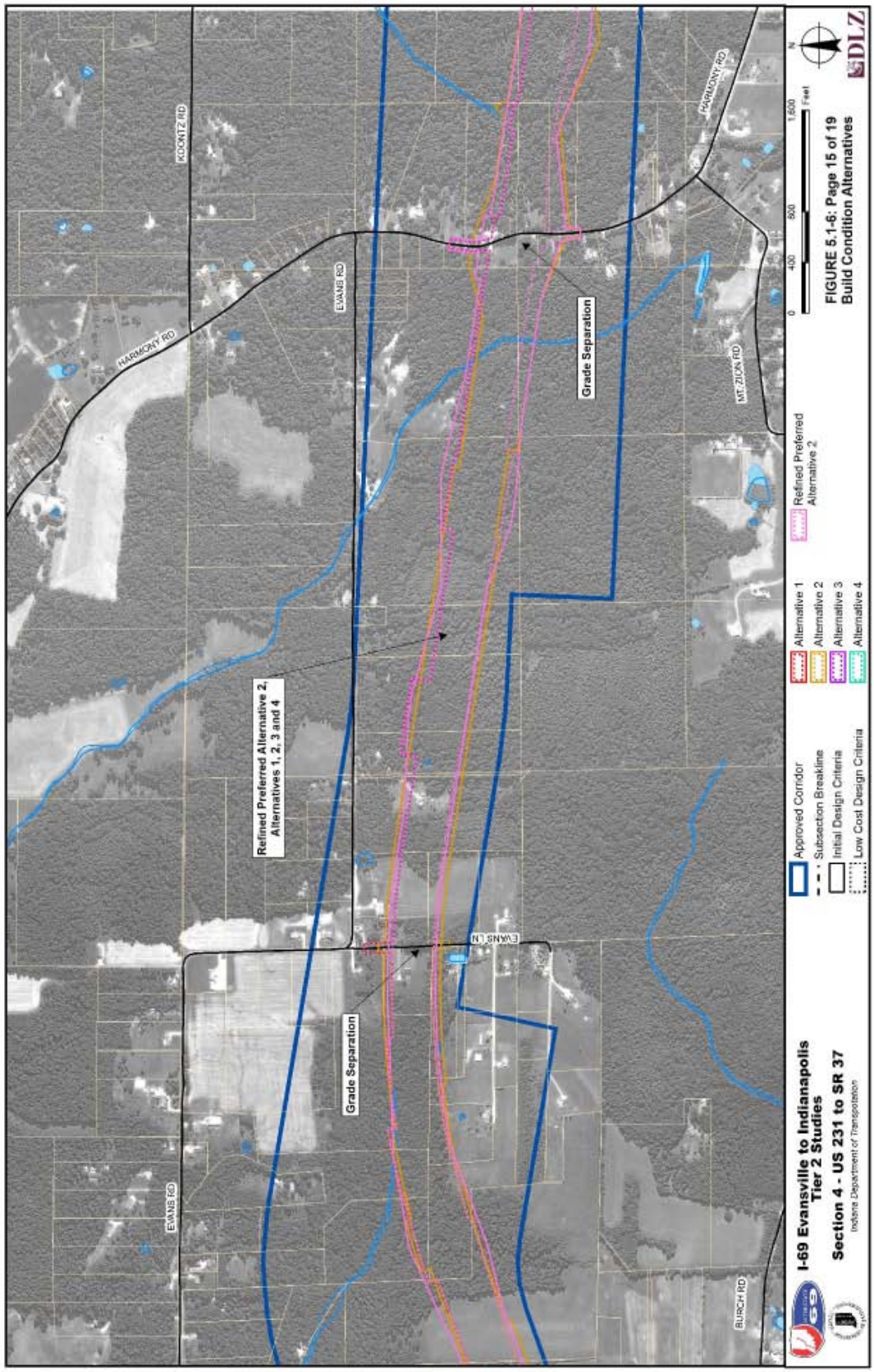
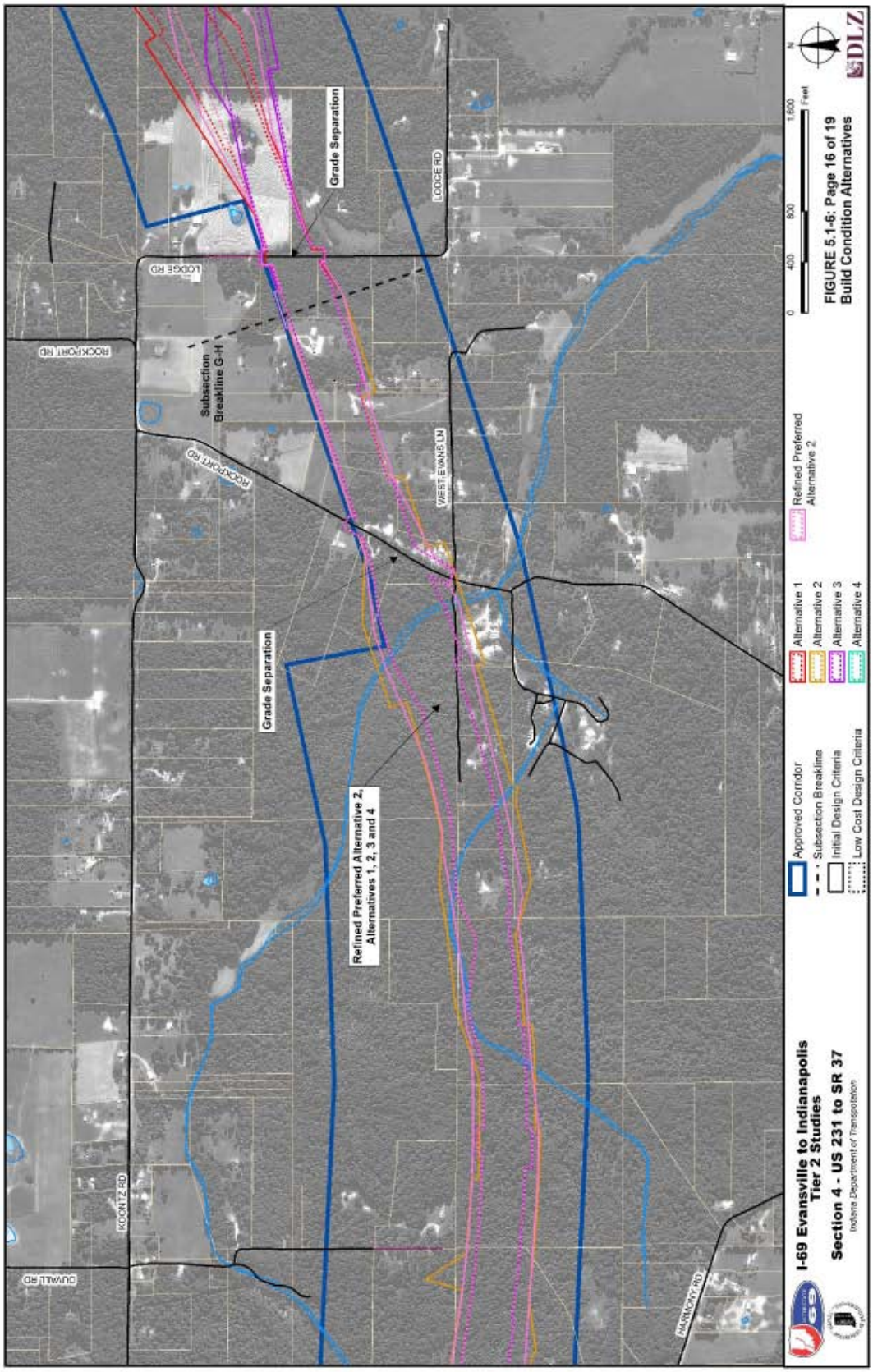


FIGURE 5.1-6: Page 15 of 19
Build Condition Alternatives


Grade Separation
LODGE RD
LODGE RD
ROCKPORT RD
Subsection Breakline G-H
ROCKPORT RD
WEST EVANS LN
Grade Separation
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
KOONTZ RD
DUMALL RD
HARMONY RD
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 16 of 19
Build Condition Alternatives
DLZ

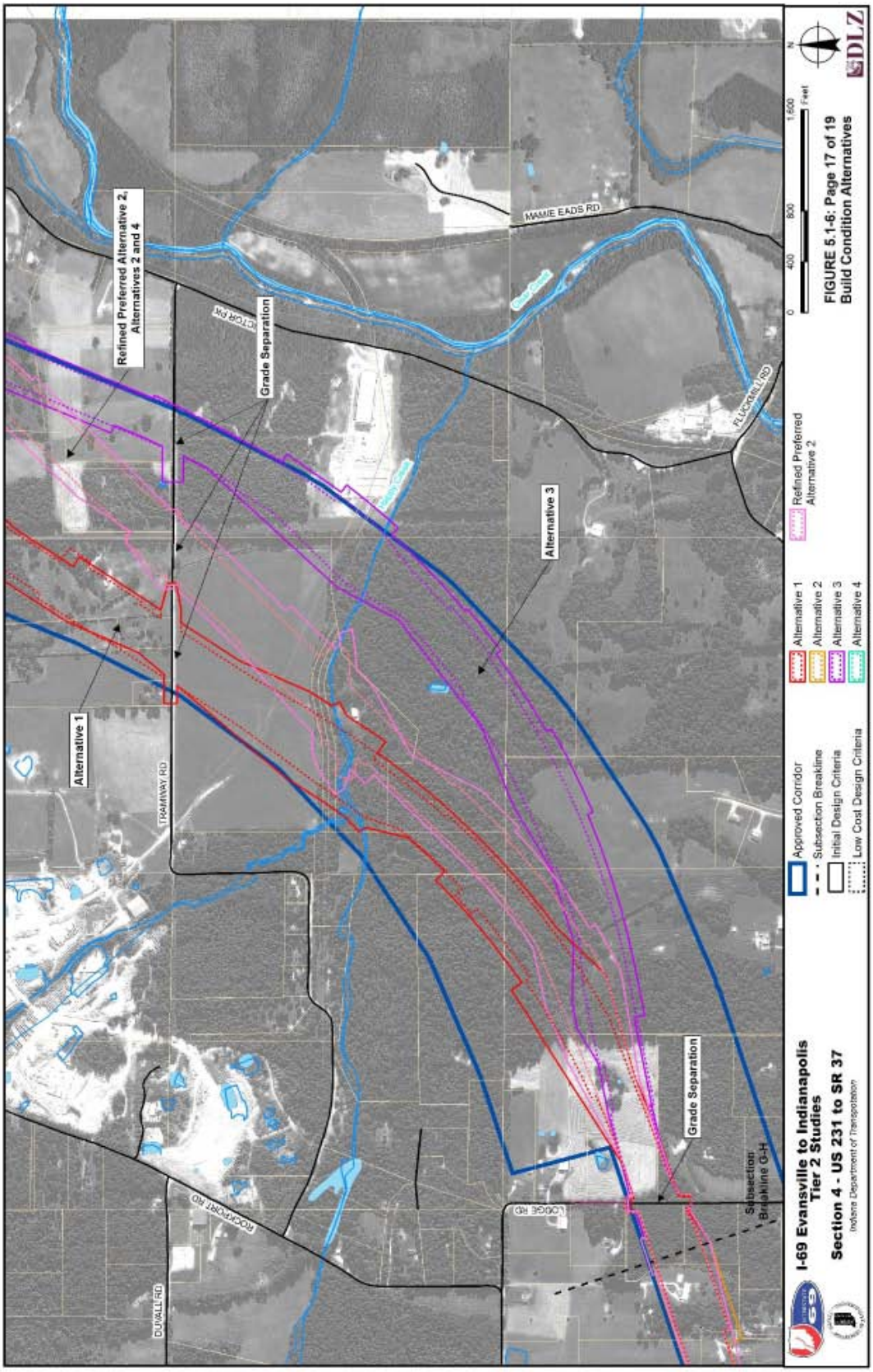
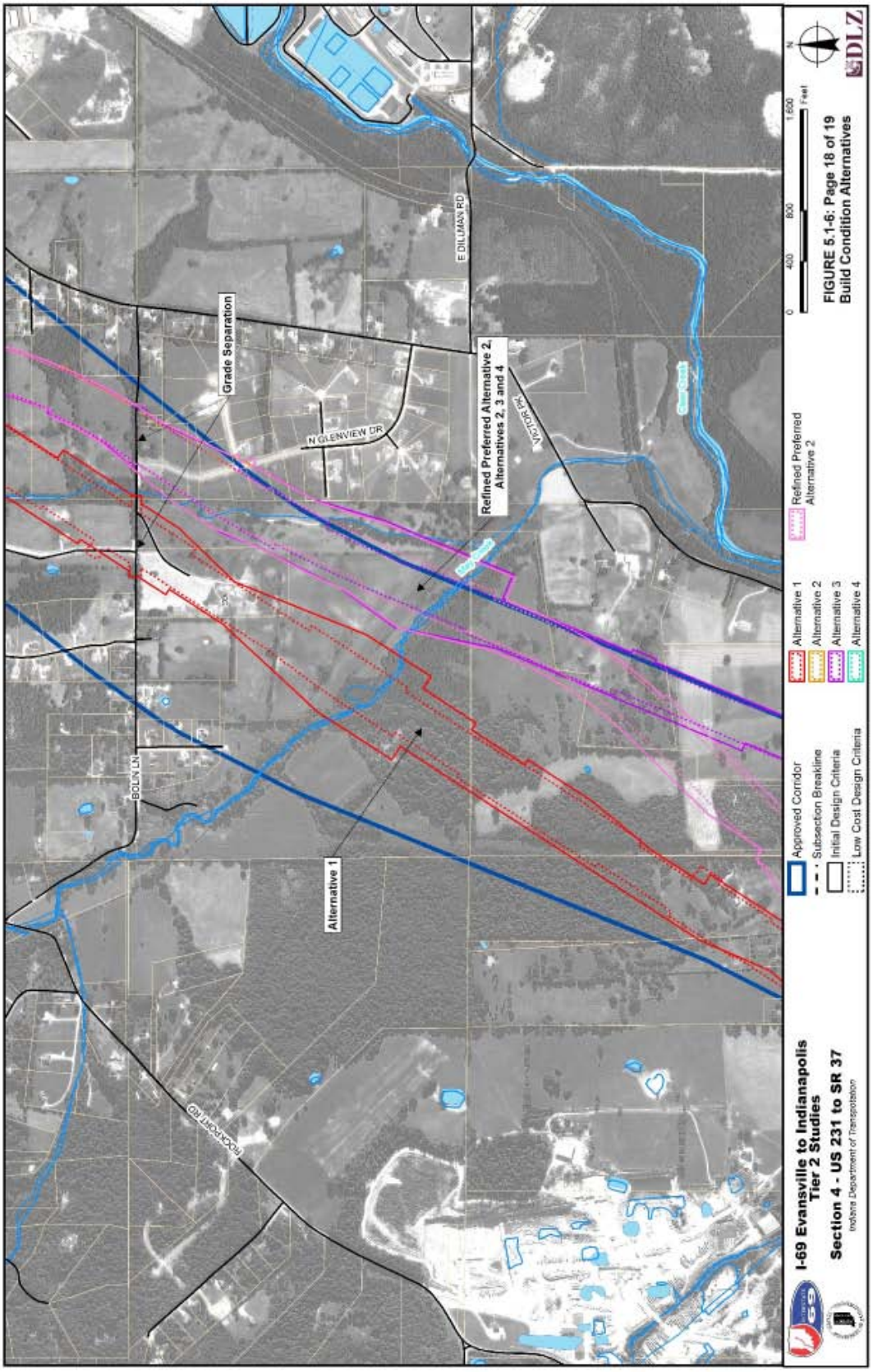


FIGURE 5.1-6: Page 17 of 19
Build Condition Alternatives


Grade Separation
Refined Preferred Alternative 2, Alternatives 2, 3 and 4
Alternative 1
BOLIN LN
N GLENVIEW DR
E DILLMAN RD
VISTOR PK
ROCKPORT RD
Approved Corridor
Subsection Breakline
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 400 800 1,600 Feet
N
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.1-6: Page 18 of 19
Build Condition Alternatives
DLZ

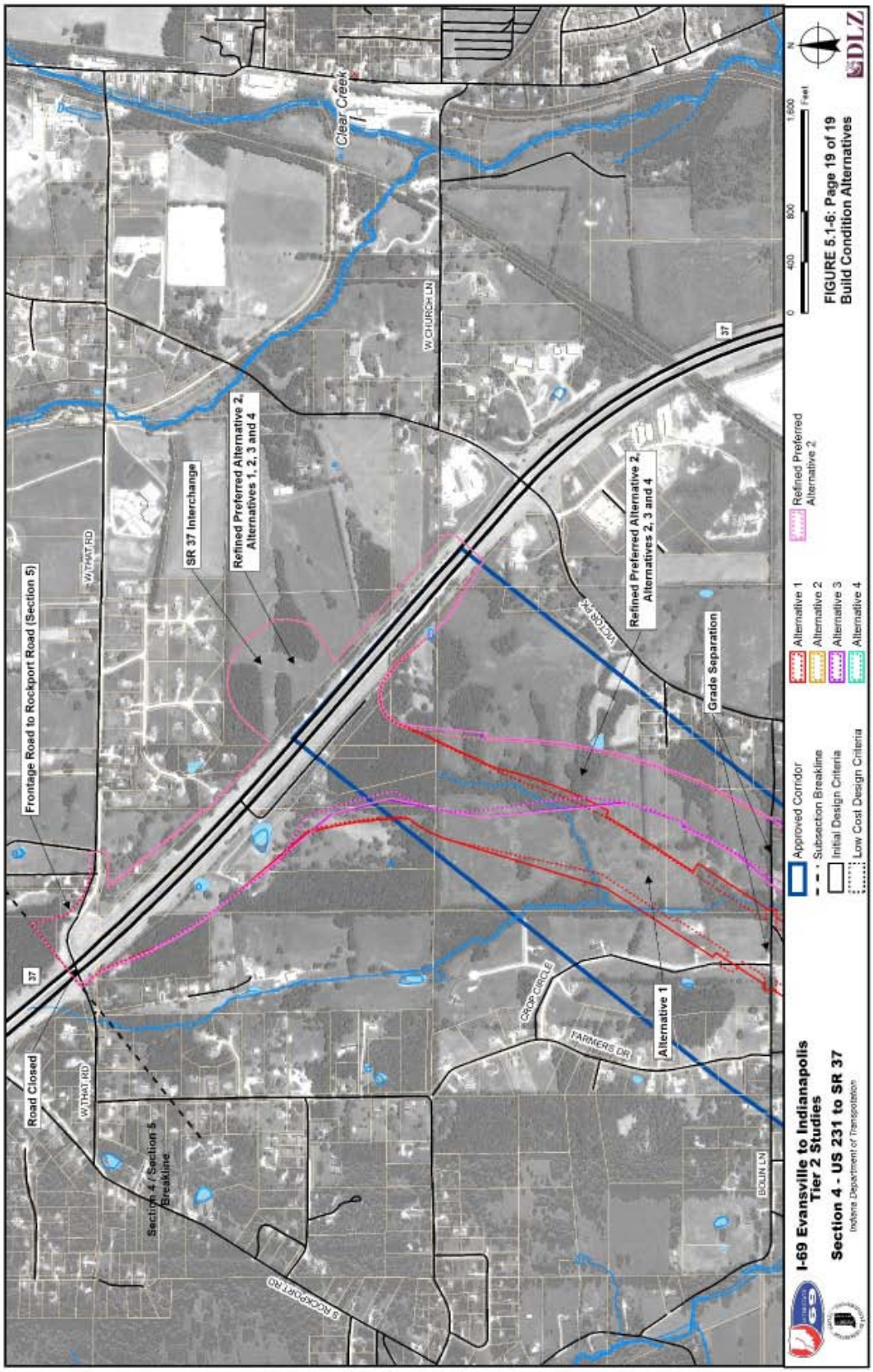


FIGURE 5.1-6: Page 19 of 19
Build Condition Alternatives

5.2 Social Impacts

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Sections 5.2.1 through 5.2.5 – Added information on the Refined Preferred Alternative 2.
- Section 5.2.3.1 – Correction to note that Greene County Census Tract 9553-BG 2 has a higher percentage of households with individuals aged 65+ than the State of Indiana, and corrected reference to **Table 4.2-5**.
- Sections 5.2.3.1 and 5.2.3.5 – Added discussion of potential Evans Lane closure and **Figure 5.2-3**, (p. 5-65) to show the location of the potential Evans Lane neighborhood relocations.
- Sections 5.2.3.2 and 5.2.5 – Updated business displacements in the text and **Tables 5.2-2 and 5.2-3**.
- Sections 5.2.3.2 and 5.2.5 –Updated information on the anticipated relocation of a business under the initial design criteria alternatives.
- Section 5.2.3.7 and 5.2.4 – Updated information on potential Unique Relocation Situations to acknowledge that Unique Relocation Situations may be anticipated with any build alternative.
- Section 5.2.4 – Correction of institutional displacement potential.

5.2.1 Introduction

The construction of the Section 4 portion of I-69 could have both positive and negative social impacts on communities directly affected by the new highway. This chapter discusses residential, commercial, and institutional displacements, along with the availability of replacement housing and replacement commercial and farm property. This section also discusses likely or foreseeable impacts on local neighborhoods and community cohesion. Community cohesion is the degree to which local residents have a sense of belonging to their community or neighborhood.

With any large highway project, one of the main potential impacts is the relocation of households and businesses. People often find the process of land acquisition difficult or emotionally unsettling. Also, the relocation of households, businesses, and community facilities can negatively affect the normal functions of a community. Further, relocating households from a neighborhood can reduce the level of social support and neighbor-to-neighbor interaction. This in turn reduces the cohesiveness of the community or neighborhood.

The removal of businesses and institutions can result in the loss of essential services on which residents rely and can reduce the sense of community in the subject area. Refined Preferred Alternative 2 and Alternatives 1, 2, and 4 would displace four businesses under the low-cost

design criteria. Alternative 3 would displace five businesses under the low-cost design criteria and six businesses under the initial design criteria. Under the initial design criteria Refined Preferred Alternative 2 would displace four businesses and Alternatives 1, 2 and 4 would displace five businesses. Refined Preferred Alternative 2 is the Section 4 Preferred Alternative.

Numerous community outreach activities have been held during the development of this project. Discussions with local residents and communities within the immediate project area have included ways to minimize the impacts resulting from the construction of I-69. The needs of the larger area of Southwest Indiana for jobs, economic vitality, improved mobility, and safety must be evaluated with respect to the potential direct impacts on individual property owners and local communities.

5.2.2 Methodology

Preliminary right-of-way was developed for the five Section 4 alternatives using two sets of design criteria – initial design criteria and low-cost design criteria (see Section 5.1, *Introduction and Methodology*). Because of cut and fill conditions, conceptual profiles, typical roadway sections, and other factors specific to the two different design criteria, right-of-way widths will vary from about 300 feet to 800 feet along the five alternatives that include the Refined Preferred Alternative 2. As such, the number of displacements will also differ along the five Section 4 alternatives.

GIS tools were used to assess the impacts of the alternatives under consideration. Local service roads have been incorporated into the alternatives in some locations where landlocked parcels would otherwise have been created or existing access would have been severed, and the impacts presented include the impacts associated with those local service roads. During final design, some local service roads may prove to not be cost-effective,[1] and those service roads would then not be constructed and the landlocked parcels would be acquired. Parcels acquired in this manner can often be sold to an adjacent landowner, thereby allowing the existing land use to continue.

Efforts were made to minimize relocation impacts during development of the Alternatives. The relocation estimates are based on the alignments for each alternative and the development of interchange ramps/loops, access roads, and crossroad overpasses that may extend beyond the approved corridor (as permitted by the Tier 1 ROD). Houses and businesses were located on aerial photos and then field checked for accuracy. Recently-constructed structures not shown on aerials were noted and counted in the relocation totals if they were likely to be impacted.

Public input was sought (see Section 11.3, *Public and Community Outreach*) to understand access issues related to I-69 that could impact area residents, farm operations, and businesses. Residences and residential clusters that could lose direct access to an existing roadway were

[1] A local service road is considered "cost effective" if the cost of providing it is less than the cost of purchasing the property and relocating the residence or business.

evaluated to determine whether it was feasible to provide local access. Frontage roads will be re-evaluated in final design as a means to maintain access.

Right-of-way and relocation costs include right-of-way costs for acreage and improvements required for actual construction, relocation costs, costs for acquiring structures and improvements resulting from lost access, and administrative fees. These costs are estimates only and are based on a field survey. Utility relocation costs have not been included in these estimates; these are included within construction costs (see **Table 6-10**). These costs are for comparison purposes only. They would change after more precise right-of-way requirements have been determined during design.

5.2.3 Potential Displacements

The relocation planning for potential displacements resulting from this federally-funded project will be completed in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act), as amended, 49 CFR (Code of Federal Regulations) 24, and Title VI of the Civil Rights Act of 1968. The following sections discuss potential residential, commercial and institutional displacements. The mitigation section further discusses the rights of displaced residents and businesses under the Uniform Act.

5.2.3.1 Residential Displacements

The total number of residences that would be acquired for right-of-way ranges from 62 to 73 using the low-cost design criteria and from 67 to 77 using the initial design criteria, depending on the alternative selected. All residences are single-family dwellings or mobile homes. Most homes in each alternative are one-story to two-story brick or frame houses or mobile homes, with an occasional home with exterior vinyl construction. Furthermore, they appear to range in age from approximately 1 year to over 100 years; the conditions of the residences range from fair (in need of minor repair) to excellent (new or like new), with the majority being in the good category (in need of painting and or other cosmetic improvements); the properties on which they are located appear well maintained. The majority of the associated structures (garages, sheds, barns, etc.) appear to be in good condition, though several dilapidated (not structurally sound or major repairs needed) structures were observed.

A residence was shown as acquired if it was located within the project right-of-way or if reasonable access to the property could not be maintained. The displacement of residences is estimated based on anticipated right-of-way requirements, subject to revision during the design phase of project development. The greatest number (concentration) of relocations would be at the Greene/Monroe County Line interchange where the large footprint of the interchange would result in similar impacts, regardless of which alternative is considered. **Table 5.2-1** shows the potential number of residential relocations for each alternative by the estimated market value ranges of the residences and associated improvements. The dollar values include the cost of a typical home site and, where applicable, the estimated cost to acquire other associated improvements within the right-of-way. Such improvements include garages, sheds, and farm-related structures (barns, silos, etc.). Full and partial takings were estimated based on the percentage of the parcel impacted by an alternative.

Subsequent to the completion of the DEIS, the residential relocations were updated. As a result of further design refinements made to each Subsection Alternative for the FEIS, a residential relocation in the $200,000-$250,000 cost range was added for each alternative and a residential relocation in the $150,000-$200,000 cost range was removed for each alternative. In addition, one residence in the $50,000-$100,000 range was added to each DEIS Alternative and the estimated value of one residence was increased from $50,000 to $125,000. These changes are shown in **Table 5.2-1**. Under both the low-cost and initial design criteria, the total estimated residential displacements for DEIS Alternatives 1, 2, 3, and 4 increased by one.

Table 5.2-1: Estimated Market Value Ranges of Residences and Associated Improvements

Cost Ranges	Number of Residences per Alternative									
	Refined Preferred Alt. 2		1		2		3		4	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
$ 0 – $ 49,999	11	11	6	6	7	7	7	7	6	6
$ 50,000 – $ 99,999	18	19	19	20	15	16	16	17	18	19
$ 100,000 – $ 149,999	18	20	19	22	17	20	20	23	16	19
$ 150,000 – $ 199,999	12	12	12	12	11	11	12	13	9	9
$ 200,000 – $ 249,999	5	6	6	6	5	6	6	7	6	7
$ 250,000 – $ 299,999	6	6	8	8	6	6	7	7	8	8
$ 300,000 and above	1	1	3	3	1	1	1	1	2	2
Total	**71**	**75**	**73**	**77**	**62**	**67**	**69**	**75**	**65**	**70**

Source: Monroe County Assessors Data - Net Assessed Value, and DLZ Indiana professional estimations (based on field observations).

Laws and programs have been developed to ensure adequate consideration and compensation for persons whose property is required for the project so that the property acquisition process is as equitable as possible. These laws and programs include the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601) and INDOT's relocation program and relocation advisory assistance program, which satisfies the requirements of Title VI of the Civil Rights Act of 1964. While preliminary engineering for each Alternative has been designed to minimize impacts to existing houses and businesses, some property takings are necessary.

Alternative 1 has an estimated 73 to 77 residential displacements. Concentrations of residential relocations typically are an indicator of disruptions to the community. Alternative 1 would displace two residences from the Clifty Hills neighborhood, five residences from the residential cluster along SR 54/CR 1250E, two residences from the Timber Trace neighborhood, and one residence from the Farmers Field Acres neighborhood. In addition, Alternative 1 would directly impact undeveloped residential lots in the Clifty Hills and Farmers Field Acres neighborhoods.

Alternative 2 has an estimated 62 to 67 residential displacements. Alternative 2 would displace two residences from the Clifty Hills neighborhood and five residences from the residential cluster along SR 54/CR 1250E. In addition, Alternative 2 would directly impact undeveloped residential lots in the Clifty Hills and Rolling Glen Estates neighborhoods.

Alternative 3 has an estimated 69 to 75 residential displacements. Alternative 3 would displace two residences from the Clifty Hills neighborhood, five residences from the residential cluster along SR 54/CR 1250E, and two residences from the Whippoorwill neighborhood. In addition, Alternative 3 would directly impact undeveloped residential lots in the Clifty Hills and Rolling Glen Estates neighborhoods.

Alternative 4 has an estimated 65 to 70 residential displacements. Alternative 4 would displace two residences from the Clifty Hills neighborhood, five residences from the residential cluster along SR 54/CR 1250E, and two residences from the Timber Trace neighborhood. In addition, Alternative 4 would directly impact undeveloped residential lots in the Clifty Hills and Rolling Glen Estates neighborhoods.

Refined Preferred Alternative 2 has an estimated 71 to 75 residential displacements. This alternative would displace two residences from the Clifty Hills neighborhood, and five residences from the residential cluster along SR 54/CR 1250E. In addition, Refined Preferred Alternative 2 would directly impact undeveloped residential lots in the Clifty Hills and Rolling Glen Estates neighborhoods.

The DEIS included a grade separation at Evans Lane (Subsection 4G). It also included an option to consider closing Evans Lane at I-69 and relocating all ten residences from the Evans Lane neighborhood south of the I-69 mainline. Based upon comments received from local governments, public organizations, and public individuals on the DEIS and additional review of environmental impact, traffic, engineering and cost factors, it was decided that Evans Lane would be closed at I-69 (see Section 5.6.3.2 and **Appendix Z**, *Documentation of Local Access Decisions*). The total residential displacement for Refined Preferred Alternative 2 includes these ten additional relocations from the Evans Lane neighborhood (See **Figure 5.2-3**, p. 5-65).

Household Characteristics

As noted, residential displacements in Section 4 would range from 62 to 77 residences, depending on the alternative and design criteria. All residences are considered to be single-family, owner-occupied housing for purposes of estimating relocation costs. Estimated market values range from less than $50,000 to over $300,000 with the majority estimated to be less than $200,000.

Data from the U.S. Census Bureau (2000) indicate that of the 4,241 households[2] located within the census blocks potentially impacted by any of the five alternatives, 3,741 (81%) dwellings are

[2] "Selected Appendices: 2000, Summary Social, Economic, and Housing Characteristics, 2000 Census of Population and Housing," issued in June 2003, states: "A household includes all the people who occupy a housing

owner occupied, and 379 dwelling units were vacant. The average household size is two individuals. Of these, 39% are occupied by families of which 81% are married couples. Because the population in the Study Area is almost exclusively white - Census Block Group populations range from 96.9% to 99.0% white (see **Table 4.2-4**) - it is assumed that this racial makeup would be representative for the households that would potentially be relocated.

According to census data, of the ten census block groups analyzed in the Study Area, only Greene County Census Tract 9553-BG 2 has a higher percentage of households (23%) with individuals aged 65+ than the state's 22.5% (see **Table 4.2-5**). While it is probable that residential relocations would include some elderly persons, there would not be a disproportionate impact on the elderly. None of the alternatives impact any group housing for seniors, or residential areas or developments with a concentration of elderly residents. Contact with residents within the corridor during various public involvement activities has indicated the population within the corridor is a mix of all age groups.

Based on the data presented in Section 4.2.1 (see **Table 4.2-9**), the weighted average median household income for the Study Area comprised of the ten Study Area Block Groups (BG) ranges from $29,619 to $53,929. The percentage of individuals in the Study Area living below the poverty level ranges from 0.0% to 15.8% (see **Table 4.2-8**). The national and state percentages of individuals living below the poverty level are 12.4% and 9.5%, respectively. In the Block Groups of the Study Area where the national and state percentages are exceeded, up to a maximum of two residences are within the right-of-way of one or more alternatives. A field review indicated that the two residences in the Block Groups of the Study Area that exceed the national and state percentages are median priced homes, and there is no indication that their residents are living below the poverty level. There are no concentrations of low-income residences in the other Block Groups of the project corridor and no visible evidence that residents who could be impacted by the project are living below the poverty level. No disproportionate impacts to low-income populations are anticipated as a result of the project. See Section 5.8, *Title VI / Environmental Justice*, for a discussion of the effects of the project in Section 4 on minority and low-income populations.

5.2.3.2 Commercial and Institutional Displacements

Businesses

The project corridor in Section 4 is rural and traverses mainly forest land and to a lesser degree, farmland. There would be impacts to farm operations due to the acquisition of cultivable land, pasture, and/or farm structures (barns, silos, etc); and the severance of farm fields and county roads by I-69. Small farming operations predominate in the Section 4 Community Impact Assessment Study Area. Most of these farming operations are part-time family farms. There are

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unit. (People not living in households are classified as living in group quarters.) A housing unit is a house, an apartment, a mobile home, a group of rooms, or a single room occupied (or if vacant, intended for occupancy) as separate living quarters…. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated people who share living quarters."

no major farming operations or agri-businesses in this Study Area. Where farm structures (grain bins, barns, etc.) are acquired, it may be possible to re-establish farming operations on the portion of the property not within the right-of-way. Where the project traverses farmland, farm operations could be disrupted. For the majority of farms, however, it is anticipated the disruption would be short-term and the permanent cessation of farming operations largely would be confined to agricultural land taken out of production. The potential impacts of the project on farmland and farm production are discussed in Section 5.4, *Farmland Impacts* and 5.24, *Indirect and Cumulative Impacts*.

For the purpose of evaluating potential business relocation impacts in this section on a consistent and conservative (most potential displacements) basis, interchanges were assumed at SR 45, the Greene/Monroe County Line (South Connector Road), and SR 37. Please refer to Chapter 6, *Comparison of Alternatives*, Section 6.3*, Comparison of Interchanges*, where the decision between the North and South Connector Roads is made. Four commercial displacements are anticipated under both the initial design criteria and low-cost design criteria for Refined Preferred Alternative 2. Alternatives 1, 2 and 4 would displace four commercial businesses under the low-cost design criteria and a fifth commercial business under the initial design criteria. Alternative 3 would displace five businesses under the low-cost design criteria and six businesses under the initial design criteria. **Table 5.2-2** lists the business displacements that would occur under the five alternatives and the interchange scenario that includes SR 45, the Greene/Monroe County Line, and SR 37 interchanges with I-69. A signalized intersection at SR 37, which is proposed as an interim improvement until the full SR 37 interchange is constructed at a later time, will not displace any businesses.

No billboards will be displaced in Section 4. Please refer to Section 5.3, **Figure 5.3-3** (p. 5-119), *Land Use and Community Impacts*, for the location of the affected businesses. Owners' concerns or comments about the project, expressed through the surveys and/or by comment forms, personal contact with project team members, or other means, are summarized, as are potential impacts (if any) as a result of the project. **Figure 5.2-1** (p. 5-61) is a copy of they survey, showing the survey questions. Additional information about the business surveys, including a tabulated summary of the survey responses, is in **Appendix A**, *Business Needs Survey*.

The following businesses will be displaced by one or more of the alternatives:

- **JM Electronics:** This electronics service and repair business is located on the east side of SR 45 just south of the SR 45/SR 445 intersection in Greene County. It has been at its current site for 16 years and has 3 full-time employees and 1 part-time employee. Under the initial design criteria and low-cost design criteria, all five alternatives would displace this business for construction of the SR 45/SR445 South Connector Road intersection. This business would not be displaced by the Greene/Monroe County Line interchange North Connector Road or SR 45 only intersection alternatives. The business owners have provided input regarding impacts to the business through visits to the project office, personal communications, and response to the survey. Their response to the Business Needs Survey is included in **Appendix A**. The owners have stated that they would likely relocate the business to a suitable nearby location. There are no zoning restrictions in Greene County to prevent such relocation.

- **Bloomfield State Bank:** This business is located in the southwest corner of the SR 45/SR 445 intersection in Greene County. The bank business has been at its current location for 34 years and employs 15 full-time employees. All five alternatives would displace this business for construction of the SR 45/SR 445 South Connector Road intersection. This business would not be displaced by the Greene/Monroe County Line interchange North Connector Road or SR 45 only intersection alternatives. The president of the company has provided input regarding impacts to the business through response to the survey and personal communications. His response to the Business Needs Survey is included in **Appendix A**. The president of the bank has stated that the bank would likely be relocated to a suitable nearby location. There are no zoning restrictions in Greene County to prevent such relocation.

- **Crossroads Collectibles/Women's Fitness Center:** This business is located in the southeast corner of the SR 45/SR 445 intersection in Greene County. It has been at its current site for 5 years and has 1 full-time employee. All five alternatives would displace this business for construction of the SR 45/SR445 South Connector Road intersection. This business would be displaced under both the initial and low-cost design criteria, but it would not be displaced by the Greene/Monroe County Line interchange North Connector Road or SR 45 only intersection alternatives. The business owner has provided input regarding impacts to the business through response to the survey and personal communications. The owner has stated that they would likely close the business because it is currently operated primarily as a hobby. The owner's response to the Business Needs Survey is included in **Appendix A**.

- **Stillion Sawmill:** This business is located southwest of the Rockport Road/West Evans Lane intersection in Monroe County. It has been at its current site for 29 years and has 4 full-time employees. In the Section 4 Tier 2 DEIS this business was shown as a displacement for all four alternatives under the initial design criteria. This business would be a displacement under FEIS initial design criteria Alternatives 1, 2, 3 and 4. Further development of the right of way for FEIS Refined Preferred Alternative 2 eliminated the need to displace this business for either design criteria (low-cost or initial). **Table 5.2-2** has been updated to include this change for Refined Preferred Alternative 2. The business's owner has provided input through personal communications and visits to the project office. The owner has stated that if the required right of way impacts the property as shown in preliminary plans, the business and an associated residence could not be relocated on the remainder of the affected parcel after I-69 is constructed. The sawmill owner also has stated that, due to difficult economic circumstances, he would likely close the sawmill business and retire if displaced. This business would not be a displacement under Refined Preferred Alternative 2 using either design criteria (low-cost or initial).

- **Pic-A-Chic Farms/Grubb's Catering**: This business is located southeast of the Rockport Road/Lodge Road intersection in Monroe County. It has been at its current site for 31 years and has 4 full-time employees and 11 part-time employees. Under either design criteria (low-cost or initial), all five alternatives would displace this business and two adjacent residences for construction of the mainline alignment. The business's owner has provided input through visits to the project office and the survey. The owner has stated that the business structure would likely be relocated on the remainder of the affected parcel after I-69

is constructed. The owner's response to the Business Needs Survey is included in **Appendix A**.

- **3D Stone, Inc**.: This limestone finishing business is located south of Tramway Road on the west side of Victor Pike in Monroe County. It has been at its current site for 3 years and has 39 full-time employees and 6 part-time employees. Alternative 3 would not directly impact the business structure. However, under Alternative 3, impacts to the business property would eliminate the water reclamation ponds behind the business that receive wastewater from the limestone cutting operations. Refined Preferred Alternative 2 would require a small amount of right of way from the business property, and Alternatives 1 and 4 would not directly impact this property. The business's owner has provided input through personal communications and the survey. The owner has stated that it would not be possible to relocate the reclamation ponds due to the hydraulic gradient conditions required for their function. Therefore, this business is considered a displacement for construction of Alternative 3. In addition, this business is strategically located in the middle of their three biggest limestone suppliers. The owner also stated that the machinery in the plant would be very difficult and expensive to relocate. Furthermore, Monroe County has zoning restrictions in place that may prevent the relocation of this business to a suitable nearby location. The owner's response to the Business Needs Survey is included in **Appendix A**.

The following businesses would be directly impacted by one or more of the alternatives; however, they would not be displaced under any alternative. This text is provided to clarify their circumstances.

- **Petro-Plus & Crossroads Café:** This gas station/convenience store/restaurant business is located in the northwest corner of the SR 45/SR 445 intersection in Greene County. It has been at its current site since 1961 and has 11 full-time employees. Though a small amount of right of way may be required from this business for construction of the Greene/Monroe County Line South Connector Road interchange scenario, none of the five alternatives would displace this business. No right-of-way would be required from this business for the construction of the Greene/Monroe County Line North Connector Road interchange or the SR 45 only interchange scenario. A survey response was received from the business's owner. The owner anticipates that the restaurant business would benefit from increased traffic in the vicinity. The owner's response to the Business Needs Survey is included in **Appendix A**.

- **Fern Hills Club, Inc.:** This private nudist resort is located south of the Rockport Road and West Evans Road intersection in Monroe County. The business is family-owned and operated and has been at its current location for over 62 years. This business has 2 full-time employees and 1 year-round resident. None of the alternatives would displace this business; however, acquisition of right-of-way from the property would be required for the construction of any alternative. The business's owners have provided input regarding impacts to the business through office visits and the survey. The survey states that the construction of I-69 would very negatively affect the business. Warm season activities at the club may attract more than 200 campers and visitors. Privacy and a natural quiet surrounding are critical to their success; however, direct line-of-sight into this nudist resort and increased

noise resulting from the I-69 mainline approximately 200 feet away will adversely affect this business. The owner's response to the Business Needs Survey is included in **Appendix A**.

Institutions[3]

Alternative 3 would displace the Monroe County Indian Creek Township Volunteer Fire Department (VFD) building located on CR 35N (Carmichael Road) within Greene County. Refer to Section 5.3, *Land Use and Community Impacts*, **Figure 5.3-8** (p. 5-150) for the VFD location within the Section 4 corridor. This VFD staffs only one driver on weekdays from 7 AM to 5 PM. The building is a simple pole barn with few amenities. The Indian Creek Township VFD could be relocated to another suitable nearby location. However, there are existing zoning regulations in Monroe County that could possibly prevent the relocation of this institution to another suitable nearby location. There would be no institutions acquired for any other Alternative. Please refer to Section 4.2, *Human Environment*, **Figure 4.2-3** (p. 4-65) for the location of the institutions mentioned in this section.

The only church located within the Section 4 corridor is the Ashcraft Chapel. The Ashcraft Chapel is located in Greene County on CR 880E (Mineral to Koleen Road), just north of CR 425S and east of the town of Koleen. The Indiana Annual Conference of Methodist-Episcopal Churches abandoned the church in 1963. There are no members. There would be no direct impacts to this abandoned church or changes in access for visitors under any alternative.

The Full Gospel Mission Church in Scotland is located in Greene County adjacent to the project corridor on the north side of SR 45/58 just west of CR 215E. The church officials did not respond to the survey of churches conducted for this project. There would be no direct impacts to this church under any alternative; however, CR 215E would be closed just north of the church under any alternative. Church visitors currently using CR 215E to access the church from the area north of the I-69 mainline would have to access the church via CR 600S and CR 200E adding approximately two to three miles to the trip depending upon the trip origin.

The Clifty Chapel is located in Greene County on CR 975E approximately 0.5 mile north of the project corridor. According to the church survey, there are no regular weekly services and no congregation members. However, a yearly homecoming event is conducted there in the second week of August and a candlelight service is conducted there on December 24th. Access to this church from the south would increase by approximately 2.25 miles for some visitors as CR 975E would be closed under any alternative. However, access to this church would be maintained through existing Greene County roads CR 225S, CR 275S and CR 295S.

See Section 5.3.5 *Community Facilities and Services* for more information on impacts to churches.

[3] In the context of this document, an institution is an established organization dedicated to public service or culture, such as churches, schools, hospitals, government or social service agencies, museums, etc.

Table 5.2-2 provides residential relocation and business displacement cost estimates in year 2010 dollars, anticipated for each alternative.

Table 5.2-2: Right-of-Way Acquisition and Relocation/Displacement Cost Estimates

Alternative	Number of Potential Residential Relocations		Number of Potential Business Displacements*		Acres within Right-of-Way		Number of Parcels		Total Estimated Relocation/ Displacement Cost	
	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial
Refined Preferred Alt. 2 - Refined 4A-2, Refined 4B-1, Refined 4C-2, Refined 4D-1, Refined Hybrid 4E-1 /4E-2, Refined 4F-3, Refined 4G-2, Refined 4H-2	71	75	4	4	1,456	1,809	315	323	$23,739,463	$25,218,547
1 - 4A-2, 4B-1, 4C-1, 4D-1, Hybrid 4E-1 /4E-2, 4F-1, 4G-2, 4H-1	73	77	4	5	1,468	1,836	292	298	$26,106,448	$27,576,742
2 - 4A-2, 4B-1, 4C-2, 4D-1, Hybrid 4E-1 /4E-2, 4F-3, 4G-2, 4H-2	62	67	4	5	1,457	1,830	306	315	$22,492,268	$24,195,510
3 - Hybrid 4A-1/4A-2, 4B-1, 4C-2, 4D-1, Hybrid 4E-1/4E-2, 4F-4, 4G-2, 4H-3	69	75	5	6	1,454	1,831	303	312	$28,281,480	$30,335,201
4 - 4A-2, 4B-1, 4C-1, 4D-1, Hybrid 4E-1 /4E-2, 4F-5, 4G-2, 4H-2	65	70	4	5	1,457	1,830	291	302	$23,624,065	$25,372,061

Note: Business displacements are shown for the combination of interchanges that includes SR 45, Greene/Monroe County Line South Connector Road and SR 37 interchanges. Under all five alternatives there would be 3 fewer business displacements if the Greene/Monroe County Line interchange North Connector Road or SR 45 only interchange scenarios were selected.

5.2.3.3 Available Replacement Housing

The real estate market in Section 4 is stable: however, there is some suburban growth pressure around the City of Bloomington. Housing prices vary from small starter houses to large houses on large tracts of land. Sufficient housing appears to be available to accommodate the expected number of relocations. Further, considerable land is available both for farming and for future growth and development. However, the availability of housing can only present a picture of the real estate market at one specific time, and conditions may change over time, although no known reasons exist to expect a significant change in the availability of housing. The data for this analysis were collected in the spring of 2010.

The following table summarizes the available land and housing within Section 4. Available housing information was obtained from websites available to the general public which provide access to the multiple listing service (MLS) for Southwest Indiana, such as www.realtor.com. These sites allow for searching a specific county and cite specific housing criteria, such as price range, number of bedrooms, bathrooms, etc. The following results show the properties available in Greene and Monroe counties listed February 24, 2010, on the website. This list does not include residences for sale by owner.

Table 5.2-3: Price Ranges of Available Single Family Residences (February 2010)

	$0-$50K	$50-$100K	$100-$150K	$150-$200K	$200K-$250K	$250K-$300K	$300K+	Total
2 Bedrooms	4	25	23	12	6	1	5	76
3 Bedrooms	8	50	112	75	40	26	33	344
4+ Bedrooms	1	8	25	59	35	31	100	259
Total	13	83	160	146	81	58	138	679

According to the current listings, there is adequate replacement housing available in all price ranges. In addition to the homes listed above there were also more than 30 homes listed without a price. Because 62 to 77 relocations are anticipated with the project (71 to 75 for Refined Preferred Alternative 2), and there are over 650 homes for sale, it is probable that sufficient comparable housing would be available at the time of acquisition. Therefore, it is likely the relocations could be accomplished using normal relocation procedures. Last Resort Housing[4] will be available if needed. This program would be used if comparable replacement housing is not available, or if it would be unavailable within the displacee's financial means and the

[4] "Last resort housing" is a program used when comparable replacement housing is not available or when it is unavailable within the displacee's financial means, and the replacement payment exceeds the state legal limitation. The purpose of the program is to allow broad latitude in methods of implementation by the state so that decent, safe, and sanitary replacement housing can be provided. This program is used, as the name implies, only as a "last resort," when there is no adequate opportunity for relocation within the area.

replacement payment exceeds the state legal limitation. It is possible that some of the potentially displaced residents could relocate on the same property, outside the proposed right-of-way of the future road. This could happen with the homes located on larger tracts of land. It should be noted that, as of March 15, 2010, no other public or private projects are proposed in Greene or Monroe counties that would compete for available housing during any time in the near future.

5.2.3.4 Availability of Commercial and Farm Property

Under the Greene/Monroe County Line interchange South Connector Road scenario, there are four businesses that would be displaced by the Refined Preferred Alternative 2. Alternatives 1, 2, and 4 would displace five businesses under the initial design criteria and four businesses under the low-cost design criteria. In addition, one more industrial business would be displaced by Alternative 3 (total five under the low-cost design criteria and six under the initial design criteria).

If the interchange alternative that includes the Greene/Monroe County Line interchange with the North Connector Road scenario is selected, or if the SR 45 interchange only scenario were selected, only one business would be displaced (within Monroe County) by Refined Preferred Alternative 2. Under the North Connector Road scenario, Alternatives 1, 2 and 4 would displace two businesses for the initial design criteria and one for the low-cost design criteria. See **Table 5.2-2** (p. 5-49) for the business displacements associated with the five alternatives. Please refer to Section 5.6, *Traffic* Impacts, **Figures 5.6-3** through **5.6-7** (pp. 5-239 through 5-243) for the location of the interchange alternatives. Under Alternative 3, which includes the North Connector Road scenario, there would be a total of two commercial business displacements under the low-cost design criteria and three displacements for the initial design criteria.

Within Monroe County there are three potential commercial displacements. Under all four Section 4 Tier 2 DEIS alternatives using the initial design criteria, the first commercial displacement in Monroe County would have been a sawmill that has four full-time employees. The sawmill owner has stated that, due to difficult economic circumstances, he would likely close the sawmill business and retire if displaced. Further development of the right of way for Refined Preferred Alternative 2 eliminated the need to displace this business under either design criteria (low-cost or initial).

The first Monroe County business that would be relocated under any FEIS alternative, or design criteria, is a catering service (Pic-A-Chic Farms/Grubb's Catering). This catering business has four full-time employees and 11 part-time employees. Though the catering service building would be displaced from its current location under any alternative, the owner has stated that a replacement structure would likely be built on the remainder of the parcel that will retain access. The second Monroe County business potentially displaced would be relocated under Alternatives 1, 2, 3 and 4 for the initial design criteria only. Stillions Sawmill would be the second business displaced under the initial design criteria for Alternatives 1, 2, 3 and 4. The third Monroe County business potentially displaced would only be relocated under Alternative 3. 3D Stone, Inc., a limestone finishing business, would be a displacement under Alternative 3 for either design criteria (low-cost or initial).

Commercial property listings are available in the project vicinity in sufficient quantity and desirable locations for relocation of the potentially displaced businesses. JM Electronics and the Bloomfield State Bank business owners have stated that they would likely relocate within the vicinity. There are no zoning restrictions in Greene County to prevent such relocations. These business owners also have stated that they would likely be impacted in the short-term by their relocation.

The owners of the Crossroads Collectibles/Women's Fitness Center have stated that they would likely retire as opposed to relocating this business. However, the owners also stated that they would be willing to sell approximately seven acres of property along the east side of SR 45 just north of the SR 45/SR 445 intersection. This property would be suitable for the relocation of the other displaced businesses in the vicinity of the intersection. In addition, this property is only a short distance from the existing locations of the potentially displaced businesses.

Land suitable for farming is often not listed for sale in the Study Area or the counties in which the Study Area is located. Farming operations in the Section 4 project area are primarily smaller part-time operations and these would not require large tracts of farmland for replacement. The largest properties listed in August 2009 included 25 acre, 50 acre, 95 acre, 148 acre and 326 acre sites. In June 2006 a 320-acre farm, located partially in the corridor, was sold. Land leases are common in the area with farmers leasing the land for a crop season. In addition, it is often developers who approach the farm owner with a purchase offer rather than a farm owner publicly listing the land for sale.

5.2.3.5 Neighborhoods

The Chapter 4 analysis of neighborhoods indicates that there are ten residential subdivisions located within the Section 4 corridor. Please refer to **Figure 5.2-2** (p. 5-62) for the location of these residential neighborhoods. These include Clifty Hills, Whippoorwill, Shady Meadows, Shea Estates and Timber Trace within Greene County, and Sierra Hills, Rolling Glen Estates, Farmers Field Acres, Victor Heights, and Bailey West/Glenview within Monroe County.

In addition to the neighborhoods associated with the unincorporated communities and subdivisions, other rural residential clusters are located along many of the county roads within the Section 4 corridor. A small rural residential cluster with possible socio-economic characteristics similar to a traditional subdivision is located within the corridor along SR 54/CR 1250E in Greene County. All five alternatives would displace five of the 20 residences in this rural cluster of residences.

All five alternatives would displace two residences in the Clifty Hills neighborhood and five residences from the SR 54/CR 1250E cluster. In addition to displacing residences from the Clifty Hills neighborhood and the SR 54/CR 1250E residential cluster, Alternatives 1 and 4 would displace two homes in the Timber Trace neighborhood and Alternative 1 would displace one additional residence from the Farmers Field Acres neighborhood. Alternative 3 would displace an additional two homes from the Whippoorwill neighborhood.

The DEIS included a grade separation at Evans Lane (Subsection 4G). It also included an option to consider closing Evans Lane at I-69 and relocating all ten residences from the Evans Lane neighborhood south of the I-69 mainline. Based upon comments received from local governments, public organizations, and public individuals on the DEIS and additional review of environmental impact, traffic, engineering and cost factors, it was decided that Evans Lane would be closed at I-69 (see Section 5.6.3.2 and **Appendix Z**, *Documentation of Local Access Decisions*). All ten residences would be displaced from the Evans Lane neighborhood for Refined Preferred Alternative 2.

5.2.3.6 Community Cohesion

Community cohesion is generally defined as the degree to which residents have a sense-of-belonging to their neighborhood, their level of commitment to the community, or a strong attachment to neighbors, groups, and institutions, usually as a result of continued association over time. Community cohesion and neighborhood impacts can, therefore, be examined by evaluating changes affecting residents, businesses, and parking availability resulting from displacements and partial acquisitions.

Community cohesion is also affected by displacement and partial acquisitions of residential and non-residential property. Nonresidential properties might include retail trade, finance, insurance, services, government agencies, or non-profit organizations. Among the various impacts of the construction of a highway or other major transportation improvement project, the acquisition of real property, including residences and businesses, is the action that often incurs the most concern among those directly involved. A displacement involves the full acquisition of a property that would require the occupants of residential and non-residential units to be displaced by the project. Residents would relocate to another property, as would any businesses intending to remain in operation. A partial acquisition is when a small area of a property is acquired, but full use of the property and dwelling structures, including multi-family units, would remain. Refer to **Table 5.2-1** (p. 5-42) for a summary of potential property displacements by alternative.

Because of the rural nature of the area traversed by the Section 4 corridor, there are few residential communities in the immediate vicinity of the corridor. Please refer to **Figure 5.2-2** (p. 5-62) for the location of the potentially affected neighborhoods. The Greene County community of Clifty Hills, as described above, is the largest Greene County "community" within the Section 4 corridor. There are 25 widely-spaced homes on large residential lots in the Clifty Hills community and numerous undeveloped lots. All five alternatives would impact this community and displace two homes in the south corner leaving all of the remaining 23 residences to the north of the highway.

Farmers Field Acres and Rolling Glen Estates are two traditional residential communities located in Monroe County in the northern portion of the Section 4 project area. These two neighborhoods would be separated from each other by any of the proposed Alternatives. Alternative 1 would displace one home from the Farmers Field Acres neighborhood and require the acquisition of two undeveloped lots from within this neighborhood.

Under the Section 4 Tier 2 DEIS option to close Bolin Lane, Farmers Field Acres resident's access to Victor Pike and SR 37 to the east would have been disrupted. These residents would have been required to use the remaining portion of Bolin Lane to the west to access Rockport Road and SR 37. Depending on their destination, this could have added approximately 0.5 mile to their travel distance. However, in both public and local government agency comments received since the publication of the Section 4 DEIS, closure of Bolin Lane at I-69 was identified as adversely affecting connectivity to vital community facilities and resources. Therefore, to maintain connectivity, it has been decided that Bolin Lane would be grade separated.

In the Section 4 Tier 2 DEIS, Alternatives 2, 3 and 4 would have severed Rolling Glen Estates resident's access to Bolin Lane and required the acquisition of nine undeveloped lots within this neighborhood. However, these residents would retain access to Victor Pike via the existing Glenview Drive under any build alternative. For Rolling Glen Estates travelers using Bolin Lane to access Rockport Road to reach destinations to the southwest, this would have added approximately 3.3 miles to their travel distance to access the Bolin Lane/Rockport Road intersection to the west. Under DEIS Alternatives 2, 3 and 4, Rolling Glen Estates travelers currently using Bolin Lane to access Victor Pike would have approximately 0.8 mile added to their travel distance. DEIS Alternative 1 would not have severed these residents access to Bolin Lane. Further development of the right of way for refined Preferred Alternative 2 eliminated the need to sever Rolling Glen Estates resident's access (via Glenview Drive) to Bolin Lane under either design criteria. Glenview Drive would be relocated along a new alignment north of Wheaton Court to connect with Bolin Lane. The Glenview Drive/Wheaton Court intersection would be modified to retain connectivity.

As noted in Section 5.2.3.5, the Evans Lane neighborhood would be fully displaced under Refined Preferred Alternative 2. This would eliminate the community cohesion for this portion of the Section 4 corridor.

Access to/from other neighborhood communities within the Section 4 CIA Study Area would not be affected by any of the proposed alternatives. However, access to the City of Bloomington and other regional destinations would be improved for all of these neighborhoods under any of the five alternatives. In addition, all of the interchange scenarios proposed for this Tier 2 Section would improve access to the City of Bloomington and other regional destinations.

A noise analysis was performed in the area of the Farmers Field Acres and the Rolling Glen Estates neighborhoods. Some of the receivers in these two communities have predicted future noise levels that would be impacts under INDOT's current noise policy. However, potential noise abatement mitigation for receivers within these two neighborhoods was determined to exceed the cost per benefited receiver threshold established for this project (see Section 5.10 *Highway Noise*). Therefore, no potential noise mitigation is proposed for these two neighborhoods.

All of the proposed alternatives would displace five residences in Greene County from a cluster of homes along SR 54/CR 1250E. I-69 would divide this cluster leaving some residences north and others south of the interstate. An overpass would be provided for SR 54, and a connector

road south of the interstate would provide access from CR 1250E to SR 54 in this area to prevent lengthy detours. However, while the homes along SR 54 would still have direct access to their neighbors' homes located north and south of the corridor, travel distance and travel time between the two areas north and south of the interstate would be longer for travelers using CR 1250E.

5.2.3.7 Unique Relocation Situations

Unique relocation situations may be anticipated with selection of any of the alternatives. When such situations arise, special advisory services would be available in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (Public Law 91-646), as amended in 1987.

The Study Area does not contain households and individuals with relatively high percentages of elderly and/or persons below the poverty level. Research, observation, and discussion with local residents found no pockets or groups of elderly or low-income people occupying residences within the proposed rights-of-way of any alternative. There were also no minorities, non-drivers, or transit-dependent individuals found to be within the rights-of-way of the alternatives. There are however, at least two families that are comprised of a handicapped/disabled/medically-impacted elderly person and their spouse known to reside in locations identified as relocations. However, none of the proposed alternatives would have a disproportionate impact to such individuals, in accordance with Executive Order 12898, *Environmental Justice*.[5] See Section 5.8, *Title VI /Environmental Justice* for a more detailed discussion.

5.2.4 Mitigation

In the development and evaluation of alternative alignments within the Section 4 corridor, extensive efforts have been made to avoid or minimize impacts to residents, businesses, institutions, and communities. However, some impacts are inevitable. Within the 27-mile length of the project, there would be from 62 to 73 residential displacements for the low-cost design criteria alternatives and from 67 to 77 for the initial design criteria alternatives. In addition, all alternatives would displace from one to six non-farm businesses.

The project corridor is rural and traverses mainly forest and farmland. There would be impacts to farm operations due to the acquisition of cultivable land, pasture, and/or farm structures (barns, silos, etc); and the severance of farm fields. Because of the proximity of the Alternatives' alignments within the corridor, the Alternatives have similar farmland impacts. Impacts to farmland and farming operations are discussed in detail in Section 5.4, *Farmland Impacts*.

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[5] The purpose of *Executive Order 12898* is to identify, address and avoid disproportionately high and adverse human health or environmental effects on minority or low-income populations. Disproportionately high and adverse human health or environmental effects on minority and low-income populations are not anticipated. Field reconnaissance and contact with local officials, as well as the socioeconomic analysis, indicated that no such enclaves are located in the project corridor. Any minority or low-income individuals are scattered throughout the corridor. Also, no neighborhoods or communities would be significantly adversely impacted.

Under Alternative 3 there would be one institutional displacement. Alternative 3 would displace the Indian Creek Township VFD building located on CR 35N (Carmichael Road) within Greene County. There would be no institutional displacements with any other alternative.

Public involvement has played a major role in this project. Local government officials and residents, as well as members of the farming and business communities potentially affected, have had opportunities to provide comments/input into the project's development. Public input identified potential loss of access to residences, farmland, businesses, and other land uses and destinations as a major concern related to the project.

Changes to existing roads would require changes in motorists' travel patterns, lengthening local travel time for some and reducing it for others. Overall, travel time and motoring safety are expected to improve throughout the corridor as a result of any alternative selected. Access and travel time to Evansville to the south and destinations such as Bloomington and Indianapolis to the north would be improved by the construction of interchanges with US 231, SR 45, the Greene/Monroe County Line, and SR 37 in the project area. See **Tables 3-4** through **3-7** in Chapter 3, *Alternatives;* (pp. 3-22 through 3-25), for a summary of projected travel distances and times to the interstate system with the no-build and build scenarios.

Maintaining access via access roads, overpasses, and alignment shifts has been carefully studied during the development of Alternatives and, where feasible, these features have been incorporated into the Alternatives. **Figures 5.3-6** through **5.3-10** (pp. 5-138 through 5-167) and Section 5.3, *Land Use and Community Impacts* show proposed access roads and road closures for each Alternative.

The following measures would be utilized to mitigate adverse social impacts:

Local Access Roads—Where reasonable and cost effective, local access roads (e.g., frontage roads and road relocations) would be used to maintain accessibility for residences, farm operations, businesses, churches, schools, and other land uses.

Road Closures—Efforts would be made to minimize the disruption of local crossroads and bicycle facilities and minimize impacts to emergency response and school bus routes. Alternatives were developed that avoid closure of local roads where possible. In some locations the Interstate would overpass the county roads, while in other instances the county roads would bridge the Interstate. Where road closures would occur, provisions (such as cul-de-sacs) for turnarounds to accommodate large vehicles such as school buses and county vehicles would be made.

Relocations—Efforts would be made to minimize the number of relocations. Relocation resources and relocation assistance advisory services would be available to all residential or nonresidential displacements without regard to race, creed, color, national origin, or economic status, as required by Title VI of the *Civil Rights Act of 1964 (42 USC 2000d et seq.), Title VIII of the Civil Rights Act of 1968 (42 USC 3601 et seq.), and Executive Order 11063 (27 FR 11527, November 24, 1962).* And, in accordance with *Environmental Justice Executive Order 12898*, it

is anticipated the project would not have a disproportionately high and adverse effect on minority or low-income populations.

All acquisitions and relocations required by this project will be completed in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act), as amended, 49 CFR 24, and Title VI of the Civil Rights Act of 1968. No person displaced by this project will be required to move from a displaced dwelling unless comparable replacement housing is available to that person. INDOT will take required actions to ensure fair and equitable treatment of persons displaced as a result of this project up to and including providing replacement housing of last resort as defined in 49 CFR 24.404. Relocation resources for this project are available to residential and business relocatees without discrimination. At the time right-of-way is acquired, a relocation agent would be assigned to this project to ascertain the needs and desires of the potentially displaced persons to provide information, answer questions, give help in finding replacement property, and issue last resort housing payments, if needed. Advisory services will be made available to farms and businesses, with the aim of minimizing the economic harm to those businesses and farm establishments.

There may be unique relocation situations anticipated with any build alternative. If a displaced resident cannot be relocated due to the unavailability of comparable housing, or because comparable housing is not available within the statutory limit of the Uniform Relocation Act, then housing of last resort will be made available to this person. Last resort housing includes, but is not limited to, rental assistance, additions to existing replacement dwellings, construction of new dwellings and dwelling relocation. Replacement dwellings must meet the requirements of decent, safe, and sanitary standards as established by FHWA.

5.2.5 Summary

The majority of the project corridor traverses sparsely populated, forest and agricultural land with residences on scattered locations. There are; however, subdivisions and one residential cluster within the corridor that would have displacements under any alternative. All alternatives would displace two homes from the Clifty Hills neighborhood and five residences from the residential cluster located along SR 54 in Greene County. Alternatives 1 and 4 would displace two homes in the Timber Trace subdivision in Greene County, Alternative 3 would displace two homes in the Whippoorwill neighborhood in Monroe County, and Alternative 1 would displace one home in the Farmers Field Acres subdivision in Monroe County.

All of the proposed alternatives would displace five residences in Greene County from a cluster along SR 54/CR 1250E. The Interstate would divide the cluster of homes along SR 54/CR 1250E, leaving some residences north and others south of the interstate. An overpass would be provided for SR 54, and a connector road south of the interstate would provide a connection from CR 1250E to SR 54 in this area to prevent lengthy detours. Travel distance and travel time between the two areas north and south of the interstate would be longer for vehicles using CR 1250E.

Residential Relocations

A total of 77 residences are within the right-of-way of one or more alternatives. The number of residences that would be acquired for right-of-way ranges from 62 to 77, depending on whether the low-cost design criteria or initial design criteria is used. Under the low-cost design criteria, Refined Preferred Alternative 2 has an estimated 71 residential displacements. While under the initial design criteria, Refined Preferred Alternative 2 would have an estimated 75 residential displacements. The total residential displacement for Refined Preferred Alternative 2 also includes ten additional relocations from the Evans Lane neighborhood.

Unique relocation situations may be anticipated with selection of any of the alternatives. When such situations arise, special advisory services would be available in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (Public Law 91-646), as amended in 1987.

Business Displacements

From one to six commercial displacements are anticipated depending on the alternative selected. The Refined Preferred Alternative 2 would displace four commercial businesses for either the low-cost or initial design criteria. Under all five alternatives the Greene/Monroe County Line interchange South Connector Road would displace three commercial businesses. These include JM Electronics, the Bloomfield State Bank, and the Crossroads Collectibles/Women's Fitness Center, which are located in Greene County at the SR 45/SR 445 intersection.

For all four Section 4 Tier 2 DEIS alternatives, the fourth business relocation (only under the initial design criteria) would have been the Stillion Sawmill located southwest of the Rockport Road/West Evans Lane intersection in Monroe County. Further development of the right of way for Refined Preferred Alternative 2 eliminated the need to displace this business for any build alternative. The business owner has stated that he may retire if the business were displaced for this project.

The fourth business relocation under any FEIS alternative is the Pic-A-Chic Farms/Grubb's Catering business located southeast of the Rockport Road/Lodge Road intersection in Monroe County. The owner of this business has stated that the business structure would likely be relocated on the remaining portion of the existing property. This owner also stated that he would likely be impacted in the short-term by the relocation.

Alternative 3 would displace one additional business. This alternative would displace the 3D Stone, Inc. business located on the west side of Victor Pike in Monroe County. The owner stated that this business is strategically located in the middle of their three biggest limestone suppliers. The owner also stated that the machinery in the plant would be very difficult and expensive to relocate. Furthermore, Monroe County has zoning restrictions in place that may prevent the relocation of this business to a suitable nearby location.

Institutional Displacement

Under Alternative 3 there would be one institutional displacement. Please refer to Section 4.2, *Human Environment*, **Figure 4.2-3** (p. 4-65) for the location of this institution. This Alternative would displace the Monroe County Indian Creek Township VFD building located on CR 35N (Carmichael Road) within Greene County. This VFD building is a simple pole barn with few amenities. The VFD could be relocated to another suitable nearby location; however, there are existing zoning regulations in Monroe County that could possibly prevent the relocation of this institution to another suitable nearby location. There would be no institutional displacements with any other alternative, including Refined Preferred Alternative 2.

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I-69 EVANSVILLE TO INDIANAPOLIS Tier 2 Studies
Section 4 – Business Needs Survey

Company Name _____

Contact Person _____

Address _____

_____

Phone Number _____

Type of Business _____

Number of years in business at this location _____
Principal product or service provided _____
Is business site owned, rented, or leased? _____
If leased or rented, who is the property owner? _____
Are business location decisions made locally or corporately from another headquarters?
_____

Number of full-time employees _____
Number of part-time employees _____
Please describe where most of your employees commute to work from _____
_____
_____

In general, what is your outlook on the future of your business? _____
_____
_____

Please indicate where most of your customers come from? (Check all that apply)
_____ **Immediate neighborhood**
_____ **Countywide**
_____ **Nationwide**
_____ **International**

The attached graphic illustrates the location of your business and the various potential alignments of I-69. Looking at this illustration, please list all effects the various alignments may have on your business operation. _____
_____
_____

_____

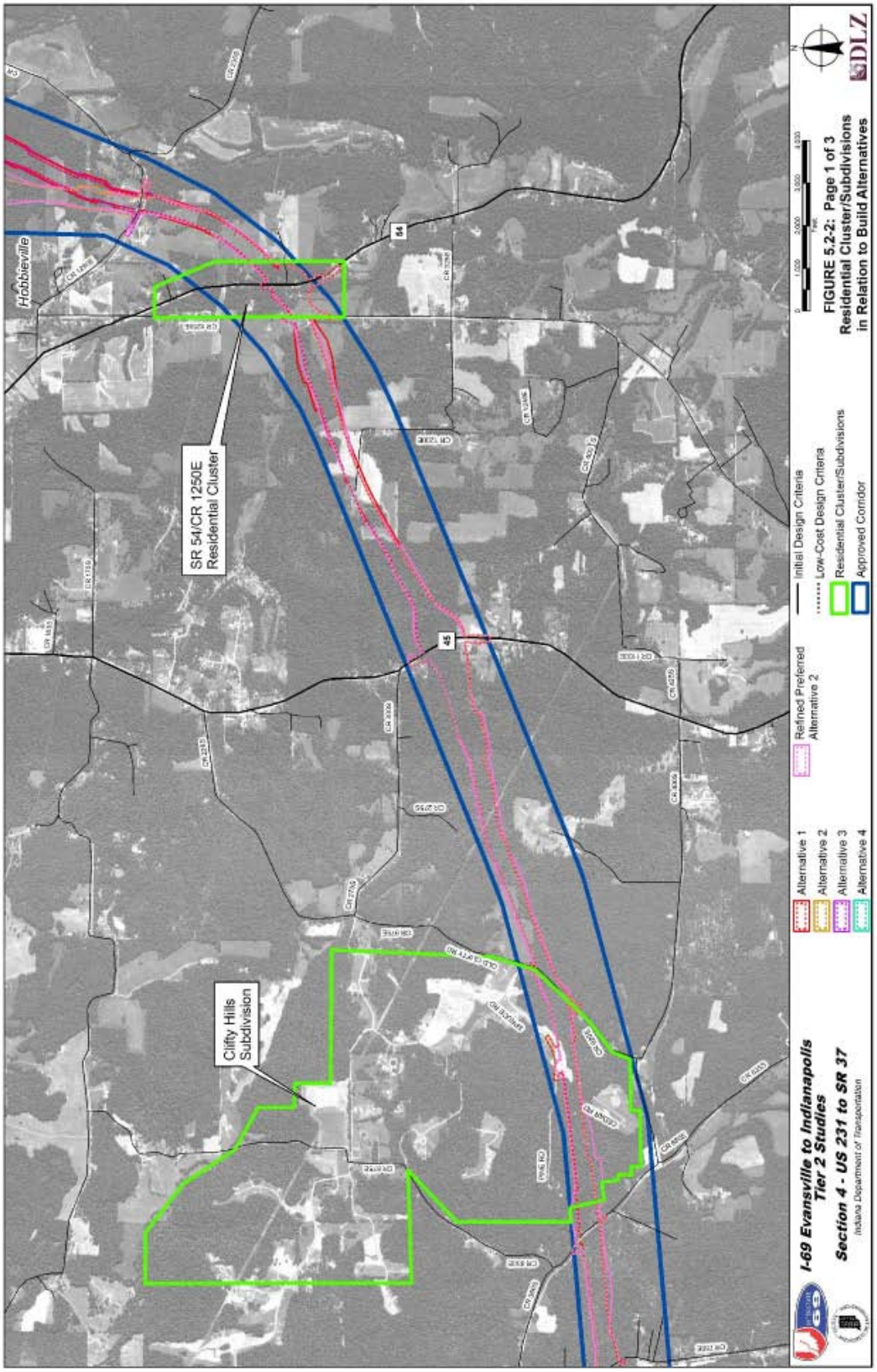
Interchanges are being evaluated for the following locations with I-69, US 231, SR 45, SR 54, and SR 37. Do you anticipate impacts to your business if you remain open at your current location and access to I-69 is allowed only at these interchange locations? If so, please describe the impacts due to the interchange locations. _____
_____
_____

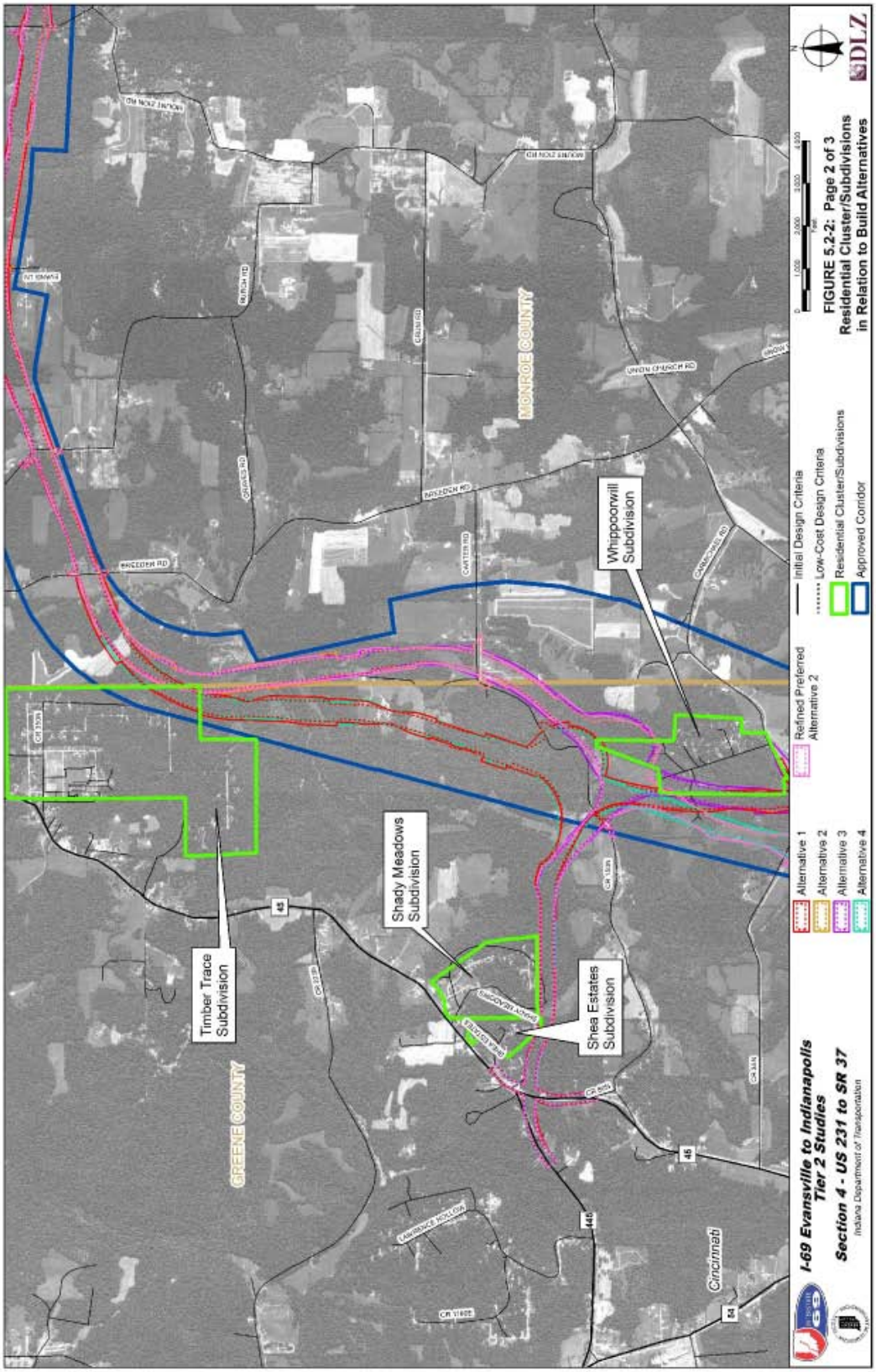
Which of the following aspects of your business operation do you perceive to be impacted by the proposed I-69 project? (Check all that apply)
_____ **Access to business operation will be impaired**
_____ **Parking will be impacted**
_____ **Customer traffic will be decreased**
_____ **Customer traffic will increase**
_____ **My workforce will relocate**
_____ **Other**

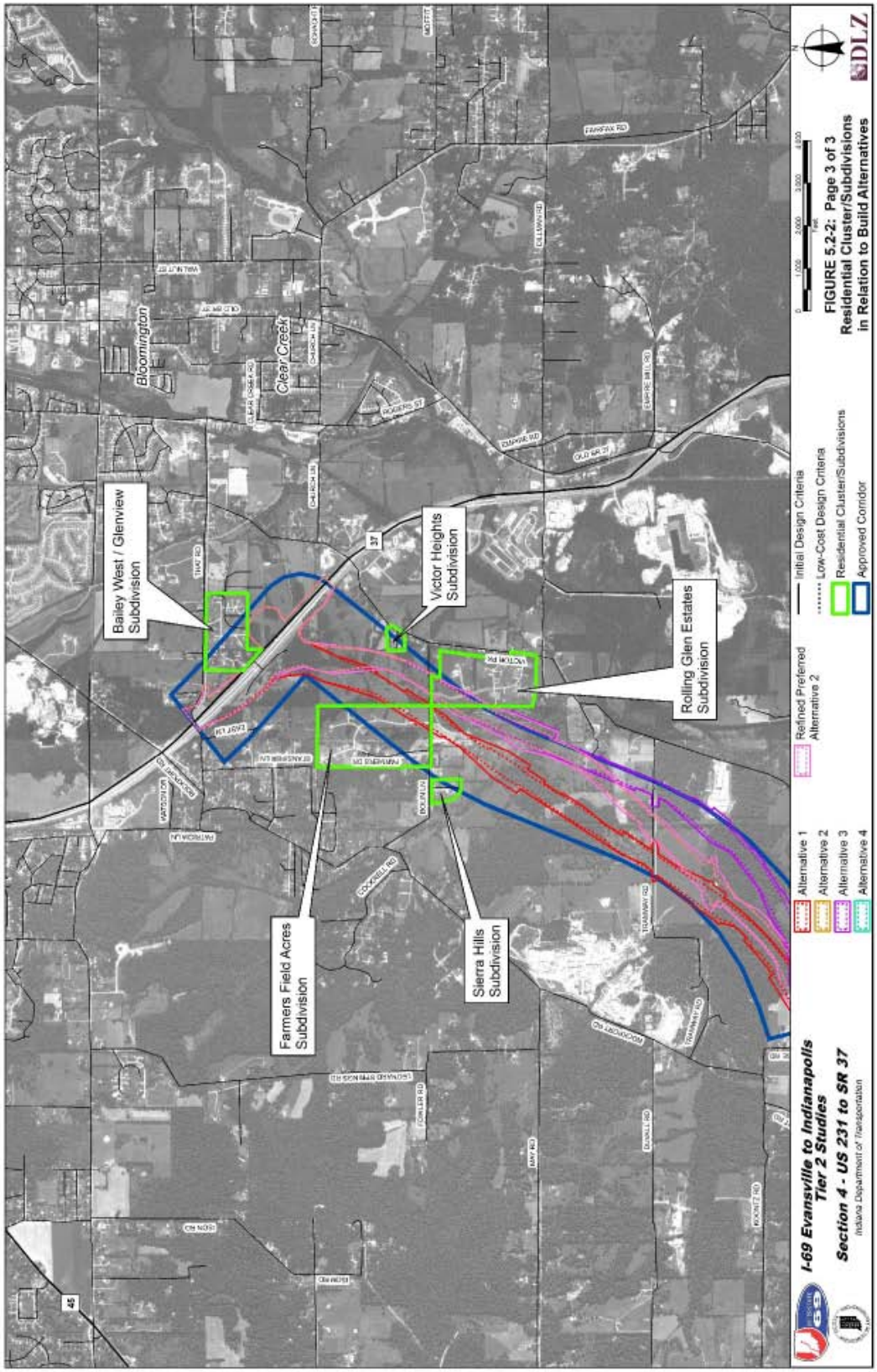
Please us the space below and/or attach additional sheets to give us your general comments and concerns regarding the proposed project.
_____
_____
_____

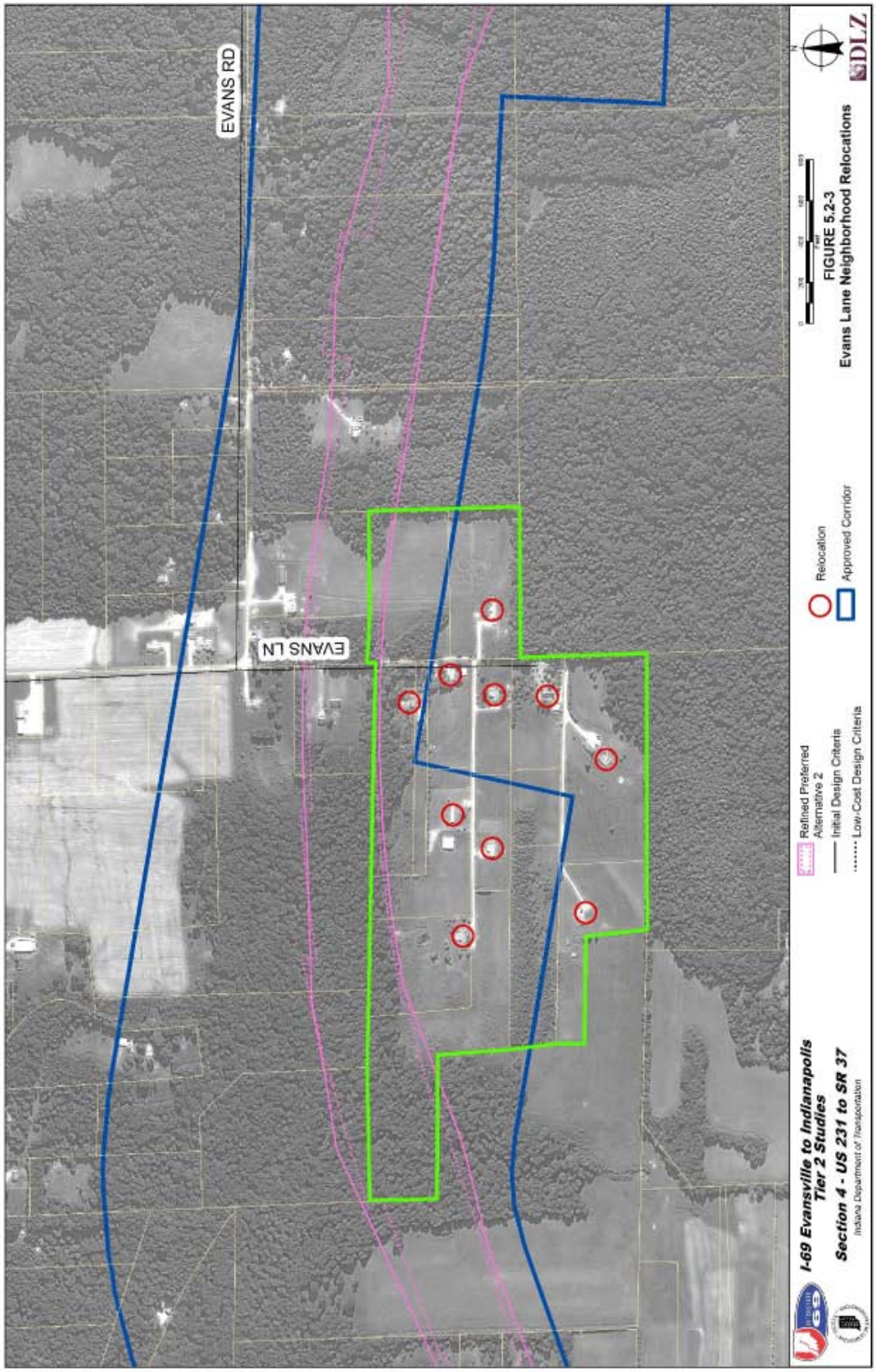
Thank you for your cooperation and participation. Please return this survey in the postage paid envelope to the attention of: **ms consultants, inc.**
Attention: William Ulik
4450 Belden Village Street N.W
Suite 801
Canton, Ohio 44718-2533

Figure 5.2-1 Business Needs Survey Questions


Hobbieville
SR 54/CR 1250E
Residential Cluster
Clifty Hills
Subdivision
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred
Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
Residential Cluster/Subdivisions
Approved Corridor
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.2-2: Page 1 of 3
Residential Cluster/Subdivisions
in Relation to Build Alternatives
DLZ


Timber Trace Subdivision
Shady Meadows Subdivision
Shea Estates Subdivision
Whippoorwill Subdivision
GREENE COUNTY
MONROE COUNTY
Cincinnati
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
Residential Cluster/Subdivisions
Approved Corridor
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.2-2: Page 2 of 3
Residential Cluster/Subdivisions in Relation to Build Alternatives
DLZ


Bailey West / Glenview Subdivision
Farmers Field Acres Subdivision
Victor Heights Subdivision
Sierra Hills Subdivision
Rolling Glen Estates Subdivision
Bloomington
Clear Creek
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
Residential Cluster/Subdivisions
Approved Corridor
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.2-2: Page 3 of 3
Residential Cluster/Subdivisions in Relation to Build Alternatives
DLZ


EVANS RD
EVANS LN
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
Relocation
Approved Corridor
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.2-3
Evans Lane Neighborhood Relocations
DLZ

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5.3 Land Use and Community Impacts

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Section 5.3.3 – added an update on the current status of the Community Planning Program in Section 4.
- Section 5.3.3.1 and **Table 5.3-1** – updated land use impacts of the alternatives, including the FEIS Refined Preferred Alternative.
- Section 5.3.4.1 – updated discussion of interchange option at SR 37 to include reference to the interim design.
- Section 5.3.4.2 – updated changes in local access as included in the Refined Preferred Alternative.
- Updated **Table 5.3-3** to discuss local service roads for the FEIS Refined Preferred Alternative.
- Updated **Table 5.3-4** to discuss road relocations and road closures for the FEIS Refined Preferred Alternative.
- Updated Section 5.3.5. to discuss comments received on the DEIS relative to emergency services.
- Updated Section 5.3.7, *Summary*, to discuss impacts of the FEIS Refined Preferred Alternative, the interim SR 37 interchange design option, and comments received on the DEIS relative to emergency services.
- Added new **Figure 5.3-4a** (pp. 5-131) showing general land use of the Refined Preferred Alternative.
- Added new **Figure 5.3-10** (pp. 5-162) showing interstate and local access for the Refined Preferred Alternative.

5.3.1 Introduction

Predicting how the construction of Section 4 of the Evansville to Indianapolis I-69 project will impact land use and support community planning objectives along the corridor is a vital step in the community impact assessment process. Community impact and planning considerations are important in large transportation projects. A Community Impact Assessment (CIA) was prepared to identify the existing socioeconomic conditions in the Section 4 Study Area; to obtain data for the analysis of the social and economic impacts on the Study Area as a result of the project; and to help identify measures to minimize or mitigate these impacts. The results of the

CIA are incorporated within Section 4.2 and several sections of Chapter 5, and provide the basis for the evaluation of impacts presented in Chapter 5, including Section 5.3.

The construction of a new freeway would affect the rate of growth and land-use development patterns in the vicinity of the new highway. This section discusses anticipated land-use changes due to both direct impacts and indirect impacts of the construction of Section 4 of the I-69 project. A detailed analysis of the indirect and cumulative impacts of the project appears in Section 5.24, *Cumulative Impacts*.

Many communities along the proposed route stand ready to take advantage of the economic development opportunities resulting from the project, but the potential impacts of development resulting from the project must also be evaluated. It is not possible to determine precisely how the new I-69 facility would impact the regional and local growth patterns, but efforts have been made to assess the impacts to the communities along the corridor. The changes in accessibility along the new facility would have a number of impacts, both positive and negative, to local communities. Local residents would have to use the interchanges to access the proposed highway. Also some local roads will be terminated at the interstate and others will be re-routed. This would alter existing travel patterns, increasing local travel times in some instances and decreasing travel times for many longer trips.

This chapter will also discuss the positive and negative impacts to community facilities and services such as schools, churches, hospitals, cemeteries, and emergency services. A community facility or service is generally defined as any public or private organization upon which a local population relies for goods and services. This chapter will analyze how the proposed project enhances or impedes the ability of the local population to make full use of community facilities and services.

5.3.2 Methodology

5.3.2.1 Land Use Impacts

The review of land use impacts, discussed in Section 5.3.3, includes (1) a review of land use plans adopted by counties in the Study Area (if available) and (2) an evaluation of the alternatives to determine consistency with land use plans and to quantify the direct and indirect impacts of each alternative on different land use types.

Direct Impacts

Direct impacts are defined by the Council on Environmental Quality (CEQ) Regulations as *"effects which are caused by the action and occur at the same time and place."* [40 CFR § 1508.8(a)]. The direct land use impacts of this project consist of land used for right-of-way for the alternatives. This was quantified by combining the proposed right-of-way for each alternative with the United States Geological Survey Land Cover data layer in the project GIS. Chapter 4, *Affected Environment*, briefly describes the types of land uses comprising these categories, and summarizes the occurrence of each within the Section 4 corridor. Using the Land Cover and right-of-way data, together with field reconnaissance for verification, direct land use impacts were estimated for each alternative. The total acreages include the right-of-way needs

for the highway as well as interchanges, grade separations, and access roads. **Table 5.3-1** summarizes the estimated direct impacts (i.e., amount of acreage within the proposed rights-of-way) to land uses as a result of the alternatives.

Indirect Impacts

Indirect impacts are defined by the CEQ Regulations as *"effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."* [40 CFR § 1508.8(b)]. The project has the potential for indirect impacts. For example, new highway access often spurs land use changes, such as new businesses/industries that create job opportunities that, in turn, attract employees to an area, spurring residential development. For this project, an example of an indirect impact would be the change in the use of a particular piece of property as a result of an alternative. These changes in land use are anticipated to occur in areas that are currently undeveloped and have not been identified as part of a proposed development. However, development on these lands as a result of the proposed action is reasonably foreseeable in response to the project.

To identify where land use changes induced by the project would be expected to occur, maps of traffic analysis zones (TAZs) within Greene and Monroe counties were used. The methodology for determining indirect impacts on land use is explained in greater detail in Section 5.24, *Cumulative Impacts*.

Cumulative Impacts

Cumulative impacts include the direct and indirect impacts of the proposed action, combined with the impacts of other past, present, and reasonably foreseeable future actions—whether or not caused by the project—in the same general geographic area. (See 40 CFR § 1508.7) For example, cumulative impacts on land use would include impacts resulting from development projects that are independent of the I-69 project. Section 5.24, *Cumulative Impacts*, presents a detailed discussion of both indirect and cumulative impacts, including the methodology for estimating those impacts.

5.3.2.2 Community Impacts

For purposes of the analysis of community impacts, the "Study Area" in this section is the same as the Study Area defined by the Census Block Groups described in Section 4.2, *Human Environment (Community Impact Assessment)*.

The evaluation of community impacts involved the preparation of a CIA, which included a review of the trends and status of social and demographic characteristics for the State of Indiana, Greene, and Monroe counties, and the Section 4 Study Area, using data from the 2000 U.S. Census and local planning agencies; and information obtained through an extensive public outreach program.

The background social and demographic data used in the evaluation of community impacts is provided in detail in Section 4.2, *Human Environment (Community Impact Assessment)*. The social impacts related to the relocation of homes and businesses and potential impacts on

community cohesion are described in Section 5.2, *Social Impacts*, while the public outreach program is discussed in detail in Chapter 11, *Comments, Coordination, and Public Involvement.*

Section 5.3.4 deals with impacts to travel patterns and local access, and Section 5.3.5 discusses impacts to community facilities within the Study Area. These potential impacts of the project in Section 4 have been identified primarily through the public outreach efforts that have included (1) a staffed project office hosting visits from the public and others seeking to learn about or comment on the project; (2) small-group meetings such as those with the Section 4 Community Advisory Committee, consulting parties to the Section 106 process (See Section 5.13, *Historic Resources Impacts*), local government officials and/or business organizations, local emergency responders, etc.; (3) large-scale Public Information Meetings, including two public information meetings with the general public (4) surveys sent to all businesses, schools, and churches identified as being potentially impacted by the project either directly (through acquisition) or indirectly (through changes to access); and (5) a project website by means of which the public can view current project information and submit comments.

Comments received from the public were often specifically related to concerns about individual properties; however, by far the most frequently expressed general concerns—from the public, businesses, local officials, emergency responders, and others—related to potential impacts to local roads and established travel patterns; and impacts to community facilities.

Regarding travel patterns and accessibility, two issues were most often raised: interchange access and local public road connectivity. Regarding local public roads, as a result of input obtained through the public outreach efforts, all public state and county roads crossed by the alternatives were studied to identify the importance attached to them by commenters, and to determine whether they could remain open (via an overpass) or would be terminated. Particular attention was paid to identifying and maintaining connectivity of emergency response routes where practicable.

To identify the potential impacts of the project on local community facilities, a field inventory of all such facilities in the Study Area was conducted, and surveys were sent to local churches. The surveys and documentation related to churches are contained in **Appendix G**, *Survey of Churches*. Input regarding local schools was provided through school representation on the Community Advisory Committee. Minutes of the Community Advisory Committee meetings are included in **Appendix EE**, *CAC and Public Information Meeting Summaries*.

5.3.3 Land Use and Zoning

This section addresses the total impacts of the I-69 alternatives upon land use and land use patterns in the Section 4 Study Area. For the purposes of this study, a *comprehensive plan* for a county is defined as an official public document adopted by a county or local municipality as a policy guiding decisions about the physical development of that municipality. A *zoning ordinance* is defined as an official public document adopted by a county or local municipality to implement a comprehensive plan through a map and written regulations.

Greene County adopted a comprehensive plan on August 3, 2009. The Greene County Comprehensive Plan was developed as a result of the I-69 Planning Grant Program. Greene

County does not have a zoning ordinance. Greene County's *Comprehensive Plan* anticipates that I-69 would promote growth at the proposed interchanges with US 231, SR 45, and at the Greene/Monroe County line. Currently, Greene County's growth is occurring primarily in the eastern portion near the Monroe County line. Continued growth is predicted in this area since it is located adjacent to the City of Bloomington urban area and Indiana University.

Within the Greene County portion of the Section 4 Study Area the *Comprehensive Plan* recommends residential land use along CR 600S from US 231 to CR 600E, infill residential in the Ashcraft Chapel area on the north side of I-69 west of SR 45, infill residential on flat ridge tops near SR 45 south of Cincinnati, residential on lands abutting SR 54 from Cincinnati to Hobbieville, residential on lands in the Cincinnati area where slopes are gradual (particularly around the Eastern Greene County schools), and scattered commercial along SR 45 west of the Greene/Monroe County Line interchange (See **Figures 5.3-6** through **5.3-10** (pp. 5-138 through 5-167)).

The stated land use development policy of the Greene County Comprehensive Plan includes the identification, preservation and development of economic development sites at the proposed interchanges of I-69. The plan also includes environmental preservation policy objectives that include the following:

Objective 4.4: Discourage development in areas subject to severe environmental constraints (floodplains, wetlands, steep slopes significant natural wildlife habitats, etc.) and ensure any development in such areas minimize adverse environmental impacts.

Objective 4.5: Ensure that public health and safety regulations are enforced to protect against problems of illegal dumping and failing septic tanks.

Monroe County has zoning ordinances and a *Comprehensive Plan*. With the exception of the City of Bloomington, Town of Ellettsville, and Town of Stinesville, the Monroe County Plan Commission reviews development proposals and conducts comprehensive land use planning for Monroe County. This zoning authority includes the Monroe County portion of the Section 4 Study Area (See Chapter 4, *Affected Environment*, **Figure 4.1-1** (p. 4-3)).

The April 20, 2010, *Draft Monroe County Comprehensive Plan* encourages continued commercial growth within the "Bloomington Urbanizing Area." The Section 4 Study Area portion of the SR 37 corridor is included in the "Bloomington Urbanizing Area," which the plan identifies for the provision of sanitary sewer service extension to accommodate future commercial and residential growth. This area includes the Robinson Industrial Park located on the southwest corner of the SR 37/Victor Pike intersection. Please refer to **Figure 5.3-5** (p. 5-137) for the location of the Robinson Industrial Park. The plan identifies no other specific development or infrastructure projects within this Study Area.

The *Draft Monroe County Comprehensive Plan* also states that "The presumed use of Rural land shall be the current use." With the exception of the SR 37 "Bloomington Urbanizing Area" vicinity, the remaining Monroe County portion of the Section 4 Study Area is within the "Rural" planned land use category. The plan identifies two rural areas outside of the "Bloomington Urbanizing Area." These are the "Rural Residential" and "Farm and Forest" categories. The

plan promotes limited growth in these areas by requiring appropriate infrastructure and/or adequate contiguous resilient land for septic systems.

The Monroe County SR 37 Corridor Plan was developed in 2010 as a result of the I-69 Planning Grant Program. The plan recommends that the County Line interchange should provide no direct access to Monroe County roads, be limited access only, and development in the vicinity of the proposed I-69 Section 4 County Line interchange (South Connector Road - located in Greene County) be strongly discouraged. The plan further recommends that construction in the connector road area be limited to rural residences and traditional agricultural-related facilities.

In addition to the SR 37 Corridor Plan, the following policy statements are included in the Monroe County November 5, 2010 Draft Comprehensive Plan:

A. Vulnerable Land shall not be disturbed to accommodate further growth and development.
B. Rural property shall not be subdivided to allow urban densities.
C. The presumed future use of rural property shall be the current vested use.
D. The scope of commercial use for rural property that depends upon natural resources available from the land shall be limited to operations related to agriculture or quarrying. Farm-related commercial and industrial uses that are not dependent upon the nature of the land shall not be permitted on rural property.
E. The conversion of rural property to urban property shall occur when either:
    a. Inclusion of the Rural property fits into an adjacent Urban property area (requirement for contiguous growth) or,
    b. Creation of a new urban property area with the adoption of a new Designated Community Plan that approximates the mean area of the existing Designated Communities.
F. Designated Community Plans shall include a full array of field studies demonstrating the availability of adequate public infrastructure and services required for the planned community area similar to the Sewer Service Extension Area maps developed in partnership with the Monroe County Plan Commission and the City of Bloomington Utilities Service Board.
G. Urban property in aggregation shall provide a range of options for residential density, and intensity of commercial, and industrial activity.
H. Urban property shall use sanitary sewers.
I. Increases in the intensity of use for a Resilient property use adjoining Vulnerable Land shall provide adequate buffers to minimize the impact of intense property use upon the Vulnerable Land.
J. Neither urban nor rural property use shall increase in intensity without a public process and approval by an appropriate hearing body of Monroe County.
K. Urban property for business and employment activities shall be designated and should be sufficient to meet the identified needs over the planning period. Prior to development, provision of sufficient infrastructure to support economic activities must be present.

The Lawrence County 2009 Strategic Plan was developed as a result of the I-69 Planning Grant Program. This strategic plan includes the following "Natural Features Goals": (NF-1) Protect Floodways and Floodplains, (NF-2) Eliminate Potentially Hazardous Septic Systems, (NF-3) Preserve and Enhance County Waterways, and (NF-7) Encourage Environmentally-Sensitive Development Practices. Lawrence County has not established planning and zoning regulations.

The City of Bedford 2010 Comprehensive Plan was developed as a result of the I-69 Planning Grant Program. The plan states: "The culmination of these planning efforts has resulted in a Future Land Use Map which should be used as a guide for future growth…." It was not determined that Lawrence County or the City of Bedford would have induced growth resulting from the construction of I-69.

It was determined in the RODs for Sections 1, 2 and 3, that due to the ready availability of non-forested (primarily agricultural) land, any indirect development would impact agricultural or other open land. I-69 Section 4 is much more heavily forested than Sections 1 through 3 of the Tier 2 I-69 Corridor. Analysis of possible indirect development in Section 4 indicates that approximately 40% of induced (indirect) growth resulting from the project would occur on forested land due to its prevalence in the Section 4 Study Area (see **Appendix CC**, *Indirect Impact Analysis*). This 40% estimate does not include the 12 TAZs in the vicinity of the US 231 interchange where Section 3 and Section 4 overlap. Indirect development within these 12 US 231 vicinity TAZs, as determined in the January 28, 2010, Section 3 ROD, is anticipated to impact only agricultural or other open land. **Appendix CC** documents that the land cover in these 12 TAZs is consistent with the forecast in the Section 3 FEIS that all impacts there would occur to agricultural or other open land.

The acreages of the identified land uses within the project corridor are provided in Section 4.2.2.1, **Table 4.2-10**. Impacts to those land uses associated with right-of-way acquisition are identified on **Table 5.3-1**. Note that there is some overlap in land use types, so that the impacts to all land use types are slightly greater (21 to 28 acres, depending upon the alternative and design criteria) than the total right of way. Direct and indirect impacts are summarized below. **Figures 5.3-1** through **5.3-4A** (pp. 5-107 through 5-136) show the general land uses within the project corridor in relationship to the alternatives. See footnote in **Table 5.3-1** for a definition of "upland habitat," which is one of the primary land uses within the Section 4 corridor.

The specific location of interchanges is very important in determining whether the I-69 project would stimulate and enhance these growth patterns, see Chapter 6.3, Comparison of Interchanges for further discussion of the Interchange impacts. Interchange locations and proposed configurations within Section 4 are discussed below. The design of the interchanges will continue to be refined after the Tier 2 process is completed. Differences in design, however, are not expected to affect the level of indirect use associated with an interchange.

Table 5.3-1: Direct and Indirect Land Use Impacts, by Alternative

Types of Land Use	Total Land Area (Acres) Required for ROW, by Alternative									
	Refined Preferred Alt. 2		1		2		3		4	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Developed Land	134.01	146.46	146.51	162.34	134.97	149.56	140.58	161.92	143.63	155.61
Agricultural Land	356.03	461.36	299.69	382.49	356.01	468.03	327.70	429.14	326.69	426.08
Upland Habitat*	962.29	1,191.66	1,019.22	1,281.32	963.18	1,201.91	983.13	1,230.96	983.11	1,236.92

Table 5.3-1: Direct and Indirect Land Use Impacts, by Alternative

Types of Land Use	Total Land Area (Acres) Required for ROW, by Alternative									
	Refined Preferred Alt. 2		1		2		3		4	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Water Open Water (Lakes, Ponds) Streams	1.45 15.80	2.14 19.42	1.98 15.46	2.73 19.48	1.53 15.79	2.40 19.80	1.61 15.09	2.31 18.64	2.04 15.33	2.96 19.12
Wetland Habitat** (Emergent/Forested/ Scrub/Shrub)	7.15	12.25	9.65	15.58	7.14	12.25	7.00	12.08	9.46	15.28
Mines/Quarries	0.96	0.96	0.00	0.00	0.96	0.96	0.00	0.00	0.96	0.96
Total ROW***	1,456	1,809	1,468	1,836	1,457	1,830	1,454	1,831	1,457	1,830
Agricultural Land, Indirect Impacts Expected by Year 2030 US 231 Vicinity (12 TAZs) Greene/Monroe County (43 TAZs) Subtotal (55 TAZs)	25 81 106	25 81 106	25 81 106	25 81 106	25 81 106	25 81 106	25 81 106	25 81 106	25 81 106	25 81 106
Forest Land, Indirect Impacts Expected by Year 2030 (43 TAZs)	54	54	54	54	54	54	54	54	54	54
TOTAL, DIRECT AND INDIRECT IMPACTS (Rounded)	**1,616**	**1,969**	**1,628**	**1,996**	**1,617**	**1,990**	**1,614**	**1,991**	**1,617**	**1,990**

* *Includes non-wetland forest, herbaceous cover, and scrub/shrub areas.*

** *Open water and wetland totals presented here are areas within the right-of-way limits, These wetland impacts may differ slightly from those provided in Section 5.19 due to rounding.*

*** *Total Right-of-Way is less than the sum of impacts to land use types, due to overlaps between land use types. The area for some small streams in forested areas is not subtracted from the forest land cover; the developed area for some homes in forested areas is not subtracted from the forest land cover.*

Because of the abundance of forest land in the Study Area, both agricultural land and forest are assumed to be converted from indirect impacts identified. (See Section 5.4, *Farmland Impacts*, and Section 5.20, *Forest Impacts*). The total acreages of right-of-way estimated to be needed for the proposed highway do not include existing state and local rights-of-way since the land is already in use for transportation purposes. Approximately 11.75 acres existing state-owned right-of-way will become part of the project within the Greene County portion of the Section 4 project area. This includes 2.63 acres of existing right-of-way at the SR 45 interchange, 6.35 acres at the Greene/Monroe County Line interchange, and 2.77 acres at the SR 54 grade separation. In addition, about 41.20 acres of existing SR 37 right-of-way are currently owned by the State within the Monroe County (SR 37 interchange) portion of the Section 4 project area.

5.3.3.1 Direct Impacts

For this project, the direct impact would be the use of a particular piece of property for right-of-way for an alternative. The land use impacts are comparable between the alternatives ranging

from about 1,454 to 1,831 acres for Alternative 3 to 1,468 to 1,836 acres of land for Alternative 1. Direct land use impacts for the Refined Preferred Alternative 2 range from 1,456 acres for the low-cost design criteria to 1,809 acres for the initial design criteria.

More upland habitat (including non-wetland forest, herbaceous cover and scrub/shrub areas) would be acquired for right-of-way than any other land use type; ranging from a low of about 962.29 to 1,191.66 acres for the Refined Preferred Alternative 2, to a high of approximately 1,019.22 to 1,281.32 acres for Alternative 1 (for the low-cost design criteria and the initial design criteria, respectively). This represents about 66 % of the total land within the right-of-way for Refined Preferred Alternative 2. Currently, upland habitat comprises about 64 % of the land cover in the corridor (See **Table 4.2-10**).

Agricultural land would be the second most impacted land use type. Approximately 356.03 to 461.36 acres of agricultural land would be acquired for the Refined Preferred Alternative 2 (Preferred). This represents about 24 to 26 % of the total amount of land within the right-of-way. Currently, agricultural lands comprise about 29 % of the total corridor.

A total of 38 wetlands were identified as being potentially impacted by the five alternatives. Each alternative has potential impacts to 20 to 32 wetlands, depending on the alternative. No alternative impacts all 38 wetlands. Total wetland impacts within the right-of-way range from approximately 7.00 acres for Alternative 3, using the low-cost design criteria to 15.58 acres for Alternative 1, using the initial design criteria. Direct wetland impacts within the right-of-way for the Refined Preferred Alternative 2 range from 7.15 acres for the low-cost design criteria to 12.25 acres for the initial design criteria. The majority of the wetland impacts are to emergent wetlands (PEM) and forested wetlands (PFO). Section 5.19, *Water Resources*, **Table 5.19-2** lists each of the 38 wetlands impacted by one or more of the five alternatives, their potential jurisdictional status, and the acreage impacted by each alternative. The difference in the total wetland acreage impacted among alternatives is minimal, approximately 2.65 acres for the low-cost design criteria and 3.50 acres for the initial design criteria.

The ability to access parcels severed by the new road is also a consideration when determining direct impacts to land uses. I-69 is a fully-controlled access facility; therefore, the only access would be at the termini interchanges with US 231 (which was approved as part of the Section 3 project in the January 28, 2010, Section 3 ROD) and SR 37, and at the potential interchanges at SR 45 and/or the Greene/Monroe County Line. While access to most severed parcels would be available via adjacent roads/frontage roads, etc., some parcels would be landlocked. The decision whether to provide access to or acquire landlocked parcels, uneconomic remnants,[1] and/or severed parcels may not be addressed until after the ROD during final design of this project.

[1] Uneconomic remnants include point rows, i.e., the formation of an acute angle along the edges of fields that limits or restricts the ability of farm equipment to access the area for farming purposes and strips of land along an edge of a field that are too narrow to farm productively.

5.3.3.2 Indirect Impacts

The project could indirectly influence the location and timing of new developments and affect the expected rate of growth. A typical scenario is the conversion of farmland or other undeveloped land to residential, highway-oriented commercial, or a mix of uses, particularly around new interchanges with existing crossroads. As noted, approximately 64% of the project corridor is upland habitat and 29% is agricultural land. Approximately 160 acres are anticipated to be indirectly converted from present use as a result of any alternative (See Section 5.24, *Cumulative Impacts*). Assuming 40% of the anticipated 135 acres of induced growth caused by Section 4 (in those TAZs outside of the US 231 vicinity) will occur on forested lands (which is the vast majority of upland habitat in the corridor), the predicted impact is 54 acres (33 acres in Greene County and 21 acres in Monroe County), and the predicted impact to agricultural/other land use is 81 acres (49 acres in Greene County and 32 acres in Monroe County). The indirect impacts caused by construction of I-69 and the US 231 interchange were assessed in the Section 3 study and also are included in this study due to the overlap of Sections 3 and 4. Indirect impacts to agricultural land in those 12 TAZs in the vicinity of the US 231 interchange are estimated to be 25 acres. The total estimated induced growth impacts for the Section 4 project are 160 acres, of which 106 acres are agricultural land and 54 acres are forest land.

The geographic scopes of the indirect impact analyses in adjacent sections of necessity overlap. Interchanges at section boundaries are locations where indirect impacts are anticipated, and it would be arbitrary to attribute these indirect impacts to one section, but not the other. Therefore, some indirect impacts are disclosed in more than one Tier 2 EIS. For this reason, the indirect impacts of the entire I-69 project cannot be calculated by "adding up" the indirect impacts disclosed in each Tier 2 EIS. Here, there are 12 TAZs proximate to the US 231 interchange. Indirect impacts associated with the US 231 interchange (which was approved as part of the Section 3 project in the January 28, 2010 Section 3 ROD) also are disclosed in the Section 4 EIS. **Table 5.3-2** and **Figure 5.3-5** (p. 5-137) show the locations of these anticipated indirect land use changes.

Table 5.3-2: Number of Jobs, Households, and Acres Induced With I-69

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing (3.96/AC)	Induced Acres for Jobs (15.4/AC)	Total Induced Acres Changes & % of Total TAZ Acres***	Size of TAZ (acres)
Greene County (US 231 Vicinity*)						
2800504	1	0	0.3	0.0	0.3	1,907
2800506	2	0	0.5	0.0	0.5	971
2800514	0	84	0.0	5.5	5.5	174
2801803	1	0	0.3	0.0	0.3	866
2801804	1	0	0.3	0.0	0.3	2,704
2801805	2	0	0.5	0.0	0.5	709
2801810	1	0	0.3	0.0	0.3	2,882
2802011	1	0	0.3	0.0	0.3	402
2802012	1	0	0.3	0.0	0.3	1,002
2802013	1	0	0.3	0.0	0.3	637
2803203	1	168	0.3	11.0	11.3	462
2803204	0	84	0.0	5.5	5.5	96

Table 5.3-2: Number of Jobs, Households, and Acres Induced With I-69

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing (3.96/AC)	Induced Acres for Jobs (15.4/AC)	Total Induced Acres Changes & % of Total TAZ Acres***	Size of TAZ (acres)
Subtotals (Rounded)	12	336	3	22	25 (0.2%)	12,812
Greene County**						
2800601	7	0	1.8	0.0	1.8	3,586
2800602	9	0	2.3	0.0	2.3	2,366
2800603	5	0	1.3	0.0	1.3	263
2800604	1	0	0.3	0.0	0.3	91
2800605	32	0	8.1	0.0	8.1	1,822
2800606	1	0	0.3	0.0	0.3	97
2800607	1	0	0.3	0.0	0.3	277
2800608	8	0	2.0	0.0	2.0	952
2800801	1	0	0.3	0.0	0.3	1,122
2800802	1	0	0.3	0.0	0.3	487
2800803	2	0	0.5	0.0	0.5	420
2800804	38	10	9.6	0.6	10.2	1,750
2800805	10	10	2.5	0.6	3.1	581
2800806	7	0	1.8	0.0	1.8	1,838
2800807	2	0	0.5	0.0	0.5	570
2800808	3	0	0.8	0.0	0.8	98
2800809	6	0	1.5	0.0	1.5	606
2800810	4	0	1.0	0.0	1.0	343
2800811	2	0	0.5	0.0	0.5	24
2800812	1	0	0.3	0.0	0.3	468
2800904	2	0	0.5	0.0	0.5	281
2800906	31	0	7.8	0.0	7.8	3,288
2801501	7	0	1.8	0.0	1.8	1,630
2801502	4	0	1.0	0.0	1.0	1,160
2801503	7	0	1.8	0.0	1.8	2,109
2801504	2	0	0.5	0.0	0.5	2,395
2801505	21	0	5.3	0.0	5.3	2,892
2801506	15	0	3.8	0.0	3.8	4,140
2801507	2	0	0.5	0.0	0.5	427
2801601	24	15	6.1	1.0	7.1	1,281
2801602	24	0	6.1	0.0	6.1	4,701
2802701	7	0	1.8	0.0	1.8	2,929
2802702	3	0	0.8	0.0	0.8	3,410
2802703	2	0	0.5	0.0	0.5	1,668
2803001	1	0	0.3	0.0	0.3	996
2803002	11	0	2.8	0.0	2.8	2,571
2803003	3	0	0.8	0.0	0.8	1,107
2803801	5	0	1.3	0.0	1.3	2,372
2803802	2	0	0.5	0.0	0.5	3,114
Subtotals (Rounded)	314	35	79	2	81 (0.1%)	60,232
Greene County Grand Total (Rounded)	326	371	82	25	106 (0.1%)	73,044

Table 5.3-2: Number of Jobs, Households, and Acres Induced With I-69

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing (3.96/AC)	Induced Acres for Jobs (15.4/AC)	Total Induced Acres Changes & % of Total TAZ Acres***	Size of TAZ (acres)
Monroe County**						
Traffic Analysis Zone (TAZ)	**Induced Number of Housing Units**	**Induced Number of Jobs**	**Induced Acres for Housing (4.82/AC)**	**Induced Acres for Jobs (17.8/AC)**	**Total Induced Acres Changes** & % of Total TAZ Acres***	**Size of TAZ (acres)**
5300721	150	0	31.1	0.0	31.1	238
5300728	0	100	0.0	5.6	5.6	416
5300729	0	50	0.0	2.8	2.8	47
5303311	0	250	0.0	14.0	14.0	76
Monroe County Grand Total (Rounded)	150	400	31	22	54 (6.9%)	778
Grand Totals (Rounded)	**476**	**771**	**113**	**47**	**160 (0.2%)**	**73,822**

** Induced growth in these TAZs is assigned to agricultural/other land use.*
*** 40% of the induced growth in these TAZs is assigned to forest land use (See **Appendix CC_**).*
****Totals may not add due to rounding.*

One means of keeping roadway-induced development within established development areas is by restricting access to the roadway. Restricting access generally discourages strip development along new roadways. As part of the interstate highway system, I-69 would be designed with full control of access, meaning that access to I-69 would be allowed only at interchanges. Roads with interchanges providing access to the interstate also would have some level of access control; for example, entrances to these roads is not allowed for a minimum distance from the interchange ramps (for the I-69 project, these access control limitations typically extend 1,200 feet from the ramp termini). This design both controls the location of development and improves traffic flow and safety in the vicinity of the interchange.

Another means of controlling the location and type of development is through land use planning. The *Greene County Comprehensive Plan* was developed as a result of the I-69 Planning Grant Program. The Tier 2 Section 4 project is anticipated in the *Greene County Comprehensive Plan*. This Greene County plan identifies I-69 growth areas near the proposed interchange with SR 45, and at the Greene/Monroe County Line interchange. However, the *Greene County Comprehensive Plan* vision includes a Land Use Development Policy that encourages preservation of environmentally sensitive areas over development. The plan also includes environmental preservation policy objectives that include the following:

> **Objective 4.4:** Discourage development in areas subject to severe environmental constraints (floodplains, wetlands, steep slopes significant natural wildlife habitats, etc.) and ensure any development in such areas minimize adverse environmental impacts.
>
> **Objective 4.5:** Ensure that public health and safety regulations are enforced to protect against problems of illegal dumping and failing septic tanks.

The Section 4 project also is included in the *Monroe County Comprehensive Plan*. The Monroe County plan identifies land in the "Bloomington Urbanizing Area" along and in the vicinity of SR 37 south of the I-69/SR 37 interchange for commercial and industrial development. However, the *Monroe County Comprehensive Plan* also recommends preservation of sensitive environmental resources and undeveloped rural lands. See Chapter 5.24, *Indirect and Cumulative Impacts*, Section 5.24.3, *Analysis*, for more information about the Monroe County plan.

The Lawrence County 2009 Strategic Plan was developed as a result of the I-69 Planning Grant Program. This strategic plan includes the following "Natural Features Goals": (NF-1) Protect Floodways and Floodplains, (NF-2) Eliminate Potentially Hazardous Septic Systems, (NF-3) Preserve and Enhance County Waterways, and (NF-7) Encourage Environmentally-Sensitive Development Practices. Lawrence County has not established planning and zoning regulations.

The City of Bedford 2010 Comprehensive Plan was developed as a result of the I-69 Planning Grant Program. The plan states: "The culmination of these planning efforts has resulted in a Future Land Use Map which should be used as a guide for future growth..." It was not determined that Lawrence County or the City of Bedford would have induced growth resulting from the construction of I-69.

5.3.4 Travel Patterns and Accessibility

Throughout the Tier 2 Section 4 public involvement process, accessibility has been one of the topics most often raised by local government officials, business owners, and residents. Access to the interstate highway and maintaining access to land within the Section 4 corridor have been highlighted as key factors to be considered in choosing the final alignment for I-69 Section 4.

The location of possible interchanges and the treatment (grade separation, relocation, or closing) of local roads being crossed by the new highway could affect land use through changes in local travel patterns and accessibility. Interchanges and travel patterns/local public road connectivity are discussed below, including changes for the alternatives that may have occurred as previously proposed by the Tier 1 study and/or as previously presented/discussed with the public during the Tier 2 project development for Section 4.

5.3.4.1 Interchange Access

Potential interchanges shown in the Tier 1 FEIS Environmental Atlas and retained for further study during Tier 2 were at SR 45 and SR 54 in Greene County and SR 37 in Monroe County. An interchange at US 231 was subsequently authorized for final design and construction by the Section 3 Tier 2 ROD. Under the Tier 1 ROD and revised Tier 1 Biological Opinion (Tier 1 BO), only one interchange could be considered in the karst area southwest of SR 37 (see Tier 1 BA Addendum, p. 14), and no interchange other than SR 37 could be considered within Monroe County for the Tier 2 Section 4 study (see Tier 1 FEIS, Section 7.3.14).

Following public and agency input received early in the Tier 2 study the Greene/Monroe County Line interchange was added as a potential interchange. The Tier 2 Preliminary Alternatives and the preliminary recommendations for the Alternatives Carried Forward, as discussed with the

Section 4 Community Advisory Committee (CAC) and presented to the public at the June 16, 2005 and November 16, 2005, public information meetings, included a maximum of two potential interchanges from the three interchange alternatives (SR 45, SR 54, and the Greene/Monroe County Line). Further analysis of an interchange at SR 54 following the preliminary recommendations for the Alternatives Carried Forward, as discussed in Chapter 3 (*Alternatives*), recommended that an interchange at SR 54 be discarded due to interchange spacing with SR 45, the low traffic demand for use of an interchange at this location, and environmental resource agency input that stated the SR 54 interchange would not be built if the Greene County/Monroe County Line interchange is included as the preferred interchange option.

A grade separation at SR 54 is common to all build alternatives. Local travel on SR 54 does not parallel I-69 as it is generally to the southeast, toward Lawrence County and Bedford, and to the northwest, toward northeastern Greene County and Bloomfield. Further, local access to the interstate for regional travel to/from southeast Greene County would be provided via the SR 45 interchange and/or the Greene/Monroe County line interchange. Therefore, the discarding of a possible interchange at SR 54 is not expected to significantly impact local travel patterns and public road connectivity. Access Road 4 would maintain connectivity between CR 1250E and SR 54 south of the I-69 mainline, and Access Road 5 would maintain access to adjacent land uses that would be impacted by the mainline alignment for the new highway. Please refer to Section 5.6 *Traffic Impacts* **Figure 5.6-9** (p. 5-245), which shows the location of the proposed SR 54 grade separation and Access Roads 4 and 5.

Traffic movements at all intersections associated with the SR 45, Greene/Monroe County line, and SR 37 interchanges would operate at uncongested conditions during peak traffic hours. For the design year 2030, I-69 in Section 4 is forecasted to have average daily traffic ranging from 23,525 Vehicles per Day (VPD) to 29,578 VPD and is projected to operate at Level of Service (LOS) A from just east of US 231 to SR 37 for the design year 2030. Please refer to Section 5.6 *Traffic Impacts* and **Figures 5.6-3** through **Figure 5.6-7** (pp. 5-239 to 5-243), which show the locations of these interchanges under all alternatives.

SR 45 Interchange

The Tier 1 Study identified a potential interchange at SR 45 in Jackson Township (Greene County) approximately three miles south of Cincinnati and three miles north of the Crane NSWC North Gate. An interchange at SR 45 was also proposed for the Preliminary Alternatives and the preliminary recommendations for the Alternatives Carried Forward during the Tier 2 study. It was decided that all five alternatives would include an interchange at SR 45. The SR 45 interchange would provide regional access for southeast Greene County and Crane NSWC. The interchange would not significantly disrupt local travel patterns and public road connectivity because through traffic on SR 45 and the adjacent CR 300S would be maintained under all alternatives. All five alternatives would require the relocation of one residence located within the SR 45 interchange right-of-way. Access Roads 3 and 6 would maintain access to land uses adjacent to the interchange. Please refer to Section 5.6 *Traffic Impacts* **Figure 5.6-3** (p. 5-239), which shows the location of Access Roads 3 and 6.

Greene/Monroe County Line Interchange

During the Section 4 Tier 2 public involvement process, numerous comments were received from local government officials, emergency responders, businesses, and the general public, in support of an access point to I-69 in Eastern Greene County. Many of the comments received noted that the location of an interstate access point in this area would serve traffic commuting between Bloomfield, Cincinnati, Crane NSWC, and Hobbieville and the greater Bloomington urbanized area. It was indicated by many that such access would provide a faster and safer highway for business commuting and personal trips for commercial, educational, and general travel between eastern Greene County and the Bloomington area. Comments also indicated a possible reduction of traffic and accidents along the heavily traveled segment of SR 45 north of the SR 445 intersection near Cincinnati.

In response to this request, an interchange connecting the I-69 mainline alignments with SR 45 in the vicinity of Cincinnati was studied in the early Tier 2 project planning. A potential interchange along the Greene/Monroe County Line that would connect with SR 45 in Center Township (Greene County) was discussed with the Section 4 CAC and presented at the June 16, 2005, Public Information Meeting. Conceptual plans for the Greene/Monroe County Line interchange were discussed with the Section 4 CAC and presented at the November 16, 2005, Public Information Meeting.

Three of the interchange options that were considered for Section 4 included a potential interchange at the Greene/Monroe County Line (See Chapter 3, *Alternatives*). Detailed traffic, engineering, and environmental studies, including consultation with U.S. Fish & Wildlife Service (USFWS), were performed. Interchange Option 2 and Interchange Option 4, both of which include a Greene/Monroe County Line interchange, were selected as Interchange Alternatives Carried Forward.

All five alternatives are based upon Interchange Option 2 (interchanges at SR 45 and the Greene/Monroe County Line with the South Connector Road). Selection of the interchange locations at SR 45 and the Greene/Monroe County Line South Connector Road was based on public comments, resource and local agency comments, and cost. The SR 45 and Greene/Monroe County Line interchanges and the Refined Preferred Alternative 2 are shown in **Figure 5.6-5** (p. 5-241). The alignment for the Greene/Monroe County Line interchange, generally west of the crossing of Indian Creek, would be the same for all five alternatives, including the alignment approaches to the SR 45/SR 445 intersection.

The Greene/Monroe County Line interchange would provide a direct connection for travel between eastern Greene County/Bloomfield (via SR 54 and SR 445) and the Bloomington urbanized area. The interchange would also provide improved accessibility to the Bloomington urban area for residents in the vicinity of Hobbieville and along/near SR 54 in Jackson Township (Greene County).

An interchange at the Greene/Monroe County Line would impact local travel patterns and public road connectivity for travelers using CR 100N/150N (Carter Road in Monroe County). Under all five alternatives this road would be closed at the I-69 mainline or Greene/Monroe County Line (See Section 5.3.4.2). Construction of the Greene/Monroe County Line interchange with the

South Connector Road would displace 10 residences and 3 commercial businesses for all five alternatives.

SR 37 Interchange

An I-69 interchange at SR 37 was proposed in the Tier 1 study. This is a major system connection to I-69 and the northern Section 4 terminus. SR 37, north of the Section 4 interchange, also is the proposed alignment for I-69 Section 5, providing access to Bloomington, Martinsville and Indianapolis. SR 37, south of the Section 4 interchange provides access to southern Monroe County, the City of Bedford, Lawrence County, and points further south. Please refer to **Figure 5.6-6 and Figure 5.6-7** (pp. 5-242 and 5-243) for the location of the SR 37 interchange. The SR 37 interchange was included in all interchange options under consideration for the Tier 2 study and is included in all five alternatives. All five alternatives would require the relocation of two residences located within the SR 37 interchange right-of-way.

Victor Pike is a county road that currently has an at-grade, signalized intersection at SR 37 just south of the proposed I-69/SR 37 interchange. Victor Pike provides access to SR 37 for adjacent businesses, including the Robinson Industrial Park and Old Capital Pike Business Park, and for area residents and businesses, including a truck route connection to a limestone quarry and the Clear Creek area south of Bloomington. Please refer to **Figure 5.3-5** (p. 5-137) for the location of the Robinson Industrial Park and Old Capital Pike Business Park in relation to the SR 37/Victor Pike intersection.

The potential impact upon the existing SR 37/Victor Pike intersection and accessibility to SR 37 were concerns expressed by many local business owners and residents during the early Tier 2 planning for the SR 37 interchange. Possible accessibility impacts to the SR 37/Victor Pike intersection due to the development of the SR 37 interchange included the development of a grade separation on Victor Pike over SR 37 or the closing of Victor Pike at SR 37. Because of potential adverse SR 37 accessibility impacts, both for businesses and residents, and a potential adverse historic effect upon the nearby Stipp-Bender Farmstead, the SR 37 interchange configuration was developed so as to maintain the existing SR 37/Victor Pike at-grade, signalized intersection. All five alternatives would maintain this existing intersection. Regional accessibility via I-69 would be provided for traffic using the SR 37/Victor Pike intersection.

That Road, which is located immediately north of the SR 37 interchange, currently has an at-grade intersection with SR 37. Traffic movements on the That Road approaches are stop controlled. The SR 37 interchange would close the current That Road access to SR 37. Through traffic movements along That Road would be maintained by use of Rockport Road west of I-69 and a proposed frontage road that would connect That Road with Rockport Road on the east side of the new highway. The proposed frontage road and the accessibility effects of closing That Road at SR 37 are included in the Section 5 Tier 2 study.

In the interim time period between the completion of Section 4 and the completion of Section 5, a temporary signalized "T" intersection would be constructed at SR 37. Please, see Section 5.6.3.3, *SR 37 Interim Traffic* Conditions (under heading **Interim SR 37 Interchange**), and **Appendix PP,** *Interim SR 37 Interchange Design,* for further discussion and analysis. The

interim intersection would maintain access at That Road to/from SR 37 until such time that the full SR 37 interchange and Section 5 improvements are constructed, as described above.

5.3.4.2 Travel Patterns and Local Public Road Connectivity

The need to control access to interstate systems can result in the severance and closure of local public roads, requiring motorists to change established routes and adjust to new travel patterns to familiar destinations. This adjustment could have negative impacts on emergency responders, school bus routes, home service deliveries, and farmers in the project area. The change in travel patterns related to road closings could produce longer trips and slower response times for emergency responders. Farmers, many of whom must access widely scattered fields with large, slow-moving farming equipment, would incur added distances which would result in lost time and reduced productivity. Conversely, the ability of emergency responders to reach major medical centers, such as Bloomington, Indianapolis and Evansville, and farmers to reach regional markets would be improved because I-69 would provide a substantial travel time savings (See Section 3.3, *Detailed Performance Analysis of Alternatives)*.

The Tier 1 study identified potential grade separations at many locations along the Section 4 corridor in order to maintain travel patterns and local public road connectivity. These grade separations and accessibility to land uses were discussed throughout the Tier 2 Section 4 public involvement process including Section 4 CAC meetings and the June 16, 2005, and November 16, 2005, public information meetings. Grade separations for most of the local roads, as recommended by the Tier 1 study, would be implemented under the alternatives. The treatment of some local roads, however, have changed from the Tier 1 study recommendations or during the Tier 2 study, including additional assessment performed during the detailed development of the alternatives. Proposed interstate and local access is shown on **Figures 5.3-6** through **5.3-10** (pp. 5-138 through 5-167). Changes at the crossings of these roads, as discussed below, may adversely affect some local travel patterns and public road connectivity.

With construction of I-69 as a limited access facility, many local roads would be severed by the new right-of-way and closed, relocated, or have a grade separation (overpass structure) to go over or under the new roadway. It would also be necessary, in certain locations, to construct short segments of roadway to provide access to properties whose access would be cut off by the new right-of-way. It is important to note that some access roads may not be necessary based on final land acquisition analysis. It may be more cost-effective and appropriate to landlock a parcel and acquire the entire property than to provide an access road. Final decisions concerning access roads and grade separations would be made during the detailed design and right-of-way acquisition.

Several proposed grade separations were presented at the Public Hearing with an option to close the local road and eliminate the crossing. As described below, in Greene County, the grade separations which were presented as optional are Dry Branch Road and Mineral-Koleen Road. In Monroe County, the grade separations which were presented as optional are Burch Road, Evans Lane, Harmony Road, and Bolin Lane. Alternatives for closure of the local road could include maintaining access with additional access roads.

The following paragraphs discuss the treatment of the local road access in the Section 4 corridor. **Figures 5.3-6** through **5.3-9** (pp. 5-138 through 5-161) show the alignments for the proposed alternatives. These figures include the proposed locations of interchanges, grade separations, access roads, and road closings associated with each alternative, as they were shown in the DEIS. **Figure 5.3-10** (pp. 5-162 through 5-167) shows Refined Preferred Alternative 2 and includes the access revisions made during the preparation of the FEIS. Additionally, the SR 45 interchange is shown in Chapter 5.6, *Traffic Impacts,* **Figure 5.6-3** (Alternatives 1, 2, 3, 4 and Refined Preferred Alternative 2), the Greene/Monroe County Line interchange is shown in **Figure 5.6-4** (Alternatives 1 and 4) and **Figure 5.6-5** (Alternatives 2, 3, and Refined Preferred Alternative 2), and the SR 37 interchange is shown in **Figure 5.6-6** (Alternative 1) and **Figure 5.6-7** (Alternatives 2, 3, 4, and Refined Preferred Alternative 2).

Grade separations would be constructed at various locations where I-69 would cross existing state highways and local roads. At some locations, local roads may be closed or relocated using an access road. **Table 5.3-3** summarizes state highway and local road access (overpasses, interchanges, road relocations, and road closures) for the alternatives and has been modified to include the recommendations of Refined Preferred Alternative 2. Some local access differs from the local access identified in the DEIS, as well as recommended for the Tier 1 study and the Alternatives Carried Forward (See Chapter 3, **Table 3-26**, *Alternatives*). Decisions on the local access described below and shown in **Table 5.3-3** were made based upon the detailed engineering development of the highway, traffic volumes, travel patterns, comments and input from the public (including school bus and emergency vehicle access), resource and local agency comments, potential impacts, and costs.

A summary of the state highway and local access is as follows. Unless otherwise noted, local access would be the same for all Section 4 alternatives.

- **CR 200E:** This road was proposed to be grade separated at I-69 in the DEIS. However, public comments, including those from emergency responders, noted the road is less frequently traveled than the adjacent CR 215 E. While CR 200E provides north-south connectivity between CR 600S, north of the I-69 corridor and SR 58, south of the I-69 corridor, it ends at CR 600S which does not provide adequate connectivity to CR 300E and areas north of the corridor. CR 215E was recommended as providing better connectivity to the unincorporated community of Scotland, the Crane NSWC West Gate, and the WestGate @ Crane Technology Park.

  The Refined Preferred Alternative 2 in the FEIS closes CR 200E at I-69 since there will be an overpass built at CR 215E approximately one-quarter mile to the east and an interchange built one mile to the west of this location. Traffic currently utilizing CR 200E for north-south travel is expected to divert to CR 215E and/or CR 400E.

- **CR 215E:** The DEIS proposed that this road would be closed at the I-69 right-of-way. During Section 4's public involvement process, comments were received asking that the overpass shown at CR 200E be moved one-quarter mile to the east to CR 215E.

  Refined Preferred Alternative 2 in the FEIS includes a grade separation to provide connectivity between CR 300 E and areas north of I-69, with SR 58, the unincorporated

community of Scotland, the Crane NSWC West Gate, and the WestGate @ Crane Technology Park.

- **CR 600S:** This road would be closed at the I-69 right-of-way in both the DEIS and FEIS. A planned overpass at CR 215E is located approximately 1.25 miles west of the I-69/CR 600S crossing. The CR 215E grade separation would provided access to CR 600S from the west and CR 400E would continue to provide access to CR 600S on the east side of I-69

- **Taylor Ridge Road:** This road follows CR 440E, a short segment of CR 450S, and CR 475E. Taylor Ridge Cemetery is located along the north side of CR 450S just west of CR 475E.

  Under Alternatives 2 and 3 in the DEIS, the mainline of the new highway would diagonally cross Taylor Ridge Road (from southwest to northeast) in the proximity of the existing CR 475E/CR 450S intersection (See **Figures 5.3-7** and **5.3-8**). The new highway would close CR 440E and CR 450S. **Access Road 1** would maintain travel between CR 475E and CR 450S (west of CR 475E) and the current access to Taylor Ridge Cemetery. While CR 475E would not be closed, continuity of travel along CR 440E and CR 450S would be terminated. North-south travel in this area would require the use of other local roads including a combination of CR 500E, CR 650S, CR 600E and CR 260S to the east of the closed roads or a combination of CR 200E, CR 600S, CR 275E, CR 300E, and CR 410E to the west of the closed roads. The closing of CR 450S would also require the use of alternative local roads in the area south of the interstate highway for east-west travel.

  Alternatives 1 and 4 in the DEIS would result in the closing of CR 475E at both the I-69 north and south rights-of-way (See **Figures 5.3-6** and **5.3-9**). No changes to CR 440E, CR 450S, or access to Taylor Ridge Cemetery would occur under these alternatives. The same roads described for Alternatives 2 and 3 for north-south travel to the west would be used for Alternatives 1 and 4. North-south travel to the east would follow CR 450S and CR 600E. East-west travel along CR 450 S would not be affected by Alternatives 1 and 4.

  Refined Preferred Alternative 2 in the FEIS closes Taylor Ridge Road as described by Alternatives 2 and 3 above (See **Figure 5.3-10**, p. 5-162). Public comments from the Bloomfield School Corporation requested additional consideration for improvement of CR 475E due to steep grades along this road. The steep grades could prevent school bus access during inclement winter weather. To address these school bus travel concerns, Taylor Ridge Road would be paved by Greene County from the Plummer Creek Bridge to a point approximately 1.08 miles south of the bridge. An agreement between INDOT and Greene County is required.

- **CR 600E:** This road would be grade separated in both the DEIS and the FEIS, maintaining north-south connectivity between Koleen and areas south of the I-69 corridor. I-69 would pass over CR 600E in conjunction with the Black Ankle Creek bridge crossing.

- **CR 400S:** This road extends as a dead-end road to the east of CR 600E. In both the DEIS and the FEIS, CR 400S would be closed east of CR 600E and the right-of-way would be absorbed by the new highway.

- **Dry Branch Road (CR 750E and 900E):** This road could be grade separated, maintaining north-south connectivity between Koleen and areas south of the I-69 corridor. I-69 would pass over Dry Branch Road in conjunction with the bridge crossing at the Dry Branch of Plummer Creek. Dry Branch Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Dry Branch Road based on public involvement, resource and local agency comments, and cost. If the determination was to remove the roadway crossing portion of this grade separation, Dry Branch Road would terminate at I-69.

  Refined Preferred Alternative 2 in the FEIS includes a grade separation at Dry Branch Road.

- **Mineral-Koleen Road (CR 360S and CR 880E):** Mineral-Koleen Road could be grade separated, maintaining north-south connectivity between Koleen and areas southeast of the I-69 corridor. I-69 would pass over Mineral-Koleen Road in conjunction with the bridge crossing of Plummer Creek. Mineral-Koleen Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Mineral-Koleen Road based on public involvement, resource and local agency comments, and cost. If the determination was to remove the roadway crossing portion of this grade separation, Mineral-Koleen Road would terminate at I-69.

  Refined Preferred Alternative 2 in the FEIS includes a grade separation at Mineral-Koleen Road.

- **Spruce Road, Pine Road and Cedar Road:** These are residential roads in the Clifty Hills Subdivision that merge as a three-way intersection with Spruce Road on the north leg, Cedar Road on the south leg, and Pine Road on the west leg of the intersection. The construction of I-69 would cut off the current intersection. **Access Road 2** as presented in the DEIS, would be constructed to maintain the connection between Spruce Road and Pine Road just north of the interstate right-of-way. Cedar Road would be closed. Properties that are accessed from Cedar Road would be acquired and existing residences would be relocated.

  Refined Preferred Alternative 2 in the FEIS includes a revised **Access Road 2a**. AR 2 as proposed in the DEIS will be replaced in the FEIS by a modification of the existing cul-de-sac at the south end of Spruce Road. The new cul-de-sac will be constructed slightly north of the existing one with a new connection to Pine Road. Cedar Road would be closed under Refined Preferred Alternative 2.

- **Old Clifty Road (CR 920E and CR 975E):** Old Clifty Road would be closed at the I-69 right-of-way in both the DEIS and the FEIS. North-south travel across I-69 in this area can be provided by Mineral-Koleen Road (about one mile to the west) and SR 45 (about 1.5 miles to the east). CR 415S provides access between Old Clifty Road and Mineral-Koleen Road south of the corridor. CR 400S/CR 425S provides access between Old Clifty Road and SR 45 south of the corridor. CR 275S/CR 300S provides access between Old Clifty Road and SR 45 north of the corridor.

- **SR 45:** This state highway would have an interchange with I-69 (See Chapter 5.6, *Traffic Impacts,* **Figure 5.6-3**) in both the DEIS and the FEIS. North-south connectivity along this

major collector road would be maintained. Access to SR 45 would not be permitted within approximately 500 feet of the ramp terminals of the interchange. **Access Road 3** would be built on the west side of SR 45 to the south of I-69 to provide access to two residential properties.

Refined Preferred Alternative 2 in the FEIS also includes Access Road 6 which would be built on the east side of SR 45 to the north of I-69 to provide access to one residential property and one undeveloped parcel

- **CR 1250E:** This road would be closed at the north right-of-way for I-69 for both the DEIS and the FEIS. In order to maintain north-south connectivity between Owensburg (to the south) and Hobbieville (to the north), CR 1250E south of I-69 would be relocated and connected to SR 54 via **Access Road 4** (See Chapter 5.6, *Traffic Impacts,* **Figure 5.6-9**). The new access road would extend CR 1250E approximately 0.20 miles to the east and establish a new intersection with SR 54 on the south side of I-69.

  The Refined Preferred Alternative 2 in the FEIS includes Access Road 4 as presented in the DEIS.

- **SR 54:** In both the DEIS and the FEIS, this state highway would have a grade separation at I-69 and north-south travel along this major collector road would be maintained (See **Figures 5.3-6** through **5.3-10**). No access to I-69 would be provided. **Access Road 5** is proposed to extend east from SR 54, on the south side of I-69, to provide access to properties whose current access would be terminated by the construction of I-69.

  Refined Preferred Alternative 2 in the FEIS includes Access Road 5 as presented in the DEIS.

- **Hobbieville Road (CR 1260E and CR 190S):** Hobbieville Road would pass over I-69 in both the DEIS and the FEIS. Local travel between Eastern Greene County and Southwestern Monroe County/Northwestern Lawrence County would be maintained.

- **CR 35N:** This road continues into Monroe County as Carmichael Road. It would be grade separated in both the DEIS and the FEIS. Local travel between Eastern Greene County and Southwestern Monroe County would be maintained.

- **CR 100N/CR 150N:** This is an east-west road that continues into Monroe County as Carter Road.

  Under the Refined Preferred Alternative 2 and Alternatives 2 and 3, CR 100N/CR 150N would remain open within Greene County. A grade separation with the South Connector Road over CR 100N/CR 150N would be constructed to maintain travel within Greene County. CR 100N/CR 150N would however be closed at the Greene/Monroe County line under the Refined Preferred Alternative 2 and Alternatives 2 and 3, and travel to/from Monroe County via Carter Road would be terminated.

Under Alternatives 1 and 4, CR 100N/CR 150N would be closed at the west right-of-way of I-69. Greene County properties located east of I-69 that are currently accessed by CR 100N/CR 150N would require access through Monroe County via Breeden Road and Carter Road. Emergency services and school buses from Greene County would be required to use CR 35N in Greene County and Carmichael Road, Rock East Road, Breeden Road, and Carter Road in Monroe County for access to the properties located east of the mainline alignment for Alternatives 1 and 4.

- **SR 45/SR 445 Intersection:** The DEIS and the FEIS alternatives both include reconstructing this existing three-way, signalized intersection as a four-way intersection (See **Figures 5.3-6** through **5.3-10**). The existing radius on SR 45 will be modified to accommodate the new intersection with SR 445 and the South Connector Road which would become the fourth leg of this intersection. SR 445 will also be relocated to the south to tie-in perpendicularly with SR 45 south of the existing intersection.

- **Carter Road:** This Monroe County road continues west into Greene County as CR 150N. Carter Road would be closed along the I-69 east right-of-way under Alternatives 2 and 3 (See **Figures 5.3-7** and **5.3-8**). This road closure would be near the Greene/Monroe County line. Carter Road would not be impacted by Alternatives 1 and 4 (See **Figures 5.3-6** and **5.3-9**).

  Refined Preferred Alternative 2 in the FEIS closes Carter Road at the I-69 right-of-way, near the Greene/Monroe County Line. (see **Figure 5.3-10**).

- **Breeden Road:** This road would be grade separated to maintain north-south travel in both the DEIS and the FEIS.

- **Burch Road:** This road could be grade separated to maintain north-south travel. If a grade separation is constructed, the curved alignment of Burch Road would be realigned, but this would not affect property access for those properties located outside of the proposed I-69 right-of-way. Burch Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Burch Road based on public involvement, resource and local agency comments, and cost. If the determination is to remove this grade separation and terminate the road at I-69, north-south travel across I-69 in this area can be provided by Breeden Road (to the west) and Rockport Road (to the east).

  Refined Preferred Alternative 2 in the FEIS includes a grade separation at Burch Road. DEIS comments were received from Monroe County and the Van Buren Township first responders proposing an EMS only access ramp from Burch Road to I-69. Final determination to include an EMS only access ramp to Burch Road will be made during the project design phase.

- **Evans Lane:** This is a short (0.3 mile long) dead-end road serving approximately 16 properties south of I-69. A grade separation was proposed in the DEIS to maintain access to these properties. Evans Lane was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Evans Lane based on public involvement, resource and local agency comments, and cost. If

the determination is to remove this grade separation and terminate the road at I-69, properties that are accessed from Evans Lane would be acquired and existing residents would be relocated.

Refined Preferred Alternative 2 in the FEIS does not include a grade separation at Evans Lane. Properties that are currently accessed from Evans Lane would be acquired and existing residents would be relocated.

- **Harmony Road:** This road could be grade separated to maintain north-south travel. Harmony Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Harmony Road based on public involvement, resource and local agency comments, and cost. If the determination is to remove this grade separation and terminate the road at I-69, north-south travel across I-69 in this area can be provided by Breeden Road (to the west) and Rockport Road (to the east).

  Refined Preferred Alternative 2 in the FEIS includes a grade separation at Harmony Road.

- **Rockport Road:** This road would be grade separated to maintain north-south travel in both the DEIS and the FEIS.

- **West Evans Road:** This is a dead-end road that extends east and west of Rockport Road. In both the DEIS and the FEIS, the portion of West Evans Road to the west of Rockport Road would be removed by the I-69 right-of-way. East of Rockport Road, access to West Evans Road would be maintained.

- **Lodge Road:** This is a dead-end road that extends south of Rockport Road and then, after crossing the I-69 corridor, turns east. Lodge Road provides access to approximately 16 properties. A grade separation would be constructed in both the DEIS and the FEIS, to maintain access to these properties.

- **Tramway Road:** This road would be grade separated to maintain east-west travel in both the DEIS and the FEIS.

- **Bolin Lane:** Bolin Lane could be grade separated to maintain connectivity from two subdivisions to both Rockport Road to the west and Victor Pike to the east. Bolin Lane was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Bolin Lane based on public involvement, resource and local agency comments, and cost. If the determination is to remove this grade separation Bolin Lane would terminate at I-69.

  Refined Preferred Alternative 2 in the FEIS includes a grade separation at Bolin Lane.

- **Farmers Drive:** Farmers Drive is a residential street in the Farmers Field Acres Subdivision that intersects Bolin Lane from the north. None of the Section 4 Tier 2 DEIS alternatives would have closed the Farmers Drive to Bolin Lane connection. Several comments were received regarding Section 4 DEIS figures that showed a connection between Farmers Drive

and Stansifer Lane to the north. The comments noted that there currently is no connection from Farmers Drive to Stansifer Lane. Further investigation and contact with Monroe County Highway Department officials determined that the connection was a planned and funded Monroe County project. This planned project will improve connectivity in the project area. There would be no impacts to Farmers Drive under any build alternative.

- **Crop Circle:** Crop Circle is a residential street in the Farmers Field Acres Subdivision that intersects Bolin Lane from the north. Crop Circle would be closed at the west right-of-way for Alternative 1 but would remain open at Bolin Lane for Alternatives 2, 3, and 4.

  Refined Preferred Alternative 2 in the FEIS allows Crop Circle to remain open to Bolin Lane.

- **Glenview Drive:** Glenview Drive is a residential street in the Rolling Glen Estates subdivision that intersects Bolin Lane from the south. The Section 4 Tier 2 DEIS recommended that Glenview Drive be closed at the east right-of-way for Alternatives 2, 3, and 4, but remain open at Bolin Lane for Alternative 1.

  Refined Preferred Alternative 2 in the FEIS includes Access Road 7 which reconnects Glenview Drive to Bolin Lane. This road provides access from Glenview Drive to Bolin Lane along a modified alignment that retains the current connection to Wheaton Court.

- **Wheaton Court:** Wheaton Court is a residential street in the Rolling Glen Estates subdivision that connects to Glenview Drive. The Section 4 DEIS showed in error that the connection to Glenview Drive would be severed by Alternatives 2, 3 and 4.

  Refined Preferred Alternative 2 in the FEIS corrects this error and includes Access Road 7 which reconnects Glenview Drive to Bolin Lane and maintains the intersection of Glenview Drive and Wheaton Court.

- **SR 37**: An interchange would be constructed at SR 37 (See **Figures 5.3-6** through **5.3-10**) in both the DEIS and the FEIS.

  In response to comments received from local planning officials, consideration was given to an interim design for the SR 37/I-69 interchange. In the interim between the completion of Section 4 and the completion of Section 5, a temporary signalized "T" intersection would be constructed at SR 37, Chapter 5.6.3.3 – SR 37 Interim Traffic Conditions discusses this further.

- **Victor Pike:** This road intersects SR 37 with an at-grade, signalized intersection just south of the SR 37 interchange. The SR 37/Victor Pike intersection would not be affected by the I-69 project.

- **Big Sky Lane:** This is an existing residential access road on the west side of SR 37 with an at-grade crossing just north of the SR 37 interchange. The existing at-grade crossing would be closed and the four residences currently using Big Sky Lane for access to SR 37 would be displaced under any alternative.

- **That Road:** In both the DEIS and the FEIS, the current at-grade crossing (and access) of That Road at SR 37 would be closed at the I-69 right-of-way. On the east side of I-69; however, a Frontage Road would extend That Road north to connect with Rockport Road. The proposed Frontage Road would be developed by Section 5 (See Chapter 5.6, *Traffic Impacts,* **Figure 5.6-6** and **Figure 5.6-7**).

  An interim signalized "T" intersection will be constructed at the junction of I-69 and SR 37. The interim intersection will enable That Road to remain open on both sides of SR 37 until such time as the full SR 37 interchange and Section 5 improvements are constructed. Please, see Section 5.6.3.3, *SR 37 Interim Traffic* Conditions, and **Appendix QQ**, *SR 37 Operational and Safety Analysis,* for further discussion and analysis of the interim condition.

Under the five alternatives, interchanges are proposed at SR 45 and/or the Greene/Monroe County Line, and SR 37. If the SR 45 interchange is not selected, a grade separation would be provided there. While the end-to-end alternatives assume both SR 45 and the Greene/Monroe County Line interchanges for the purpose of assessing impacts, three interchange scenarios (SR 45 only, SR 45 and the county line, or the county line only) are considered in Chapter 6, *Comparison of Alternatives*. Several overpasses are proposed to maintain county public road connectivity. In addition, local access roads are proposed where road closures are required, while in other instances local roads would be relocated or have sections realigned. **Table 5.3-3** identifies grade separations, interchanges, road closures, and road relocations proposed for each alternative. **Table 5.3-4** lists the new access roads for each alternative. **Figures 5.3-6** through **Figure 5.3-10** (pp. 5-138 through 5-167) show the locations of proposed interchanges, grade separations, road closures, and access roads associated with each alternative. Additional information regarding accessibility is provided in Section 5.6, *Traffic Impacts*.

Table 5.3-3: Proposed Local Access – Grade Separations, Interchanges, Road Closures, and Road Relocations by Alternative

State / County Roads	County	Alternatives				
		Refined Preferred Alternative 2	1	2	3	4
CR 200E	Greene	Closed	Overpass	Overpass	Overpass	Overpass
CR 215E	Greene	Underpass	Closed	Closed	Closed	Closed
CR 600S	Greene	Closed	Closed	Closed	Closed	Closed
CR 440E	Greene	Closed	Not Affected	Closed	Closed	Not Affected
CR 450S	Greene	Closed	Not Affected	Closed	Closed	Not Affected
CR 475E	Greene	Closed	Closed	Closed	Closed	Closed
CR 600E	Greene	Underpass	Underpass	Underpass	Underpass	Underpass
CR 400S	Greene	Closed	Closed	Closed	Closed	Closed
CR 750E/CR 900E (Dry Branch Road)	Greene	Underpass**	Underpass or Close	Underpass or Close	Underpass or Close	Underpass or Close
CR 360S/CR 880E (Mineral-Koleen Road)	Greene	Underpass**	Underpass or Close	Underpass or Close	Underpass or Close	Underpass or Close
Spruce Road-Pine Road	Greene	Relocated - Connected (AR 2 Rev)	Relocated - Connected (AR 2)	Relocated - Connected (AR 2)	Relocated - Connected (AR 2)	Relocated - Connected (AR 2)
Cedar Road	Greene	Closed	Closed	Closed	Closed	Closed
CR 920E/CR 975E (Old Clifty Road)	Greene	Closed	Closed	Closed	Closed	Closed
SR 45	Greene	Interchange	Interchange	Interchange	Interchange	Interchange
CR 1250E	Greene	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)
SR 54	Greene	Underpass	Underpass	Underpass	Underpass	Underpass
CR 1260E/CR 190S (Hobbieville Road)	Greene	Overpass	Underpass	Underpass	Underpass	Underpass
CR 35N (Carmichael Rd)	Greene	Underpass	Overpass	Underpass	Underpass***	Underpass
CR 100N/CR 150N (Carter Rd)	Greene	Underpass	Closed	Underpass	Underpass	Closed
SR45/SR 445 Intersection	Greene	Relocated	Relocated	Relocated	Relocated	Relocated
Carter Rd (CR 100N/CR 150N)	Monroe	Closed	Not Affected	Closed	Closed	Not Affected
Breeden Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass
Burch Road	Monroe	Overpass**	Overpass or Closed	Overpass or Closed	Overpass or Closed	Overpass or Closed
Evans Lane	Monroe	Closed**	Overpass or Closed	Overpass or Closed	Overpass or Closed	Overpass or Closed
Harmony Road	Monroe	Overpass**	Overpass or Closed	Overpass or Closed	Overpass or Closed	Overpass or Closed
Rockport Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass

Table 5.3-3: Proposed Local Access – Grade Separations, Interchanges, Road Closures, and Road Relocations by Alternative

State / County Roads	County	Alternatives				
		Refined Preferred Alternative 2	1	2	3	4
West Evans Road	Monroe	West-Closed East-Not Affected	West-Closed East-Not Affected	West-Closed East-Not Affected	West-Closed East-Not Affected	West-Closed East-Not Affected
Lodge Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass
Tramway Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass
Bolin Lane	Monroe	Underpass**	Underpass or Closed	Underpass or Closed	Underpass or Closed	Underpass or Closed
Farmers Drive	Monroe	Not Affected	Not Affected	Not Affected	Not Affected	Not Affected
Crop Circle	Monroe	Not Affected	Closed	Not Affected	Not Affected	Not Affected
Glenview Drive	Monroe	Relocated (AR 7)	Not Affected	Closed	Closed	Closed
Wheaton Court	Monroe	Relocated (AR 7)	Not Affected	Closed	Closed	Closed
SR 37	Monroe	Interchange	Interchange	Interchange	Interchange	Interchange
Victor Pike	Monroe	Not Affected	Not Affected	Not Affected	Not Affected	Not Affected
Big Sky Lane	Monroe	Closed	Closed	Closed	Closed	Closed
That Road	Monroe	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)

*** Final determination of local access was based on public involvement, resource and local agency comments, and cost. See **Appendix Z** for more information*
**** Overpass under the Low-Cost Scenario.*

Five new access roads were required for the alternatives in the DEIS. **Table 5.3-4** has been modified to include two additional access roads which are included in the Refined Preferred Alternative 2. Access Road 1 would be required for the Refined Preferred Alternative and Alternatives 2 and 3. Access Roads 2 through 5 would be developed at the same location for each of the alternatives. Access Roads 6 and 7 are included in the Refined Preferred Alternative. The total length of access roads is approximately 3,450 feet for Alternatives 1 and 4 and 4,450 feet for Alternatives 2 and 3. The Refined Preferred Alternative 2 has a total length of access roads of 4,550 feet.

Table 5.3-4: Description of Proposed Access Roads

Access Road (AR)	Description	Length (feet)	Length (miles)
AR 1	Proposed in the DEIS. On the north side of I-69, this road would connect CR475E with Taylor Ridge Cemetery. **Refined Preferred Alternative 2 and Alternatives 2 and 3**	1,000	0.19
AR 2	Proposed in the DEIS. On the north side of I-69, this road would realign the intersection connection between Pine Road (west leg) and Spruce Road (north leg) in the Clifty Hills Subdivision. **Alternatives 1, 2, 3, and 4**	1,250	0.24
AR 2a (revised)	Included in the Refined Preferred Alternative 2 only in the FEIS. AR 2 as contained in the DEIS will be replaced by a modification of the existing cul-de-sac at the south end of Spruce Road. The new cul-de-sac will be constructed slightly north of the existing one with a new connection to Pine Road in the Clifty Hills Subdivision. **Refined Preferred Alternative 2**	150	0.03
AR 3	Proposed in the DEIS. On the south side of I-69, west of SR 45, a short access road is needed to provide access to two properties because of the limited access right-of-way associated with the I-69/SR 45 Interchange. **Refined Preferred Alternative 2 and Alternatives 1, 2, 3, and 4**	100	0.02
AR 4	Proposed in the DEIS. On the south side of I-69, this road connects CR 1250E to SR 54. CR 1250E would be closed on the north side of I-69 so this road provides north-south connectivity between communities on either side. **Refined Preferred Alternative 2 and Alternatives 1, 2, 3, and 4**	1,300	0.25
AR 5	Proposed in the DEIS. On the south side of I-69 and the east side of SR 54 this road provides access to several properties whose current access would be cut off by the construction of I-69. **Refined Preferred Alternative 2 and Alternatives 1, 2, 3, and 4**	800	0.15
AR 6	Included in the Refined Preferred Alternative 2 only in the FEIS. On the north side of I-69, east of SR 45, a short access road is needed to provide access to two properties because of the limited access right-of-way associated with the I-69/SR 45 interchanges. **Refined Preferred Alternative 2**	150	0.03
AR 7	Included in the Refined Preferred Alternative 2 only in the FEIS. On the south side of I-69, this road reconnects Glenview Drive to Bolin Lane. This road provides access from Glenview Drive to Bolin Lane along a modified alignment that retains the current connection to Wheaton Court. **Refined Preferred Alternative 2**	1,050	0.20

5.3.5 Community Facilities and Services

The following section identifies potential impacts to community facilities and related services from the project. These include schools, churches and cemeteries, libraries, fire/police/EMS stations, hospitals, parks and recreation areas, bicycle and pedestrian facilities, and utilities/infrastructure. Because the corridor is mostly rural (almost entirely forest, rural residential, and agricultural), few of the listed facilities are within the corridor; most are located in the communities within the Study Area—Scotland, Owensburg, Cincinnati, and Solsberry in Greene County, and Stanford and Southwestern Bloomington in Monroe County. **Figure 4.2-3** (p. 4-65) shows the locations of the facilities/services discussed below. Where facilities are within the corridor, they are shown in relationship to the alternatives on figures accompanying the text that describes the potential impacts.

Schools—There are no schools within the project corridor. Two kindergarten-primary and secondary schools are located within the Study Area. As a task of Section 4's evaluation of impacts to communities and community services, a survey of schools was conducted, by mail, in July of 2009. The survey and responses are contained in **Appendix I**, *Survey of Schools*. The information obtained from the surveys, and from personal contact with some school administrators, was among the data used to identify critical routes that should remain open. The schools are identified below and located on **Figure 4.2-3:**

- **Public and Private Elementary and Secondary Schools**: A survey of public and private schools (kindergarten through high school) that serve the project area was conducted in the spring of 2005. Surveys were sent to the Bloomfield School District, Eastern School District of Greene County; and the Monroe County Community School Corporation. The Eastern School District of Greene County contains the largest population of students of the public schools serving the Section 4 Study Area. Information about the schools was gathered primarily to identify the locations of school bus routes that might be impacted by the project.

  Responses were received from the Bloomfield School District, Eastern School District of Greene County, the Lighthouse Christian Academy, and the Monroe County Community School Corporation. In addition, information from each of the school districts was obtained from personal contact. A representative of the Eastern School District of Greene County serves on Section 4's CAC. The Monroe County Community School Corporation indicated that their bus routes change frequently and given at least two weeks prior notice they would adjust school bus routes that were impacted by the project.

  The Lighthouse Christian Academy is located on West That Road approximately one mile east of the Section 4 corridor. All five alternatives would construct a cul-de-sac on the west side of the West That Road and SR 37 intersection. On the east side of SR 37 a connector road to Rockport Road would be constructed to the north from West That Road. There would no longer be direct access to SR 37, or to future I-69 and the Interstate system via West That Road or Rockport Road. This would result in longer drive times for traffic currently using West That Road to access the Lighthouse Christian Academy. School bus access across I-69 would be via Rockport Road overpass. For residents in the area, access to the interstate system would be via the Victor Pike/SR 37 intersection south of the SR 37/I-69 interchange, and via a (Section 5) proposed interchange with I-69 at Fullerton Pike to the north.

  School bus routes are evaluated yearly to adjust to changing student populations. Changes in access for school bus routes will be discussed with the school systems well in advance of when they actually take place so the school systems can adjust routes in a timely manner. Where roads are severed, provisions for school bus turnarounds would be included during the final design phase of the project. **Table 5.3-4** identifies local access roads proposed with each alternative. **Table 5.3-3** identifies overpass locations, road relocations, and road closures.

Churches—Ashcraft Chapel is the only church located within the Section 4 corridor. However, the Clifty Church, which is located approximately 0.5 mile north of the Section 4 corridor on CR 975E, will lose access along this road from the south under all five alternatives. These churches were included in a survey conducted to identify potential benefits and impacts to the churches' membership that could result from the project. **Figure 4.2-3** shows the locations of the churches.

- **Ashcraft Chapel**: Ashcraft Chapel is located on CR 635S (Mineral to Koleen Road) and is the only church within the Section 4 corridor. This church would not be displaced by any of the alternatives. Ongoing coordination with church representatives via the CAC, consulting parties process, the church survey and other public involvement initiatives (See Chapter 11, *Comments, Coordination and Public Involvement*) have identified as the church's major

concerns: 1) acquisition of the church for right-of-way, and 2) loss of access to the church's cemetery on the south side. Regarding these concerns, none of the alternatives would require acquisition of the church for right-of-way. All alternatives would provide continued direct access from CR 635S to the church and the cemetery.

- **Clifty Church**: This church is located on CR 975E, approximately 0.5 mile north of the project corridor. The *Historic Properties Report* prepared for this project recommended this church as eligible for listing in the NRHP. There will be auditory effects upon the Clifty Church property but the effects will not rise to the level of an adverse effect. (See Section 5.13, *Historic Resource Impacts*, Section 5.13.4, *Effects Evaluation*). All alternatives propose closing CR 975E south of the church at the I-69 corridor. While this would mean longer drives times for some, access to CR 975E and the church would be available via CR 300S, CR 225S and other county roads.

Cemeteries—Nine cemeteries are located within the limits of the Section 4 corridor.

- **Dowden Cemetery** is located on the east side of CR 275E, north of CR 625S. It would be approximately 1,200 feet from all of the alternatives.

- **Hassler Cemetery** is located on the south side of CR 625S, east of CR 275E. It would be approximately 500 feet from all of the alternatives.

- **Taylor Ridge Cemetery** is located along the north side of CR 450S just west of CR 475E. Refined Preferred Alternative 2 and Alternatives 2 and 3 would be constructed within 200 feet from this cemetery while Alternatives 1 and 4 would be constructed approximately 100 feet from this cemetery. Under Refined Preferred Alternative 2 and Alternatives 2 and 3, the new highway would close CR 440E and CR 450S at the I-69 mainline. Under Refined Preferred Alternative 2 and Alternatives 2 and 3, Access Road 1 would be constructed within 100 feet from the cemetery to maintain travel between CR 475E and CR 450S (west of CR 475E). Access Road 1 would also maintain the current access to Taylor Ridge Cemetery. While CR 475E would be closed under Alternatives 1 and 4, continuity of travel along CR 440E and CR 450S would be maintained. A cemetery development plan would likely be required for Refined Preferred Alternative 2 and Alternatives 2 and 3 if Access Road 1 disturbs ground within 100 feet of the cemetery (IC 14-21-1-26.5 and IC 23-14-44-1).

  Refined Preferred Alternative 2 and Alternatives 2 and 3 would result in the closing of CR 475E at both the I-69 north and south rights-of-way (See **Figures 5.3-7** and **5.3-8**). No changes to CR 440E, CR 450S; however, access to Taylor Ridge Cemetery would occur via Access Road 1 under these alternatives.

- **Cooper Cemetery** is located on CR 725E. It would be approximately 1,000 feet from all of the alternatives.

- **Shoptaw Cemetery** is located on CR 360S. It would be approximately 800 feet from all of the alternatives.

- **Ashcraft Cemetery** is located on CR 360S. It would be approximately 1,200 feet from all of the alternatives.

- **Carmichael Cemetery** is located on Carmichael Road in Eastern Greene County. It would be approximately 1,500 feet from Alternatives 1 and 3, and approximately 1,800 feet from Refined Preferred Alternative 2 and Alternatives 2 and 4.

- **Sparks Cemetery** is located southeast of the Timber Trace subdivision, northwest of Indian Creek in eastern Greene County. It would be approximately 200 feet from Refined Preferred Alternative 2 and Alternatives 1 and 2, and approximately 400 feet from Alternatives 3 and 4.

- **Adams/Breeden Cemetery** is located west of Breeden Road, north of Graves Road in Monroe County. It would be approximately 200 feet from Alternatives 3 and 4, and approximately 400 feet from Refined Preferred Alternative 2 and Alternatives 1 and 2.

This project would be developed in accordance with Indiana Code regulating construction near cemeteries (IC 14-21-1-26.5 and IC 23-14-44-1). The proposed right-of-way limits for all alternatives would be at least 100 feet from any cemetery boundary, with the exception of Alternatives 1 and 4. Access Road 1 would be constructed within 100 feet of Taylor Ridge Cemetery under Refined Preferred Alternative 2 and Alternatives 2 and 3, and would likely require the submittal of a cemetery development plan. If future design plans require the preferred alternative to disturb ground within 100 feet of a burial site, a development plan would be completed and submitted to IDNR Division of Historic Preservation and Archaeology during the design phase of project development as per the Indiana Historic Preservation and Archaeology Law (IHPAA).

Libraries—Libraries in Cincinnati, Owensburg, and Bloomington will not be displaced by the alternatives and accessibility to these libraries will not be impacted. Access Road 4 will maintain travel along CR 1250E and access to the Bloomfield-Eastern Greene County Public Library/Hatfield Museum in Owensburg for residents in the Hobbieville area and northern Jackson Township.

Fire, Police, and Emergency Medical Services—The following identifies fire, police and emergency medical service agencies within the Section 4 Study Area and provides an assessment of potential impacts upon the services provided by these agencies.

- **Fire Departments:** All properties within the Section 4 Study Area are served by volunteer fire departments (VFD). In Greene County, these are Richland-Taylor Township VFD, Jackson Township/Owensburg VFD, and Center Township VFD. In Monroe County, these are Indian Creek Township VFD, Van Buren Township VFD, and Perry-Clear Creek VFD. Reciprocity (mutual-aid) agreements exist between these fire departments. The City of Bloomington Fire Department is also available for mutual-aid assistance. Bloomington Township VFD provides haz-mat response services for the entire Section 4 Study Area.

  Extensive coordination with these fire departments has been maintained throughout the project development. Considerable input on emergency services were received during the

DEIS comment period from local governments, the various emergency service providers, and the public (see Volume III and **Appendix Z**, *Documentation of Local Access Decsions*).

Decisions on the disposition of local roads crossing I-69 for Refined Preferred Alternative 2 considered the many comments received on emergency services. This included the options to consider the possible closing of Dry Branch Road and Mineral-Koleen Road in Greene County and Burch Road, Evans Lane, Harmony Road, and Bolin Lane in Monroe County. The proposed local road closings for the Refined Preferred Alternative 2, as listed in **Table 5.3-3**, have been reviewed by the local fire departments and it has been determined that no adverse impacts for fire responses to properties within Section 4 would occur.

Richland-Taylor VFD expressed a concern about the proposed closing of CR 215E under the four alternatives. Travel distances from their station in Scotland to properties in the general area of CR 215E/CR 600S/CR 300E on the north side of I-69 would be increased and was identified as a local concern. It was also pointed out that the proposed grade separation at CR 200E would not provide service to this area due to the poor or restricted travel conditions along CR 600E to the east of CR 200E. Under Refined Preferred Alternative 2, the proposed grade separation at CR 200E has been eliminated and a grade separation at CR 215E would be built. The CR 215E grade separation would maintain the current route used by Richland-Taylor VFD to access this general area north of I-69. The closing of CR 200E at I-69 would not adversely impact responses to the general area of CR 200E/CR 600S. Access to this area would be available via US 231.

A direct impact upon fire services would occur under Alternative 3. Indian Creek Township VFD is located along CR 35N in Greene County. The alignment of CR 35N would be shifted to the south for the development of a grade separation over I-69 under Alternative 3. The road realignment would displace the Indian Creek Township VFD station located along the south side of the road (See **Figure 5.3-8,** p. 5-150). This was one reason that Alternative 3 was not preferred. Refined Preferred Alternative 2 would not impact this fire station.

Center Township VFD expressed a concern about access to properties along CR 150N just west of the Greene County/Monroe County line. Access to these properties under Alternatives 3 and 4 would require travel into Monroe County (via Carmichael Road, Rock East Road, Breeden Road, and Carter Road) before returning to Greene County along CR 150N. The use of this route would increase travel distance and time. Alternatives 1 and 2 would not impact access to this area. Refined Preferred Alternative 2 would also not impact access for emergency service providers in this area of Greene County.

Another identified fire/emergency response concern is the ability of the fire departments to respond to an emergency/life-safety incident along I-69. Richland-Taylor Township VFD, Jackson Township/Owensburg VFD, and Center Township VFD can provide adequate service to the segment of I-69 within Greene County via the interchanges at US 231, SR 45, and the Greene County/Monroe County line under Refined Preferred Alternative 2.

Access to the segment of I-69 within southwestern Monroe County, however, has been identified as a primary concern by local governments, Indian Creek Township VFD, Van Buren Township VFD, Perry-Clear Creek VFD, and the public. These concerns include

both a response to an emergency/life-safety incident along I-69 as well as a potential haz-mat spill in the karst sensitive area of southwest Monroe County. A potential mitigation measure for these concerns is the development of an emergency access ramp. Van Buren Township VFD Station 19 in Stanford has been identified as the closest fire station to provide access to the mid and western portions of I-69 Section 4 in southwest Monroe County. A possible access point has been identified on the north side of I-69 at Burch Road. Perry-Clear Creek VFD Station 11 can provide the quickest access to the eastern portion of I-69 Section 4 via the proposed SR 37 interchange. Coordination with emergency service providers, an emergency response memorandum, an interstate emergency access memorandum, and an emergency access feasibility design memorandum are included in **Appendix BB**, *Emergency Responder Coordination*. A decision on a possible emergency access ramp at Burch Road will be made in the project design phase.

- **Police Departments:** The Greene County Sheriff's Department in Bloomfield and Monroe County Sheriff's Department in Bloomington serve their respective counties. There are no local (community) police departments within the Section 4 Study Area. The counties operate the central dispatch for emergency calls (See Section 4.2.2.5). The proposed local road closings for Refined Preferred Alternative 2, as listed in **Table 5.3-3**, would not have an adverse impact upon local police patrols or emergency responses.

  The Indiana State Police would provide patrols along I-69. Access to the highway would be available at interchanges located at US 231, SR 45, Greene County/Monroe County Line, and SR 37.

- **Ambulance Service:** Emergency medical services are available in the Study Area by dialing 911. Greene County Ambulance Service operates ambulances at Greene County Memorial Hospital (Linton), Bloomfield Fire Department, and Eastern Greene Fire Department (Station 3 in Solsberry). Emergency medical service in Monroe County is provided by Bloomington Hospital and Ambulance Service. The disposition of local roads under Refined Preferred Alternative 2 has been reviewed by Greene County Ambulance Service and Bloomington Hospital and Ambulance Service. Emergency medical services would not be adversely impacted by the local road closures under Refined Preferred Alternative 2. I-69 Section 4 would improve regional access to medical facilities.

Public Parks and Recreation Areas—Section 4(f) of the Department of Transportation Act of 1970 prohibits using public parkland for highway purposes unless no prudent and feasible alternative can be found and all possible planning measures are taken to minimize harm. Park projects funded with federal Land & Water Conservation Fund grants may involve Section 6(f) restrictions on converting parkland to non-park uses, including replacement in kind with a comparable parcel agreed to by the Secretary of the Interior.

There are no public parks or recreation areas within or near the project corridor that are expected to be significantly impacted by the Section 4 alternatives. However, the City of Bloomington Parks and Recreation Foundation Inc. owns a parcel of land (Parcel No. 014-17050-00) along a railroad right-of-way, located to the south of Tramway Road and west of Victor Pike in Monroe County. See Chapter 8, *Section 4(f) Evaluation*, **Figure 8-1** (p. 8-7) for the location of the City-owned parcel and additional discussion on this topic. This parcel of land encroaches into the

Section 4 corridor. While its status under Section 4(f) is unclear, it is being treated as a resource which potentially is afforded protection under Section 4(f) as a publicly-owned park and/or recreation land. This property would not be impacted by the Section 4 Refined Preferred Alternative 2. FHWA and INDOT have coordinated with the City of Bloomington to assure that any proposed project on the parcel is appropriately planned along with I-69 in a joint development process.

Section 4 does not have impacts to any public park or Section 6(f) property. I-69 would increase access to the Hoosier National Forest, Indiana University and Monroe Lake, all of which are located in Monroe County.

Pedestrian and Bicycle Facilities—There are no public pedestrian facilities or bicycle routes within the corridor. The *Monroe County Alternative Transportation & Greenway System Plan* proposes several "road improvement" opportunities as an alternative transportation opportunity within the right-of-way of several county roads that cross the Section 4 corridor. Coordination with local government representatives in Monroe County has been performed and, in consideration of the recommendations of the alternative transportation plan, it has been decided that additional shoulder width will be provided along Breeden Road, Harmony Road, Rockport Road, Tramway Road, and Bolin Lane where these roads cross I-69 in order to accommodate future shared bicycle lanes/shoulders. Pavement striping and/or signage for the bicycle lane will be implemented at a future time by Monroe County (see **Appendix Z**, *Documentation of Local Access Decisions*).

The Bloomington Bicycle Club has nine established on-road bicycle routes that traverse portions of Greene and Monroe counties within the vicinity of the Section 4 corridor. None of the bicycle club routes would be impacted.

The Clear Creek paved Multi-Use Trail, which is included as a "greenway opportunity" in the *Monroe County Alternative Transportation & Greenway System Plan*, crosses That Road approximately 4,000 feet east of SR 37, just outside the Section 4 Corridor. The current at-grade crossing (and access) of That Road at SR 37 would be closed at the I-69 right-of-way. On the east side of I-69; however, a Frontage Road is proposed to extend That Road north to connect with Rockport Road. The proposed Frontage Road would be developed by Section 5. Parking for access to the Clear Creek Trail is available at Tapp Road and at Church Lane. The I-69 Section 4 project is not expected to significantly impact access to or functioning of the Clear Creek Trail.**Utilities and Roadways—**

Utilities: The primary utility providers in the Study Area are listed below.

> Electric—Utilities District of Western Indiana REMC and Duke Energy. There are several overhead power transmission lines extending across the corridor. The Indianapolis Power and Light Company has a high-tension electrical transmission line which passes through the corridor over US 231 near the US 231/SR 45/58 intersection. Hoosier Energy has two electrical transmission lines within the corridor, one runs north-south to the east of US 231, the other enters the corridor along CR 1250E then traverses northeast exiting the corridor at CR 1320E. Duke Energy also has two overhead power transmission lines that pass through the corridor. One line traverses the corridor west of

SR 45 in a northwest-southeast direction. The other line runs in a north-south direction and passes through the corridor near Tramway Road.

Water—Municipally-owned systems are Eastern Heights Utilities, Inc., Van Buren Water, Inc., and Southern Monroe Water, Inc.

Wastewater—No sewage treatment plants or major sewer lines are located within the Section 4 corridor. The Dillman Road Wastewater Treatment Plant, operated by the City of Bloomington Utilities, is located along SR 37 just south of the corridor.

Natural Gas—Vectren is the supplier of natural gas within the Study Area. They have a distribution network that serves the Farmer's Field and Rolling Glen subdivisions on the north and south sides of Bolin Lane, respectively. Vectren has two high-pressure transmission lines that cross the corridor. One is a 4" steel gas main in the right-of-way of SR 45. The other is a 16" steel gas main that runs north-south across the corridor in the vicinity of Tramway Road. Both lines are major transmission lines that cannot be interrupted during the heating season. Texas Gas Transmission, LLC has a 12" gas transmission line that crosses the corridor at SR 54 south of the CR 1250E intersection.

Telephone—Smithville Telephone provides local telephone service in the Study Area.

All public utilities facilities have been field located or identified through contact with the utility and pipeline companies. A GIS layer showing their locations and sizes (where appropriate) would be prepared for use in the final design of the highway.

Due to the narrow corridor and the proximity of all alternatives within the corridor, there would be no discernable difference in the alternatives' impacts to utilities. Utility relocation plans are a function of final design, and coordination with the utility companies that initiated in this phase of the project would continue during the final design phase of the project.

Local and State Roadway System: Existing transportation facilities within the Study Area include a U.S. highway (US 231), five state highways (SR 58, SR 45, SR 54, SR 445, and SR 37), numerous county roads, and several residential streets in subdivisions. Interchanges will provide direct access to SR 45, SR 445 (for the County Line Interchange South Connector), and SR 37. The US 231 interchange (being developed by Section 3) will provide access to US 231 and SR 58. SR 54 will be grade separated at I-69 under all five alternatives. Access to I-69 for SR 54 traffic would be available at the Greene/Monroe County Line interchange.

Several Greene County and Monroe County roads and local subdivision streets traverse or could be impacted by proximity to the project corridor. All roads are shown on **Figure 5.3-6** through **Figure 5.3-10** (pp 5-138 through 5-167). **Table 5.3-3** identifies grades separations, interchanges, road closures, and road relocations proposed for each alternative. **Table 5.3-4** lists the new access roads for each alternative. Further discussion of impacts to local public roads is included in Section 5.3.4.2.

Railroads: The project corridor does not cross any operating railroad rights-of-way.

Airports: The only public airport in the vicinity of Section 4 is the Monroe County Airport located about four miles southwest of the City of Bloomington and about five miles north of the Section 4 corridor. The average daily use of the airport is 140 aircraft operations. Sixty-eight percent of air traffic is transient general aviation, 27% is local general aviation, and 4% is air taxi (AirNav website – www.airnav.com, accessed March 29, 2010). The nearest commercial passenger airports are Indianapolis International Airport, Evansville-Vanderburgh Airport and Louisville (KY) International Airport. All are within approximately 100 miles of the Section 4 project area, and the project would improve access to these destinations. There would be no impacts to airports as a result of any Section 4 alternative.

5.3.6 Mitigation

Section 4 is mainly rural. The land use is primarily forest and farmland with some residential, commercial, and institutional land uses. Some forest and farmland in Section 4 may be converted to limestone-mined lands in the future. The following measures would be utilized to mitigate the potential impacts on land use patterns:

- **I-69 Community Planning Program**—The I-69 Community Planning Program would set in place a regional strategy for providing resources to local communities to manage the growth and economic development associated with I-69. The grant application program has been developed and grants were made available to eligible communities in two phases beginning in August 2007. On October 29, 2007, INDOT awarded $950,000 in grants to communities located along the I-69 corridor in Southwest Indiana. Greene, Lawrence and Monroe counties and the cities of Bedford, Bloomfield, Bloomington, Ellettsville, and Linton were eligible for grants. The City of Bloomington elected not to participate in the program.

  In the first phase, Greene County, the Town of Bloomfield, and the City of Linton together were awarded a grant for $150,000. Using this grant, Greene County developed its Draft Comprehensive Plan on August 3, 2009. On February 1, 2008, Monroe County submitted an application for a $50,000 grant. A grant was awarded to Monroe County in the second phase of the program on July 30, 2008, and this grant was used for the preparation of the April 20, 2010, *Draft Monroe County Comprehensive Plan*. A transportation corridor plan for SR 37/I-69 also was developed by Monroe County as a result of the grant program. In addition, the Lawrence County 2009 Strategic Plan and City of Bedford 2010 Comprehensive Plan also were developed as a result of the I-69 Planning Grant Program. Section 7.2, *Major Mitigation Initiatives*, describes the program in greater detail. **Appendix T**, *I-69 Planning Grant Program Update*, gives the outcomes and current status of these projects.

- **Context Sensitive Solutions (CSS)**—CSS is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project would exist. A Community Advisory Committee (CAC) was developed in the fall of 2004 to facilitate communication between project team members and representatives of key constituent groups in the project area. Through a series of four meetings committee members learned details of the project and provided feedback on such subjects as local needs and plans, community issues, and the development of alternatives.

Local access, farmland impacts, economic development, and the potential impact of the project on emergency response times were the issues most frequently raised by CAC members as important considerations in planning the Interstate's location and design features. The information they provided regarding farming operations, travel patterns, local development plans, and critical emergency response routes helped guide the development of alternatives that would avoid or minimize farmland severances, and provide for local access by measures that would maintain the connectivity of many local roads. In addition, based upon feedback received from regulatory agencies and Section 4 CAC members, Context Sensitive Solutions in the form of wildlife crossings are proposed at 37 locations. Other Context Sensitive Solutions may be incorporated as the study process continues for this project.

- **Cemeteries**— Under the Refined Preferred Alternative 2 and Alternatives 2 and 3, the proposed right-of-way limits for Access Road 1 are within 100 feet from the Taylor Ridge Cemetery boundary (See **Figure 5.3-7**, **Figure 5.3-8 and Figure 5.3-10** (pp. 5-144, 5-150 and 5-162, respectively)). This project would be developed in accordance with Indiana Code regulating construction near cemeteries (IC 14-21-1-26.5 and IC 23-14-44-1). If future design plans require the preferred alternative to disturb ground within 100 feet of the cemetery boundary, a development plan would be completed and submitted to IDNR Division of Historic Preservation and Archaeology during the design phase of project development as per the Indiana Historic Preservation and Archaeology Law (IHPAA).

- **Access**—Local and interstate access relating to economic development, and the emergency response services were the issues most frequently raised by CAC members, local officials and organizations, and the public as important considerations in planning I-69's location and design features. The information they provided regarding travel patterns, local development plans, and critical emergency response routes helped guide the development of alternatives that would avoid or minimize impacts and maintain the connectivity of many local roads, including the majority of those regarded as key access routes for emergency responders. Where reasonable and cost effective, local access roads (e.g., frontage roads and road relocations) would be used to maintain accessibility for residences, farm operations, businesses, churches, schools, and other land uses (See **Table 5.3-4**). The determination of whether access roads to potentially landlocked parcels will be constructed or whether the landlocked parcels will be acquired due to the cost of providing access will be made during final design.

  Changes in roads used by school bus routes would be discussed with the school systems well in advance of when they actually take place so the school systems can adjust routes in a timely manner. Where roads are severed, provisions for turnarounds would be included during the final design phase of the project.

For a more detailed listing of proposed mitigation measures, see Chapter 7, *Mitigation and Commitments.*

5.3.7 Summary

Right-of-Way Impacts

The land use impacts are comparable between the low-cost design criteria and initial design criteria alternatives ranging from 1,454 to 1,831 acres for Alternative 3 to about 1,468 to 1,836 acres of land for Alternative 1, respectively. Refined Preferred Alternative 2 would require right-of-way acquisition of about 1,456 acres for the low-cost design criteria alternative to about 1,809 acres for the initial design criteria alternative. Upland habitat (including forest, herbaceous cover and scrub/shrub areas) accounts for about 962.29 to 1,019.22 (66-69% of the total) acres for the low-cost design criteria alternatives and 1,191.66 to 1,281.32 acres for the initial design criteria alternatives (66-70% of the total acreage within the right-of-way). Agricultural land accounts for approximately 299.69 to 356.03 acres (20-24% of the total acreage within the right-of-way) for the low-cost design criteria alternatives, and about 382.49 to 468.03 acres (21-26% of the total acreage within the right-of-way) for the initial design criteria alternatives. The difference in the total acreage impacted among low-cost design criteria alternatives is minimal—approximately 14 acres separating the minimum and maximum amount of right-of-way required (i.e., 1,468 acres with Alternative 1 and 1,454 acres with Alternative 3). For the initial design criteria alternatives the difference is approximately 27 acres (i.e., 1,836 acres with Alternative 1 versus 1,809 acres with Refined Preferred Alternative 2.)

Induced Development Impacts (Indirect Effects)

The indirect land use changes have been forecasted to be 106 acres to be converted from agricultural land use and 54 acres to be converted from forest land use as a result of all alternatives (See Section 5.24, *Cumulative Impacts*).

Access and Travel Pattern Impacts

- **SR 45, SR 54 Greene/Monroe County Line Interchange Access Issues**—Maintaining existing local access and interstate access have been major issues raised by the public. Under all five alternatives, SR 54 would have a grade separation at I-69. Access to the interstate system would be provided via the Greene/Monroe County Line interchange. This would impact local travel patterns, including those of emergency responders reaching locations on I-69 from the fire stations in Cincinnati or Owensburg. Under all five alternatives, the nearest interstate access for emergency responders would be either the SR 45 interchange south of Cincinnati, or the proposed Greene/Monroe County Line interchange. An interchange at SR 45 and one at SR 54 initially were proposed for Tier 2 study; however, INDOT determined that the Greene/Monroe County Line interchange would be included as a feature of the Section 4 I-69 Tier 2 Studies instead of a SR 54 interchange. The Greene/Monroe County Line interchange was proposed to reduce traffic between the SR 45/SR445 intersection and Bloomington. This also would facilitate north-south access for Crane NSWC employees, and east-west access for Bloomfield residents, farmers and others.

- **SR 37 Interchange Access Issues**—Some of the initial conventional interchange designs for the I-69/SR 37 interchange proposed a grade separation at the Victor Pike/SR 37 intersection or terminating Victor Pike at SR 37. This would have negative impacts to numerous

businesses in the vicinity of the Victor Pike and SR 37 intersection. In response to input from local businesses and planning officials, consideration was given to a loop interchange design that shifts the SR 37/I-69 interchange slightly north so that access to SR 37 from Victor Pike could be maintained and design performance standards could be achieved. Please refer to Section 5.6 *Traffic Impacts* **Figures 5.6-6** and **5.6-7** (pp. 5-242 and 5-243) which show the location of the SR 37 loop interchange in relation to the alternatives.

All of the alternatives in this study use the loop design. The loop design maintains east-west connectivity and access to the Victor Pike/SR 37 intersection for the truck stop and businesses in the Old Capital Pike Business Park and Robinson Industrial Park. Please refer to **Figure 5.3-5** (p. 5-137) for the location of the Robinson Industrial Park and Old Capital Pike Business Park in relation to the SR 37/Victor Pike intersection. This loop design also would alleviate potential impacts to limestone and aggregate operations and emergency responders. Under all alternatives, access from Victor Pike to SR 37 would be maintained.

In response to comments received from local planning officials, consideration was given to an interim design for the SR 37/I-69 interchange. In the interim between the completion of Section 4 and the completion of Section 5, a temporary signalized "T" intersection would be constructed at SR 37. The interim intersection would enable That Road to remain open on both sides of SR 37 until such time that the full SR 37 interchange and Section 5 improvements are constructed.

- **Local Access**—Discussions were held with emergency responders, school districts, and the general public to determine what routes they considered critical for access to their service areas. This information was among the data used to identify routes that should remain open.

  Based on these discussions all alternatives currently propose adding a connector road on the south side of I-69 to connect CR 1250E to the east to SR 54, since CR 1250E would be severed at I-69. Of the roads identified as critical routes by emergency responders, all would remain open or would be provided with nearby alternative access.

  Comparisons of traffic impacts as a result of the alternatives are discussed in Section 5.6, *Traffic Impacts.*

- **Grade Separations**—The decision to construct a grade separation or to close a local road impacted by I-69 made in this FEIS may differ from that which was recommended in the DEIS. Some roads shown with grade separations in this FEIS may have been recommended as closed or optional in the DEIS. Within Greene County, CR 200E was recommended as a grade separation in the DEIS and the adjacent CR 215E was recommended as closed. Based on comments received from local emergency responders, government agencies and the public, it was decided that CR 200E would be closed at I-69 and CR 215E would be grade separated. Final approval of local access and grade separations would be made within the ROD for this project and would be based on public involvement, resource and local agency comments, and cost.

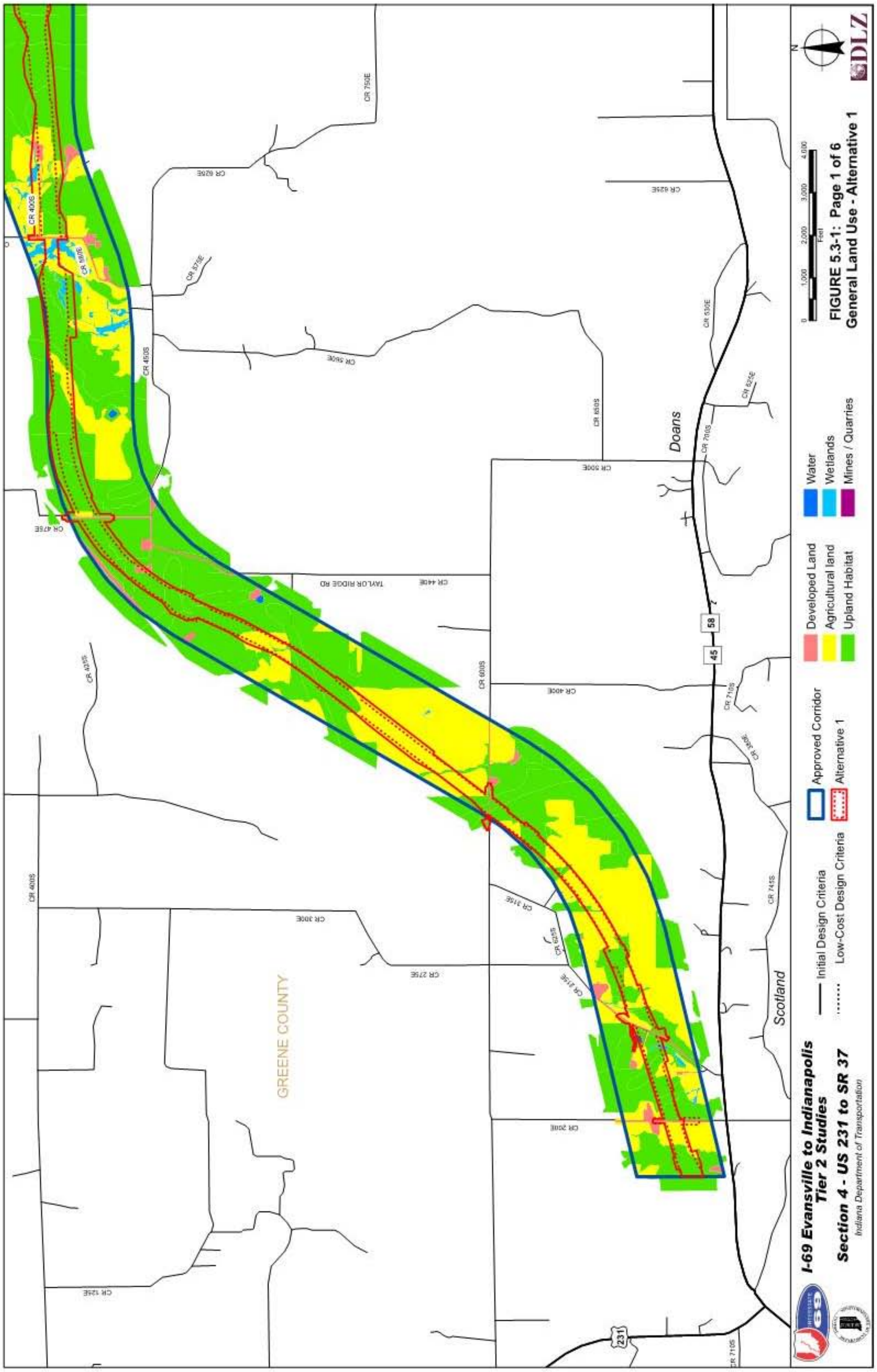
Community Facilities and Services

The majority of the project corridor consists of forest, farmland or residences on scattered, rural sites. Other than access-related issues described above, negative impacts to community facilities such as libraries, parks and recreation areas, cemeteries, hospitals, schools, churches, pedestrian/bikeways, etc., are not anticipated because most are outside the project corridor. However, one fire station and one church are located within the corridor. Several utility companies have facilities traversing the corridor.

The following community facilities were identified as being located within the corridor and potentially impacted by the one or more of the alternatives:

- Ashcraft Chapel is the only church within the project corridor. All five alternatives would avoid this church.
- The Indian Creek Township VFD is located along CR 35N within the project corridor. While Refined Preferred Alternative 2 would avoid this facility, it would be displaced by Alternative 3.
- All public utilities have been field located or identified through contact with the utility and pipeline companies, and a GIS layer showing their locations and, where appropriate, sizes, would be prepared for use in the final design of the highway. Coordination with the utility companies that initiated in this environmental analysis phase of the project will continue during the final design phase of the project.

Anticipated benefits of Section 4 that would enhance community facilities include improved access and safety, support for economic development, and relief of traffic congestion. An example of this would be improved access for local residents near Eastern Greene County Schools and the communities of Cincinnati and Hobbieville to the new Monroe Hospital. While emergency vehicles may see an improvement in travel times, depending on the time of day and weather conditions, the reduction in travel time for personal vehicles between these destinations could be significant. The increase in access to interstate destinations and intermodal transportation would benefit those visiting local community facilities and those traveling from local community facilities to distant locations.



I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 1
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
FIGURE 5.3-1: Page 1 of 6
General Land Use - Alternative 1
DLZ
GREENE COUNTY
Scotland
Doans

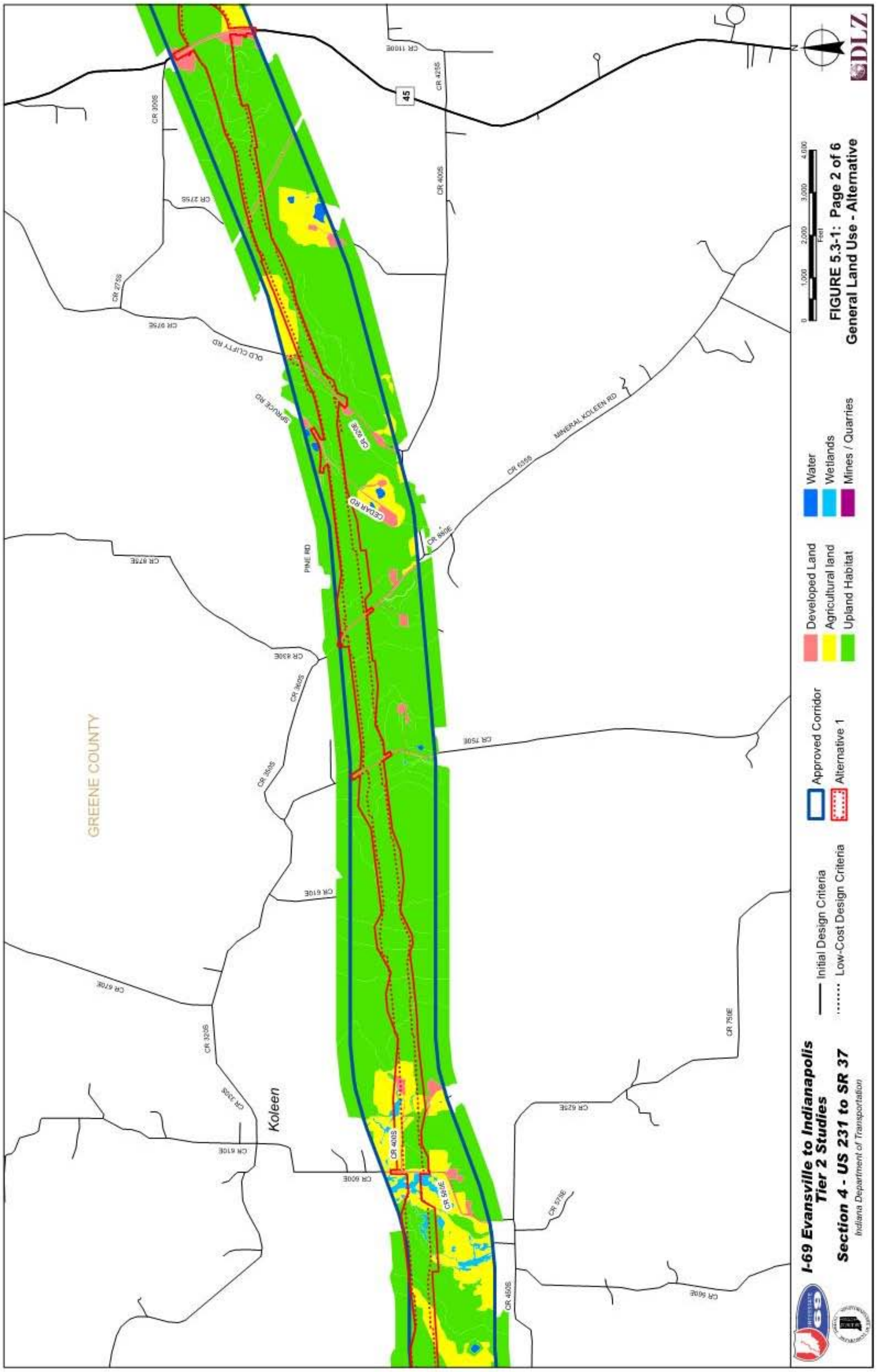

I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 1
Developed Land
Agricultural land
Upland Habitat
Water
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FIGURE 5.3-1: Page 2 of 6
General Land Use - Alternative
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GREENE COUNTY
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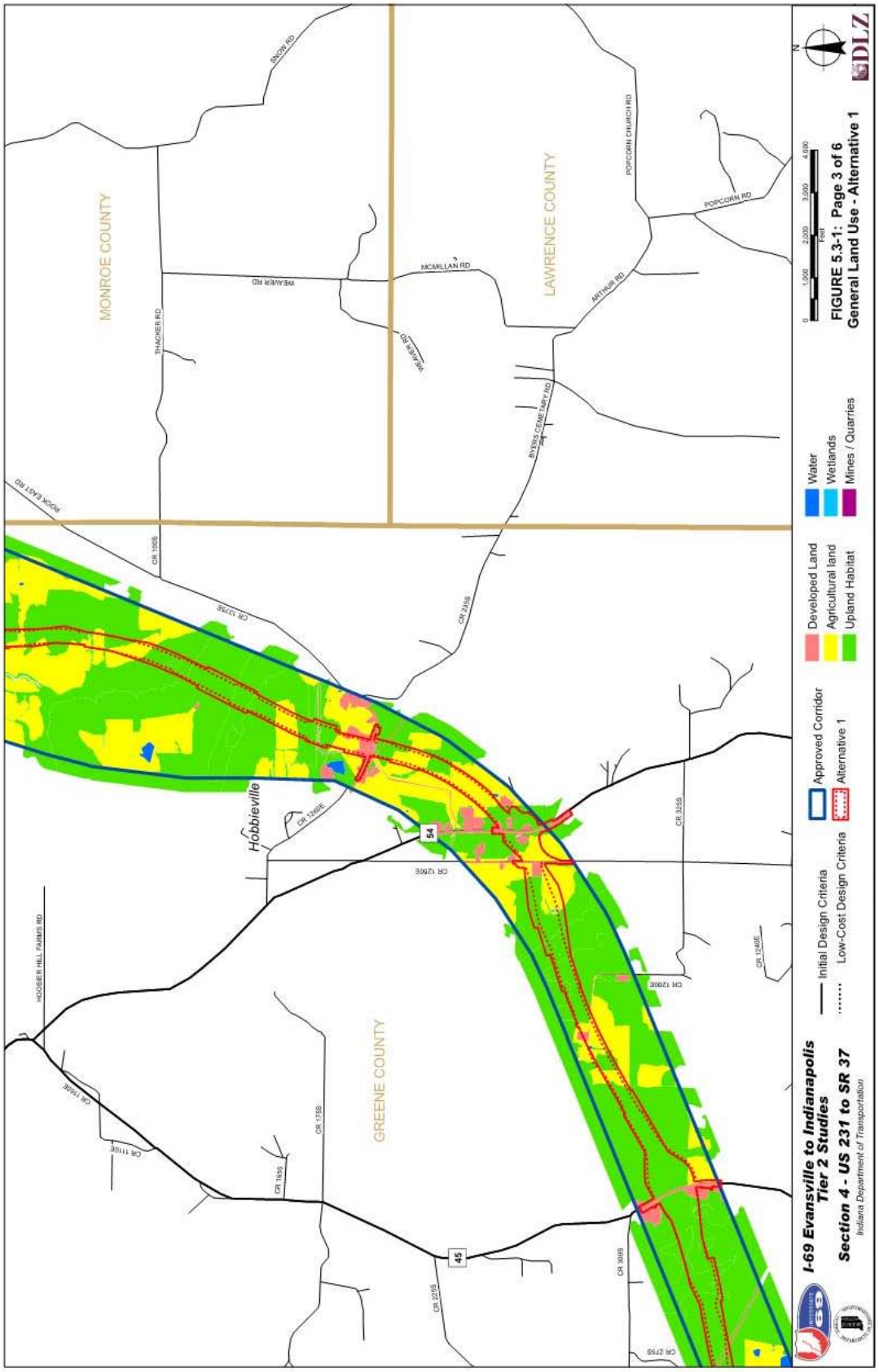
SPRUCE RD
CEDAR RD
PINE RD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LAWRENCE COUNTY
GREENE COUNTY
Hobbieville
SNOW RD
THACKER RD
WEAVER RD
MCMILLAN RD
POPCORN CHURCH RD
POPCORN RD
ARTHUR RD
BYERS CEMETERY RD
ROCK EAST RD
CR 100S
CR 1375E
CR 2355
CR 1240E
CR 1200E
CR 3255
HOOSIER HILL PARKS RD
CR 1110E
CR 1755
CR 1655
CR 3015
CR 2755
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Developed Land
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Upland Habitat
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Mines / Quarries
Approved Corridor
Alternative 1
Initial Design Criteria
Low-Cost Design Criteria
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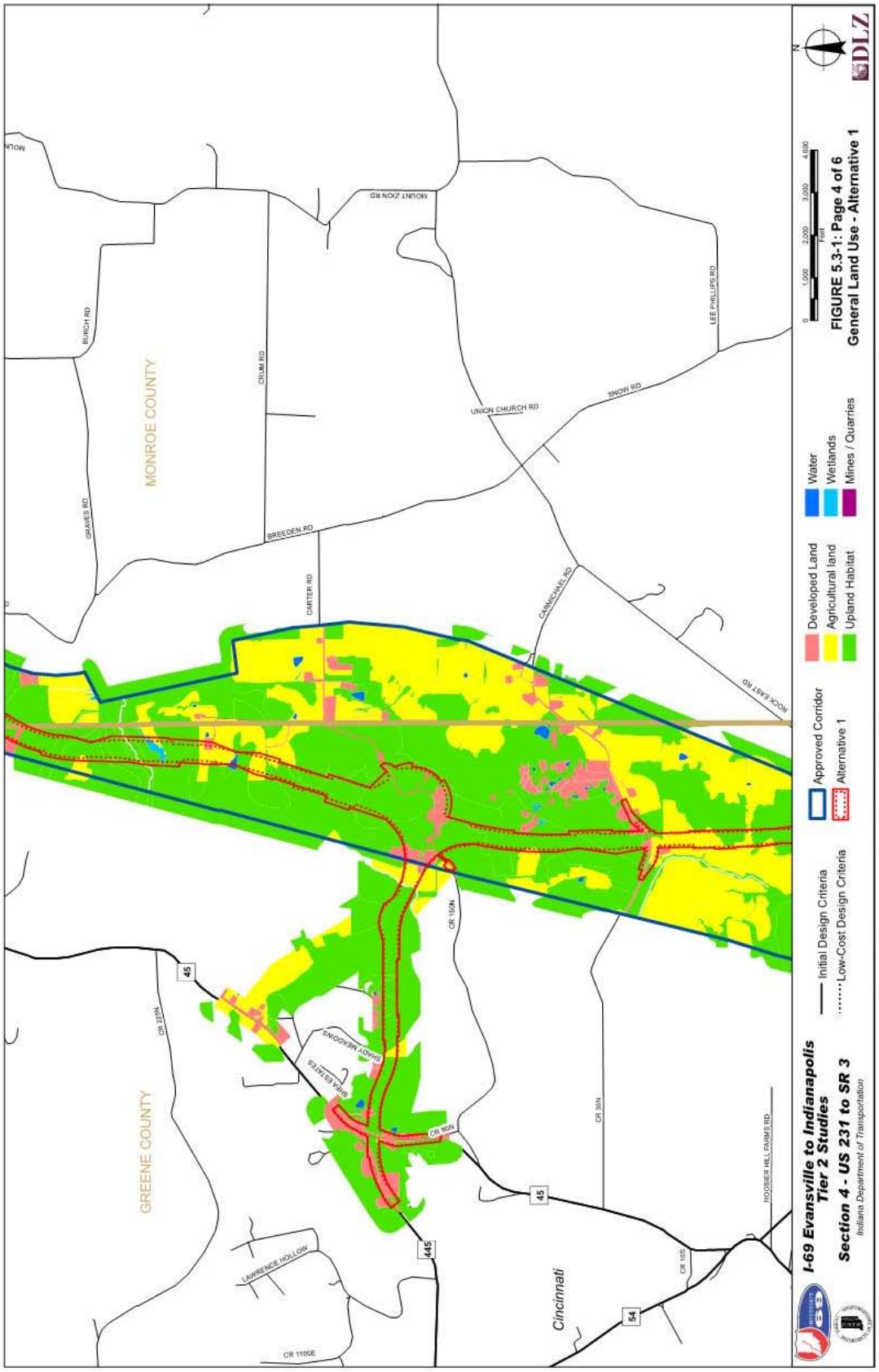
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-1: Page 3 of 6
General Land Use - Alternative 1
DLZ


MONROE COUNTY
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CR 1100E
LAWRENCE HOLLOW
SHADY MEADOWS
HOOSIER HILL FARMS RD
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Developed Land
Agricultural land
Upland Habitat
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Mines / Quarries
Approved Corridor
Alternative 1
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FIGURE 5.3-1: Page 4 of 6
General Land Use - Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
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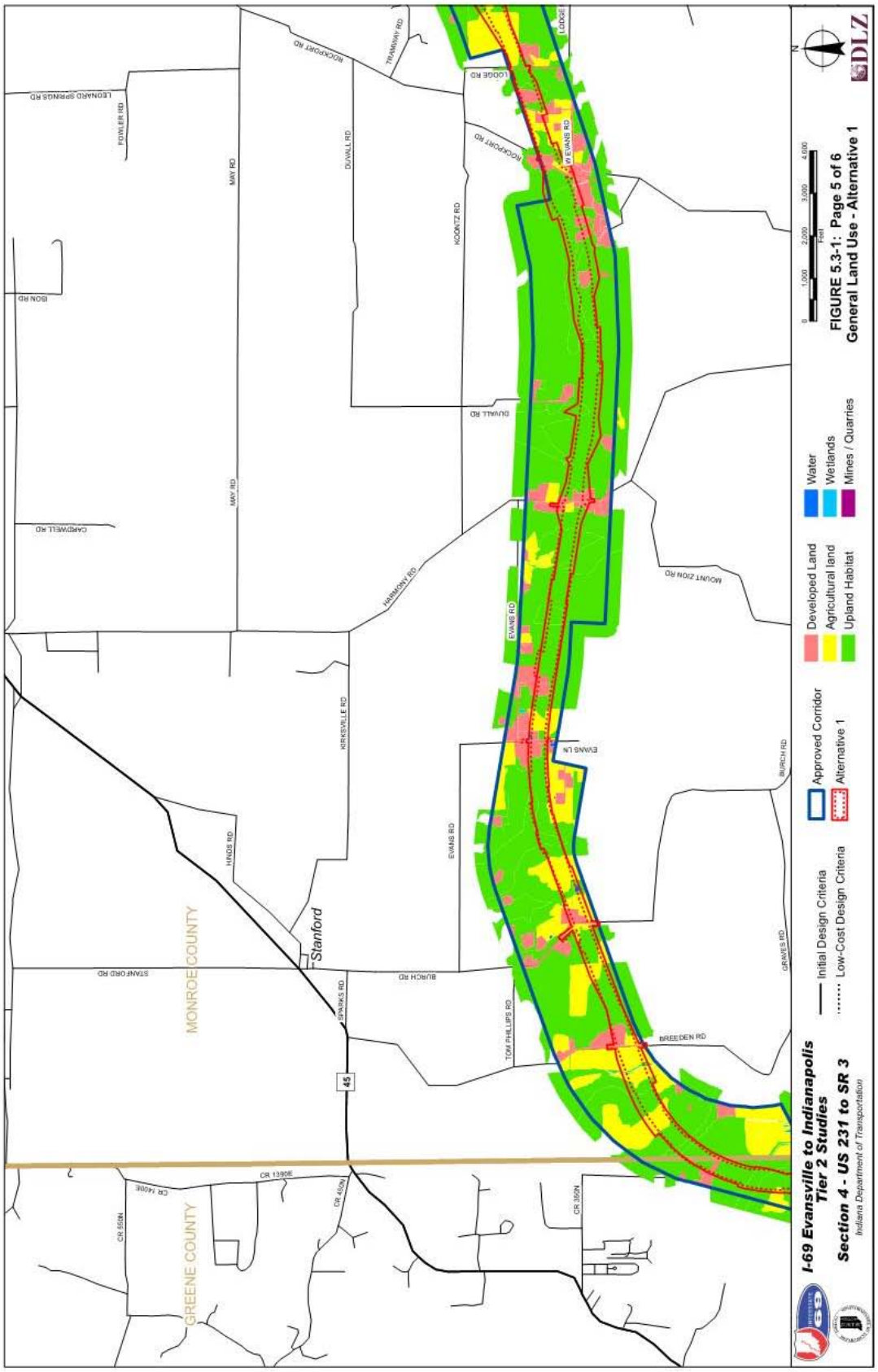
FIGURE 5.3-1: Page 5 of 6
General Land Use - Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
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Low-Cost Design Criteria
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GREENE COUNTY
Stanford
DLZ

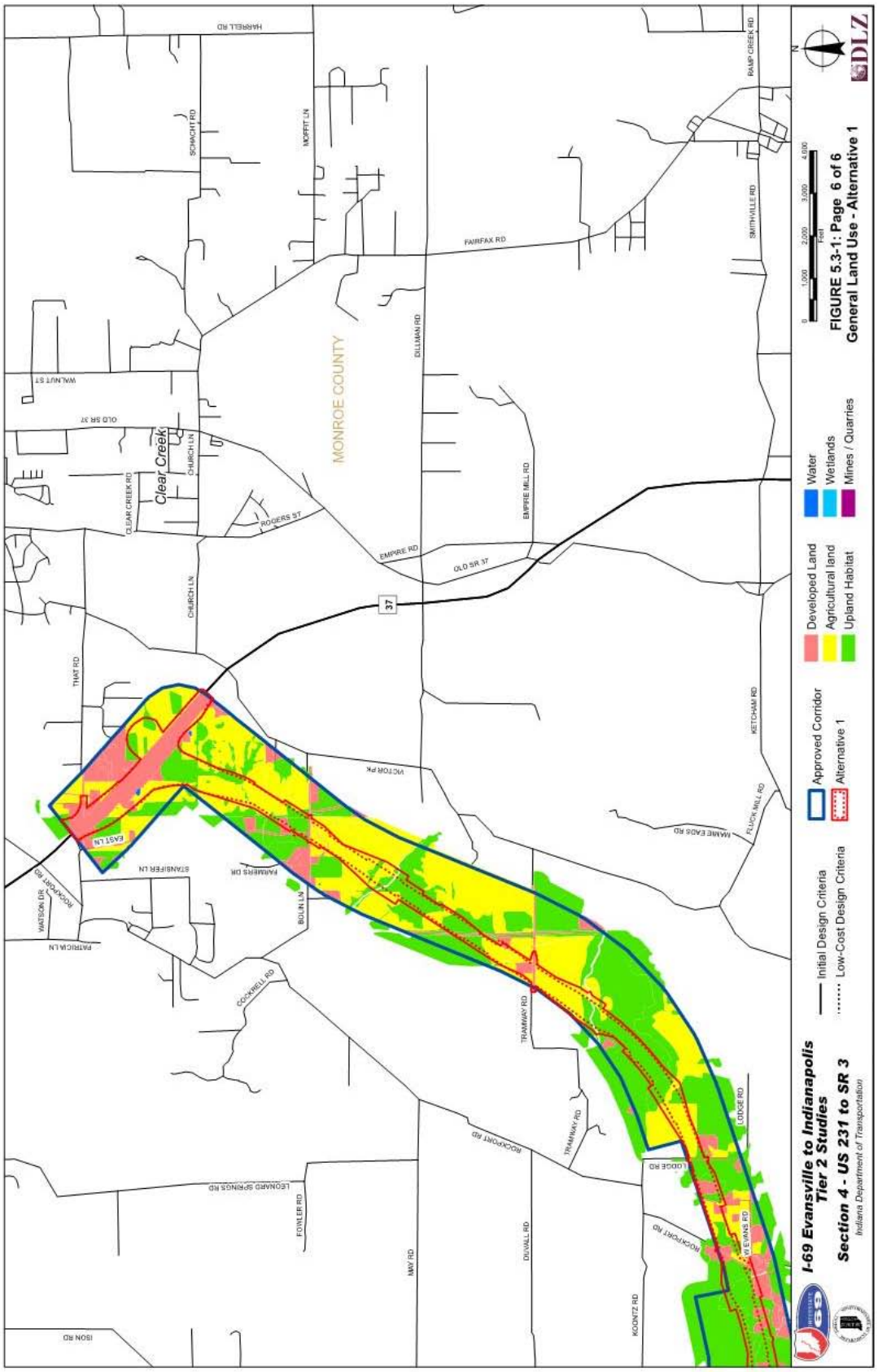
FIGURE 5.3-1: Page 6 of 6
General Land Use - Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
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Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 1
Developed Land
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Upland Habitat
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MONROE COUNTY
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FAIRFAX RD
RAMP CREEK RD
SMITHVILLE RD
DILLMAN RD
WALNUT ST
OLD SR 37
CHURCH LN
CLEAR CREEK RD
ROGERS ST
EMPIRE RD
EMPIRE MILL RD
37
THAT RD
KETCHAM RD
VICTOR PK
MAME EADS RD
FLICK MILL RD
EAST LN
STANSIFER LN
FARMERS DR
BOLIN LN
WATSON DR
MOCKPORT RD
PATRICIA LN
COCKRELL RD
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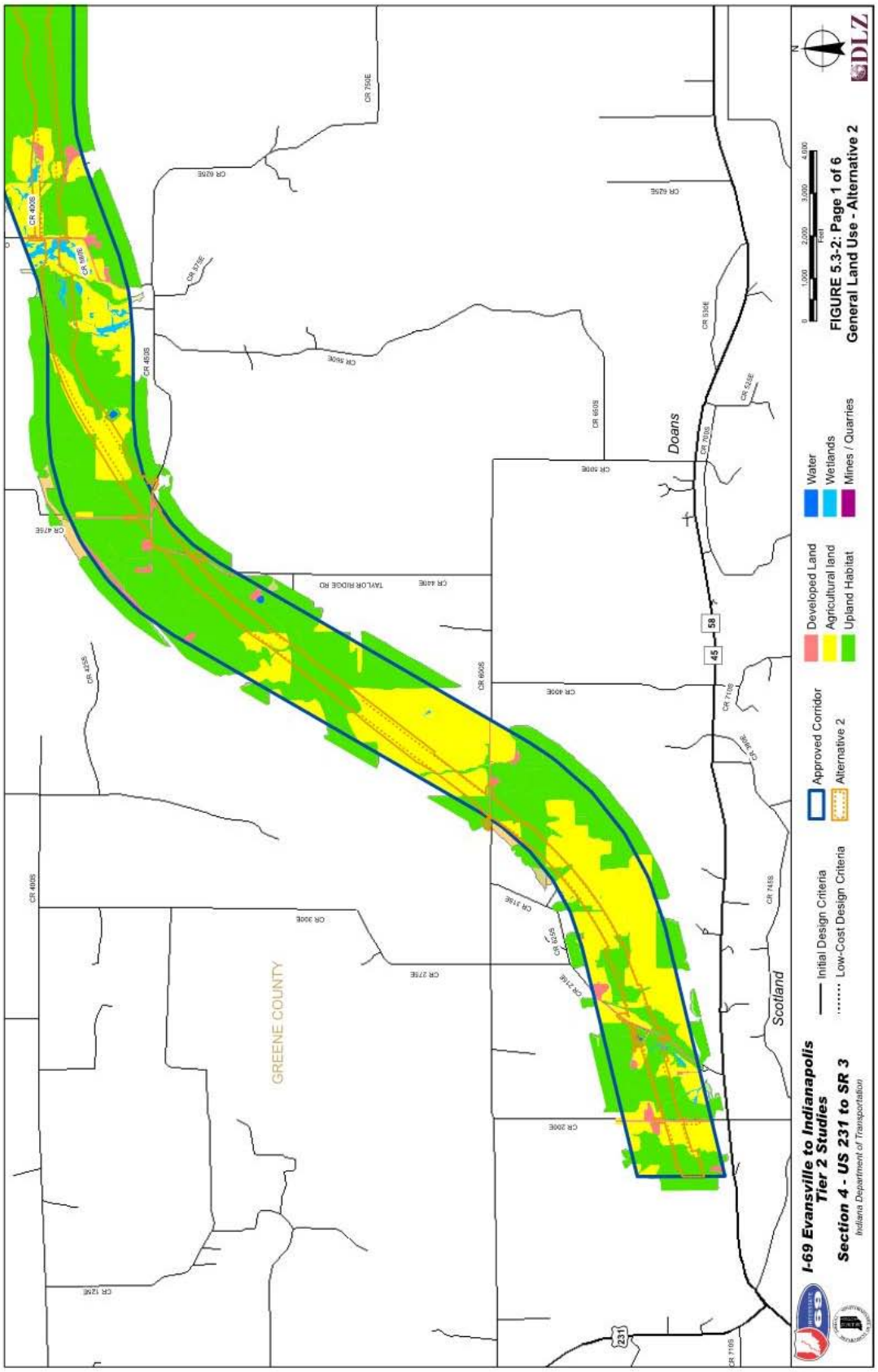
FOWLER RD
MAY RD
DUVALL RD
W EVANS RD
KOONTZ RD
ISON RD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Low-Cost Design Criteria
Approved Corridor
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Upland Habitat
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Mines / Quarries
FIGURE 5.3-2: Page 1 of 6
General Land Use - Alternative 2
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GREENE COUNTY
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TAYLOR RIDGE RD
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CR 426E
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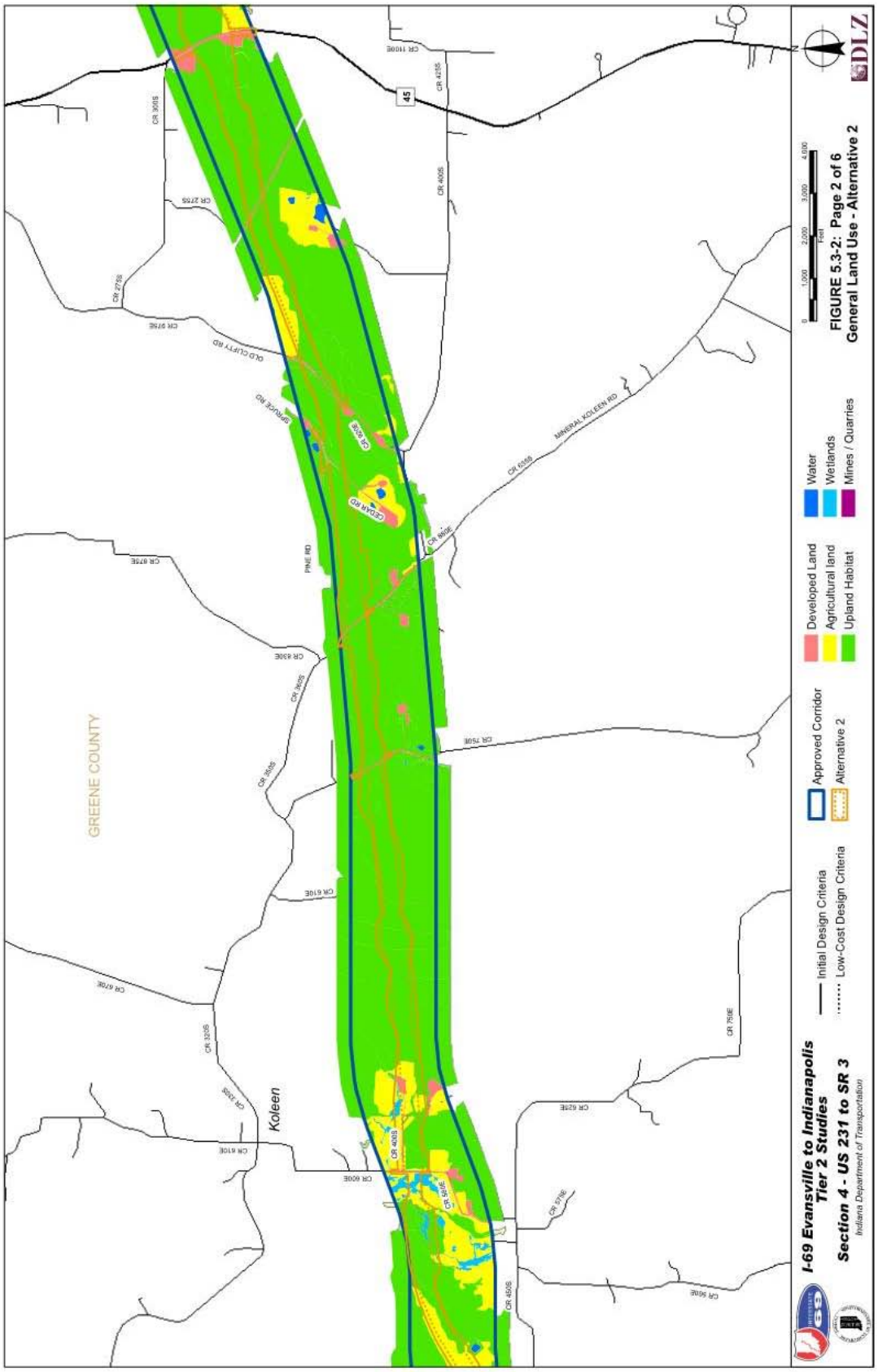
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CEDAR RD
PINE RD
CR 8505E
MINERAL KOLEEN RD
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FIGURE 5.3-2: Page 2 of 6
General Land Use - Alternative 2
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I-69 Evansville to Indianapolis
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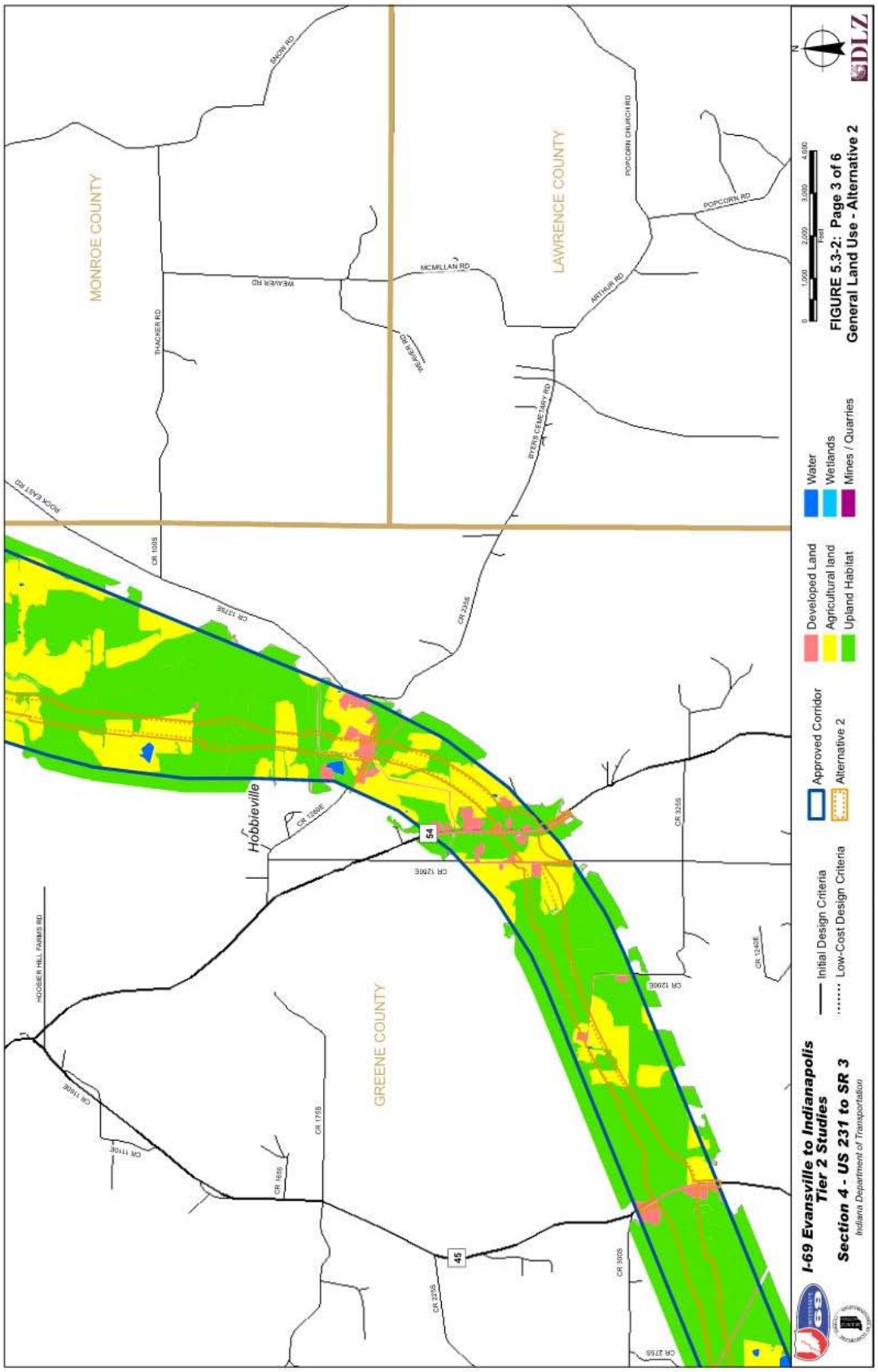
Section 4 - US 231 to SR 3
Indiana Department of Transportation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ARTHUR RD
BYERS CEMETARY RD
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Approved Corridor
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Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
FIGURE 5.3-2: Page 3 of 6
General Land Use - Alternative 2
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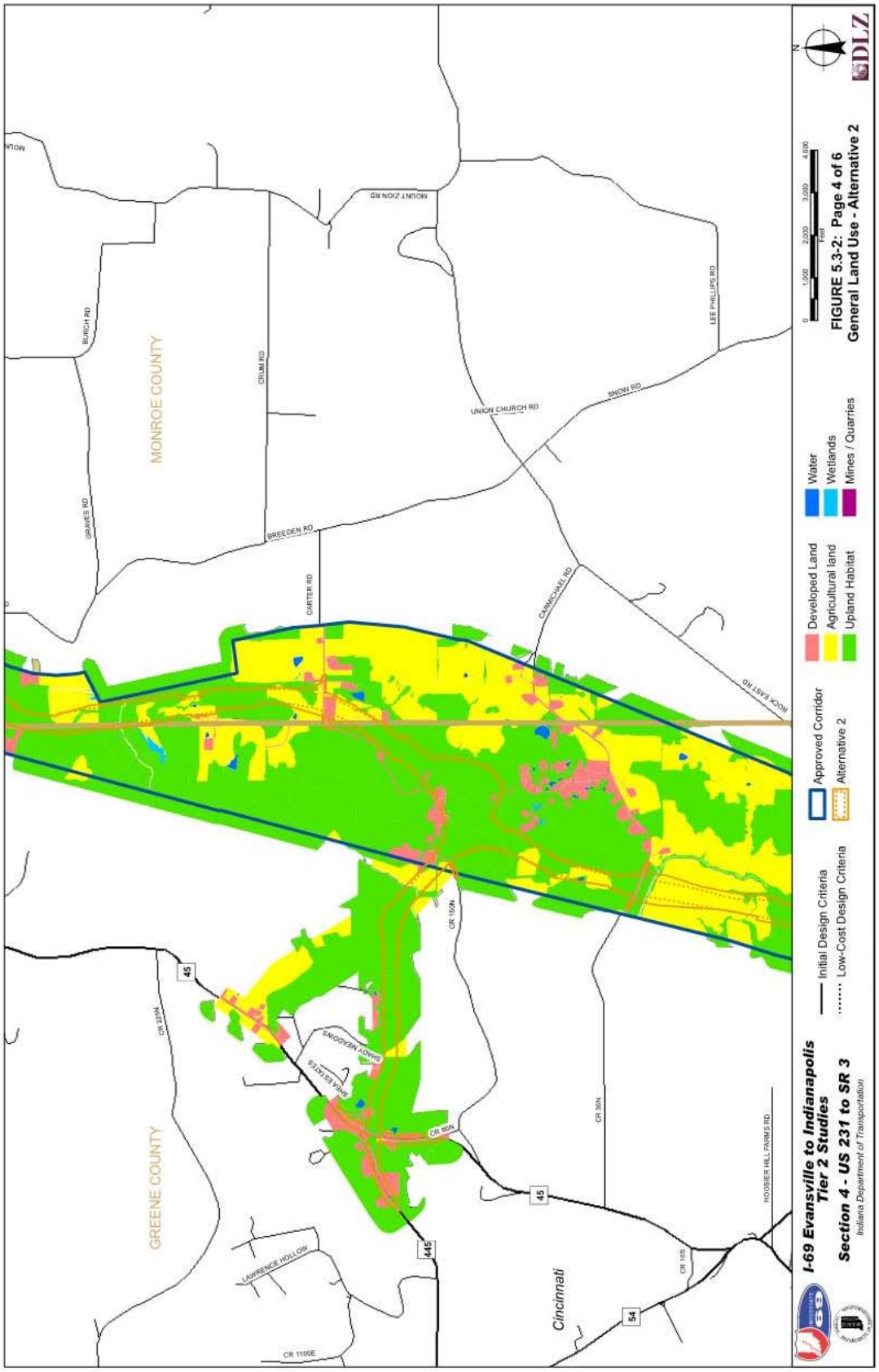
MONROE COUNTY
GREENE COUNTY
Cincinnati
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CRUM RD
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CARTER RD
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CAMMICHAEL RD
SNOW RD
LEE PHILLIPS RD
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CR 1100E
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AREA ESTATES
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Mines / Quarries
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FIGURE 5.3-2: Page 4 of 6
General Land Use - Alternative 2
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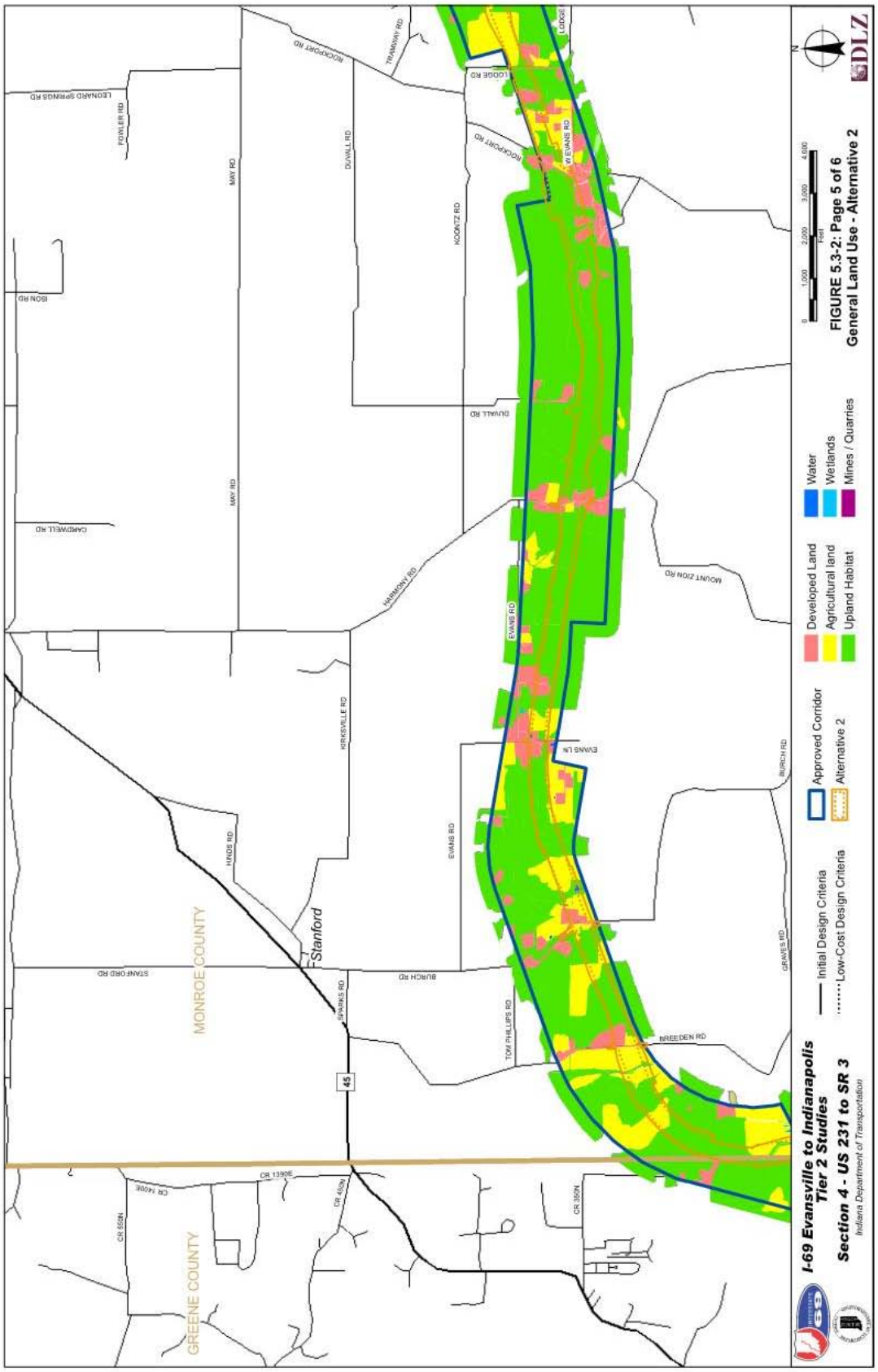
FIGURE 5.3-2: Page 5 of 6
General Land Use - Alternative 2
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Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 2
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Low-Cost Design Criteria
MONROE COUNTY
GREENE COUNTY
Stanford
LODGE RD
ROCKPORT RD
TRAMWAY RD
LEONARD SPRINGS RD
FOWLER RD
MAY RD
DUVALL RD
KOONTZ RD
EVANS RD
ISON RD
CAMPBELL RD
HARMONY RD
MOUNT ZION RD
EVANS LN
HIRAMSVILLE RD
HINDS RD
BURCH RD
STANFORD RD
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GRAVES RD
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CR 1400E
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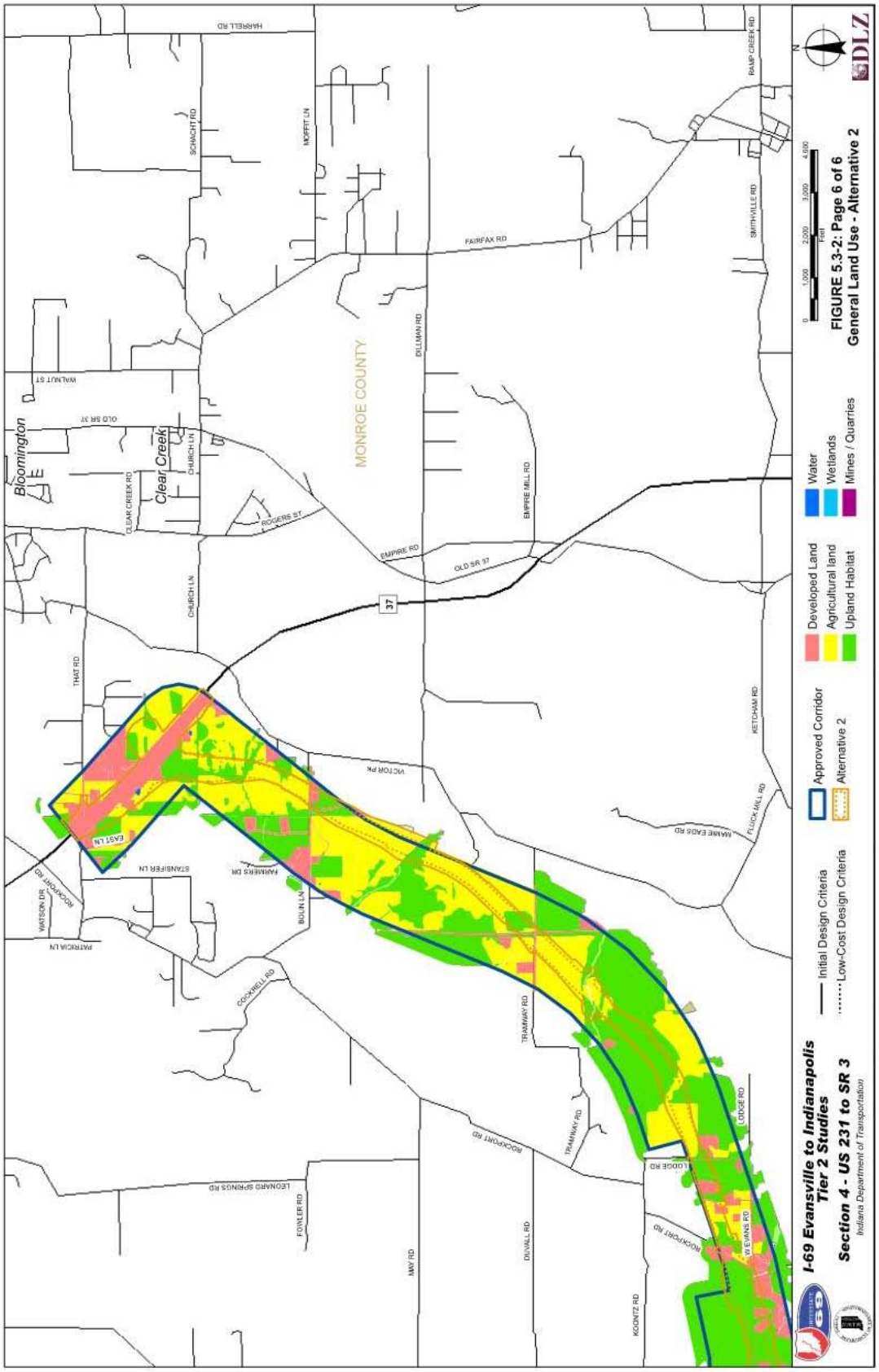
FIGURE 5.3-2: Page 6 of 6
General Land Use - Alternative 2
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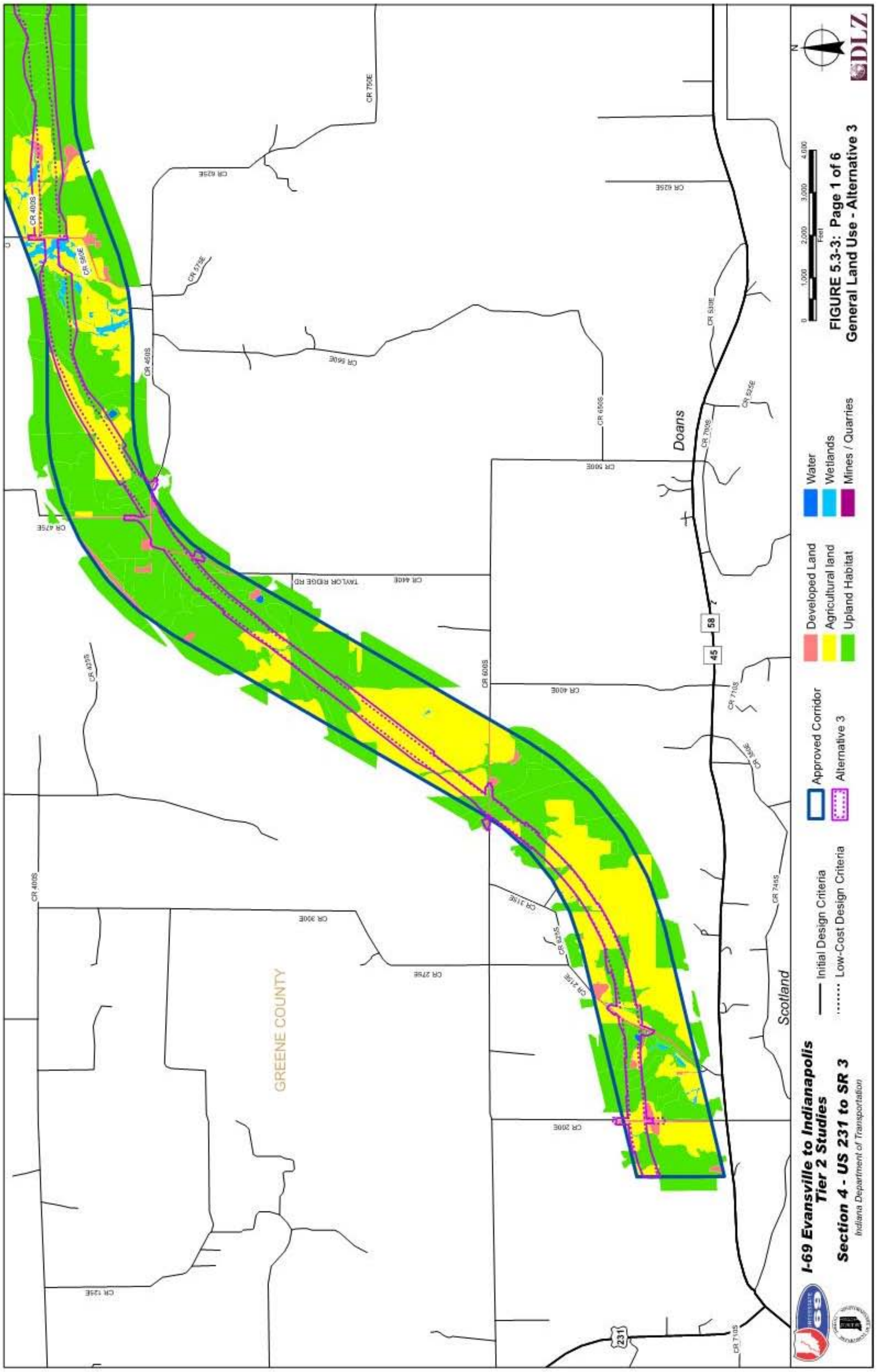
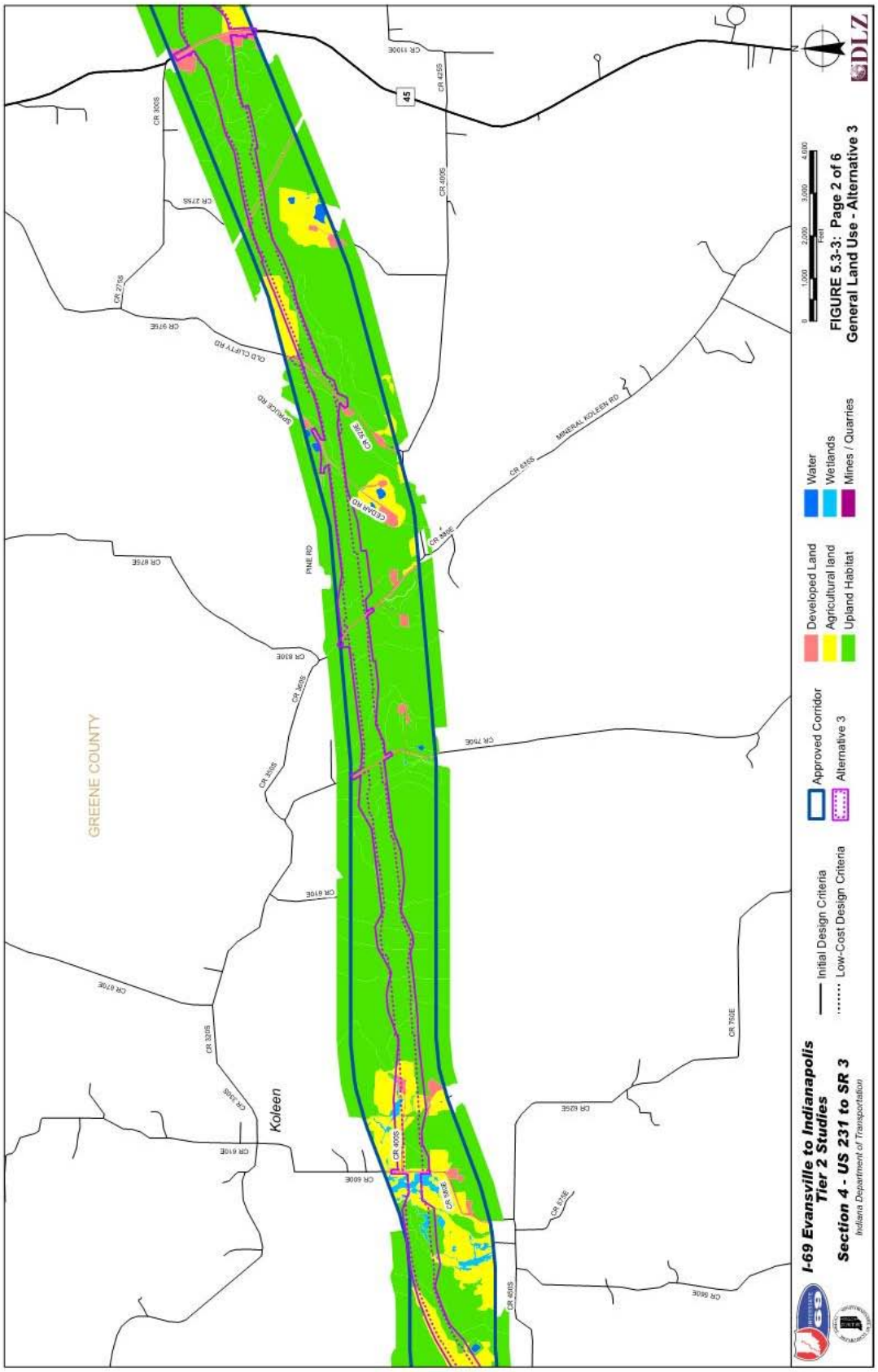
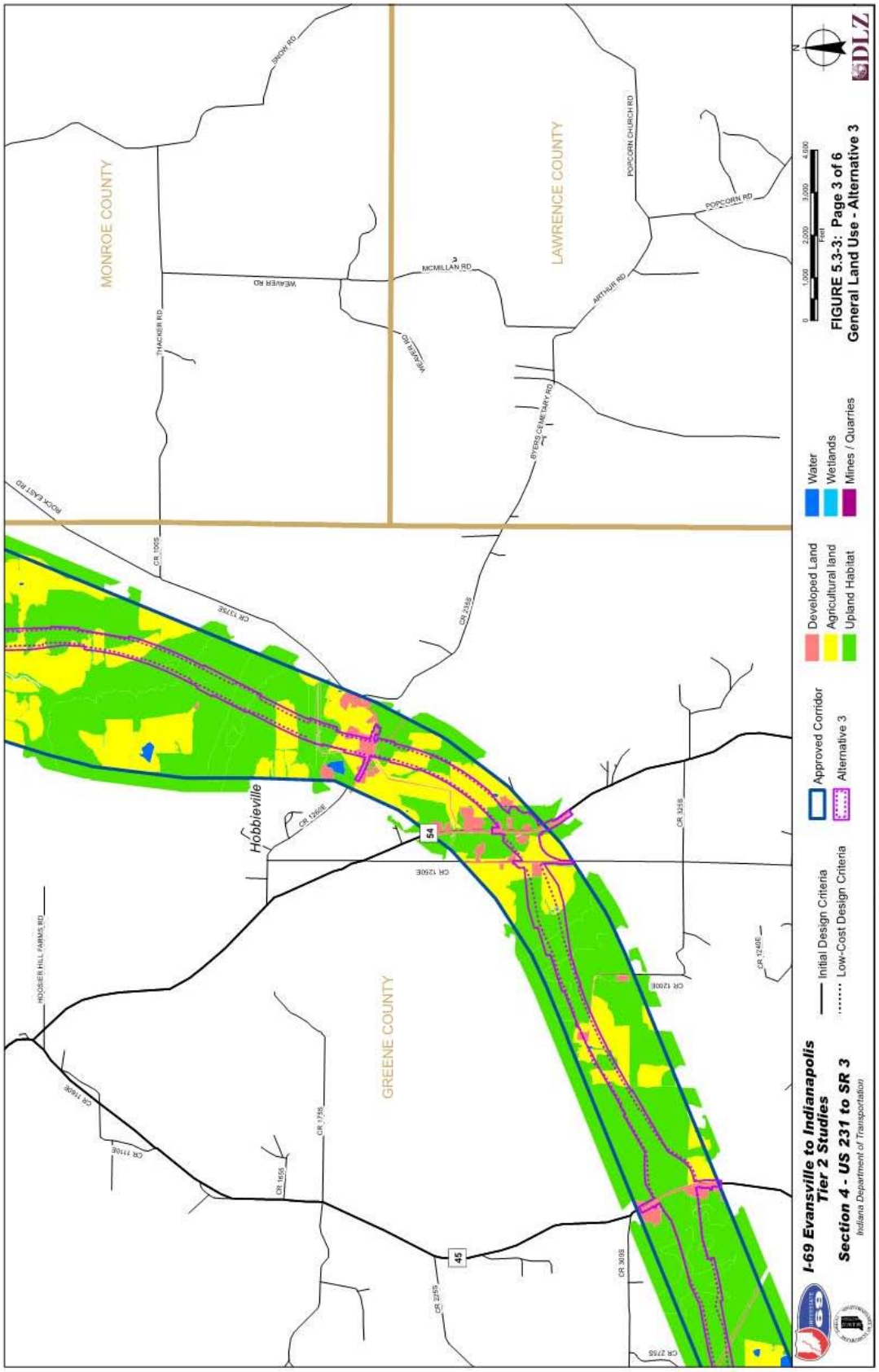
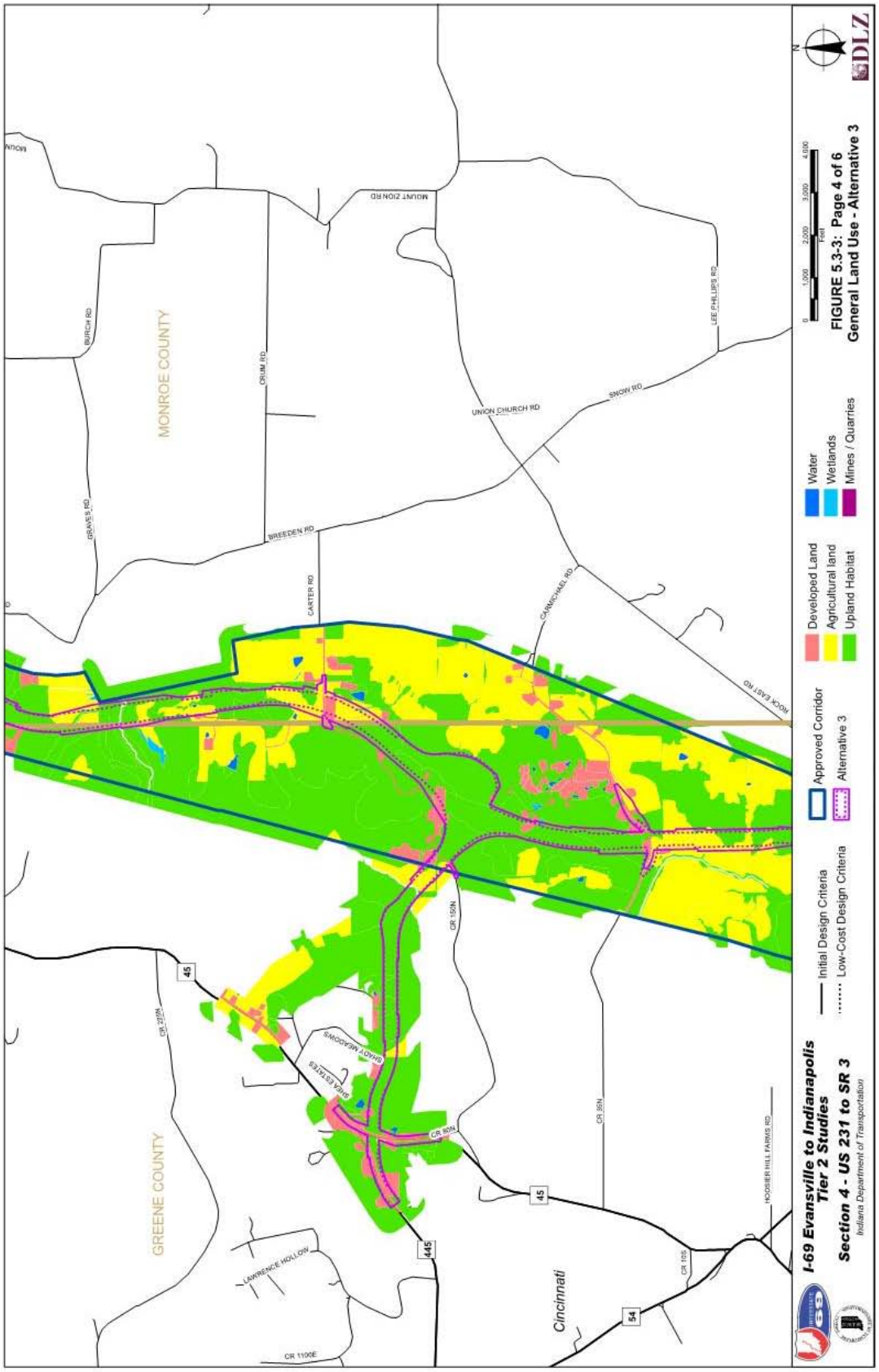
Wetlands
Mines / Quarries
MONROE COUNTY
Bloomington
Clear Creek
DLZ


I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
FIGURE 5.3-3: Page 1 of 6
General Land Use - Alternative 3
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 3
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
GREENE COUNTY
Doans
Scotland
TAYLOR RIDGE RD
DLZ


GREENE COUNTY
Koleen
45
CR 1100E
CR 425S
CR 400S
CR 300S
CR 275S
CR 275E
CR 975E
OLD CLIFTY RD
SPRUCE RD
CR 925E
CEDAR RD
CR 825E
MINERAL KOLEEN RD
CR 675S
PINE RD
CR 875E
CR 625E
CR 300S
CR 750E
CR 325S
CR 675E
CR 725E
CR 625E
CR 575E
CR 525E
CR 475E
CR 425E
CR 375E
CR 325E
CR 275E
CR 225E
CR 175E
CR 125E
CR 75E
CR 25E
CR 400S
CR 425S
CR 475S
0 1,000 2,000 3,000 4,000
Feet
FIGURE 5.3-3: Page 2 of 6
General Land Use - Alternative 3
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 3
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
DLZ


MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Hobbieville
SNOW RD
THACKER RD
WEAVER RD
MCMILLAN RD
POPCORN CHURCH RD
POPCORN RD
ARTHUR RD
BYERS CEMETARY RD
ROCK EAST RD
HOOSIER HILL FARMS RD
CR 1005
CR 1375E
CR 2358
CR 1266E
CR 1250E
CR 1200E
CR 3258
CR 1245E
CR 1165
CR 1175E
CR 1185E
CR 2255
CR 3035
CR 2755
54
45
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 3
Initial Design Criteria
Low-Cost Design Criteria
0 1,000 2,000 3,000 4,000
Feet
N
FIGURE 5.3-3: Page 3 of 6
General Land Use - Alternative 3
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
DLZ


MONROE COUNTY
GREENE COUNTY
Cincinnati
BURCH RD
GRAVES RD
DRUM RD
MOUNT ZION RD
BREEDEN RD
CARTER RD
UNION CHURCH RD
CARMICHAEL RD
LEE PHILLIPS RD
ROCK EAST RD
CR 150N
CR 80N
CR 35N
CR 105
CR 1100E
LAWRENCE HOLLOW
HOOSIER HILL FARMS RD
45
445
54
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 3
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
FIGURE 5.3-3: Page 4 of 6
General Land Use - Alternative 3
DLZ

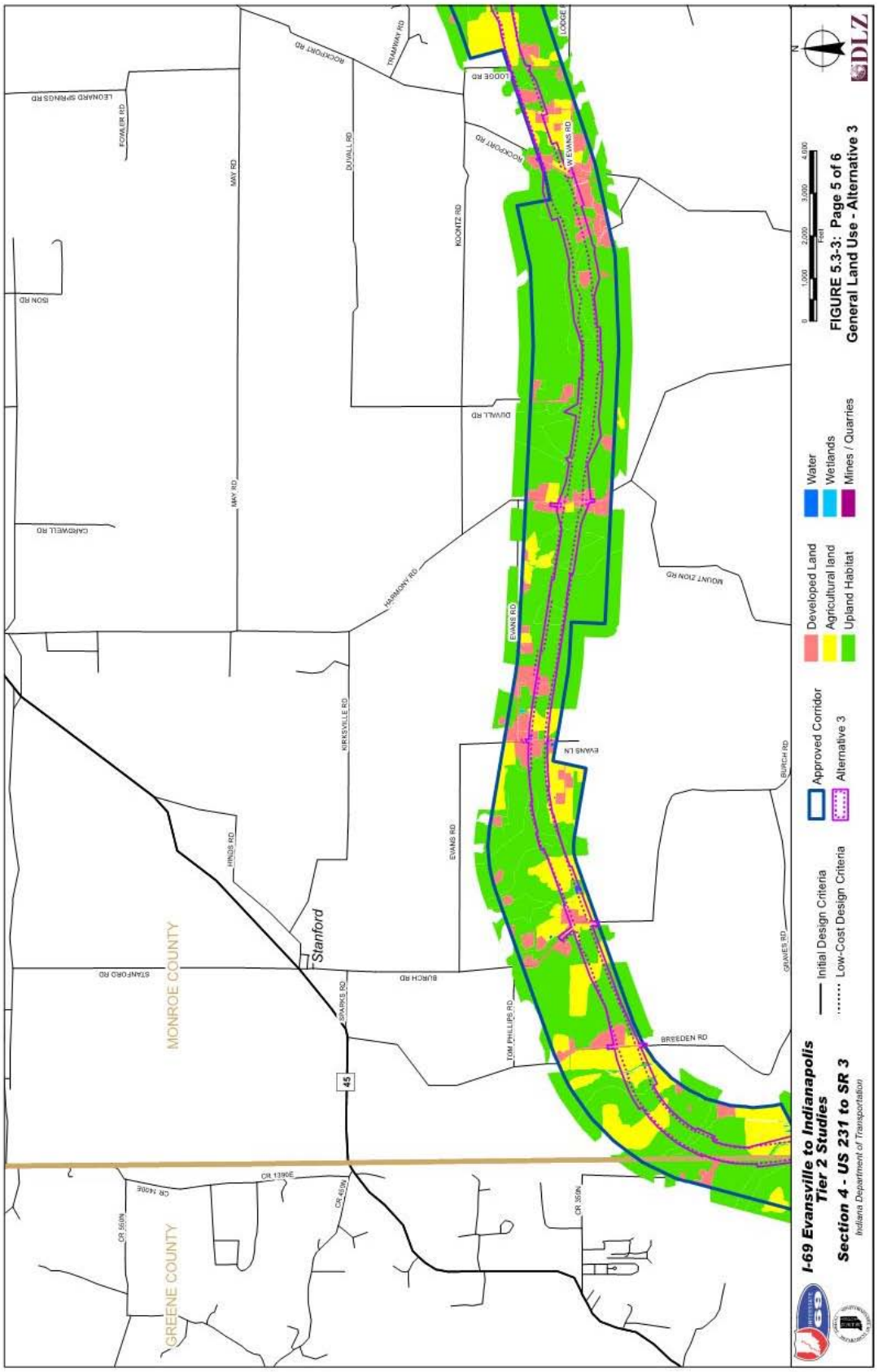
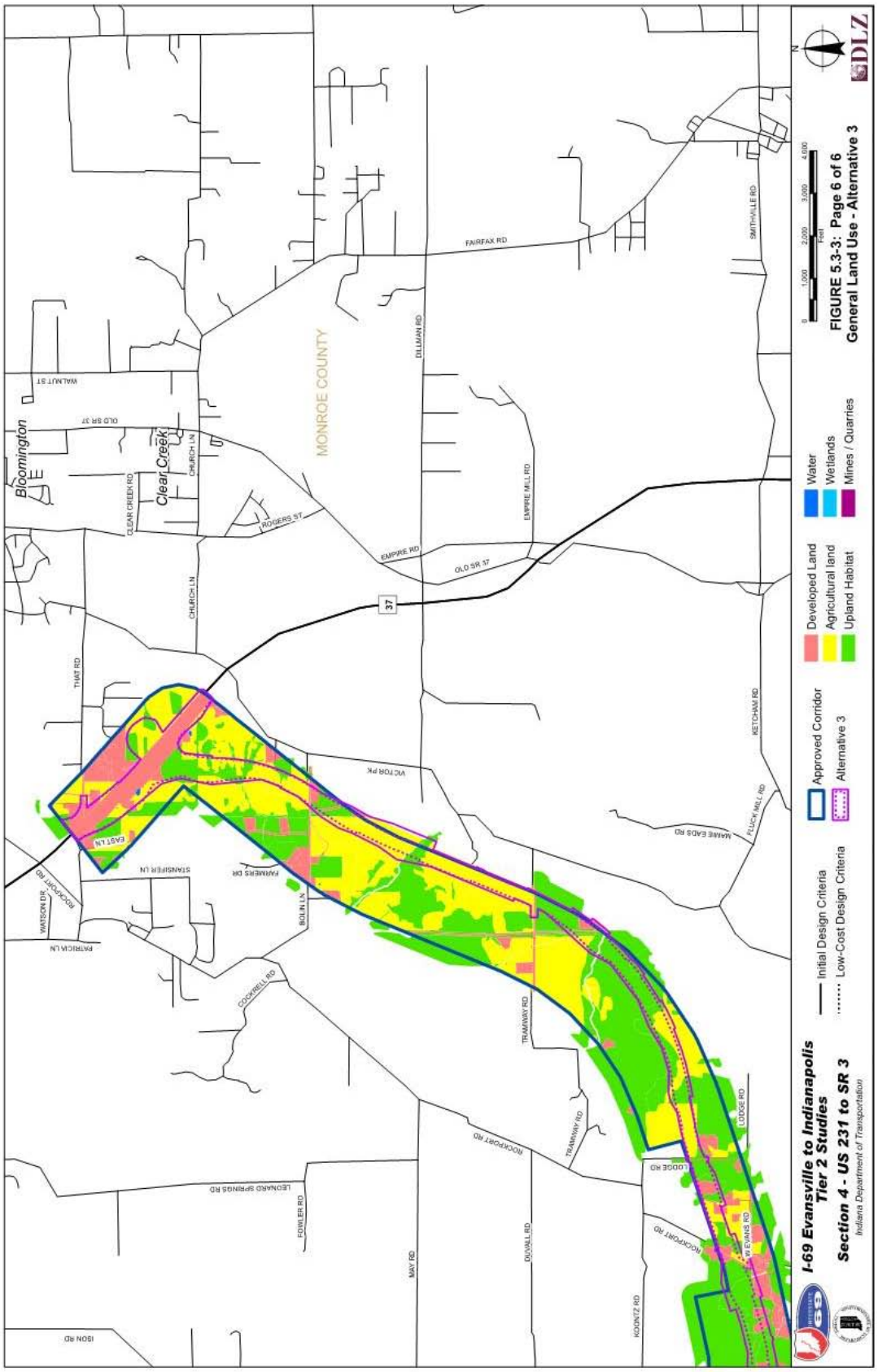
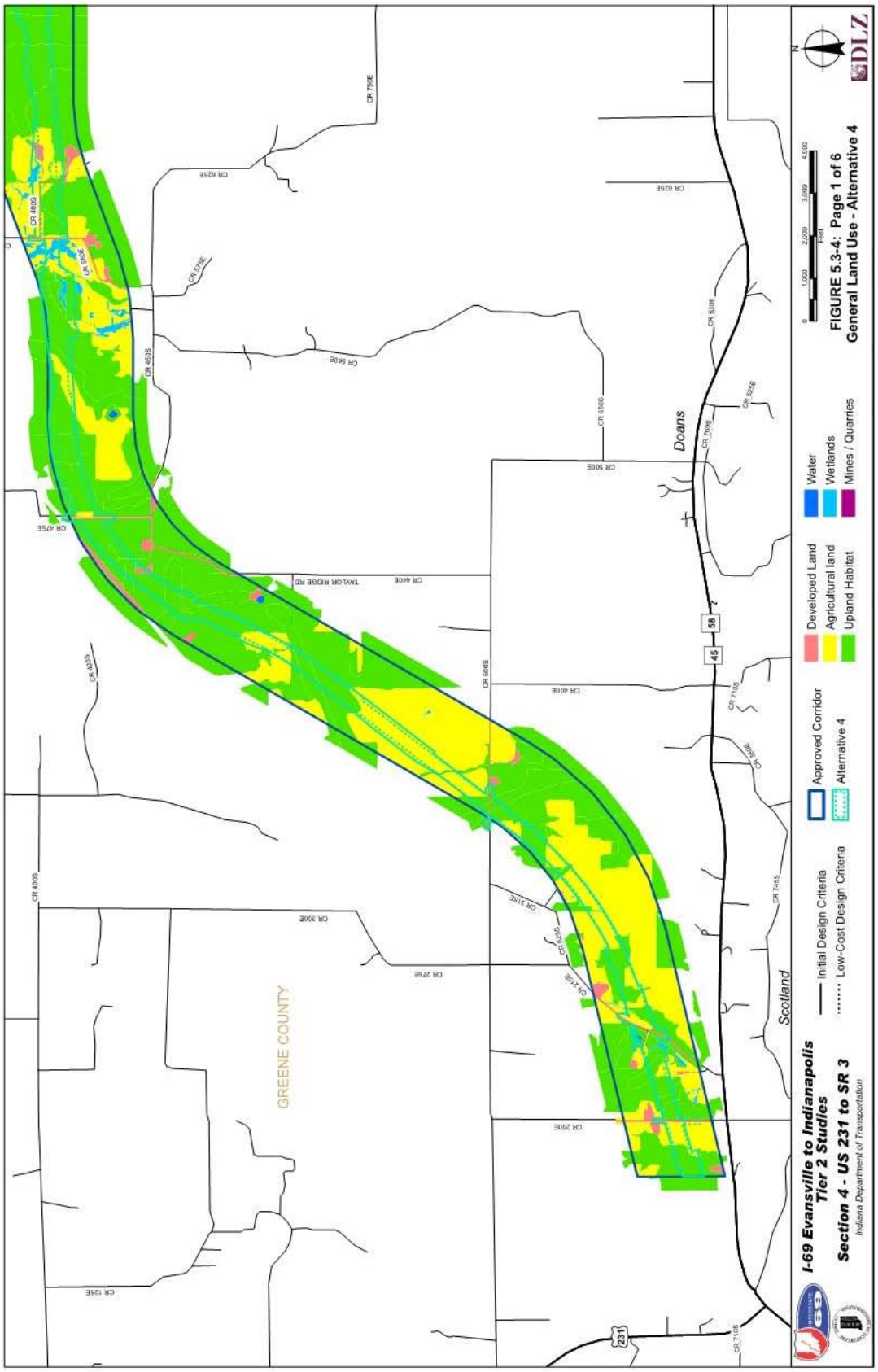
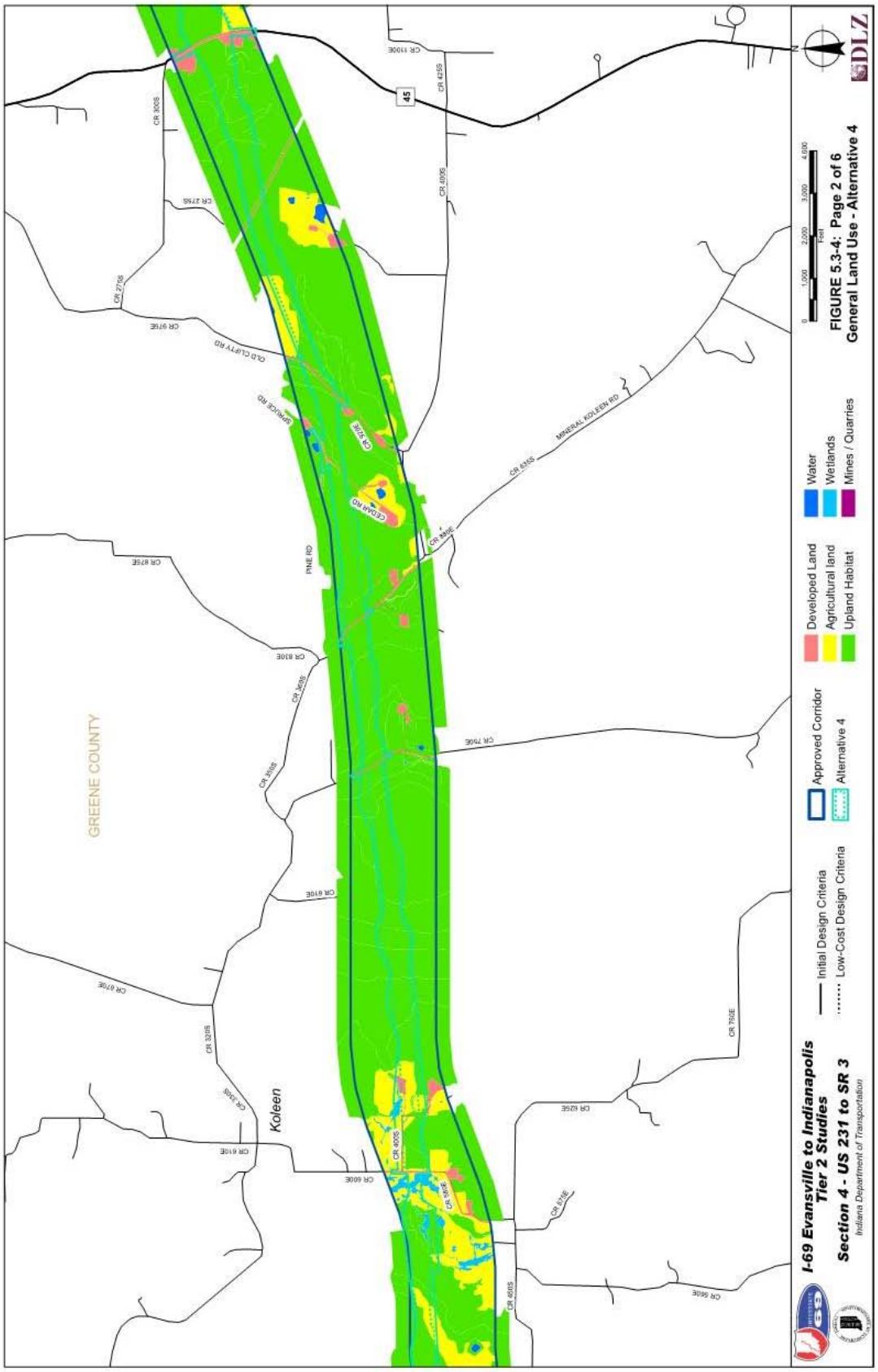
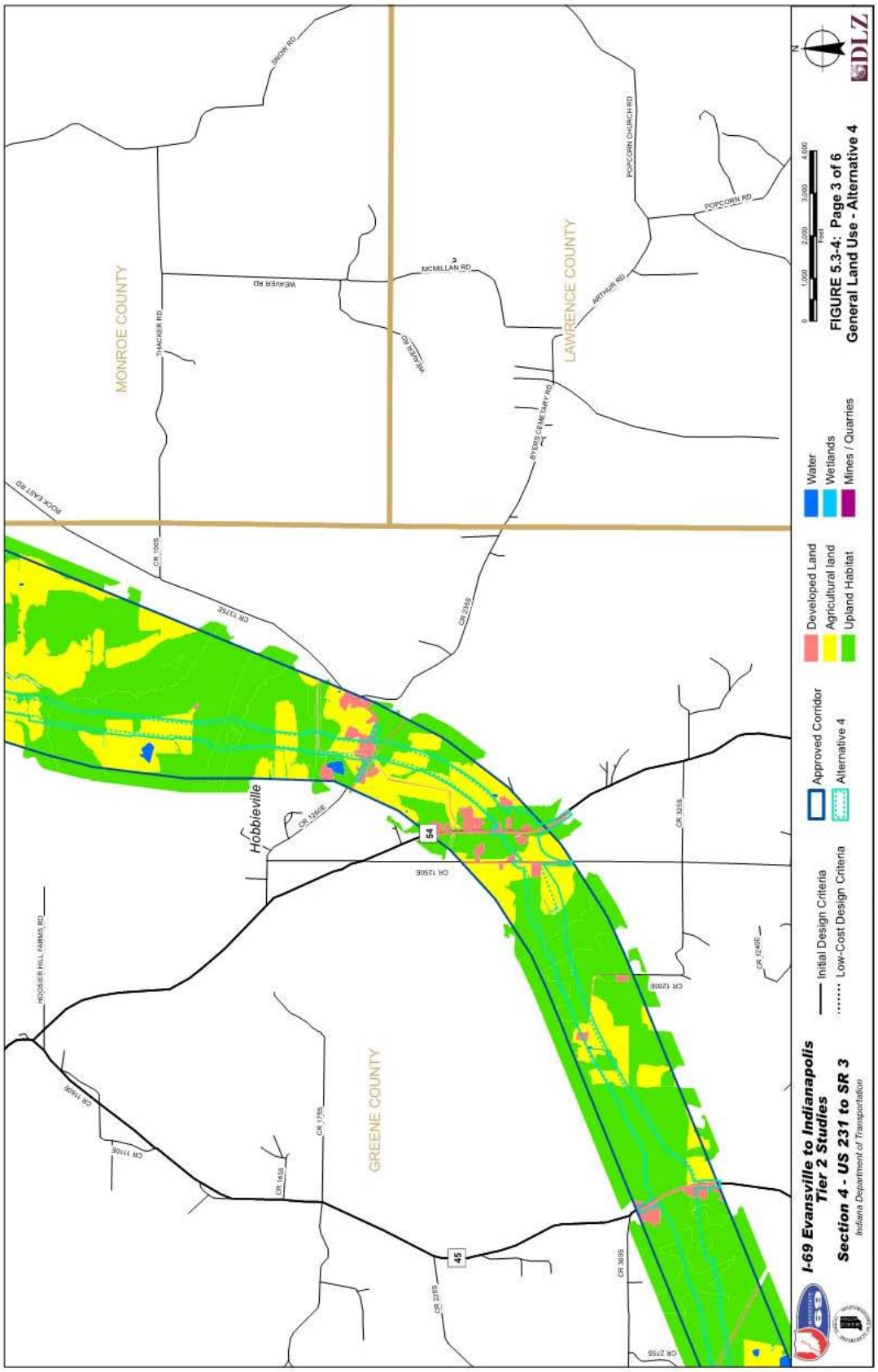


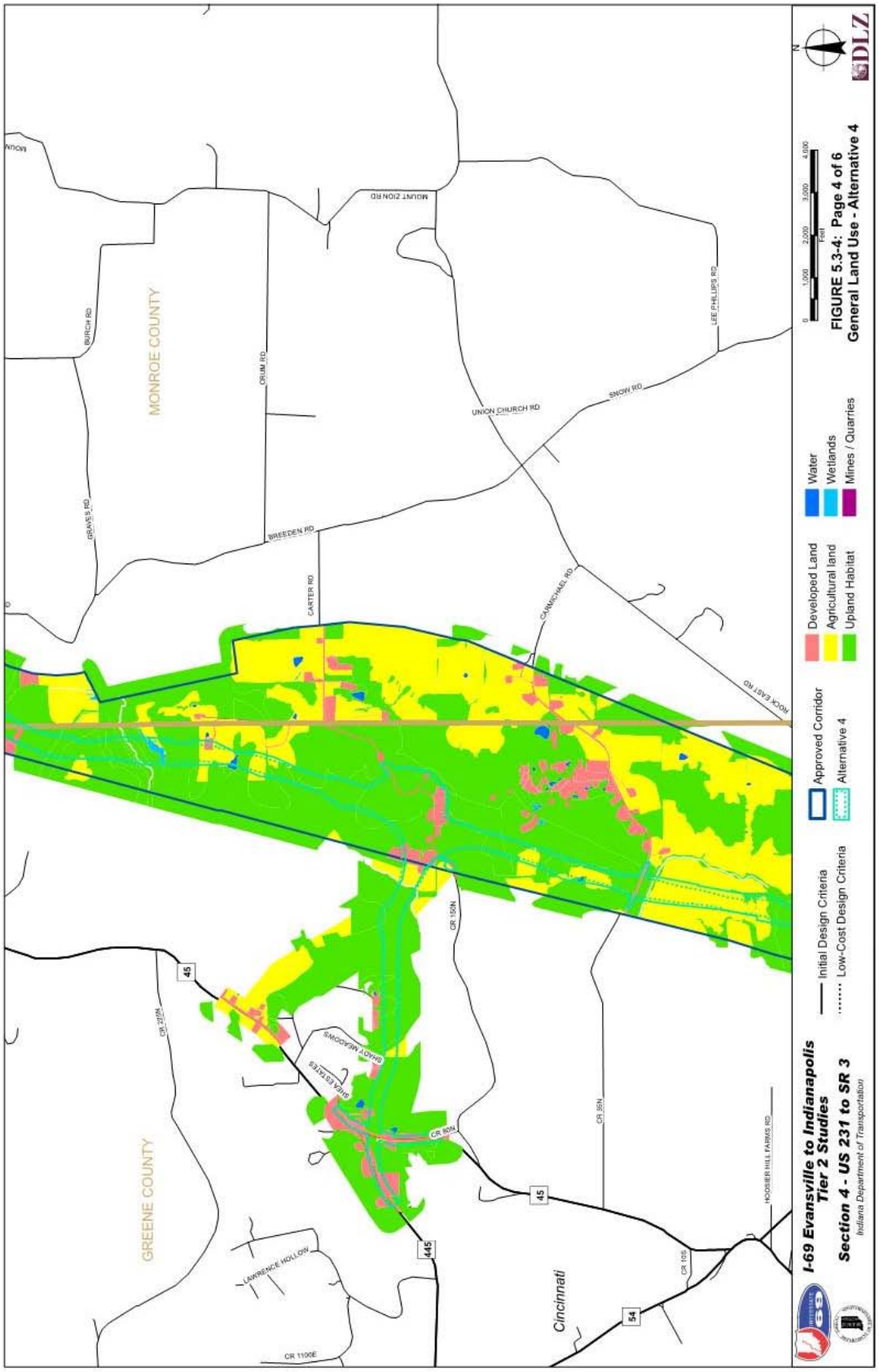
FIGURE 5.3-3: Page 5 of 6
General Land Use - Alternative 3
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 3
Initial Design Criteria
Low-Cost Design Criteria
MONROE COUNTY
GREENE COUNTY
Stanford
BREEDEN RD
TOM PHILLIPS RD
EVANS RD
EVANS LN
BURCH RD
GRAVES RD
MOUNT ZION RD
HARMONY RD
KIRKSVILLE RD
HINDS RD
STANFORD RD
MAY RD
DUVALL RD
ROONTZ RD
MOCKPORT RD
LODGE RD
FRAMMAN RD
FOWLER RD
LEONARD SPRINGS RD
CARDWELL RD
CR 1390E
CR 450N
CR 350N
CR 450E
CR 350E
45

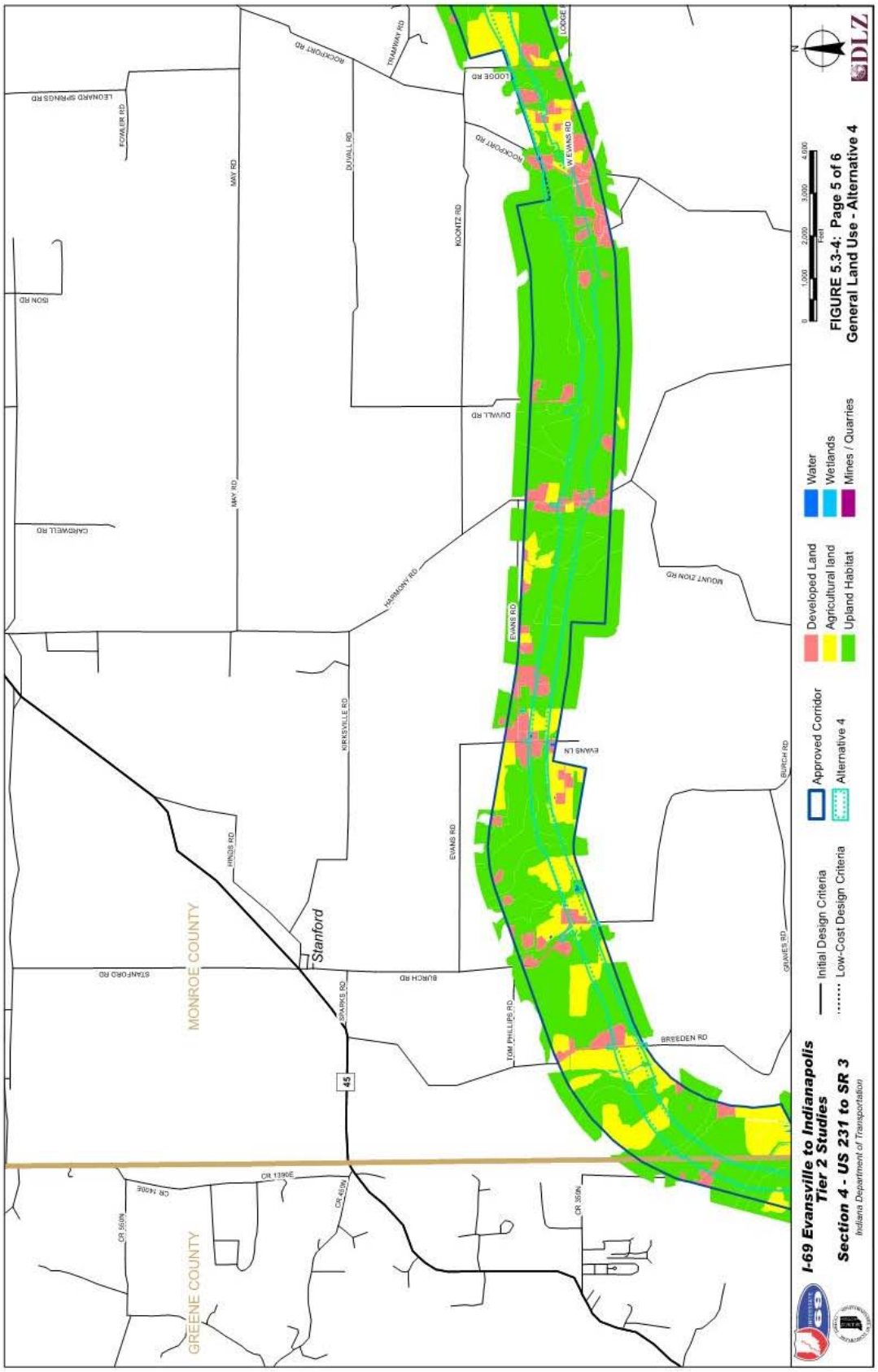

Bloomington
Clear Creek
MONROE COUNTY
WALNUT ST
OLD SR 37
CLEAR CREEK RD
CHURCH LN
ROGERS ST
EMPIRE RD
OLD SR 37
EMPIRE MILL RD
DILLMAN RD
FAIRFAX RD
SMITHVILLE RD
THAT RD
37
VICTOR PK
KETCHAM RD
PLUCK MILL RD
MAINE EADS RD
EAST LN
STANSIFER LN
FARMERS DR
BOLIN LN
ROCKPORT RD
WATSON DR
PATRICIA LN
COCKRELL RD
TRAMWAY RD
LODGE RD
W EVANS RD
LEONARD SPRINGS RD
FOWLER RD
MAY RD
DUVALL RD
KIONTZ RD
ISON RD
0
1,000
2,000
3,000
4,000
Feet
FIGURE 5.3-3: Page 6 of 6
General Land Use - Alternative 3
DLZ
Water
Wetlands
Mines / Quarries
Developed Land
Agricultural land
Upland Habitat
Approved Corridor
Alternative 3
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation

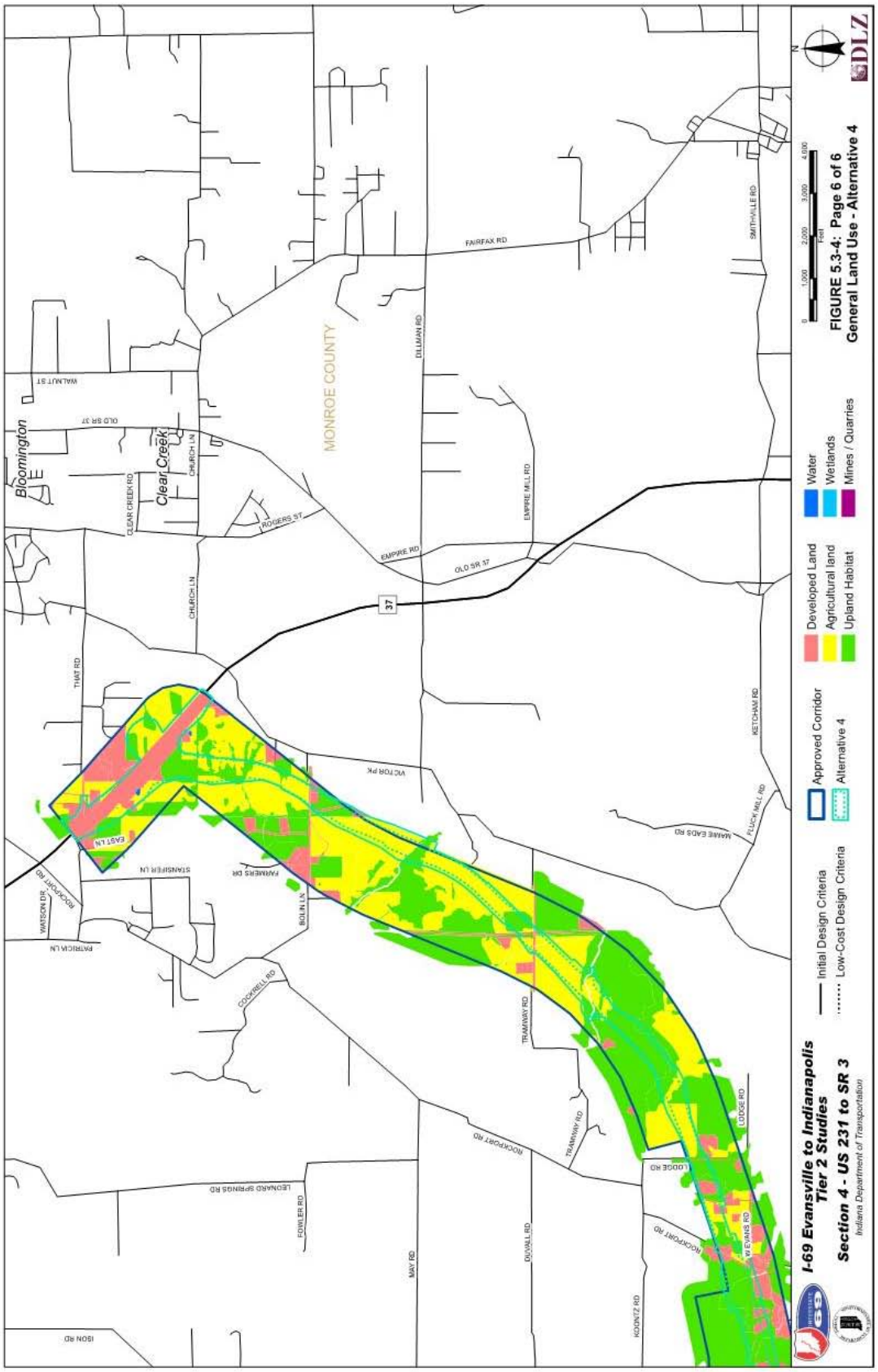

GREENE COUNTY
Doans
Scotland
TAYLOR RIDGE RD
CR 70SE
CR 62SE
CR 40SE
CR 50SE
CR 60SE
CR 40SE
CR 60SS
CR 40SS
CR 30SE
CR 27SE
CR 21SE
CR 20SE
CR 12SE
CR 71SS
CR 74SS
CR 72SS
CR 72SE
CR 52SE
CR 70SS
CR 62SS
CR 42SS
CR 42SE
CR 44SE
CR 60SS
CR 40SE
CR 32SE
CR 32SS
CR 40SS
58
45
231
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 4
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
FIGURE 5.3-4: Page 1 of 6
General Land Use - Alternative 4
Feet
0
1,000
2,000
3,000
4,000
N
DLZ

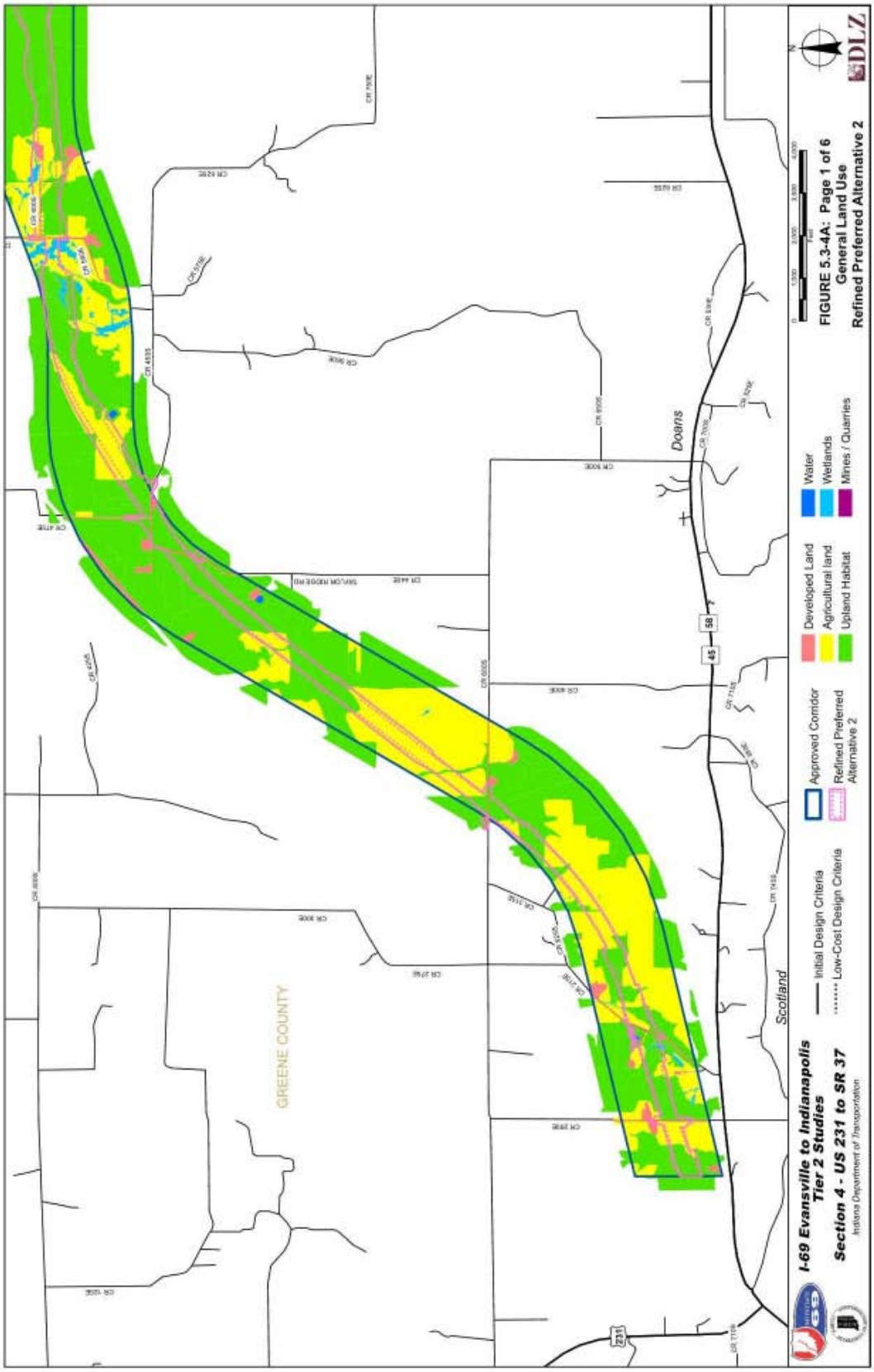

GREENE COUNTY
Koleen
45
CR 1100E
CR 425S
CR 400S
CR 300S
CR 275S
CR 275E
CR 975E
OLD CLIFTY RD
SPRUCE RD
CR 925E
CEDAR RD
CR 875E
PINE RD
CR 825E
MINERAL KOLEEN RD
CR 675S
CR 625E
CR 575E
CR 525E
CR 475E
CR 425E
CR 375E
CR 325E
CR 275E
CR 225E
CR 175E
CR 125E
CR 75E
CR 25E
CR 400S
CR 425S
CR 475S
0
1,000
2,000
3,000
4,000
Feet
FIGURE 5.3-4: Page 2 of 6
General Land Use - Alternative 4
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 4
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
DLZ

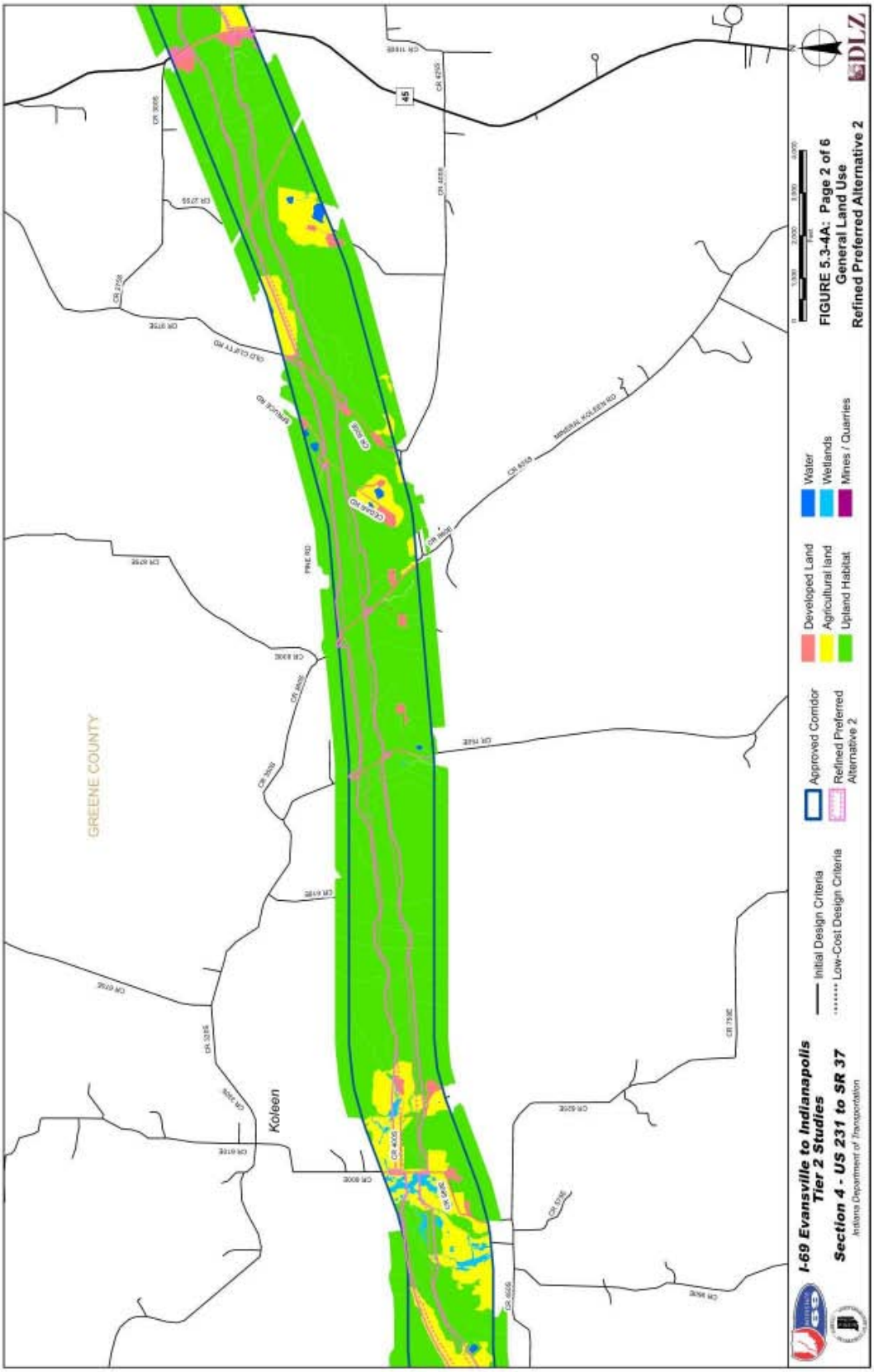

MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Hobbieville
SNOW RD
THACKER RD
WEAVER RD
MCMILLAN RD
POPCORN CHURCH RD
POPCORN RD
ARTHUR RD
BYERS CEMETARY RD
ROCK EAST RD
HOOSIER HILL FARMS RD
CR 1005
CR 1375E
CR 1265E
CR 1250E
CR 1200E
CR 1325E
CR 1245E
CR 1175E
CR 1165E
CR 1155
CR 1255
CR 2255
CR 2755
CR 3035
54
45
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Alternative 4
Initial Design Criteria
Low-Cost Design Criteria
0 1,000 2,000 3,000 4,000
Feet
N
DLZ
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
FIGURE 5.3-4: Page 3 of 6
General Land Use - Alternative 4

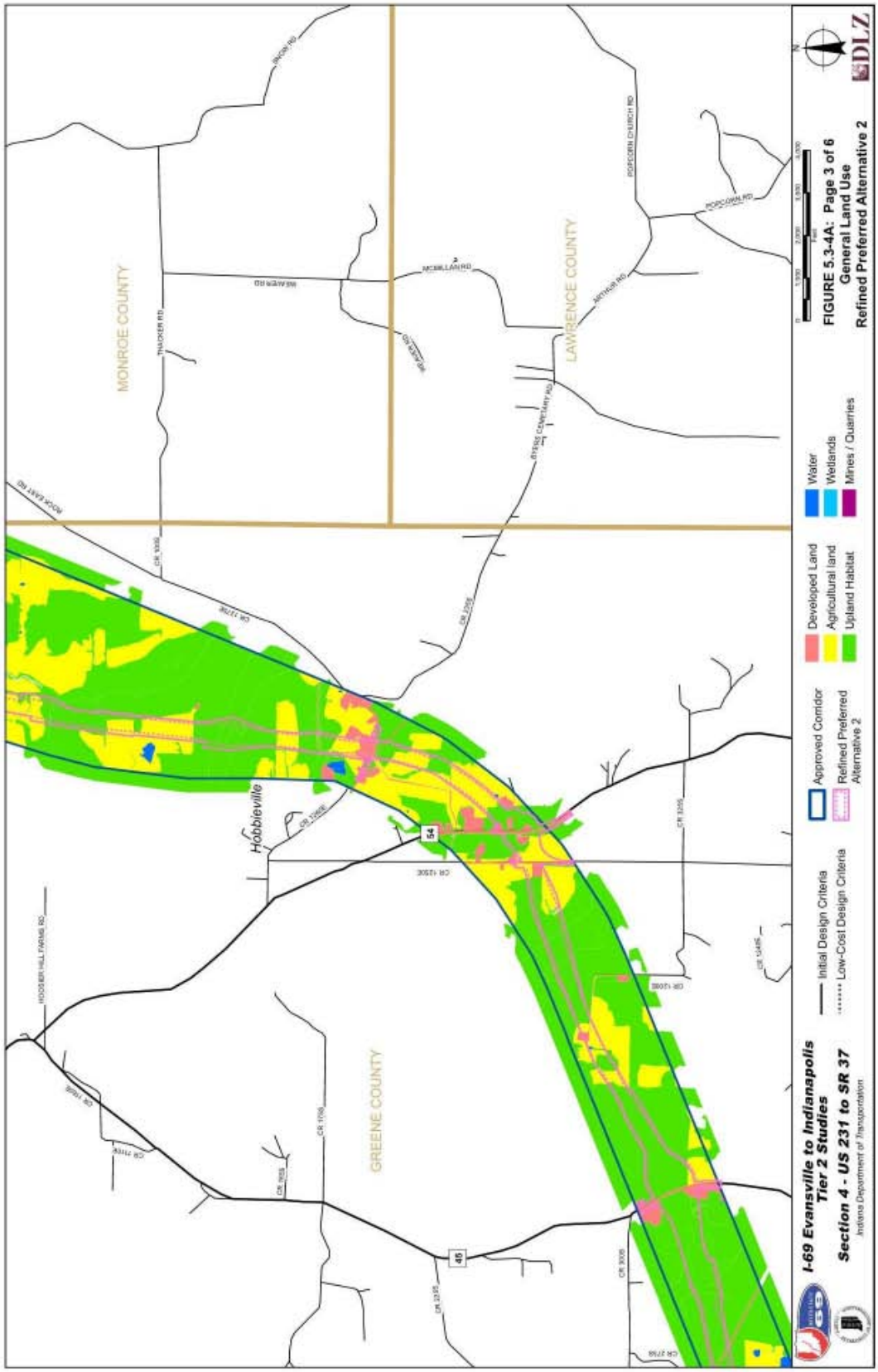

MONROE COUNTY
GREENE COUNTY
Cincinnati
BURCH RD
GRAVES RD
DRUM RD
MOUNT ZION RD
BREEDEN RD
CARTER RD
UNION CHURCH RD
CARMICHAEL RD
LEE PHILLIPS RD
ROCK EAST RD
CR 150N
CR 80N
CR 35N
CR 105
CR 1100E
LAWRENCE HOLLOW
HOOSIER HILL FARMS RD
45
445
54
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 4
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
0
1,000
2,000
3,000
4,000
Feet
N
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
FIGURE 5.3-4: Page 4 of 6
General Land Use - Alternative 4
DLZ

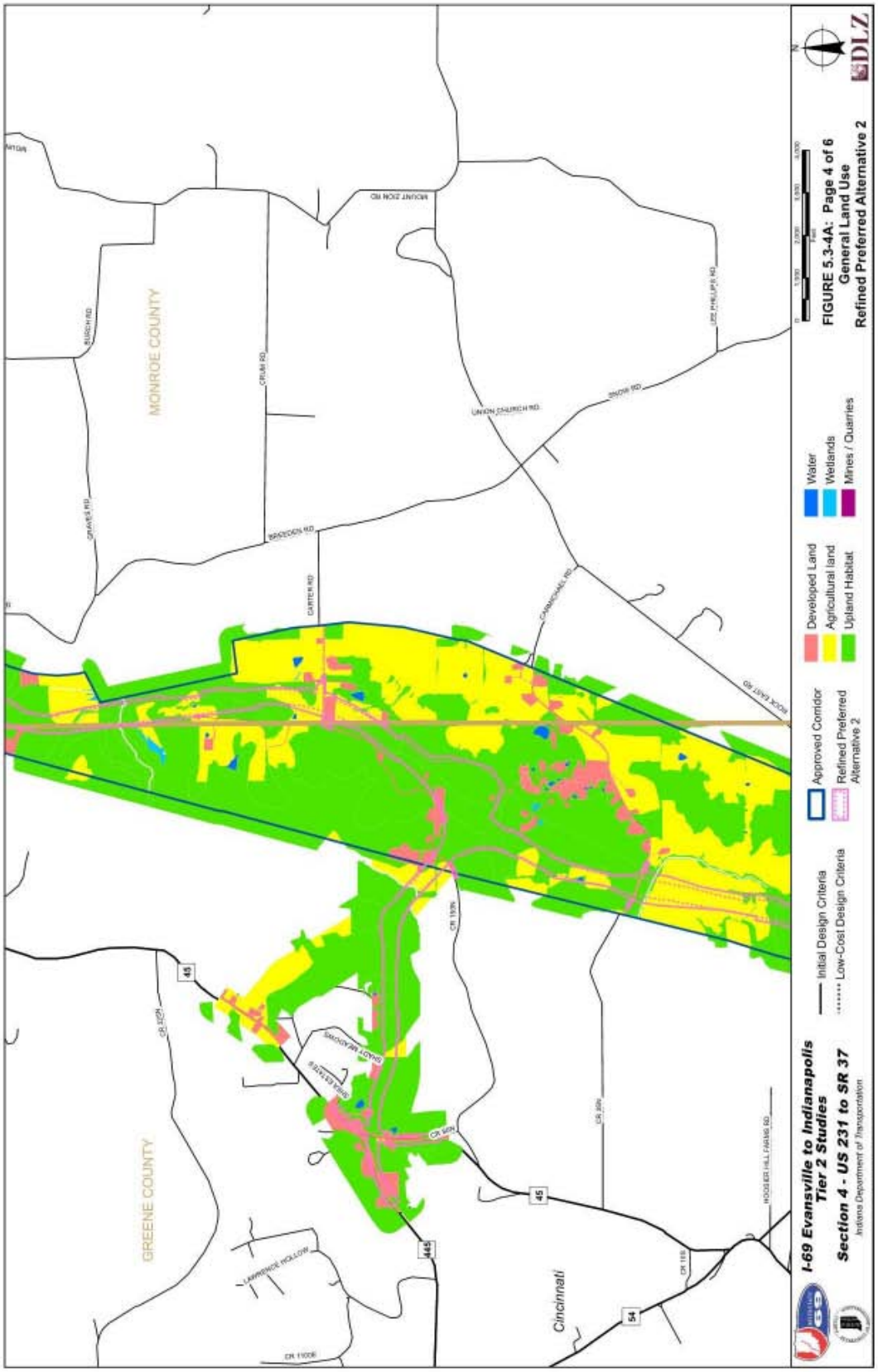

MONROE COUNTY
GREENE COUNTY
Stanford
45
LEONARD SPRINGS RD
FOWLER RD
MAY RD
DUVALL RD
ROCKPORT RD
TRAMPAY RD
LODGE RD
W EVANS RD
ROONTZ RD
ISON RD
CARDWELL RD
HARMONY RD
EVANS RD
MOUNT ZION RD
KIRKSVILLE RD
EVANS LN
BURCH RD
HINDS RD
STANFORD RD
GRAVES RD
TOM PHILLIPS RD
BREEDEN RD
CR 1390E
CR 450N
CR 350N
CR 450E
CR 350E
0
1,000
2,000
3,000
4,000
Feet
N
DLZ
FIGURE 5.3-4: Page 5 of 6
General Land Use - Alternative 4
Water
Wetlands
Mines / Quarries
Developed Land
Agricultural land
Upland Habitat
Approved Corridor
Alternative 4
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation

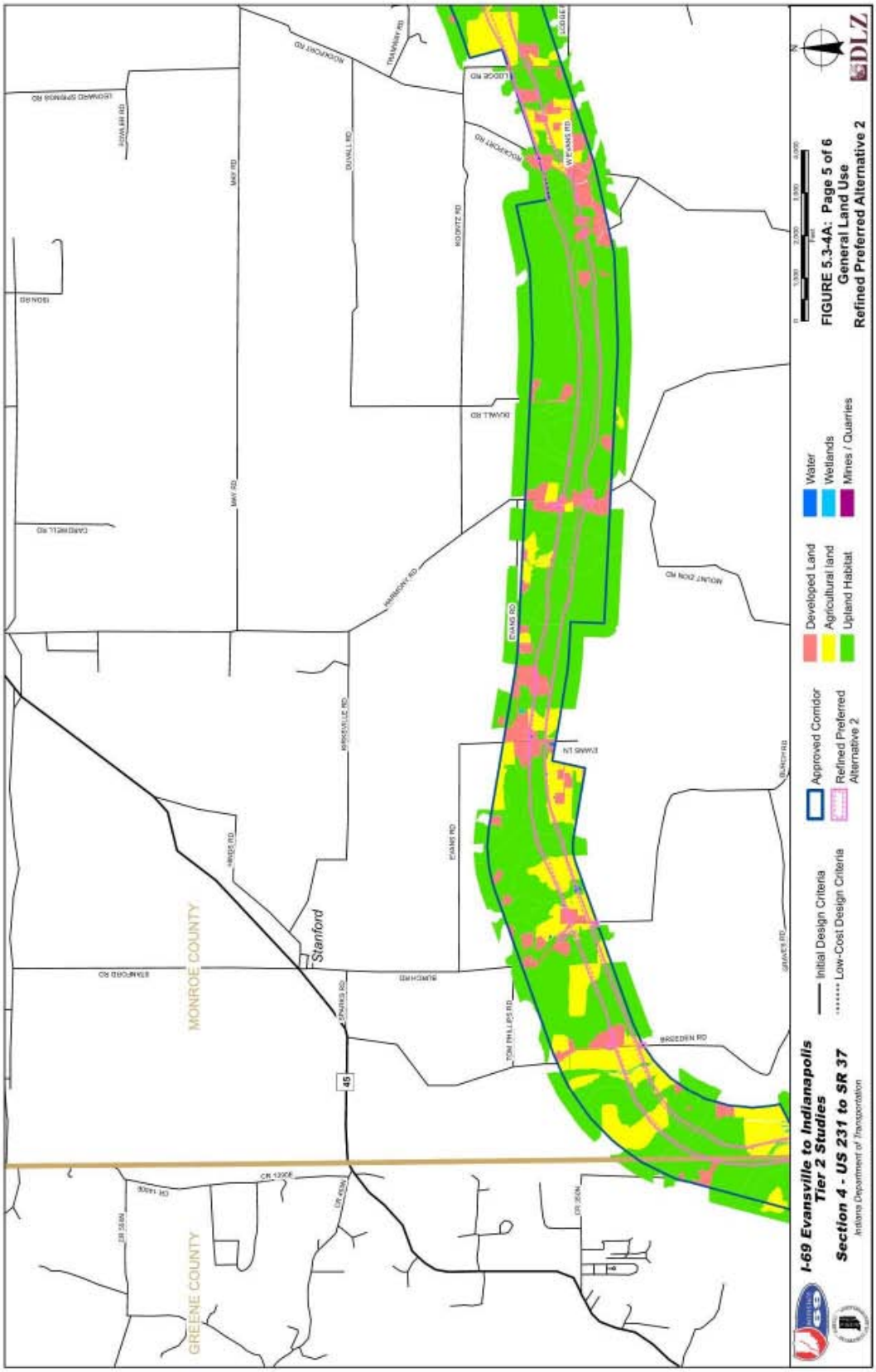

Bloomington
Clear Creek
MONROE COUNTY
WALNUT ST
OLD SR 37
CLEAR CREEK RD
CHURCH LN
ROGERS ST
EMPIRE RD
OLD SR 37
EMPIRE MILL RD
DILLMAN RD
FAIRFAX RD
SMITHVILLE RD
37
THAT RD
VICTOR PK
KETCHAM RD
PLUCK MILL RD
MAINE EADS RD
EAST LN
STANSIFER LN
FARMERS DR
BOLIN LN
WATSON DR
ROCKPORT RD
PATRICIA LN
COCKRELL RD
TRAMWAY RD
LODGE RD
ROCKPORT RD
W EVANS RD
LEONARD SPRINGS RD
FOWLER RD
MAY RD
DUVALL RD
KIONTZ RD
ISON RD
0
1,000
2,000
3,000
4,000
Feet
FIGURE 5.3-4: Page 6 of 6
General Land Use - Alternative 4
Water
Wetlands
Mines / Quarries
Developed Land
Agricultural land
Upland Habitat
Approved Corridor
Alternative 4
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 3
Indiana Department of Transportation
DLZ
N


GREENE COUNTY
Doans
Scotland
58
45
231
Approved Corridor
Refined Preferred Alternative 2
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-4A: Page 1 of 6
General Land Use
Refined Preferred Alternative 2
DLZ


GREENE COUNTY
Koleen
45
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-4A: Page 2 of 6
General Land Use
Refined Preferred Alternative 2
DLZ


MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Hobbieville
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-4A: Page 3 of 6
General Land Use
Refined Preferred Alternative 2
DLZ


MONROE COUNTY
GREENE COUNTY
Cincinnati
Approved Corridor
Refined Preferred Alternative 2
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-4A: Page 4 of 6
General Land Use
Refined Preferred Alternative 2
DLZ


MONROE COUNTY
GREENE COUNTY
Stanford
45
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
Approved Corridor
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-4A: Page 5 of 6
General Land Use
Refined Preferred Alternative 2
DLZ

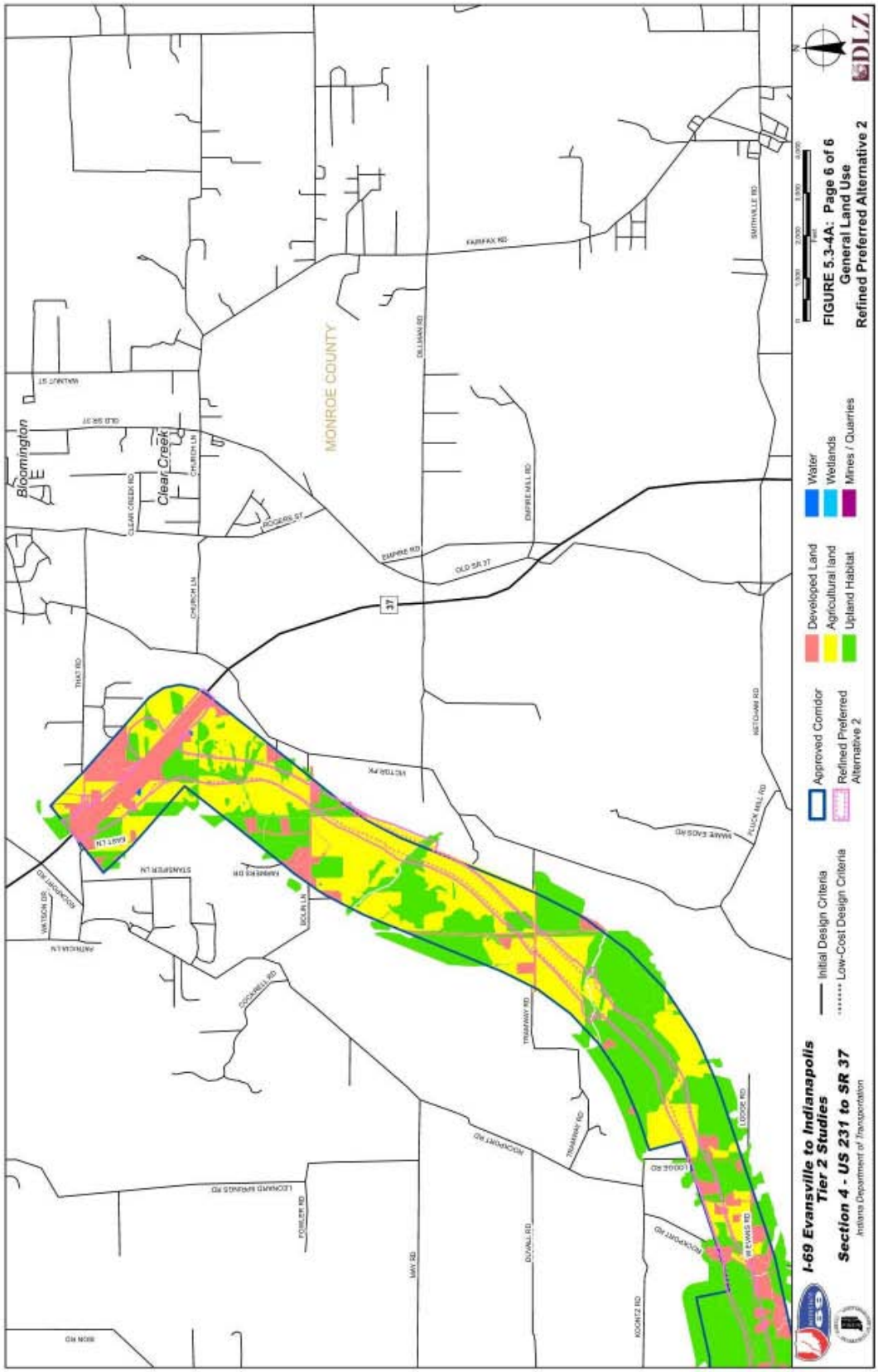


FIGURE 5.3-4A: Page 6 of 6
General Land Use
Refined Preferred Alternative 2
DLZ
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Refined Preferred Alternative 2
Developed Land
Agricultural land
Upland Habitat
Water
Wetlands
Mines / Quarries
MONROE COUNTY
Bloomington
Clear Creek
37
FAIRFAX RD
SMITHVILLE RD
DILLMAN RD
EMPIRE HILL RD
EMPIRE RD
OLD SR 37
CLEAR CREEK RD
CHURCH LN
THAT RD
KETCHAM RD
PLUCK HILL RD
BOLIN LN
TRAMWAY RD
LODGE RD
MOUNTAIN RD
DUVALL RD
KOONTZ RD
MAY RD
FOWLER RD
COCKRELL RD
STANSBERY LN
EAST LN
WATSON DR
ARTHUR LN
EDWARD BRANDS RD
BEON RD

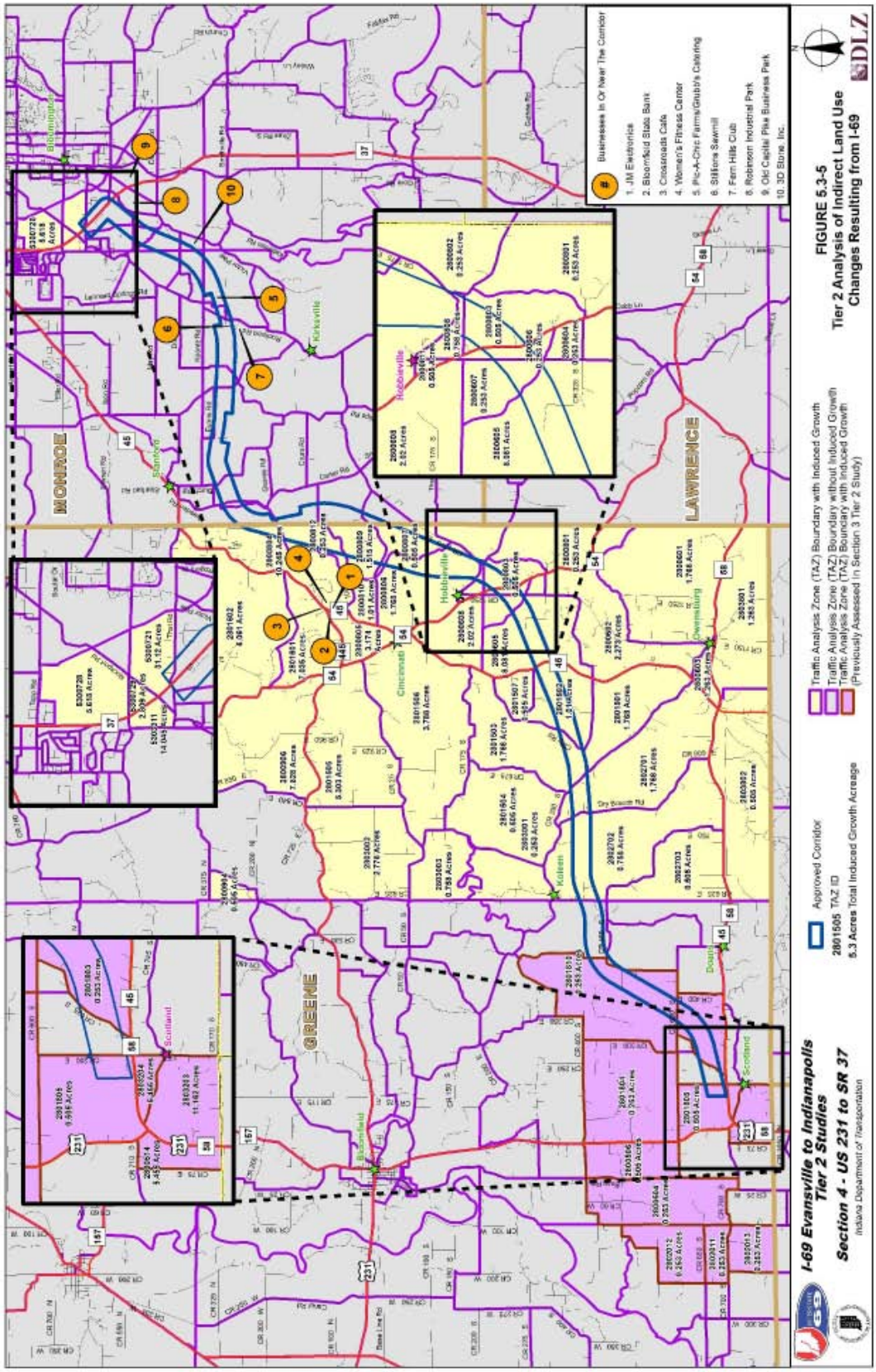
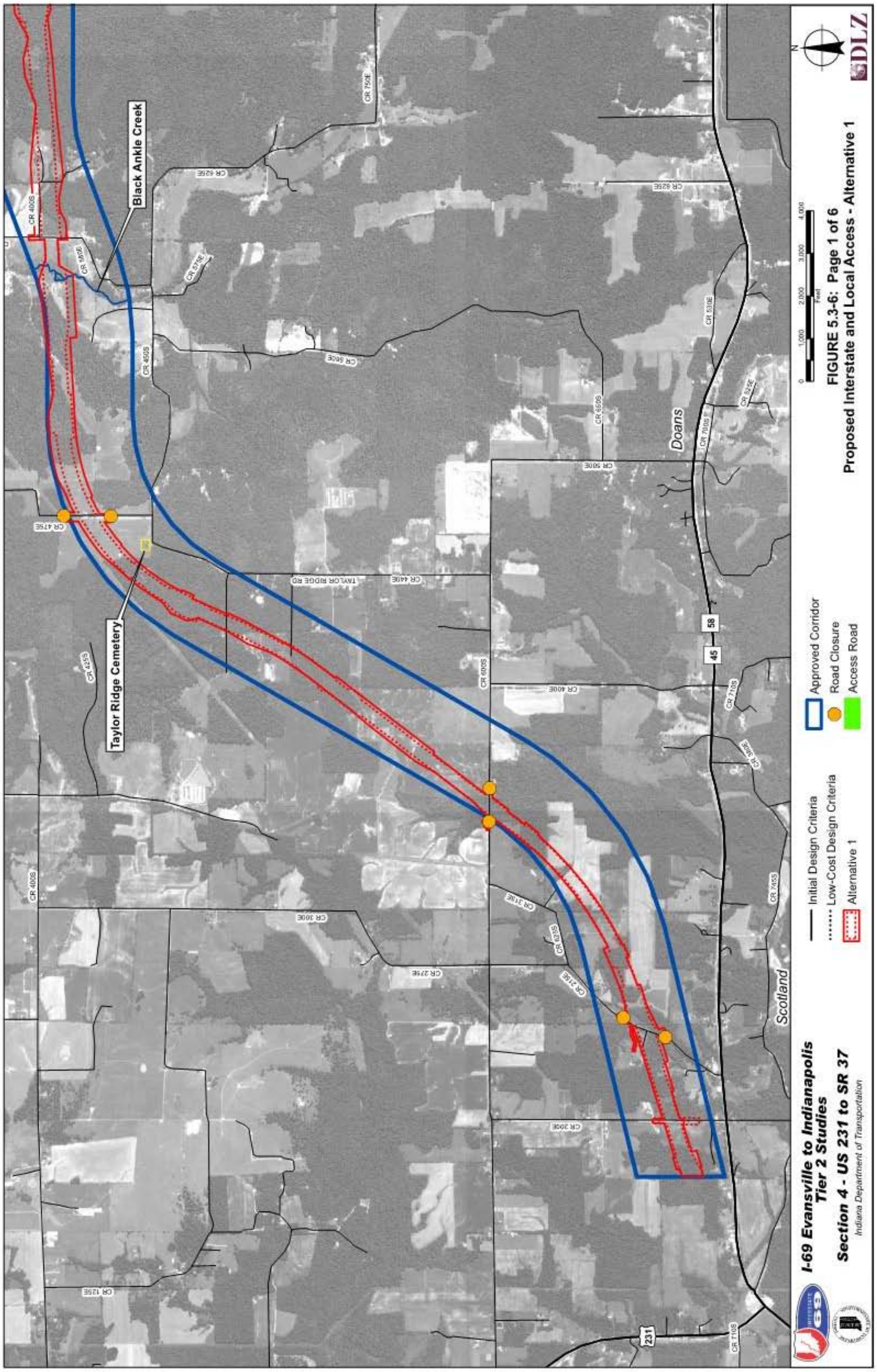
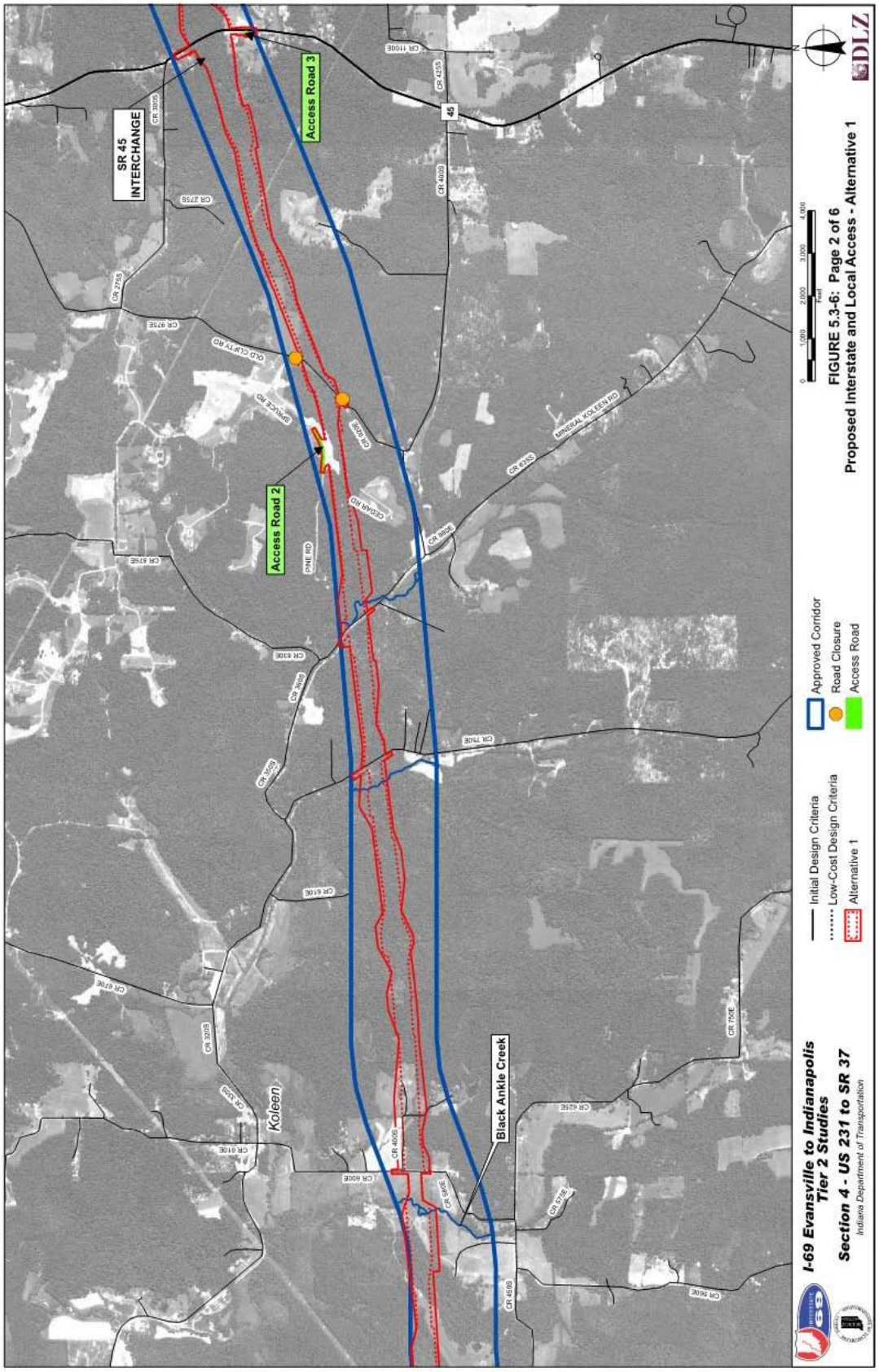
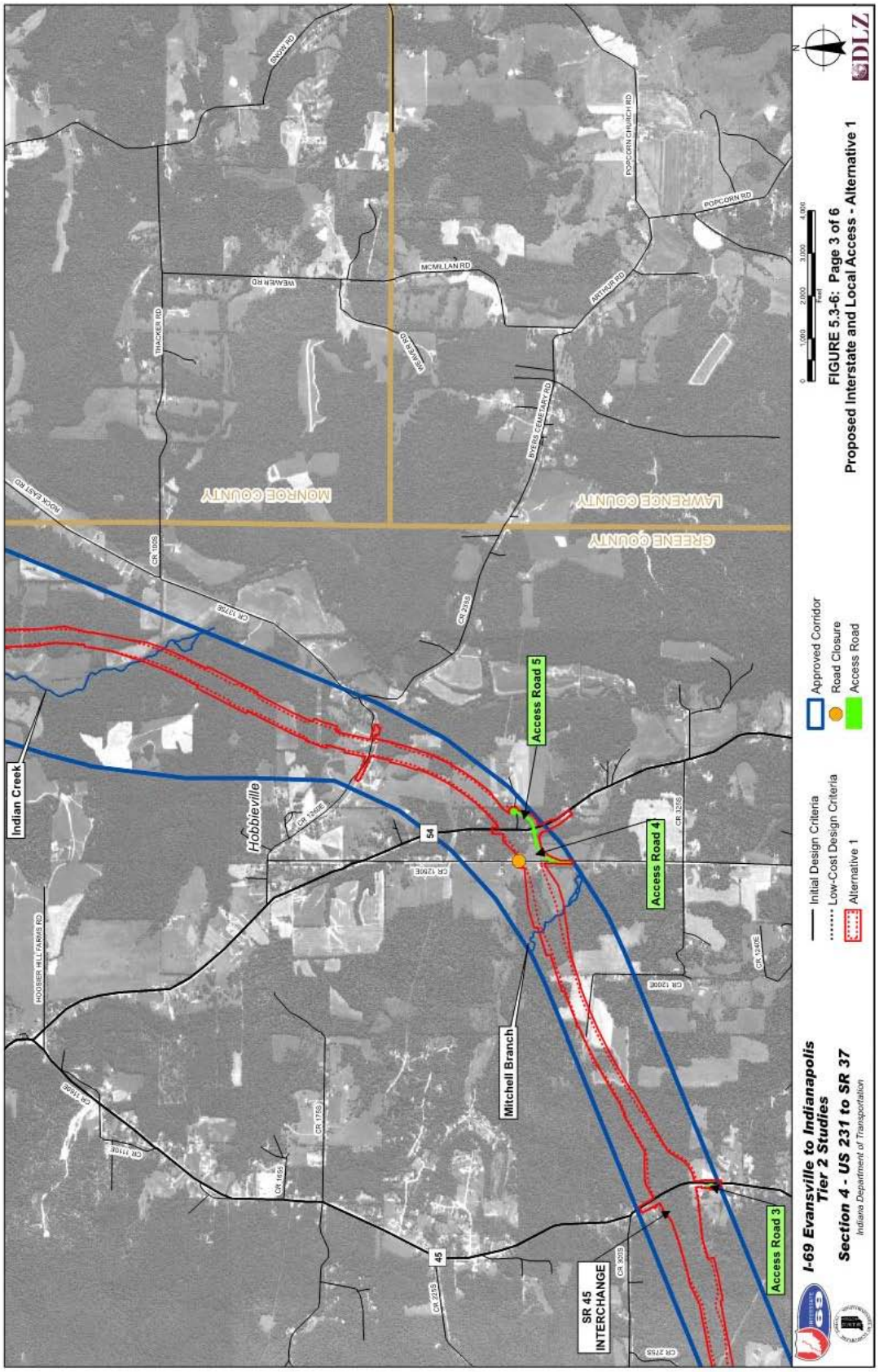
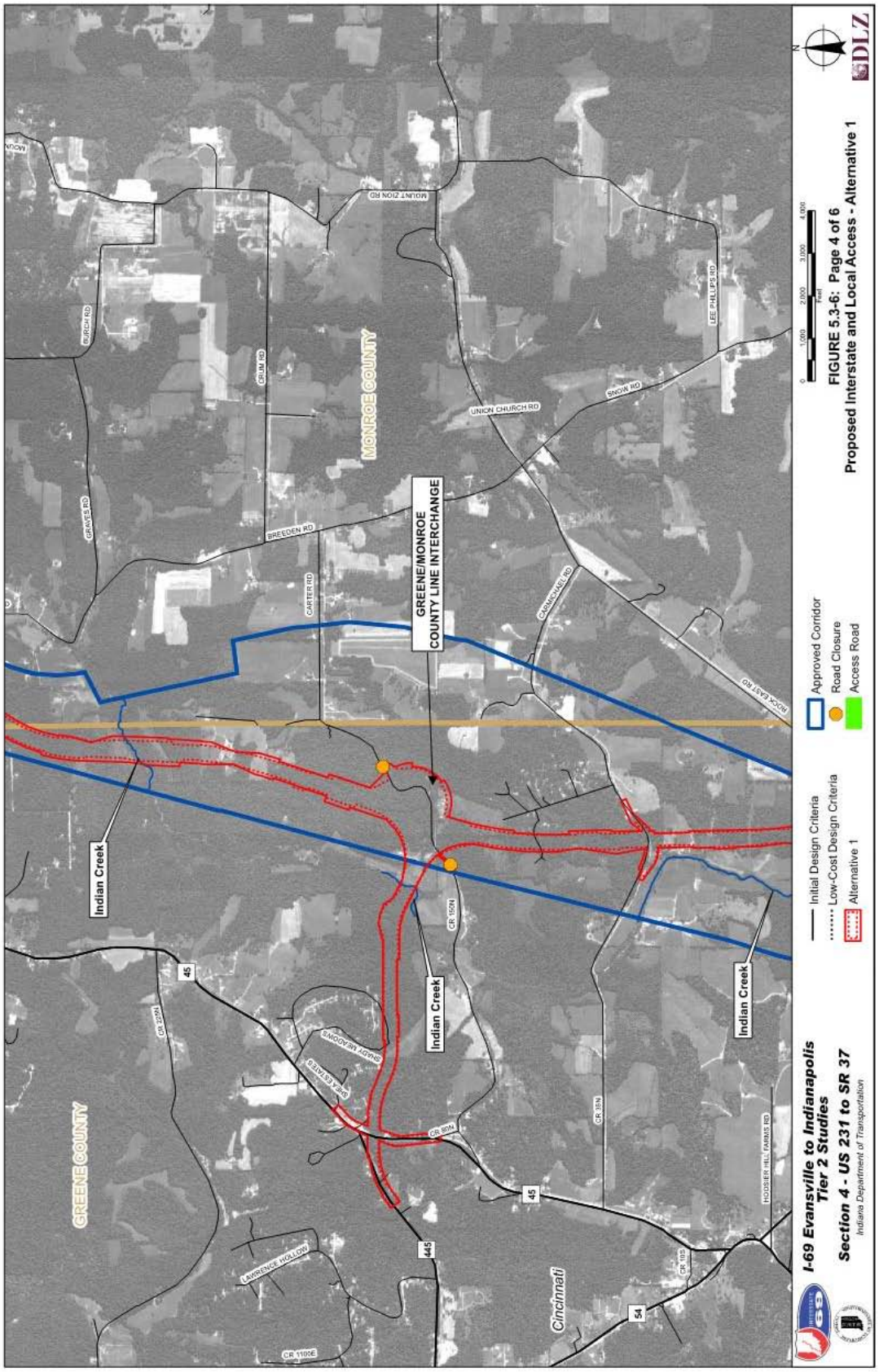


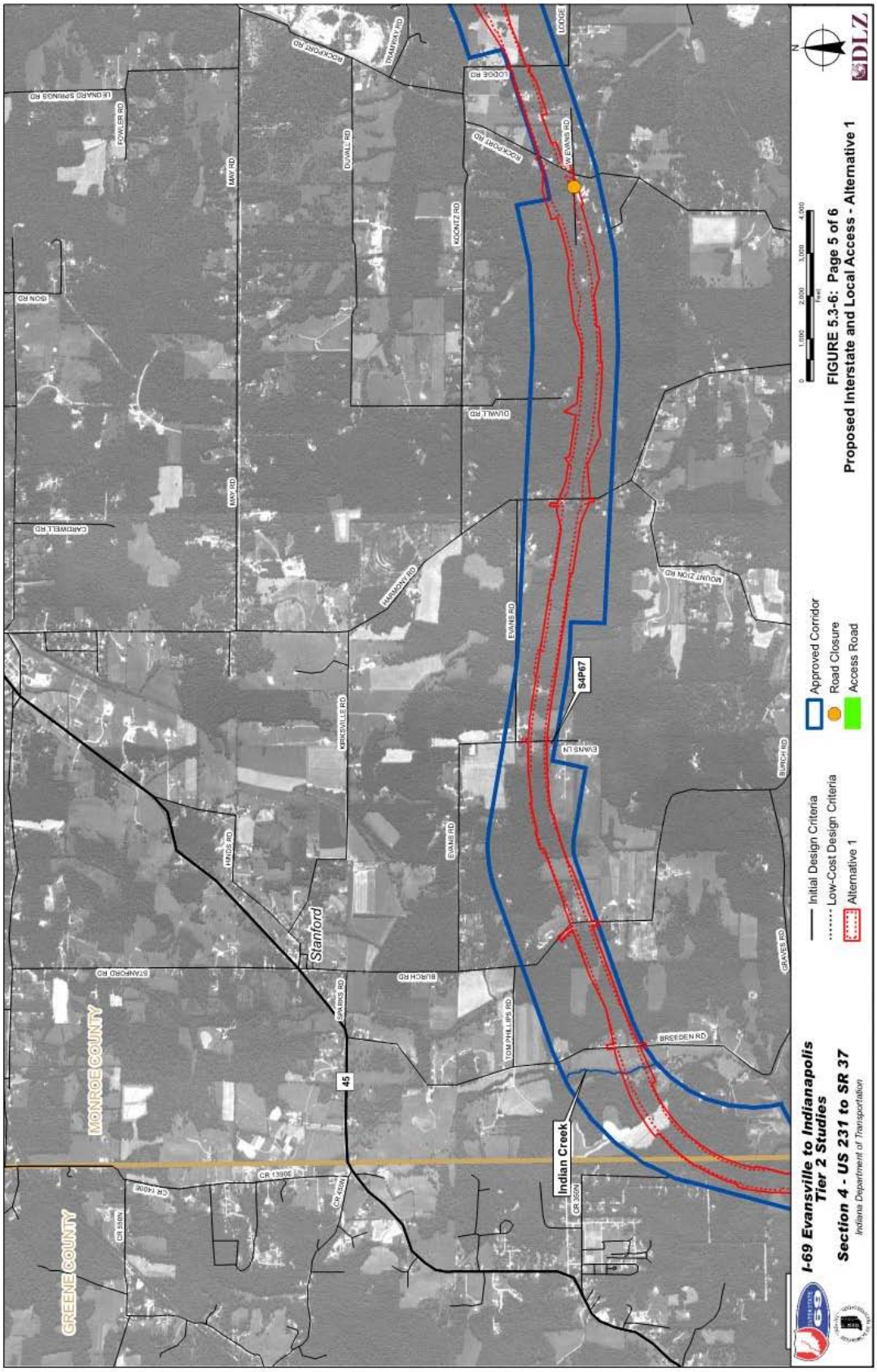
FIGURE 5.3-5
Tier 2 Analysis of Indirect Land Use Changes Resulting from I-69

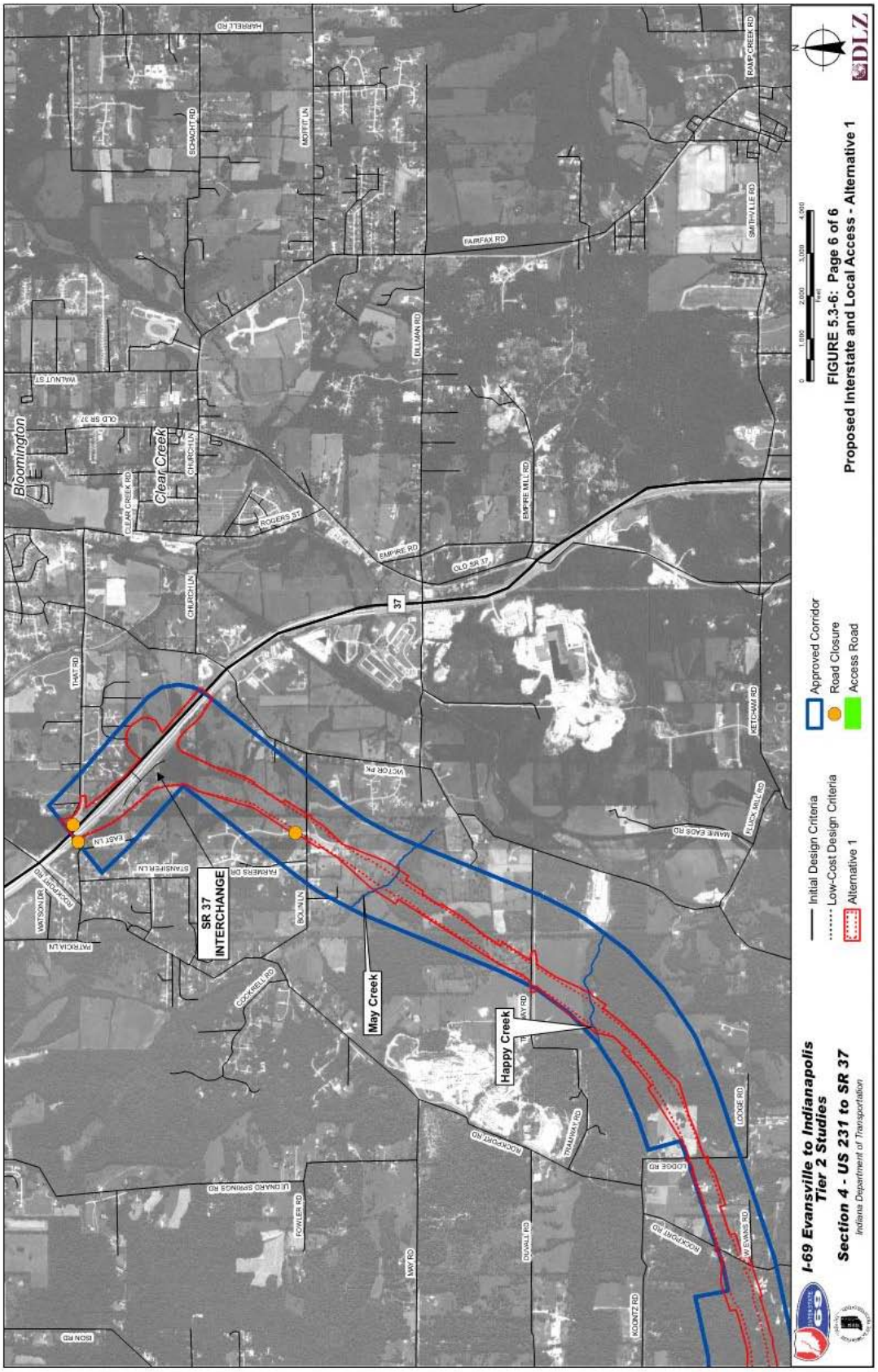

I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-6: Page 1 of 6
Proposed Interstate and Local Access - Alternative 1
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
Approved Corridor
Road Closure
Access Road
Black Ankle Creek
Taylor Ridge Cemetery
Doans
Scotland
DLZ

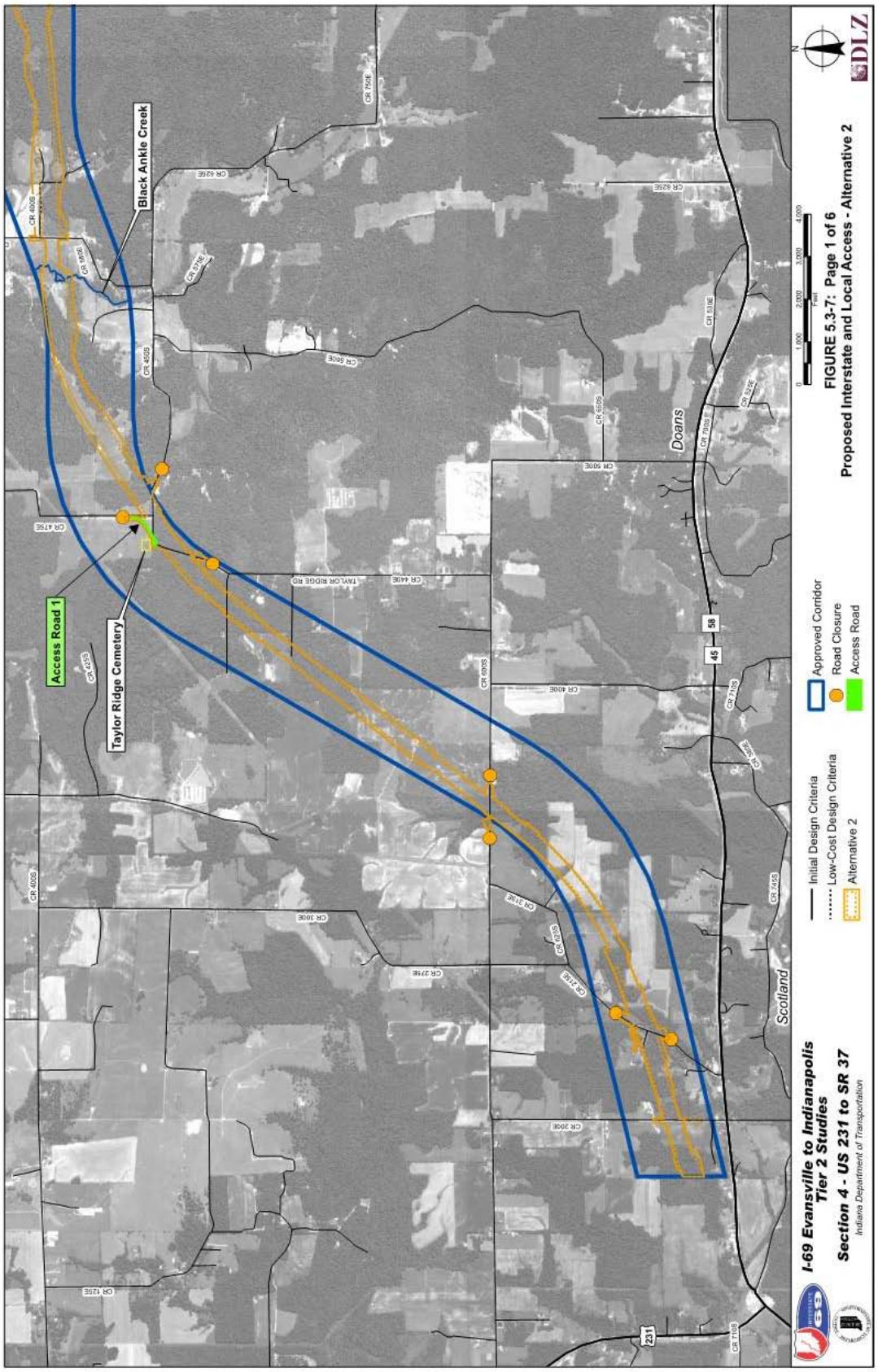

SR 45 INTERCHANGE
Access Road 3
Access Road 2
Koleen
Black Ankle Creek
45
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-6: Page 2 of 6
Proposed Interstate and Local Access - Alternative 1
DLZ


Indian Creek
Hobbieville
Mitchell Branch
Access Road 5
Access Road 4
Access Road 3
SR 45 INTERCHANGE
54
45
MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
HOOSIER HILL FARMS RD
ROCK EAST RD
TRACKER RD
WEMBER RD
MCMILLAN RD
ARTHUR RD
POPCORN CHURCH RD
POPCORN RD
AVERY CEMETERY RD
CR 1025
CR 1275E
CR 1250E
CR 1200E
CR 1150E
CR 1100E
CR 1050E
CR 1000E
CR 1275S
CR 1250S
CR 1200S
CR 1150S
CR 1100S
CR 1050S
CR 1000S
CR 1275E
CR 1250E
CR 1200E
CR 1150E
CR 1100E
CR 1050E
CR 1000E
CR 1275S
CR 1250S
CR 1200S
CR 1150S
CR 1100S
CR 1050S
CR 1000S
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-6: Page 3 of 6
Proposed Interstate and Local Access - Alternative 1
DLZ


GREENE COUNTY
MONROE COUNTY
GREENE/MONROE
COUNTY LINE INTERCHANGE
Indian Creek
Indian Creek
Indian Creek
Cincinnati
BIRCH RD
GRAVES RD
GRIM RD
BREEDEN RD
CARTER RD
MOUNT ZION RD
UNION CHURCH RD
SNOW RD
LEE PHILLIPS RD
CARMICHAEL RD
NOX EAST RD
CR 150N
CR 100N
CR 80N
CR 30N
CR 1100E
CR 1025
LAWRENCE HOLLOW
HOOSIER HILL FARMS RD
45
445
54
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-6: Page 4 of 6
Proposed Interstate and Local Access - Alternative 1
DLZ


GREENE COUNTY
MONROE COUNTY
Stanford
Indian Creek
45
S4P07
CR 1390E
CR 400N
CR 350N
STANFORD RD
BURCH RD
TOM PHILLIPS RD
BREEDEN RD
GRAVES RD
EVANS LN
EVANS RD
HADIS RD
VIRKSVILLE RD
HAMMONS RD
MOUNT ZION RD
CARDWELL RD
MAY RD
DUVALL RD
KOCKTZ RD
ROCKPORT RD
LODGE RD
LODGE
FOWLER RD
LE GUARD SPRINGS RD
ISON RD
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
Approved Corridor
Road Closure
Access Road
FIGURE 5.3-6: Page 5 of 6
Proposed Interstate and Local Access - Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


Bloomington
Clear Creek
SR 37
INTERCHANGE
May Creek
Happy Creek
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-6: Page 6 of 6
Proposed Interstate and Local Access - Alternative 1
DLZ


Black Ankle Creek
Access Road 1
Taylor Ridge Cemetery
Doans
Scotland
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 2
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-7: Page 1 of 6
Proposed Interstate and Local Access - Alternative 2
DLZ

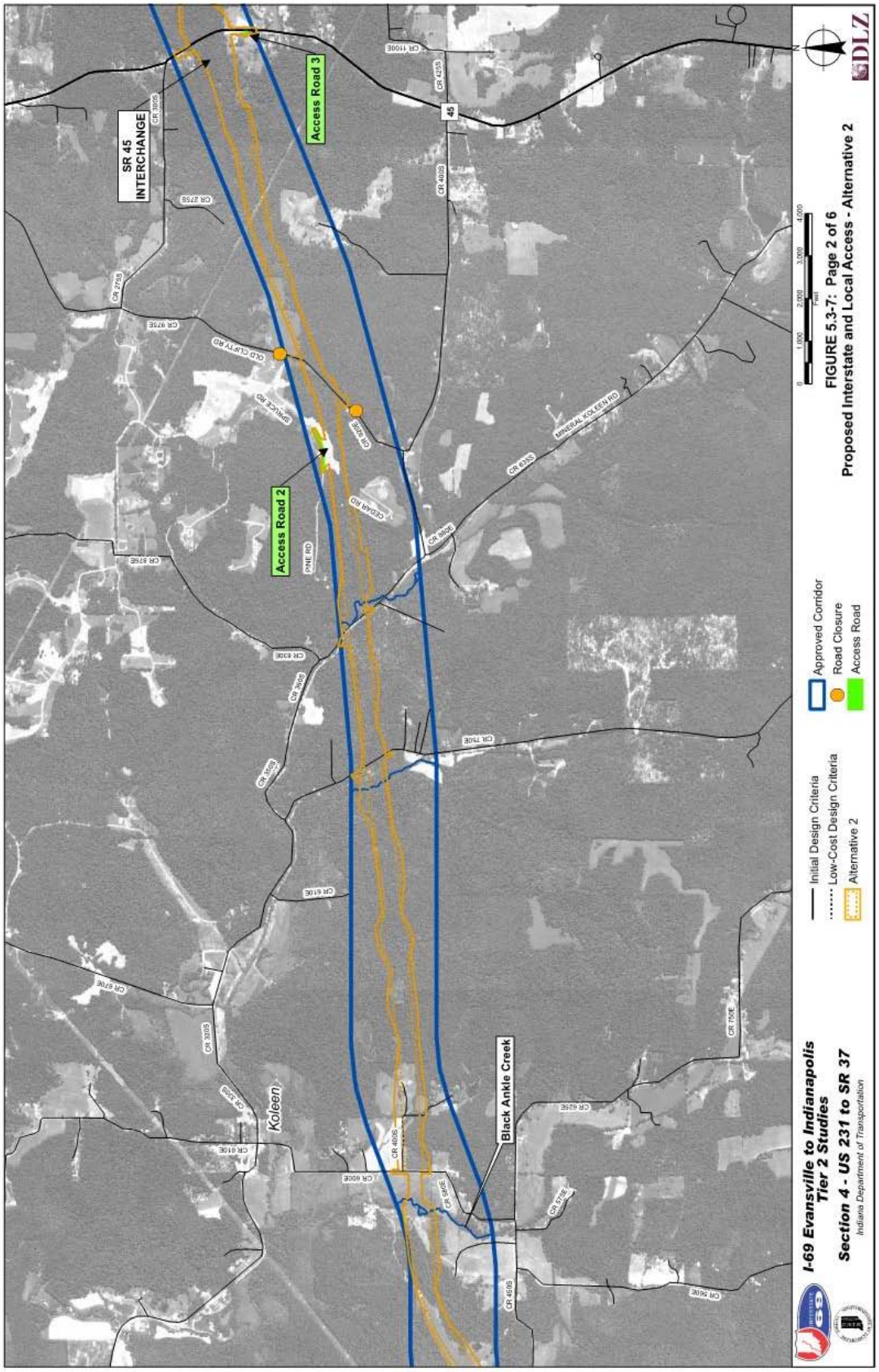
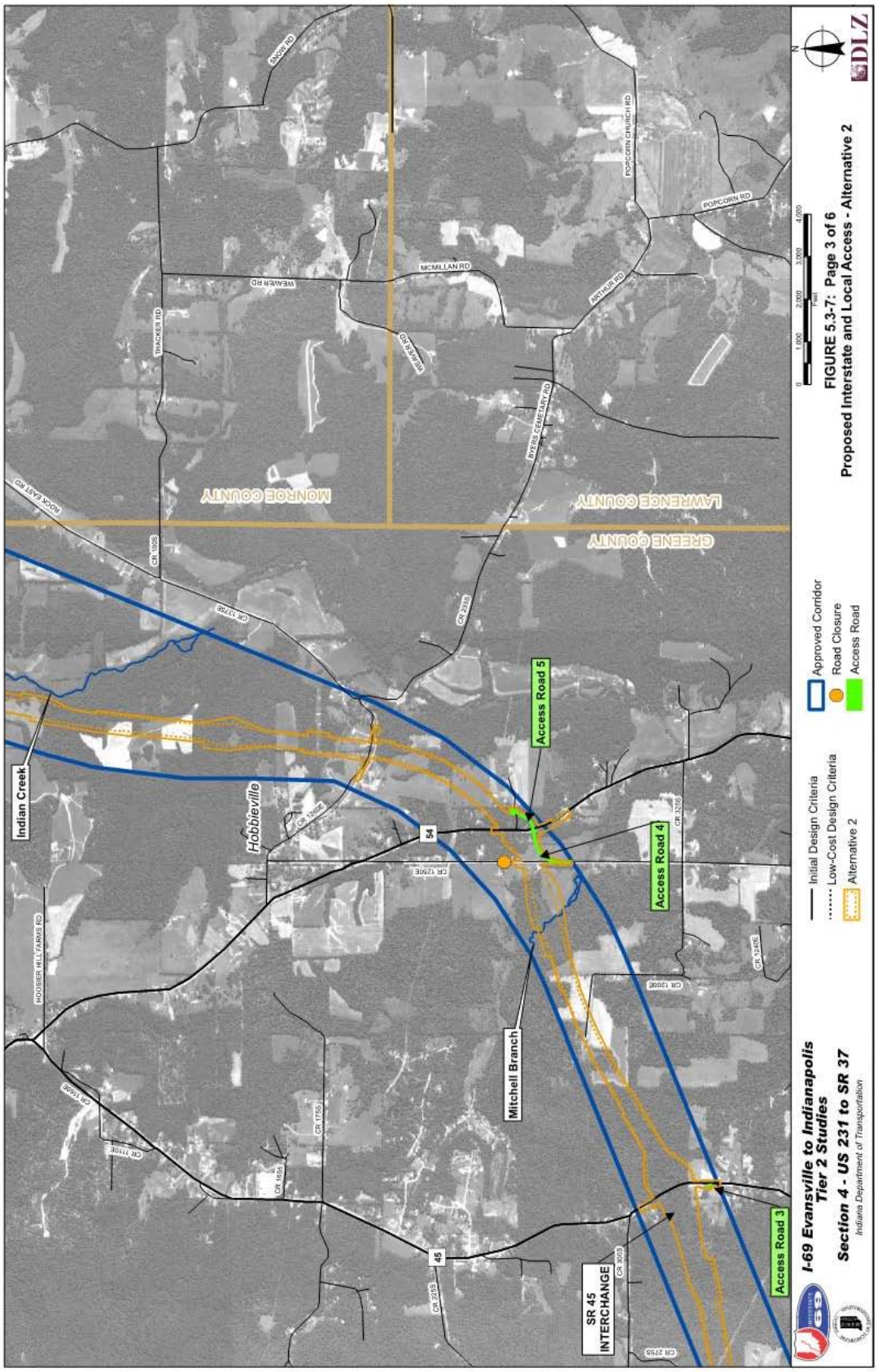
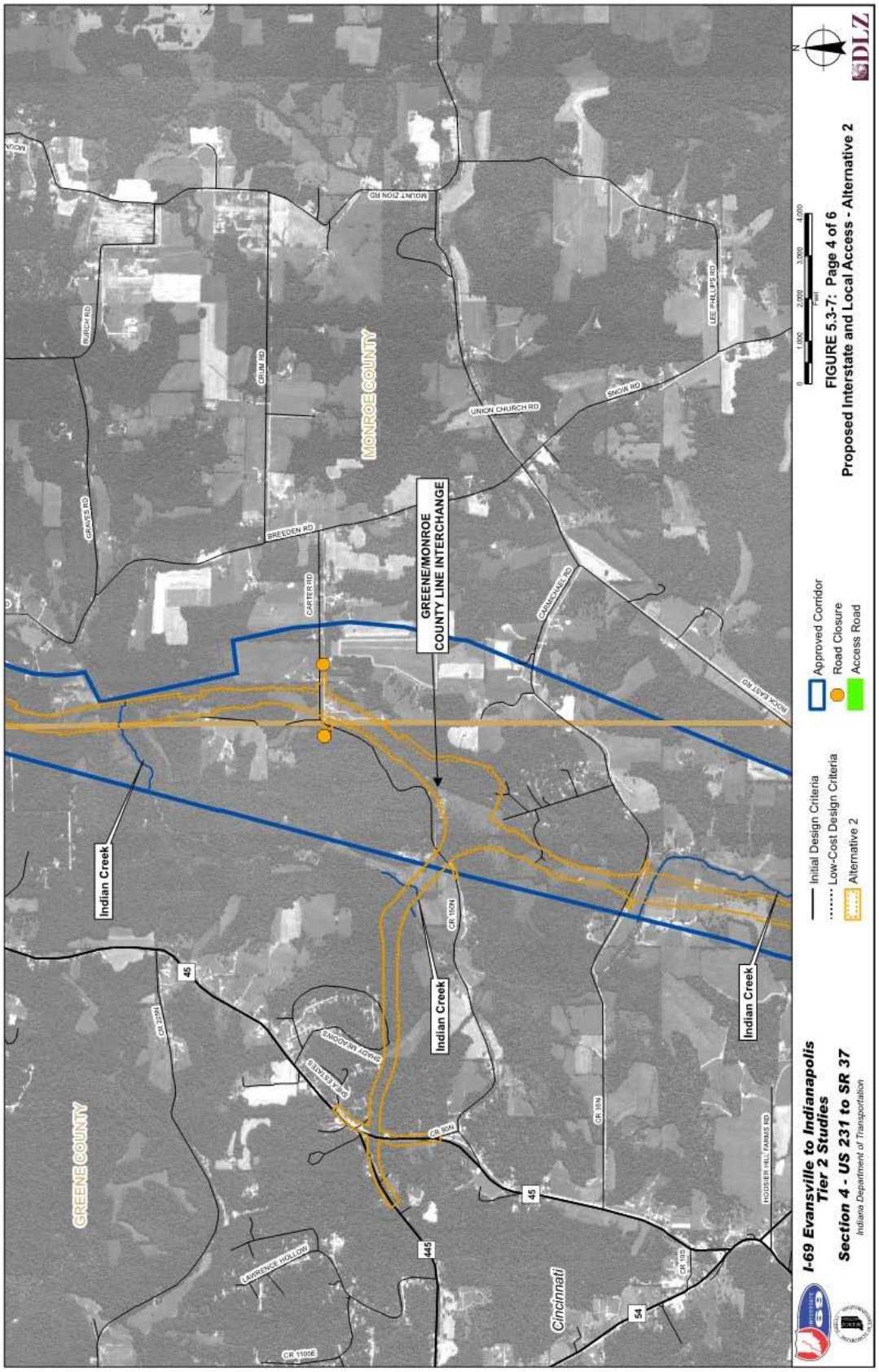
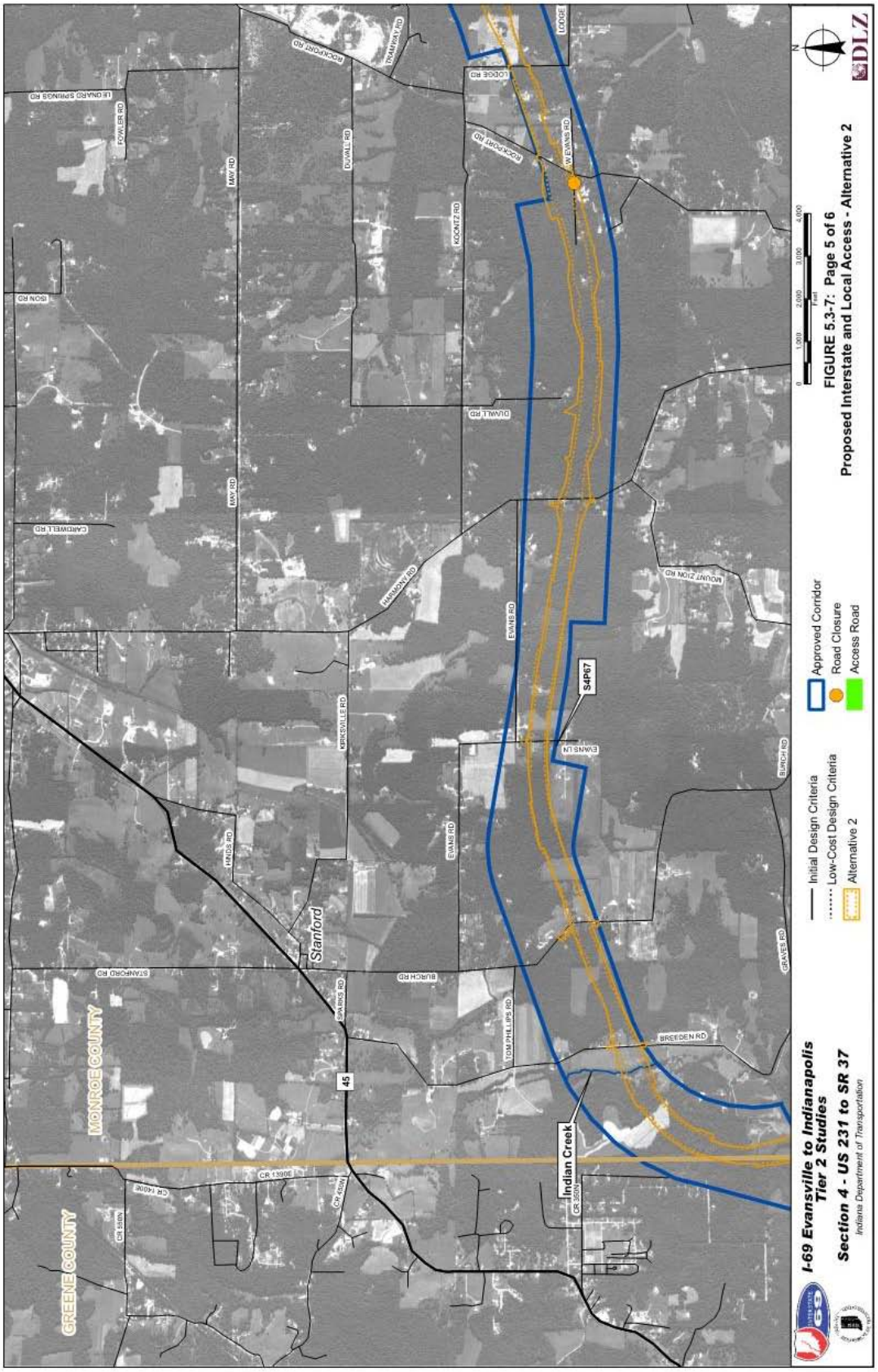
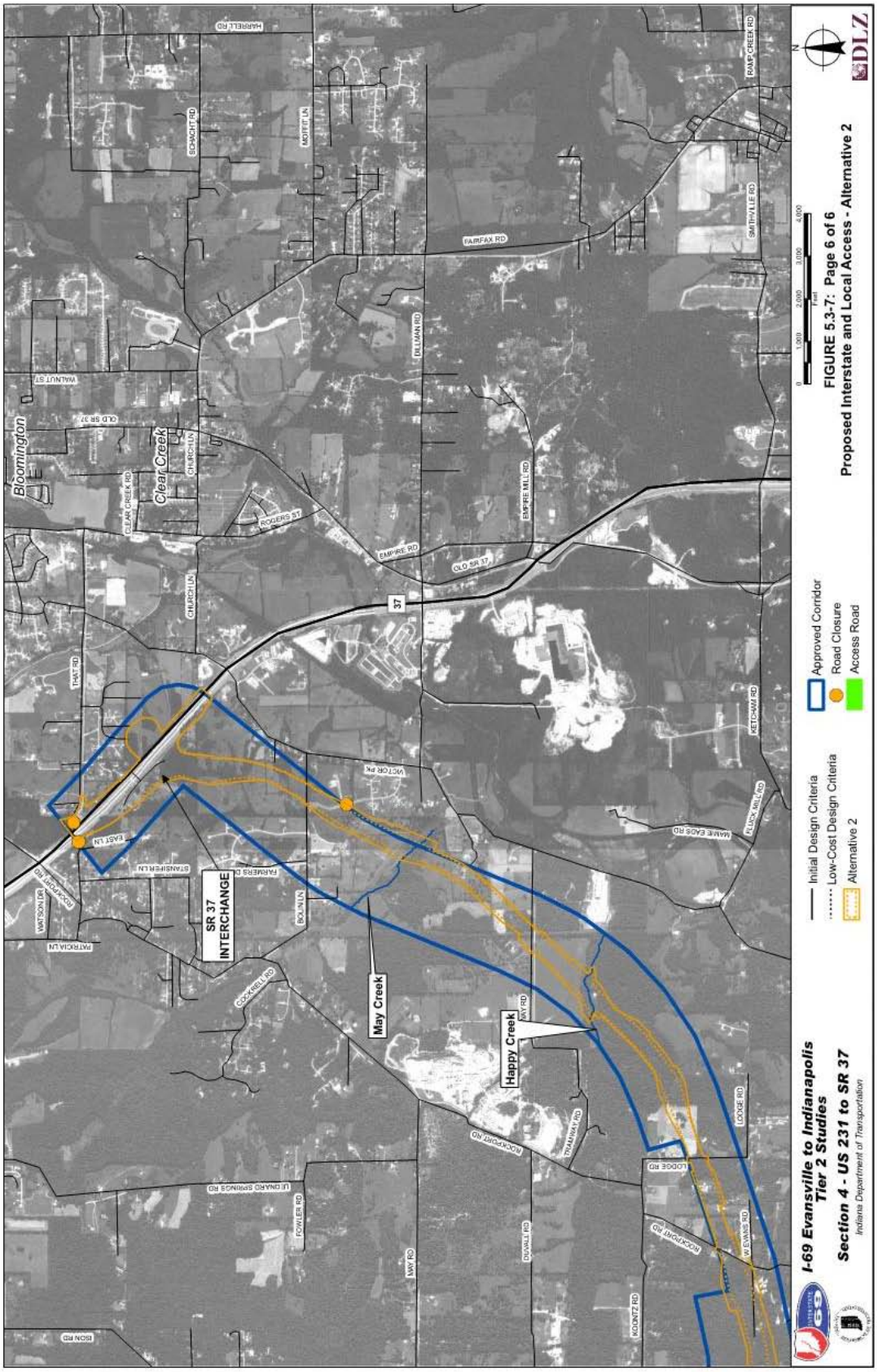


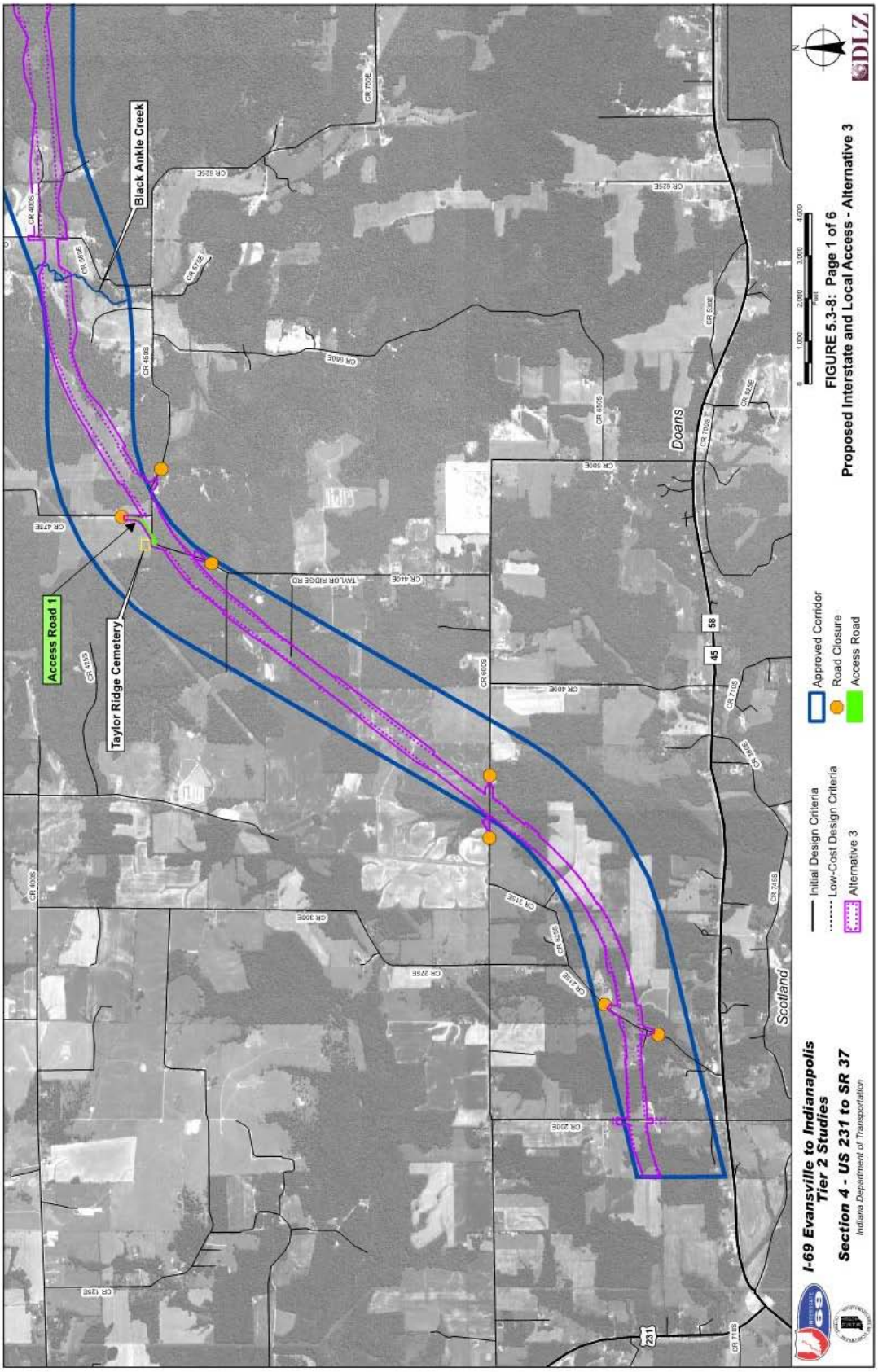
FIGURE 5.3-7: Page 2 of 6
Proposed Interstate and Local Access - Alternative 2

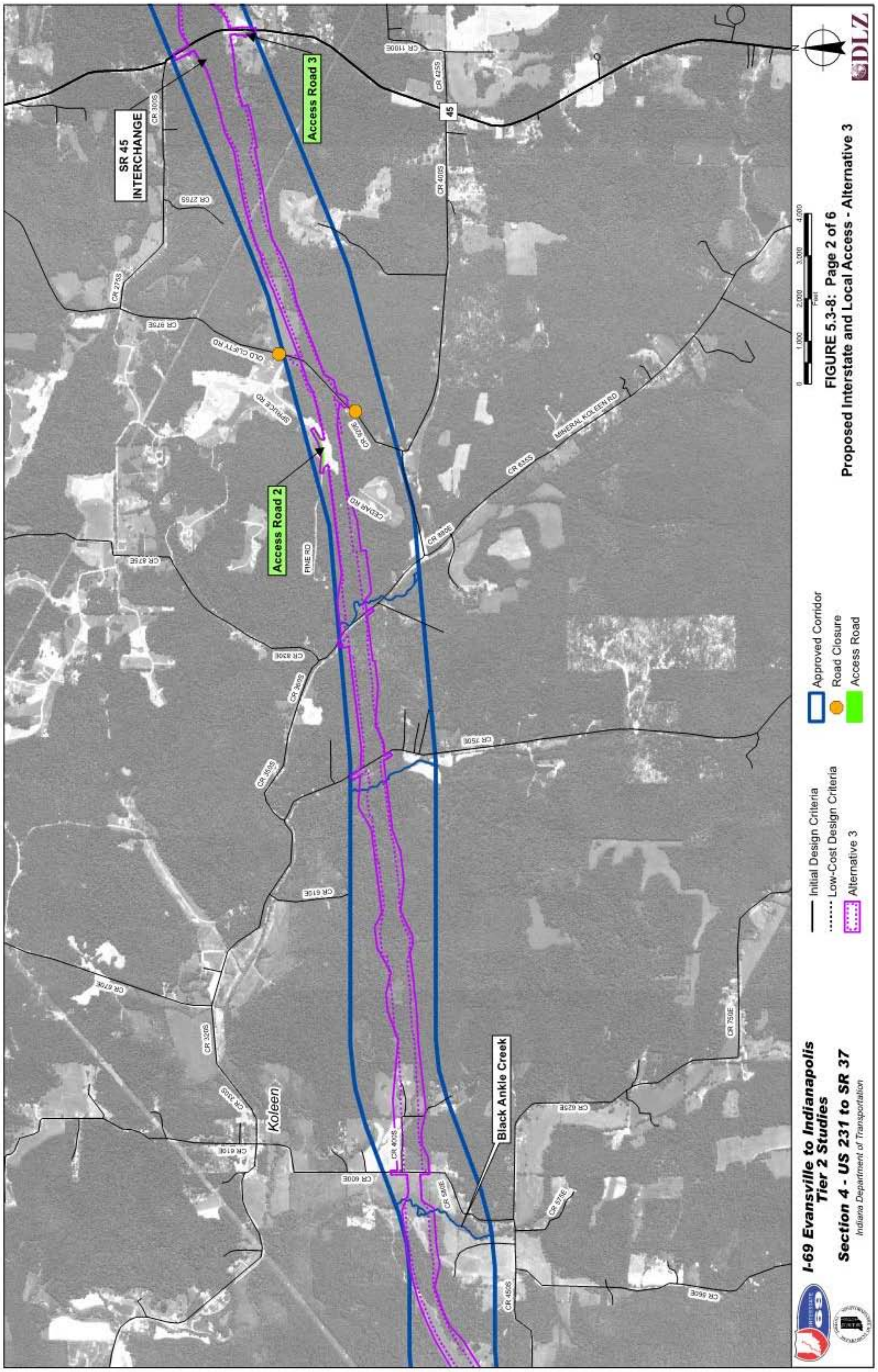

Indian Creek
Hobbieville
Mitchell Branch
Access Road 5
Access Road 4
Access Road 3
SR 45 INTERCHANGE
54
45
MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
HOOSIER HILL FARMS RD
ROCK EAST RD
TRACKER RD
WEMBER RD
MCMILLAN RD
ARTHUR RD
POPCORN RD
POPCORN CHURCH RD
AVERY CEMETERY RD
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 2
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-7: Page 3 of 6
Proposed Interstate and Local Access - Alternative 2
DLZ

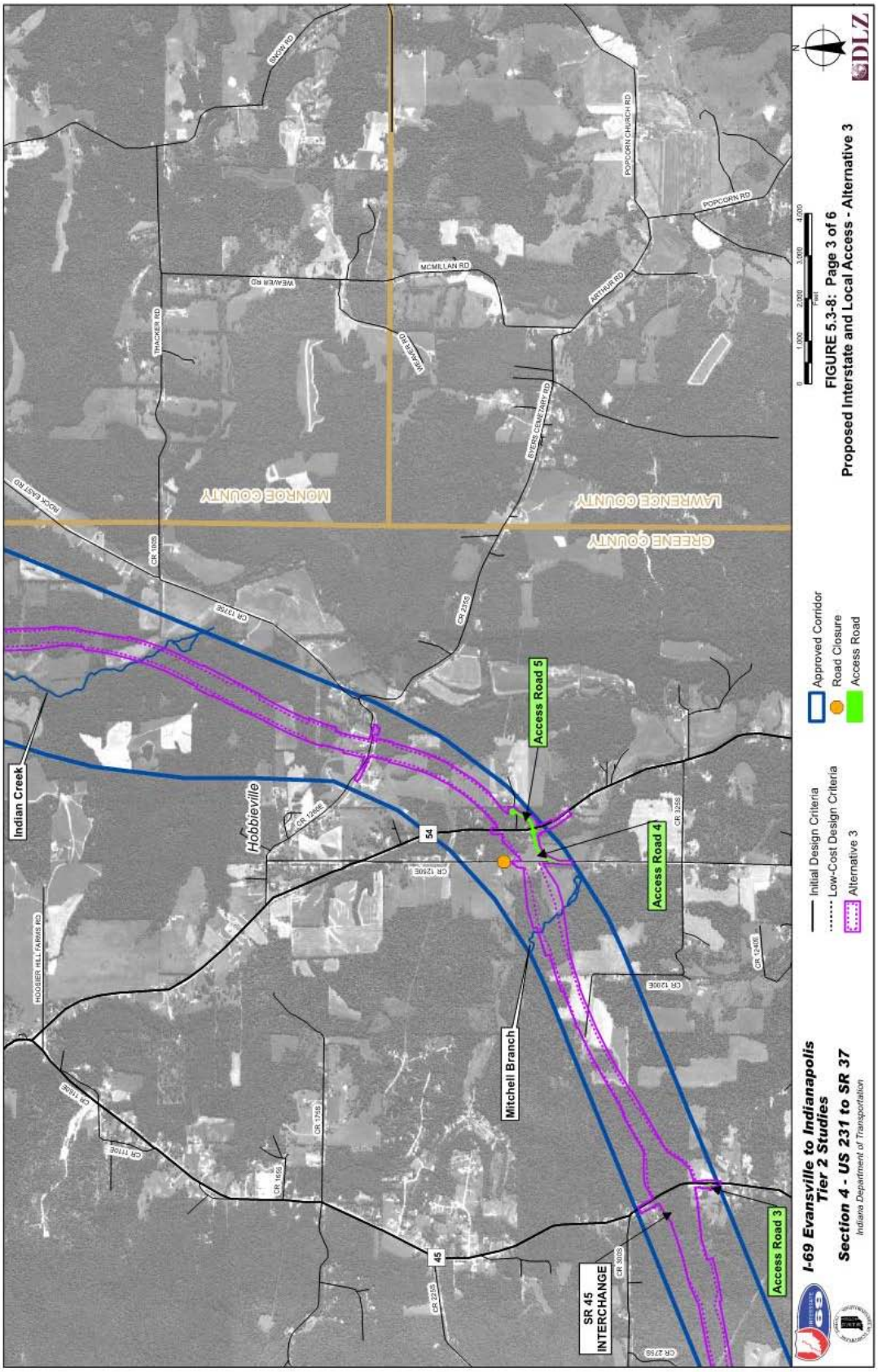

GREENE COUNTY
MONROE COUNTY
GREENE/MONROE
COUNTY LINE INTERCHANGE
Indian Creek
Indian Creek
Indian Creek
Cincinnati
BIRCH RD
GRAVES RD
GRIM RD
BREEDEN RD
CARTER RD
MOUNT ZION RD
UNION CHURCH RD
CARMICHAEL RD
SNOW RD
LEE PHILLIPS RD
NICK EAST RD
CR 150N
CR 100N
CR 80N
CR 30N
CR 10S
CR 1100E
LAWRENCE HOLLOW
HOOSIER HILL FARMS RD
45
445
54
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 2
FIGURE 5.3-7: Page 4 of 6
Proposed Interstate and Local Access - Alternative 2
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


GREENE COUNTY
MONROE COUNTY
Stanford
Indian Creek
45
S4P67
EVANS RD
EVANS LN
BREEDEN RD
BURCH RD
GRAVES RD
TOM PHILLIPS RD
MOUNT ZION RD
HAMILTON RD
DUVALL RD
KOCZNTZ RD
MAY RD
FOWLER RD
LODGE RD
ROCKPORT RD
CARDWELL RD
STANFORD RD
HADIS RD
MORKSVILLE RD
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 2
FIGURE 5.3-7: Page 5 of 6
Proposed Interstate and Local Access - Alternative 2
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


Bloomington
Clear Creek
SR 37
INTERCHANGE
May Creek
Happy Creek
37
HARRELL RD
BOSHOLT RD
MOUTON LN
FAIRFAX RD
RAMP CREEK RD
SMITHVILLE RD
WALNUT ST
OLD SR 37
DILLMAN RD
CLEAR CREEK RD
CHURCH LN
ROGERS ST
EMPIRE RD
EMPIRE MILL RD
THAT RD
MOTOR PK
KETCHUM RD
MAINE EADS RD
PLUCK MILL RD
EAST LN
STANSHIRE LN
FARMERS C
BOUN LN
VATSON DR
PATRICIA LN
COCKRELL RD
MAY RD
TRAMWAY RD
MOCKPORT RD
LODGE RD
W EVANS RD
LE GNARD SPRINGS RD
FOWLER RD
DUVALL RD
KIDDITZ RD
SON RD
0 1,000 2,000 3,000 4,000
Feet
N
DLZ
FIGURE 5.3-7: Page 6 of 6
Proposed Interstate and Local Access - Alternative 2
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 2
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation


Black Ankle Creek
Access Road 1
Taylor Ridge Cemetery
Doans
Scotland
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 3
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-8: Page 1 of 6
Proposed Interstate and Local Access - Alternative 3
DLZ


SR 45 INTERCHANGE
Access Road 3
Access Road 2
Black Ankle Creek
Koleen
OLD CLIFTY RD
SPRUCE RD
CEDAR RD
PINE RD
MINERAL KOLEEN RD
Initial Design Criteria
Low-Cost Design Criteria
Alternative 3
Approved Corridor
Road Closure
Access Road
FIGURE 5.3-8: Page 2 of 6
Proposed Interstate and Local Access - Alternative 3
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


Indian Creek
Hobbieville
Mitchell Branch
Access Road 5
Access Road 4
Access Road 3
SR 45 INTERCHANGE
MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 3
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-8: Page 3 of 6
Proposed Interstate and Local Access - Alternative 3
DLZ

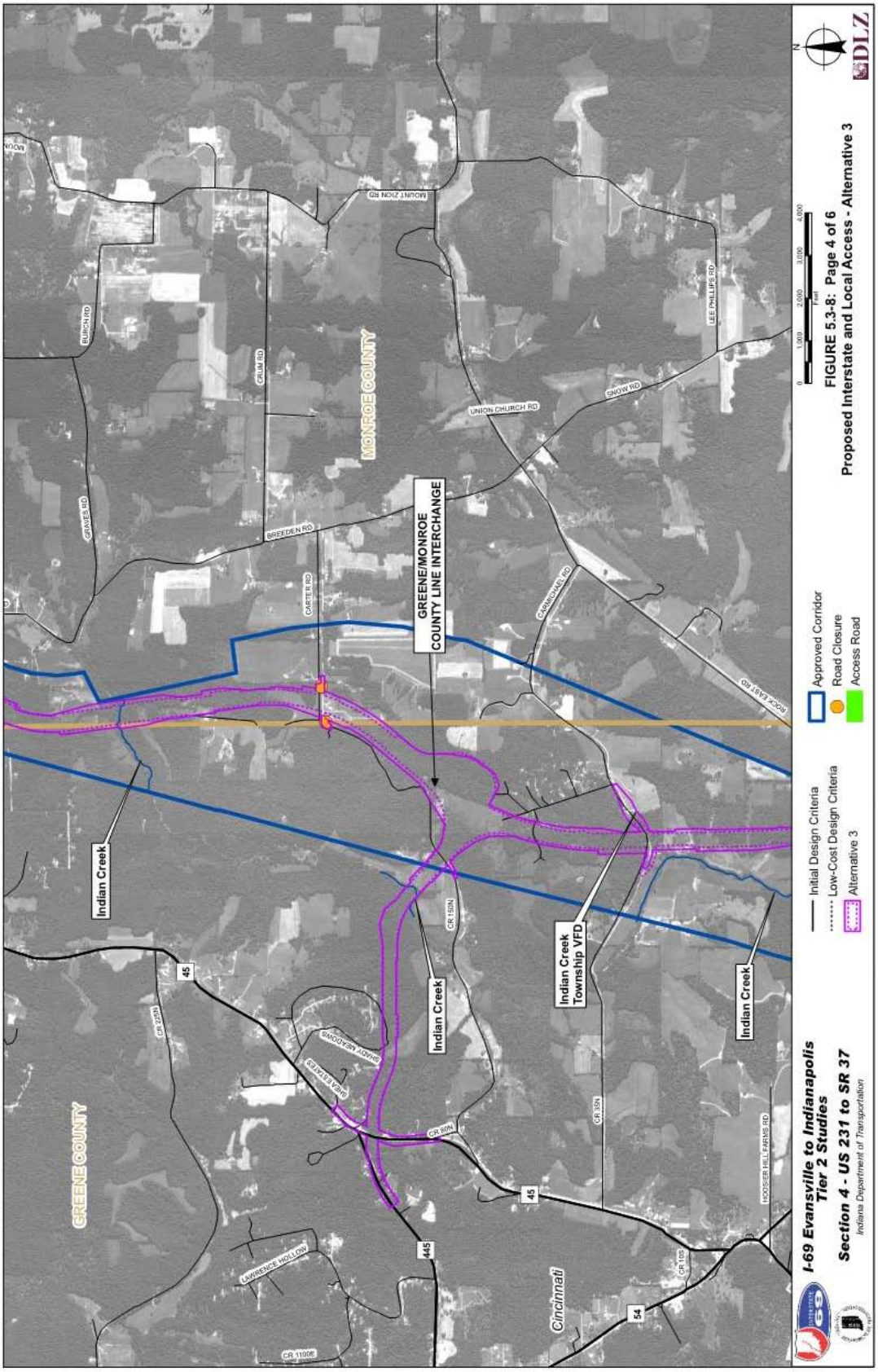
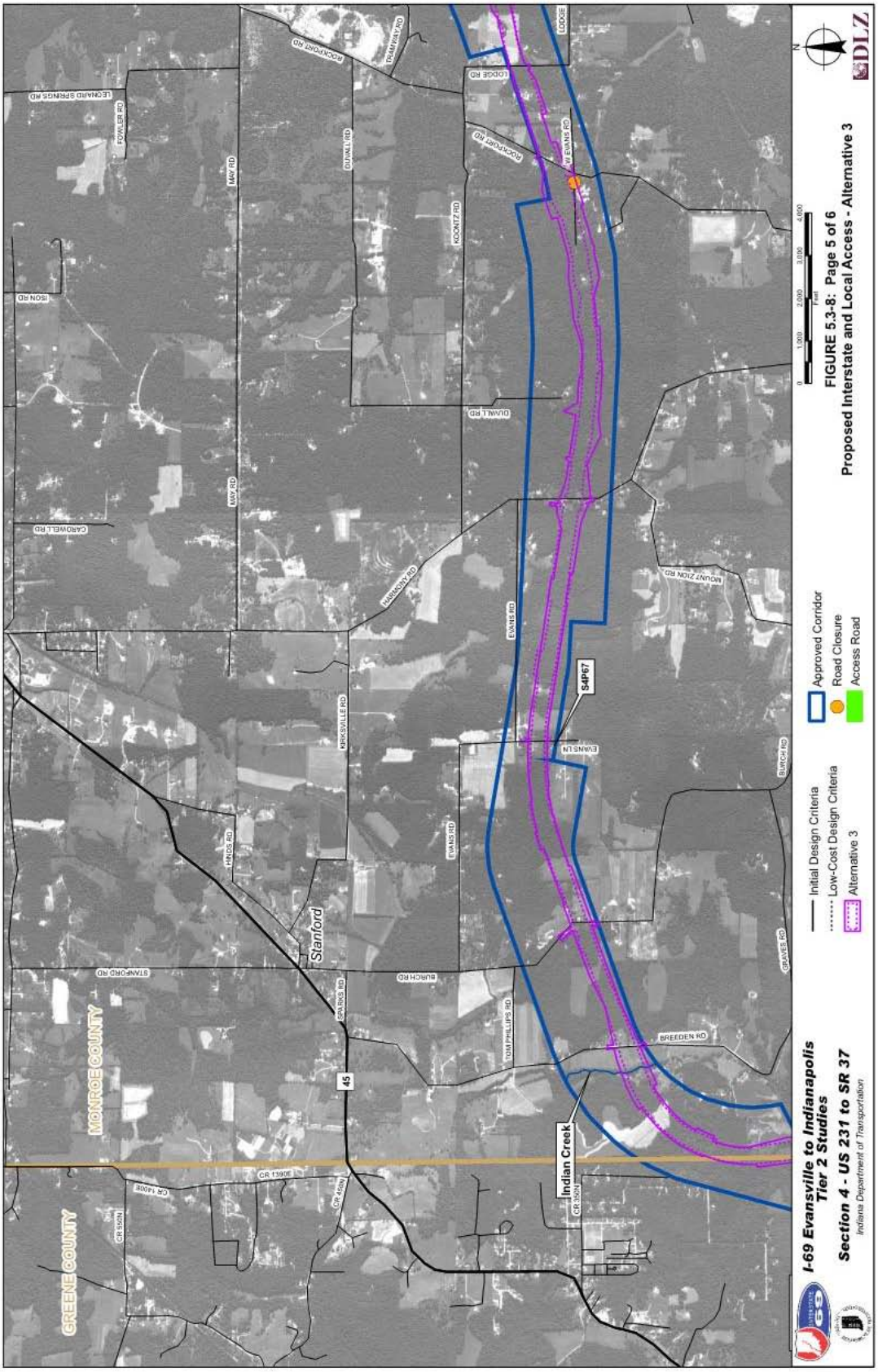
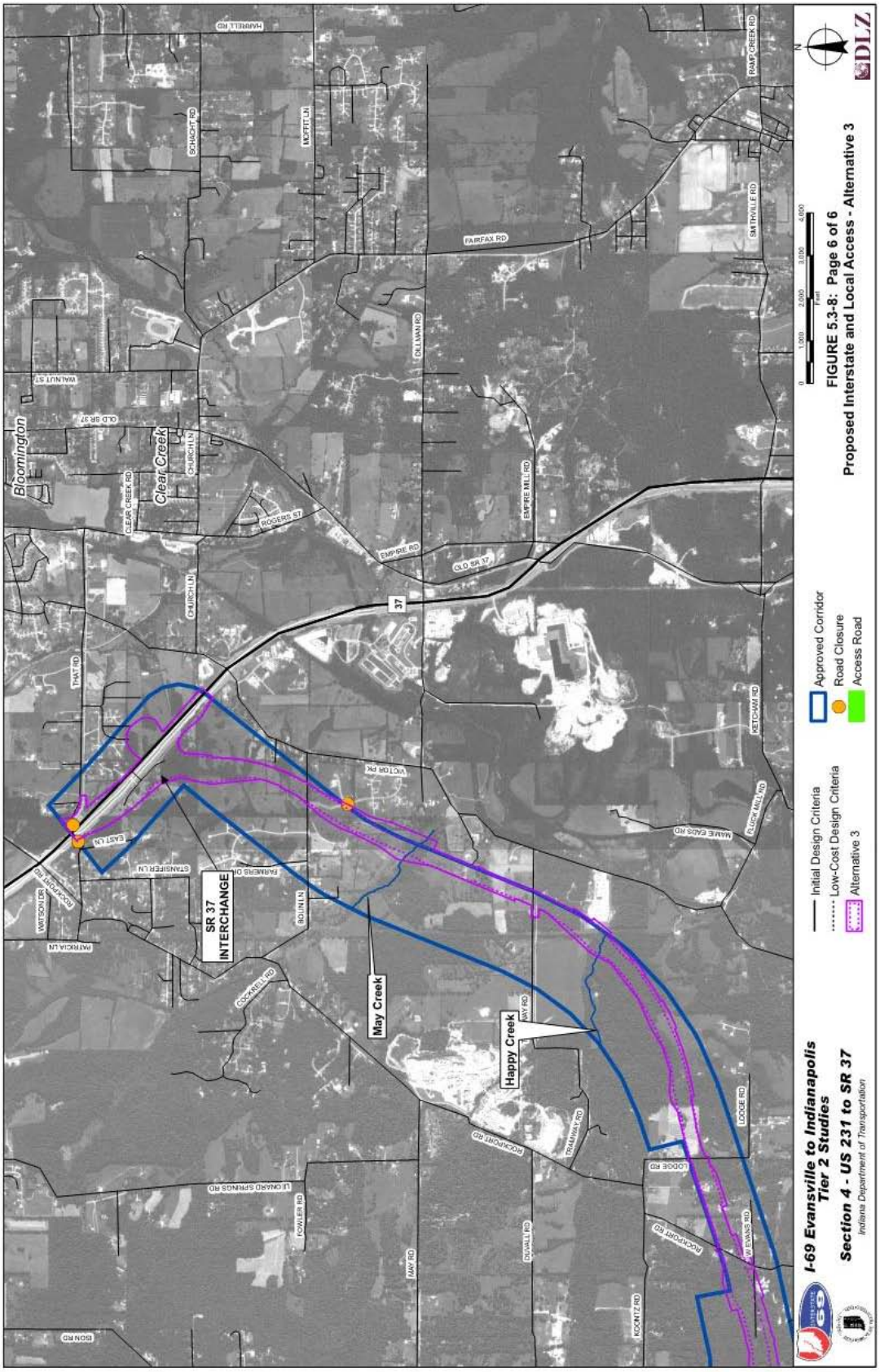
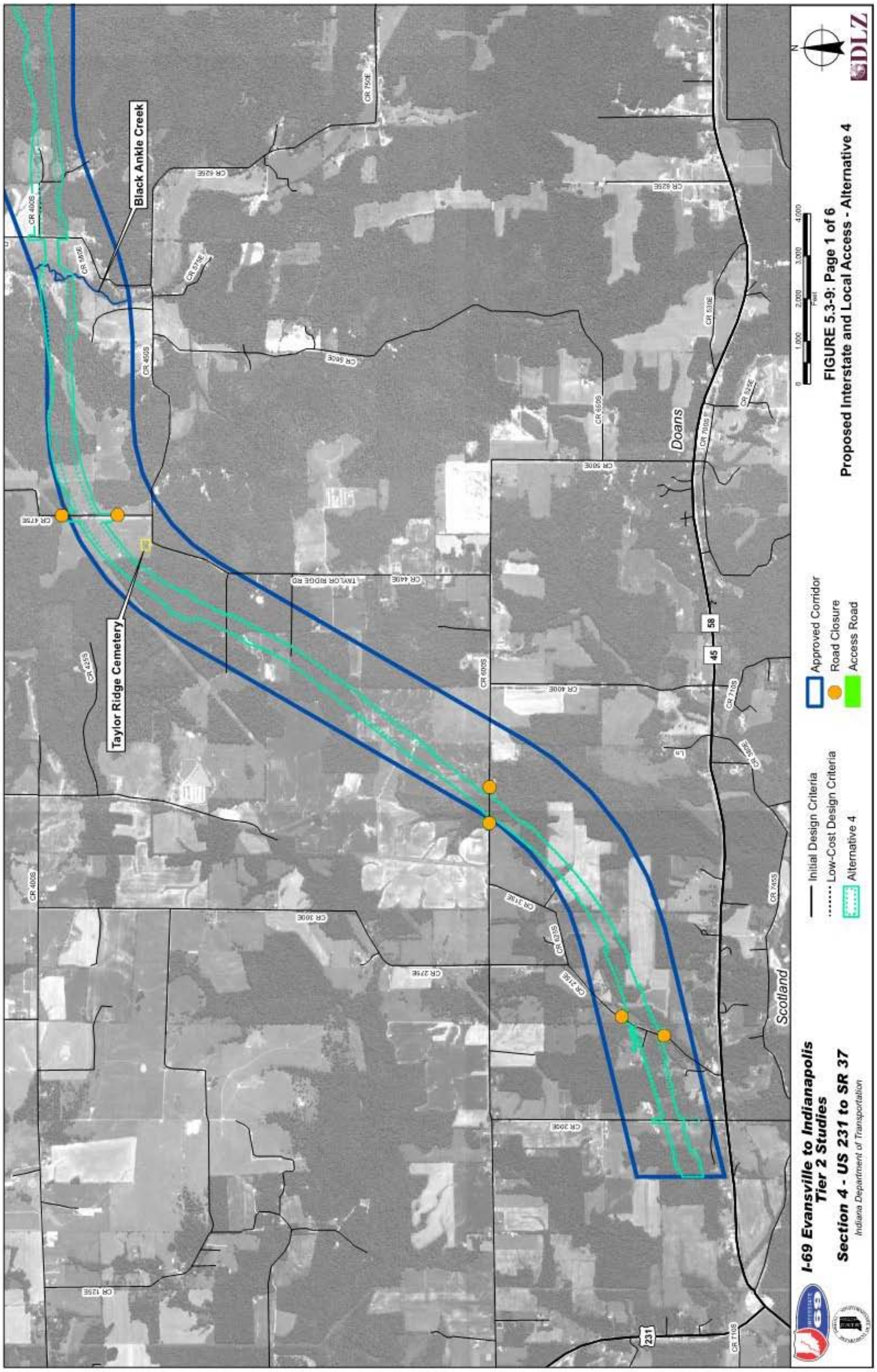
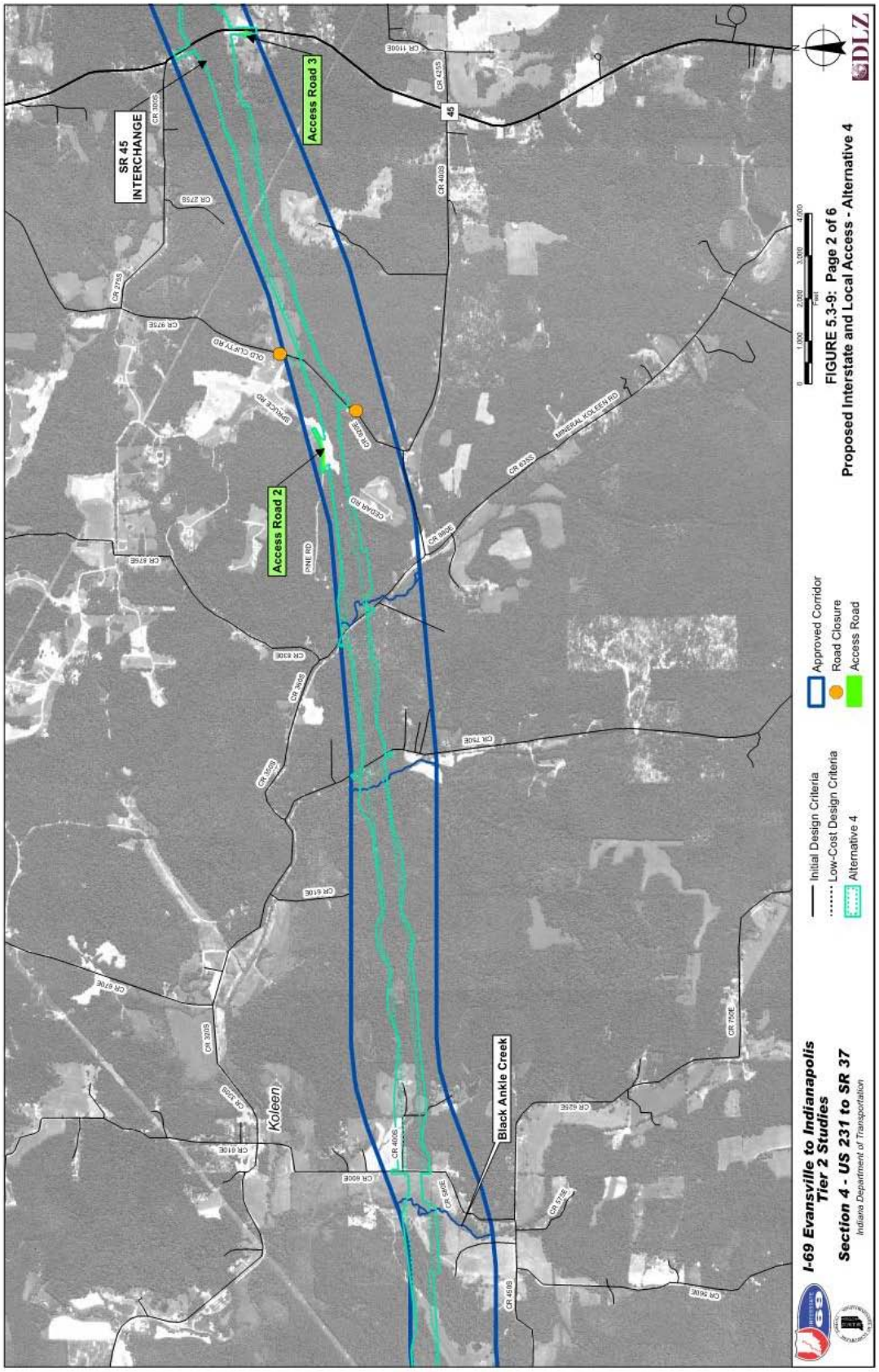


FIGURE 5.3-8: Page 4 of 6
Proposed Interstate and Local Access - Alternative 3


GREENE COUNTY
MONROE COUNTY
Stanford
Indian Creek
S4P67
45
CR 1390E
CR 1400E
CR 350N
CR 450N
CR 300N
STANFORD RD
BURCH RD
TOM PHILLIPS RD
BREEDEN RD
GRAVES RD
EVANS LN
EVANS RD
HANDS RD
MINNSVILLE RD
HARRISON RD
MOUNT ZION RD
OLWILL RD
KOONTZ RD
MAY RD
FOWLER RD
LEONARD SPRINGS RD
CARDWELL RD
ROCKPORT RD
LODGE RD
W EVANS RD
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 3
0
1,000
2,000
3,000
4,000
Feet
N
DLZ
FIGURE 5.3-8: Page 5 of 6
Proposed Interstate and Local Access - Alternative 3
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation


Bloomington
Clear Creek
SR 37
INTERCHANGE
May Creek
Happy Creek
37
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 3
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-8: Page 6 of 6
Proposed Interstate and Local Access - Alternative 3
DLZ


Black Ankle Creek
Taylor Ridge Cemetery
Doans
Scotland
Initial Design Criteria
Low-Cost Design Criteria
Alternative 4
Approved Corridor
Road Closure
Access Road
FIGURE 5.3-9: Page 1 of 6
Proposed Interstate and Local Access - Alternative 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


SR 45 INTERCHANGE
Access Road 3
Access Road 2
Koleen
Black Ankle Creek
45
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-9: Page 2 of 6
Proposed Interstate and Local Access - Alternative 4
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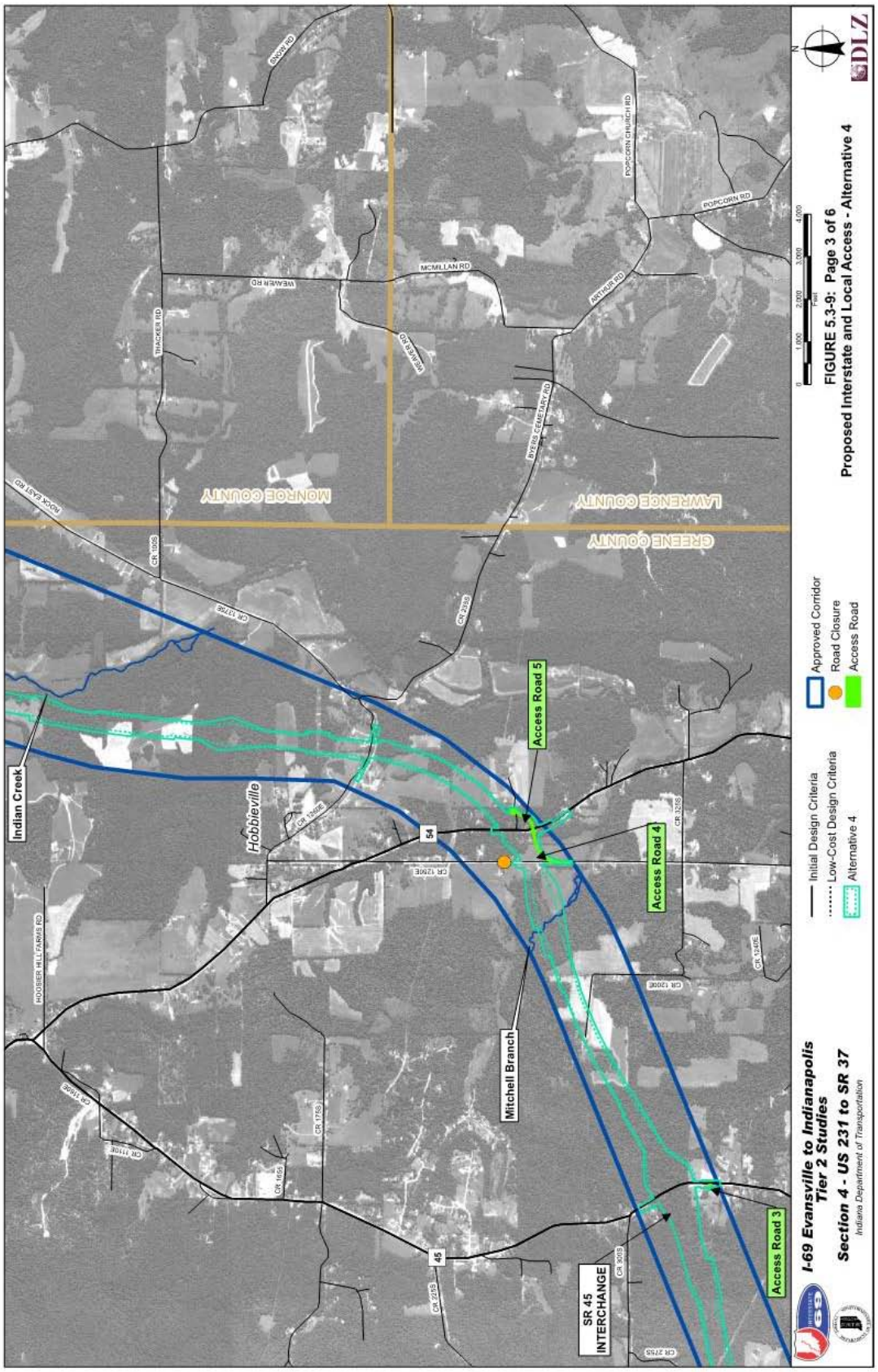
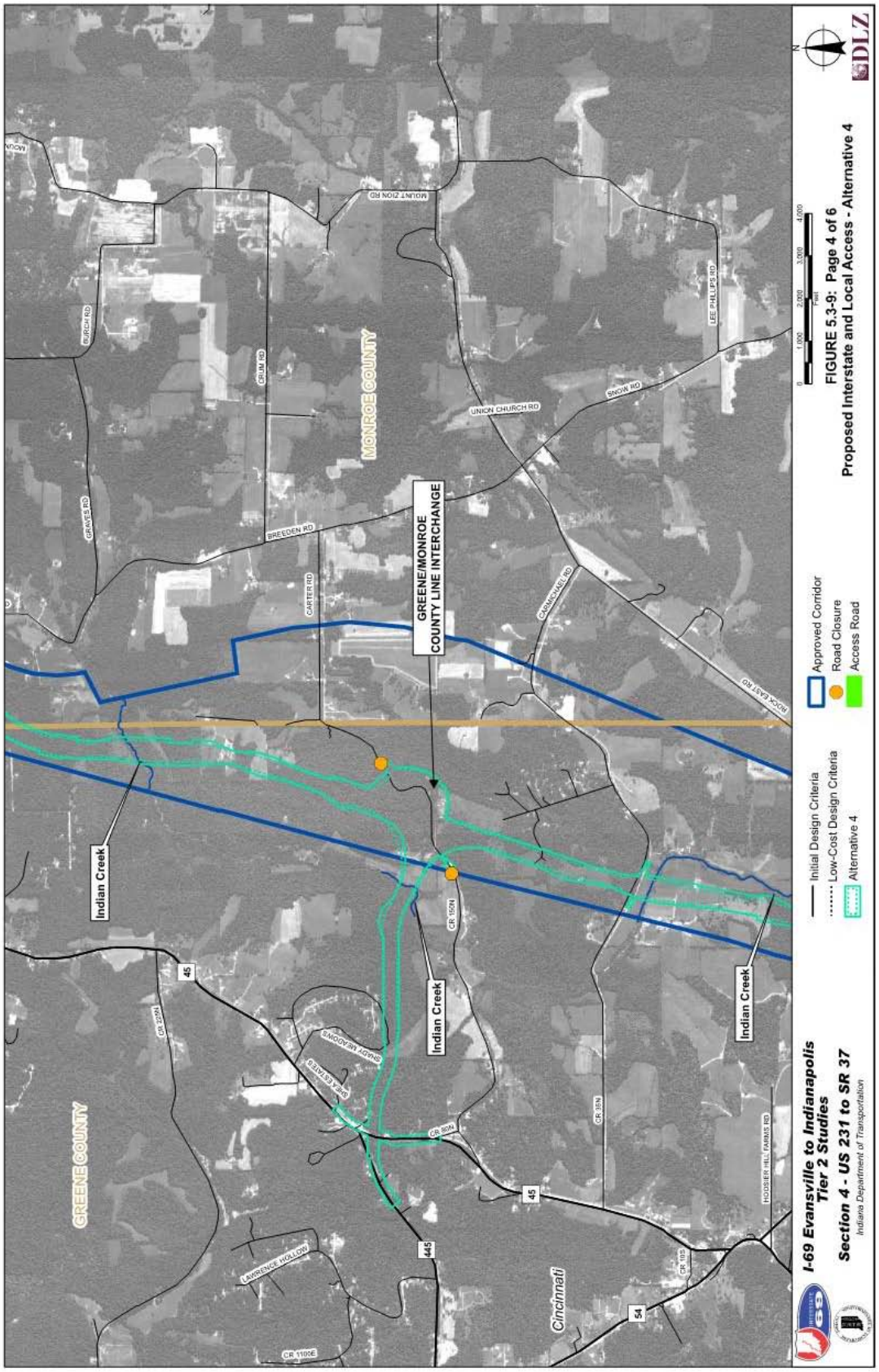
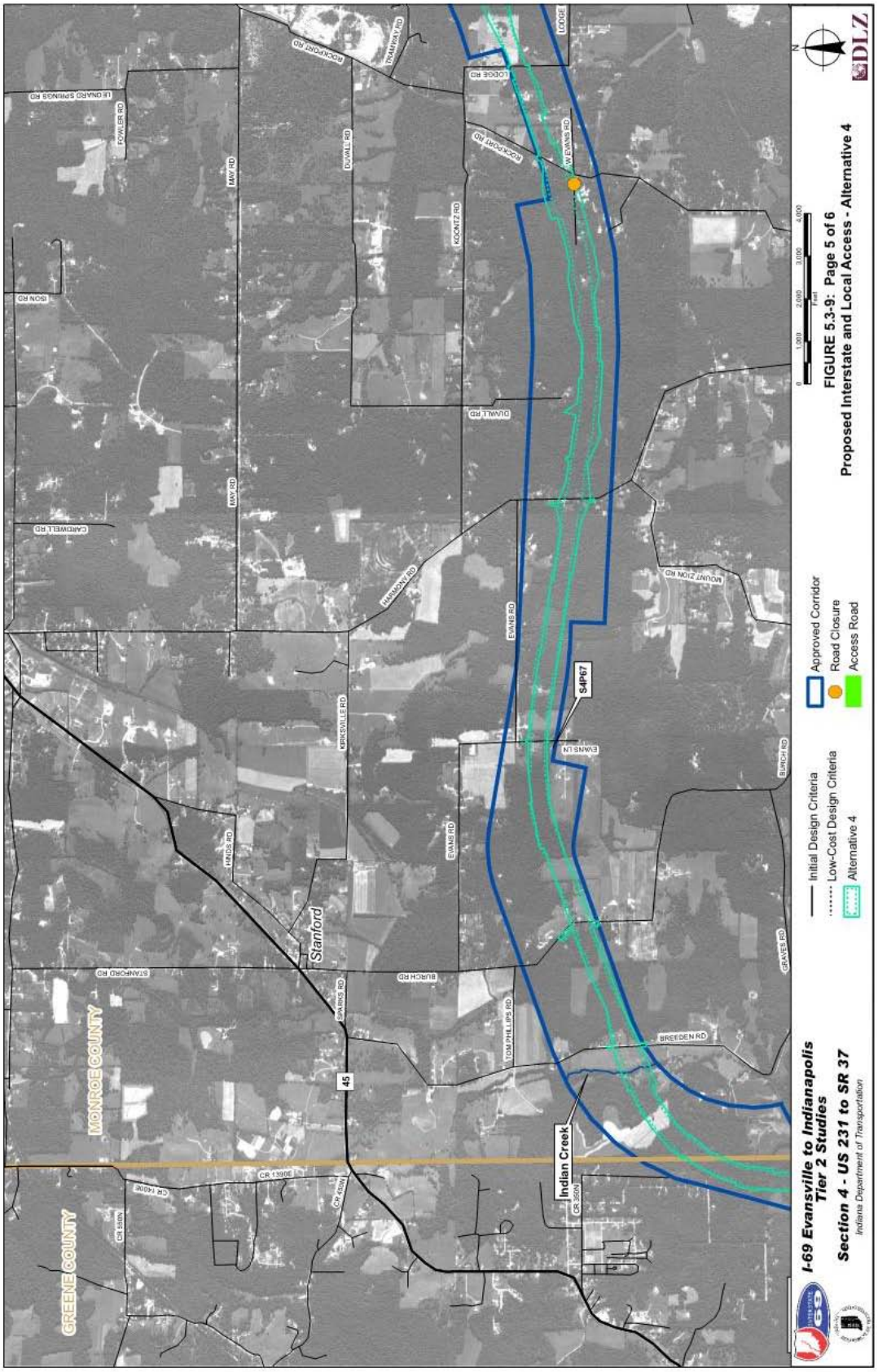
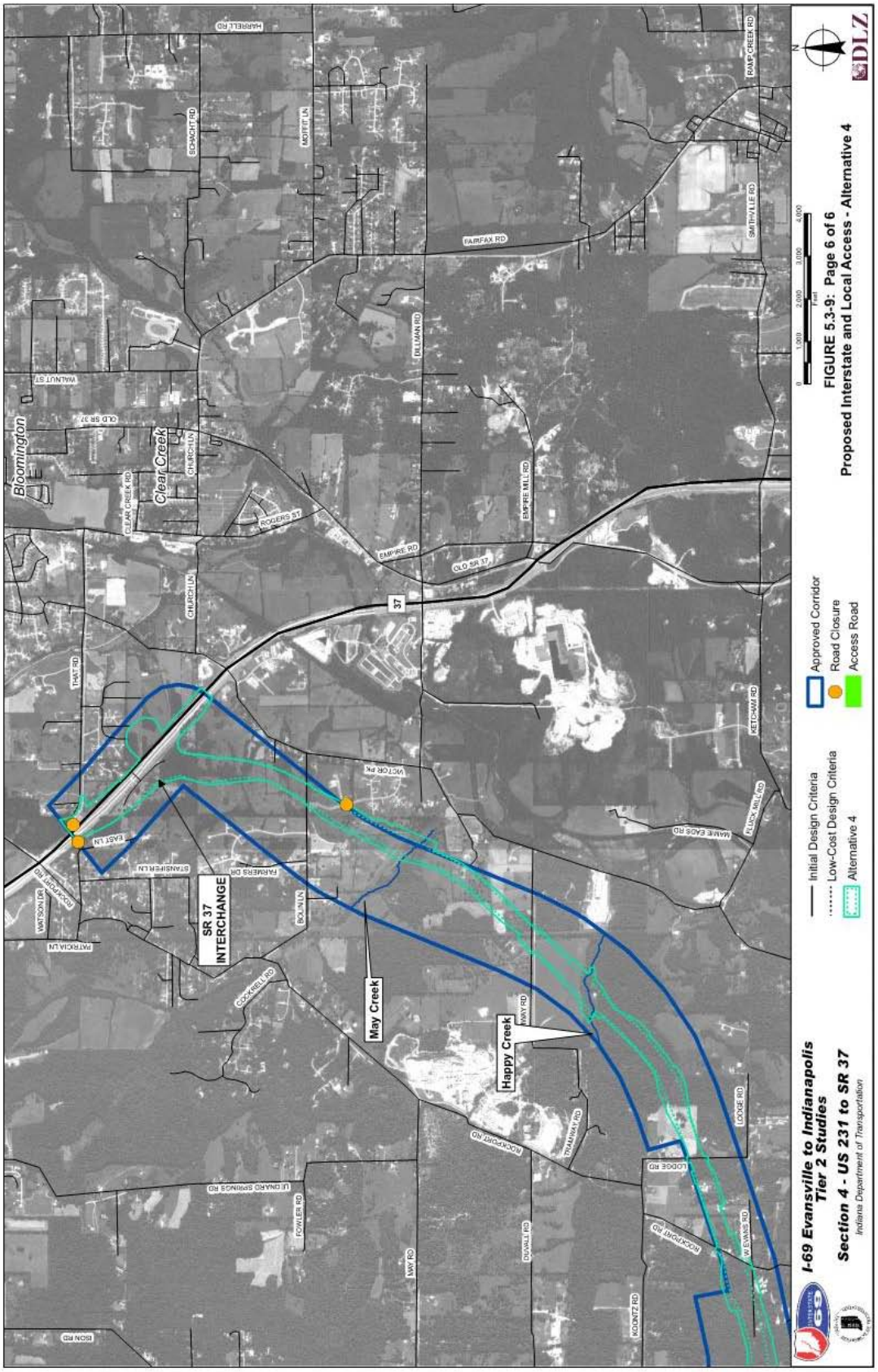
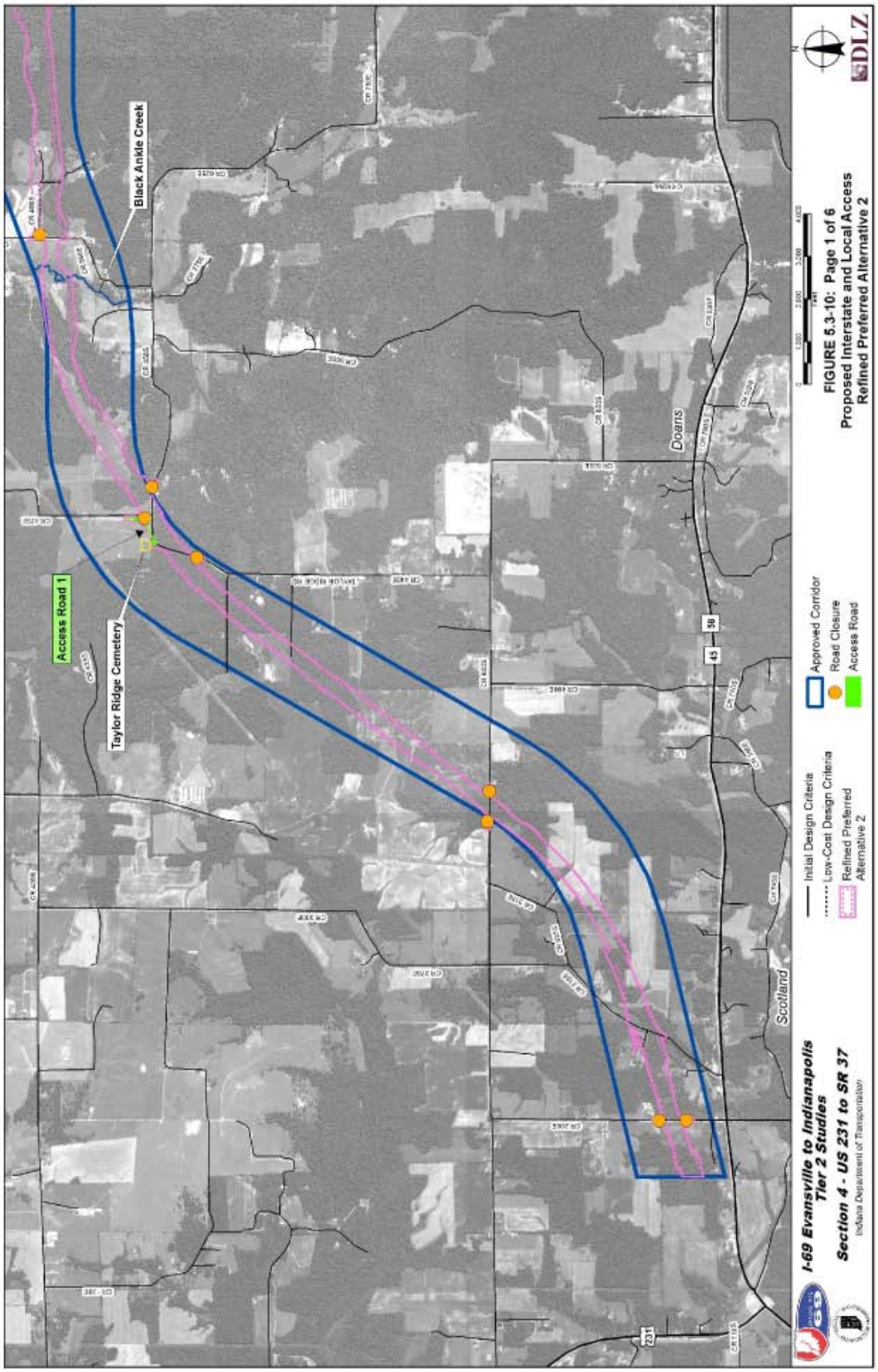
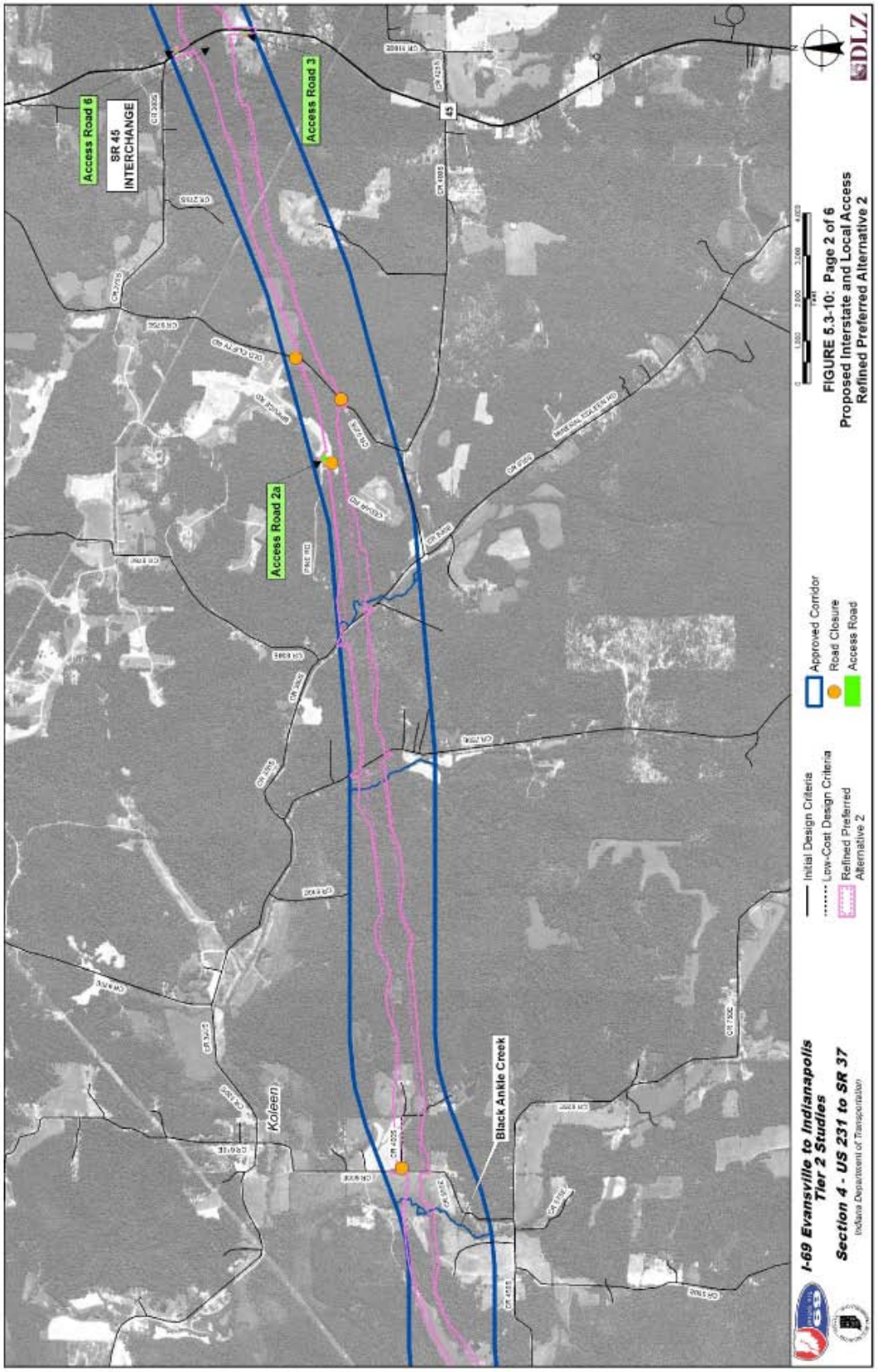

Indian Creek
Hobbieville
Mitchell Branch
Access Road 5
Access Road 4
Access Road 3
SR 45 INTERCHANGE
54
45
MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
HOOSIER HILL FARMS RD
ROCK EAST RD
TRACKER RD
WEMBER RD
MCMILLAN RD
ARTHUR RD
POPCORN RD
POPCORN CHURCH RD
AVERIL CEMETARY RD
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-9: Page 3 of 6
Proposed Interstate and Local Access - Alternative 4
DLZ

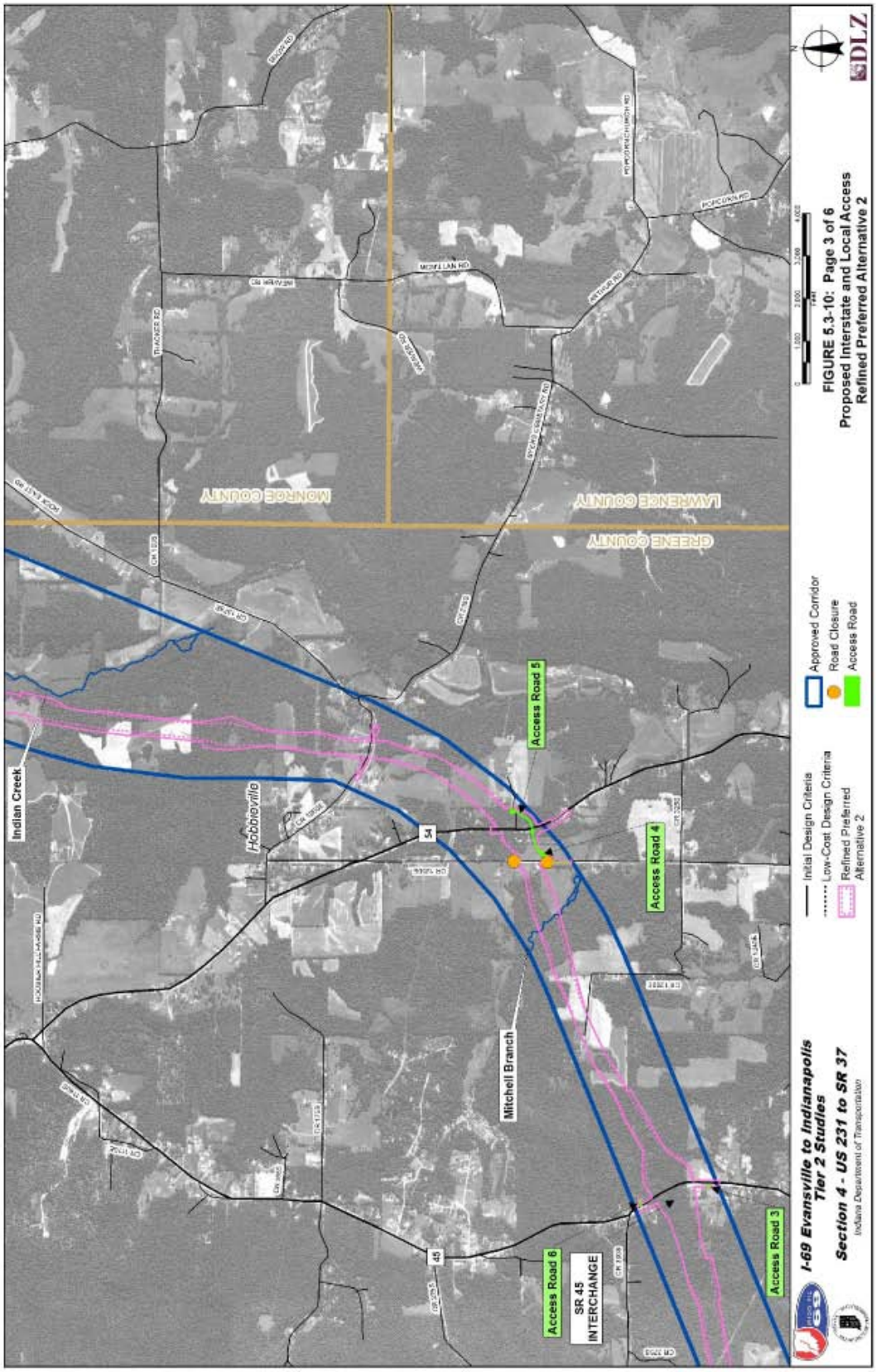

GREENE COUNTY
MONROE COUNTY
GREENE/MONROE COUNTY LINE INTERCHANGE
Indian Creek
Indian Creek
Indian Creek
Cincinnati
BIRCH RD
GRAVES RD
GRIM RD
CARTER RD
BREEDEN RD
MOUNT ZION RD
UNION CHURCH RD
SNOW RD
LEE PHILLIPS RD
CARMICHAEL RD
NOX EAST RD
CR 150N
CR 100N
CR 80N
CR 30N
CR 10S
CR 1100E
LAWRENCE HOLLOW
SNOW VILLAGE
SNOW ESTATES
HOOSIER HILL FARMS RD
45
445
54
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 4
FIGURE 5.3-9: Page 4 of 6
Proposed Interstate and Local Access - Alternative 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ

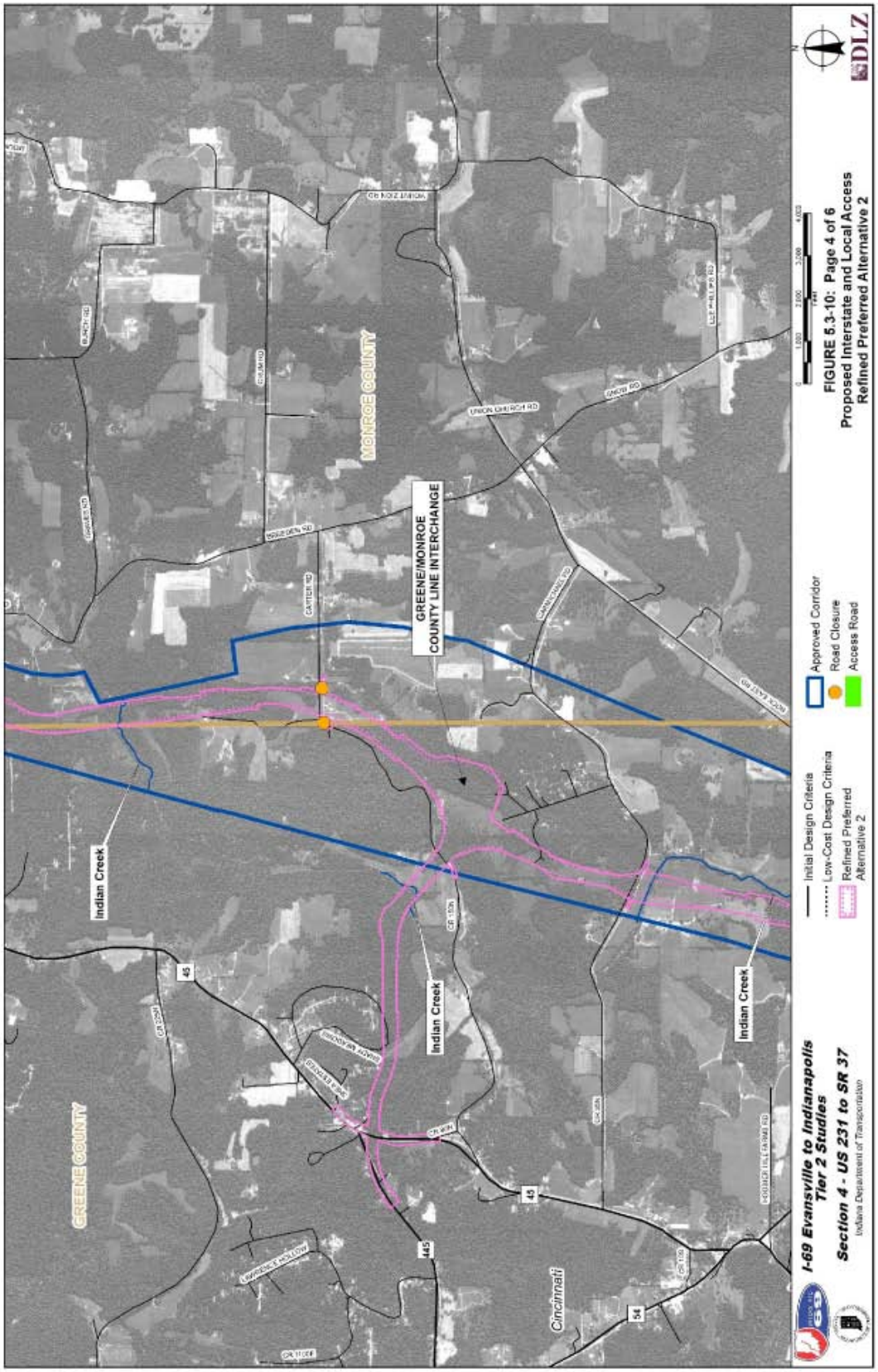

GREENE COUNTY
MONROE COUNTY
Stanford
Indian Creek
45
S4P67
EVANS LN
EVANS RD
BREEDEN RD
BURCH RD
GRAVES RD
TOM PHILLIPS RD
MONROE RD
STANFORD RD
HADIS RD
HARMONY RD
MOUNT ZION RD
CARDWELL RD
MAY RD
DUVALL RD
KOCENTZ RD
ROCKPORT RD
LODGE RD
FOWLER RD
LE GUARD SPRINGS RD
ISON RD
CR 1390E
CR 450N
CR 360N
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Alternative 4
0
1,000
2,000
3,000
4,000
Feet
N
DLZ
FIGURE 5.3-9: Page 5 of 6
Proposed Interstate and Local Access - Alternative 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation


Bloomington
Clear Creek
May Creek
Happy Creek
SR 37
INTERCHANGE
37
Initial Design Criteria
Low-Cost Design Criteria
Alternative 4
Approved Corridor
Road Closure
Access Road
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-9: Page 6 of 6
Proposed Interstate and Local Access - Alternative 4
DLZ


Black Ankle Creek
Access Road 1
Taylor Ridge Cemetery
Doans
Scotland
231
45
58
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-10: Page 1 of 6
Proposed Interstate and Local Access
Refined Preferred Alternative 2
DLZ


Access Road 6
SR 45 INTERCHANGE
Access Road 3
Access Road 2a
Kolleen
Black Ankle Creek
45
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-10: Page 2 of 6
Proposed Interstate and Local Access
Refined Preferred Alternative 2
DLZ


Indian Creek
Hobbieville
Mitchell Branch
Access Road 5
Access Road 4
Access Road 6
Access Road 3
SR 45
INTERCHANGE
MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-10: Page 3 of 6
Proposed Interstate and Local Access
Refined Preferred Alternative 2
DLZ


GREENE COUNTY
MONROE COUNTY
GREENE/MONROE COUNTY LINE INTERCHANGE
Indian Creek
Indian Creek
Indian Creek
Cincinnati
Approved Corridor
Road Closure
Access Road
Initial Design Criteria
Low-Cost Design Criteria
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.3-10: Page 4 of 6
Proposed Interstate and Local Access
Refined Preferred Alternative 2
DLZ

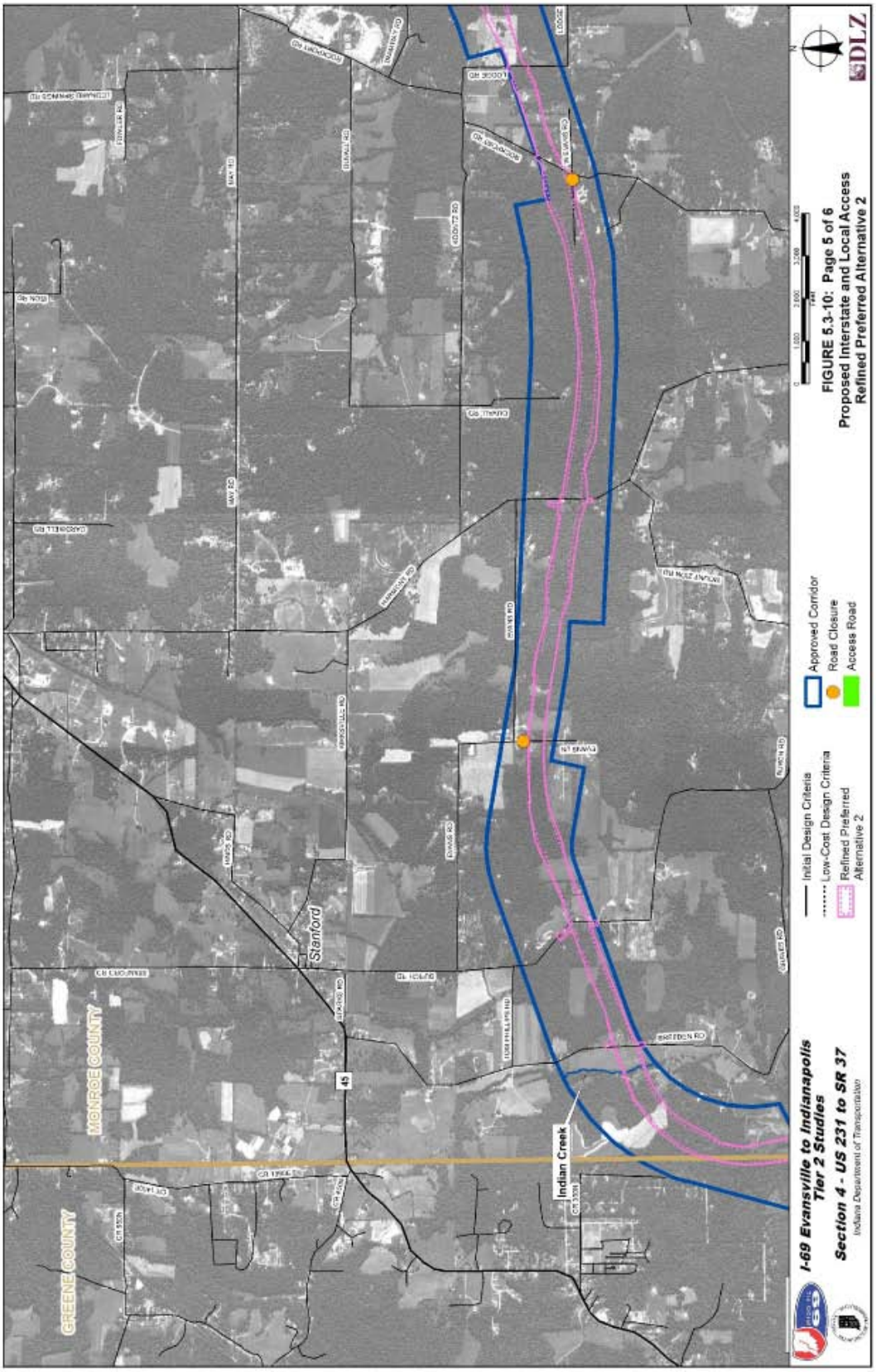


FIGURE 5.3-10: Page 5 of 6
Proposed Interstate and Local Access
Refined Preferred Alternative 2

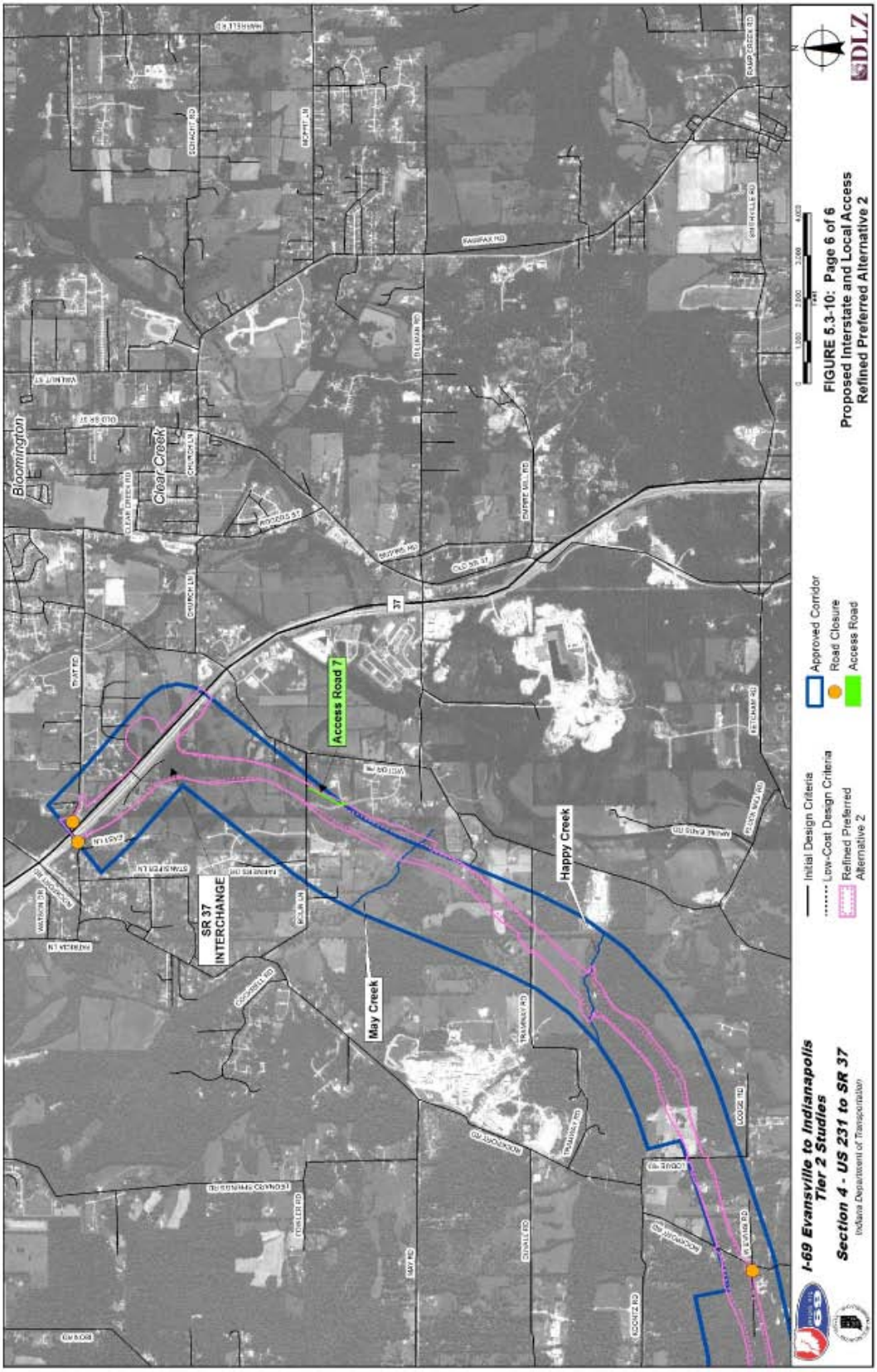


FIGURE 5.3-10: Page 6 of 6
Proposed Interstate and Local Access
Refined Preferred Alternative 2

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5.4 Farmland Impacts

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Sections 5.4.3.1 – Updated **Table 5.4-2**.
- Section 5.4.3.2 – Updated **Table 5.4-4** and **Table 5.4-5**.
- Section 5.4.5 – Updated **Table 5.4-7**.

5.4.1 Introduction

Since early settlement, agricultural land in Indiana has been, and continues to be, one of the most valuable natural resources within the state. There is a continued loss of farmland (especially prime farmland) as cities expand and rural areas become more attractive for industry and housing. Data from the 2007 Census of Agriculture indicated that 14.8 million acres, or 64% of Indiana's 22.9 million acres, was farmland (National Agricultural Statistics Service, 2007). The state's cropland and pastureland (including wooded pastureland) accounted for 12.4 million (54%) and 986,522 (4%) acres, respectively. The remaining 1.3 million acres exists as miscellaneous agricultural property, including non-pasture woodland.

In 1997, 12.9 million acres of land in Indiana were considered rural prime farmland, placing it eighth in the country in total acreage of this resource (USDA, 1997). Only three states have more than 50% of their land area classified as prime farmland: Indiana, Illinois, and Iowa (Indiana Land Resources Council, 1999). In fact, at 58%, Indiana ranks second only to Illinois in the percent of its land that is considered prime farmland. However, with 124,200 acres of prime farmland converted to developed land from 1992 to 1997, Indiana ranks second in the highest percent of prime farmland conversion in the nation and seventh in the average annual rate (24,800 acres/year) of prime farmland converted to developed land (USDA, 1997). Eighty-four percent of Indiana's prime farmland in 1997 was utilized for cropland, 6% was devoted to pastureland, and the remaining 10% was in the form of forestland, Conservation Reserve Program (CRP) land or miscellaneous rural land.

Farmland preservation and the conversion of prime and unique farmland to urban development are serious issues in Indiana. Continued population growth, increases in transportation systems and efficiency, and communication flexibility are some of the factors that make it increasingly easier to live and work in widely dispersed communities today. The Hoosier Farmland Preservation Task Force[1] indicates that from 1978 to 1992, an average of 88,714 acres of

[1] The Task Force was commissioned by Indiana's Governor in 1997 to study farmland preservation issues. The group identified Indiana land use trends, causes of farmland loss, and consequences of farmland conversion; and made recommendations to the Governor and Legislature in 1999 that included requiring Farmland Impact Assessments from INDOT and establishing an Indiana Land Resources Council (ILRC). ILRC was established that same year. ILRC is charged with providing technical assistance and resources to local communities on land use tools and strategies.

farmland per year have been lost to other uses (Indiana Land Resources Council, 1999). Data from the 2007 Census of Agriculture indicates that from 1997 to 2007, approximately 75,197 acres of farmland was lost annually to other uses. The National Resource Conservation Service (NRCS) has estimated that prime and important agricultural soils are being converted at a rate three to four times that of less productive non-prime farmland (USDA, 2002). In light of this trend, one of the goals of the Farmland Protection Program is to protect and slow the loss of farmland. The concern is not so much the overall acreage of cropland converted to urban development, but the quality and pattern of cropland conversion. Preservation strategies are not intended to be anti-development or anti-growth, but instead to concentrate efforts to direct industrial, residential and commercial growth to areas less suitable for farming, thus preserving more valuable prime farmland, and ultimately achieve a balanced utilization of rural, suburban and urban land resources (Indiana Land Resources Council, 1999).

The U.S. Department of Agriculture (USDA) oversees the Farmland Protection Policy Act (FPPA). The Act's ultimate goal is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. The FPPA establishes the protocol and criteria to be used by federal agencies to (a) identify and take into account the adverse effects of their programs on the preservation of farmland, (b) consider alternative actions, as appropriate, that could lessen adverse effects, and (c) ensure that their programs are compatible with state and units of local government and private programs and policies to protect farmland. The FPPA does not provide authority to withhold federal assistance for projects that convert farmland to non-agricultural uses. For the purposes of implementing the FPPA, farmland is defined as prime or unique farmlands or farmland that is determined by the state or unit of local government agency to be farmland of statewide or local importance [7 CFR 658.2(a)]. The NRCS defines prime farmland as:

> "Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding" (SSM, USDA Handbook No. 18, October 1993).

The NRCS generally identifies prime farmland in terms of the soil series and phase depicted as map units in each of the county soil surveys. In some instances, the series or a phase of the series is considered to be conditionally prime farmland only if it is drained, irrigated, or protected from frequent flooding. Prime farmland does not include land already in or committed to urban development or water storage. Land utilized or designated for commercial, industrial or residential purposes is, therefore, categorically excluded from consideration.

5.4.2 Methodology

Impacts to agricultural lands resulting from direct conversion to transportation use were assessed using three different methods. The first assessment concerns the total number of farmland acres converted as defined in the FPPA. The second addresses the potential annual loss in crop production. The third focuses on the severance of existing farm operations and the creation of point row tracts.

5.4.2.1 Farmland Protection Policy Act

The project is being developed in compliance with the *Farmland Protection Policy Act of 1981* and in accordance with the state and federal regulations concerning farmland protection. The guidelines for evaluation of program or project compliance with the FPPA using the Farmland Conversion Impact Rating for Corridor Type Projects form NRCS-CPA-106 system are outlined in 7 CFR 658.4. The NRCS is the USDA agency responsible for providing assistance in the evaluation. 7 CFR 658.4(e) states that "[I]t is advisable that evaluations and analyses of prospective farmland conversion impacts be made early in the planning process before a site or design is selected, and that, where possible, agencies make the FPPA evaluations part of the National Environmental Policy Act (NEPA) process." To facilitate the analysis, each alternative was superimposed onto the project aerial photography. The following steps were taken in preparation for the submittal of the NRCS-CPA-106 form:

- Step 1. The total area of all land within the right-of-way of each of the four alternatives under consideration was calculated for Greene and Monroe counties separately based on the right-of-way shown on the aerial photography. The calculations included both the mainline right-of-way and that of all proposed interchanges and frontage/service roads.
- Step 2. The total area of all land outside the right-of-way that would be left as uneconomic remnants (too small to productively farm) or would be landlocked was calculated.

The requisite sections (Parts I and III) of the NRCS-CPA-106 form were completed and submitted to the NRCS Indianapolis headquarters office for evaluation. As prescribed in Part III of the form, the following data was presented for each of the alternatives:

A. *Total Acres To Be Converted* [to transportation use] *Directly.* This data was obtained from the Step 1 calculations, referenced above.

B. *Total Acres To Be Converted Indirectly, Or To Receive Services.* This data was obtained from the Step 2 calculations, referenced above.

C. *Total Acres In Corridor.* This is the sum of the Step 1 and Step 2 data.

The NRCS used the Land Evaluation and Site Assessment (LESA) system for the assessment. As described on the NRCS website (http://www.nrcs.usda.gov/programs/lesa/), "In agricultural land evaluation, soils are rated and placed into groups ranging from the best [referred to as prime] to the least suited for a specific agricultural use, such as cropland, forestland, or rangeland. Then, a relative value is determined for each group. For example, the best group may be assigned a value of 100, while all other groups are assigned lower values." The NRCS evaluated the submitted data and returned the forms with the following information identified for each alternative:

A. Total Acres Prime And Unique Farmland.

B. Total Acres Statewide And Local Important Farmland.

C. Percentage Of Farmland In County Or Local Gov[ernmen]t. Unit To Be Converted.

D. Percentage Of Farmland In Gov[ernmen]t. Jurisdiction With Same Or Higher Relative Value.

The returned forms included the NRCS-assigned relative value of the farmland to be converted (scale of 0 – 100), per alternative for both Greene and Monroe counties (**See Appendix K**, *NRCS Forms*). Ten corridor assessment criteria, listed in Part VI of NRCS-CPA-106, were then applied to each alternative. The criteria have assigned values ranging from 0-5 to 0-25 points. The assessment criteria were scored according to the NRCS instructions and 7 CFR 658.5. The points identified for each criterion were then added to determine the Corridor Assessment score for each alternative. This score was then added to Relative Value (Part V) points identified by the NRCS for the portion of each alternative within Greene and Monroe counties. In 7 CFR 658.4(c)(1), the USDA recommends that "sites with the highest combined scores be regarded as most suitable for protection under these criteria and sites with the lowest scores, as least suitable." In addition, USDA recommends in 7 CFR 658.4(c)(3) that "sites receiving scores totaling 160 or more be given increasingly higher levels of consideration for protection."

5.4.2.2 Annual Crop Production Loss

The method employed to assess the impact of each alternative on agricultural production follows the general outline provided in INDOT's *Procedural Manual for Preparing Environmental Studies* (1996). This approach looks at each county as an agricultural unit for which statistical data for production, cultivation, and commodity sales price can be averaged and used to calculate an annual crop loss estimate for acreages of farmland within each working alignment. All raw data used in this analysis was taken directly from the USDA 2007 Census of Agriculture or from the most recent three issues of the Indiana Agricultural Statistics' Annual Summary (2006, 2007, and 2008). The latest three years of data available for acres of corn, soybean, wheat, and hay harvested in both counties traversed by at least one of the alternatives was used to determine the most recent average of harvested land. Next, the latest three years of production data for these four commodities was averaged for both counties. Using the average acreage harvested and the average production, the average yield for each commodity was calculated. Average sale prices (dollars/bushel or dollars/ton) were determined by averaging three years of statewide annual averages for each commodity. **Table 5.4-1** shows the production averages for Greene and Monroe counties.

Table 5.4-1: Production of Principal Crops—Averages for Years 2006 – 2008, Greene and Monroe Counties

Years 2006-2008 Average	Corn		Soybeans		Wheat*		Hay		Total	
	Greene	Monroe	Greene	Monroe	Greene	Monroe	Greene	Monroe	Greene	Monroe
Harvested Acres	42,000	5,300	43,867	6,333	NA	NA	17,633	11,933	103,500	23,567
Production (thousands, 000)	Bushels		Bushels		Bushels		Tons			
	6,158.9	733.5	1,899.9	233,9	NA	NA	41.6	29.3		
Average Yield (per acre)	146.6	138.4	43.3	36.9	NA	NA	2.4	2.5		
Statewide Average Annual Market Price	Per Bushel		Per Bushel		Per Bushel		Per Ton			
	$3.77		$8.68		$4.84		$131.50			

**NA = Not Available. Data for wheat is not available at the individual county level .*

Sources: USDA, National Agricultural Statistics Service:

http://www.nass.usda.gov/Statistics_by_State/Indiana/Publications/Annual_Statistical_Bulletin/index.asp Accessed March 15, 2010.

Because a certain percentage of farmland in a county is harvested as corn, a certain percentage is harvested as soybean and so on for wheat and hay; these percentages for each county were applied to the farmland within each alternative to reflect a proportional impact to each of the four principal farmland commodities. The four prorated percentages were calculated by taking the three-year average harvest acreage for each crop commodity and dividing it by the total three-year average harvest acreage for all four crops. Added together, the four prorated percentages for these crops within each county equal 100%. Calculating the dollar loss for each commodity within an individual county based on a specific farmland acreage purchase can then be achieved through the following equation:

$$CCL_{com} = CFA \times CPF_{com} \times CYR_{com} \times SAP_{com}$$

where:

CCL_{com} **is the county crop loss for a specific commodity (dollars)**

CFA **is the county farmland area within the right-of-way (acres)**

CPF_{com} **is the county prorate factor for a specific commodity**

CYR_{com} **is the county yield rate for a specific commodity (bushels/acre of tons/acre)**

SAP_{com} **is the state average price for a specific commodity (dollars/bushel or dollars/ton)**

Finally, the total production loss in dollars for each alternative was achieved by adding the appropriate commodity subtotals for each county and then adding the county subtotals. To determine the annual percent loss in crop cash receipts for each affected county, it was necessary to determine the average annual crop cash receipts for both counties crossed by the alternative, using three years of recent data. Using this county average data, the loss of crop cash receipts

resulting from the direct purchase of farmland by each alternative can be translated into a percent loss for each county (See Section 5.4.3.2).

5.4.2.3 Parcel Severance, Point Rows and Landlocked Parcels

Property information was obtained from the county assessor in each county to determine the ownership and property line locations of the agricultural land within the Study Area. The property boundary lines were then transcribed on aerial photographs. The right-of-way limits of each alternative were overlaid on these aerials to obtain the following information about potential farmland impacts resulting from each alternative:

- Number of parcels within the right-of-way and number of acres, per parcel, within the right-of-way.
- Number and size (acres) of parcels created as a result of the alternative's severing (splitting) of farmland.
- Number and size of uneconomic remnants (i.e., point rows, or strips of land too narrow or small to farm or have other productive uses).

In addition, each severed parcel was examined to determine whether the property could be accessed via a local service road. Where the cost of constructing a local service road exceeded the value of the property served, the parcels were considered to be landlocked property and included in the total of farmland acreage impacted by the project.

5.4.3 Analysis

Direct impacts on farmland will result from the acquisition of farmland for additional right-of-way needed for construction of Section 4 of I-69. The results of the assessment for the Alternatives allow for general comparisons of prime farmland impacts, loss of crop production, parcel severance and point row creation.

5.4.3.1 Farmland Protection Policy Act

Formal consultation with the (USDA), Natural Resources Conservation Service for compliance with the FPPA was initiated using the Farmland Conversion Impact Rating for Corridor Type Projects form NRCS-CPA-106 to assess this project's effect on farmland. The assessment criteria included on the NRCS-CPA-106 form were scored according to the NRCS instructions and 7 CFR 658.5. NRCS provided its assessment of impacts to farmland and the total point values determined for each alternative. The NRCS assessment data is shown in **Table 5.4-2**.

The total points calculated ranged from 110 to 119 in Greene County and 130 to 135 in Monroe County. Since this project received total point values of less than 160 points, it will receive no further consideration for farmland protection, as the project will have no significant impact to farmland. No alternatives other than those discussed in this document will be considered without a re-evaluation of the project's potential impacts upon farmland. **Appendix K** contains the completed NRCS-CPA-106 forms and related NRCS correspondence.

Table 5.4-2: Farmland Conversion Impact Rating for Section 4 Alternatives

From NRCS-CPA-106	Alternatives							
	Alt. 1		Alt. 2		Alt. 3		Alt. 4	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Total acres prime +unique farmland								
Greene County	250.9	335.4	238.1	309.5	251.8	309.7	250.4	322.1
Monroe County	169.4	208.3	208.5	238.5	182.4	226.5	128.4	166.6
Total acres statewide and local important farmland								
Greene and Monroe counties	0	0	0	0	0	0	0	0
Percentage of farmland in county or local government unit to be converted								
Greene County	0.352	0.442	0.332	0.401	0.325	0.391	0.351	0.433
Monroe County	0.311	0.390	0.372	0.454	0.335	0.423	0.263	0.343
Total Points: Relative value of farmland to be converted + Corridor assessment								
Greene County	110	111	117	118	119	119	117	117
Monroe County	135	135	135	134	130	130	135	134

This data is from the NRCS, based on Early Coordination which occurred prior to the development of the Refined Preferred Alternative 2. Refined Preferred Alternative 2 is a variation of Alternative 2 from the DEIS.

5.4.3.2 Annual Crop Production Loss

Table 5.4-1 (Section 5.4.2.2) compares the production of the main crops in the two counties over the most recent three-year period for which the data is recorded. **Table 5.4-3** summarizes the agricultural production in Greene and Monroe counties and state ranking according to the USDA National Agricultural Statistics Service: Indiana, 2008-2009.

Table 5.4-3: Agricultural Production—Greene and Monroe Counties and Indiana

Description	Indiana	Greene County	Monroe County
Total Land Area (acres) *	22,924,685	346,699	252,360
Land in Farms (and % of Total Area)*	14,773,184 (64.4%)	169,750 (49.0%)	53,538 (21.2%)
Harvested Cropland (acres)*	12,108,940	110, 257	22,747
State Ranking for Agricultural Production (2008)			
Corn **		75	86
Soybeans **		52	88
Wheat **		63	81
Hay**		5	20

* *U.S. Department of Agriculture, Year 2007 Census of Agriculture. The census is taken every five years covering the years ending in "2" and "7."*

** *U.S. Department of Agriculture, National Agricultural Statistics Service: Indiana, 2008-2009 Edition: (http://www.nass.usda.gov/Statistics_by_State/Indiana/Publications/Annual_Statistical_Bulletin/0809/09index.asp.) Accessed March 15, 2010.*

Table 5.4-4 summarizes the estimated farm income losses, by county, for each of the four alternatives in the Section 4 corridor. The estimated acres and losses are based on three-year

averages (2006, 2007, and 2008). As can be seen, the losses as a result of the alternatives will be a very small percentage (maximum 0.24% for Greene County and 0.74% for Monroe County) of the overall receipts realized from crop production collectively. **Table 5.4-5** summarizes this information for the four alternatives extending the full length of the project corridor.

Table 5.4-4: Estimated Crop Production and Production Loss for Alternatives, by County

Alternative		Corn		Soybeans		Wheat		Hay		Total		Receipts: County 3-Year $ Average	County % 3-Year $ Average
		Acres	$ Loss	Acres	$ Loss	Acres	$ Loss	Acres	$ Loss	Acres	$ Loss		
Greene County													
1	Low-Cost Design Criteria	47.9	$26,492	50.1	$18,809	n/a	n/a	20.1	$6,247	118.1	$51,547	$31,896,667	0.16%
	Initial Design Criteria	60.5	$33,442	63.2	$23,743	n/a	n/a	25.4	$7,885	149.1	$65,071	$31,896,667	0.20%
2	Low-Cost Design Criteria	54.9	$30,326	57.3	$21,531	n/a	n/a	23.0	$7,151	135.2	$59,007	$31,896,667	0.18%
	Initial Design Criteria	72.1	$39,881	75.3	$28,314	n/a	n/a	30.3	$9,403	177.8	$77,598	$31,896,667	0.24%
3	Low-Cost Design Criteria	47.3	$26,129	49.4	$18,551	n/a	n/a	19.8	$6,161	116.5	$50,840	$31,896,667	0.16%
	Initial Design Criteria	61.7	$34,122	64.5	$24,225	n/a	n/a	25.9	$8,046	152.1	$66,393	$31,896,667	0.21%
4	Low-Cost Design Criteria	55.1	$30,445	57.5	$21,615	n/a	n/a	23.1	$7,179	135.7	$59,239	$31,896,667	0.19%
	Initial Design Criteria	70.6	$39,008	73.7	$27,694	n/a	n/a	29.6	$9,198	173.9	$75,900	$31,896,667	0.24%
Refined Preferred Alternative 2	Low-Cost Design Criteria	54.9	$30,355	57.3	$21,551	n/a	n/a	23.1	$7,157	135.3	$59,064	$31,896,667	0.19%
	Initial Design Criteria	71.6	$39,594	74.8	$28,110	n/a	n/a	30.1	$9,336	176.5	$77,040	$31,896,667	0.24%
Monroe County													
1	Low-Cost Design Criteria	18.3	$9,568	21.9	$7,021	n/a	n/a	41.3	$13,331	81.5	$29,920	$6,757,000	0.45%
	Initial Design Criteria	23.7	$12,380	28.4	$9,084	n/a	n/a	53.4	$17,248	105.5	$38,712	$6,757,000	0.58%
2	Low-Cost Design Criteria	23.4	$12,192	27.9	$8,946	n/a	n/a	52.6	$16,987	103.9	$38,125	$6,757,000	0.56%
	Initial Design Criteria	30.5	$15,918	36.5	$11,680	n/a	n/a	68.7	$22,178	135.7	$49,775	$6,757,000	0.74%
3	Low-Cost Design Criteria	22.0	$11,470	26.3	$8,417	n/a	n/a	49.5	$15,981	97.8	$35,868	$6,757,000	0.53%
	Initial Design Criteria	28.5	$14,875	34.1	$10,915	n/a	n/a	64.2	$20,724	126.8	$46,513	$6,757,000	0.69%
4	Low-Cost Design Criteria	19.1	$9,983	22.9	$7,325	n/a	n/a	43.1	$13,908	85.1	$31,216	$6,757,000	0.46%
	Initial Design Criteria	25.4	$13,254	30.4	$9,725	n/a	n/a	57.2	$18,466	113.0	$41,446	$6,757,000	0.61%
Refined Preferred Alternative 2	Low-Cost Design Criteria	23.4	$12,200	27.9	$8,952	n/a	n/a	52.6	$16,998	104.0	$38,151	$6,757,000	0.56%
	Initial Design Criteria	30.0	$15,662	35.9	$11,492	n/a	n/a	67.6	$21,821	133.5	$48,975	$6,757,000	0.72%

Acres = Estimated number of acres that would be converted from farmland as a result of the project. Acreages are prorated by percentages based on "Harvested Acres" of each crop averaged over a 3-year period, as shown on Table 4.2-12. Acres and $ Loss per crop may not add up to the County total due to rounding.

Source: Based on 2005, 2006, and 2007 data from USDA, National Agricultural Statistics Service:

http://www.nass.usda.gov/Statistics_by_State/Indiana/Publications/Annual_Statistical_Bulletin/0708/08index.asp. Accessed March 15, 2010.

Note: Some costs reported for Alternative 2 and Refined Preferred Alternative 2 differ slightly due to small differences in the acreage which may not be apparent due to rounding.

Table 5.4-5: Estimated Annual Crop Production Loss for Section 4 Alternatives—Greene County and Monroe County Combined

Alternative (Greene + Monroe Cos.)		Total Harvested Acres to Be Acquired	Total $ Loss (3-year Average)
1	Low-Cost Design Criteria	200	$81,468
	Initial Design Criteria	255	$103,783
2	Low-Cost Design Criteria	239	$97,132
	Initial Design Criteria	313	$127,374
3	Low-Cost Design Criteria	214	$86,709
	Initial Design Criteria	279	$112,906
4	Low-Cost Design Criteria	221	$90,454
	Initial Design Criteria	287	$117,346
Refined Preferred Alternative 2	Low-Cost Design Criteria	239	$97,215
	Initial Design Criteria	310	$126,015

Source: Based on USDA 2006, 2007, 2008 Indiana average prices. Acreages are prorated by percentage based on "Harvested Acres, **Table 4.2-12**

While crop production losses would occur as a result of I-69, some reduction in farm-related transportation costs would be expected with the interstate due to improved travel safety and travel time to local and regional markets and suppliers. (See Section 5.5.3.1, *Direct Economic Impacts*, for further discussion of potential economic impacts to farms.)

5.4.3.3 Parcel Severance, Point Rows, and Landlocked Parcels

Table 5.4-7 shows the impacts to farmland, by alternative, as a result of right-of-way acquisition. Impacts include removal of agricultural land from production for right-of-way and the creation of uneconomic remnants[2] as a result of farmland severances and/or parcels landlocked[3] as a result of or loss of access. The number of existing parcels of farmland that will be severed as a result of the alternatives using the low-cost design criteria and initial design criteria varies from 171 to 196. The number of parcels remaining after severance ranges from 249 to 278, the majority of which will be 10 or more acres in size. The number of remaining parcels that potentially will be uneconomic remnants ranges from 8 to 16. Regarding uneconomic remnants, it is unlikely that all of these parcels would have no productive use: Most are adjacent to other farm parcels owned either by the same individual or by a neighbor who might want to acquire or lease the farmland. The state could buy the uneconomic remnant to offer for resale. Also, depending on location, some parcels might be suitable for development. In the case of landlocked parcels, many parcels that would have lost access as a result of the project will be provided new access via access or frontage roads as features of the project. For 13 to 18 cases, depending on the alternative, providing access was not deemed reasonable from an economic

[2] Uneconomic remnants include point rows, i.e., the formation of an acute angle along the edges of fields that limits or restricts the ability of farm equipment to access the area for farming purposes; and strips of land along an edge of a field that are too narrow to farm productively.

[3] Landlocked parcels are those parcels to which road or driveway access has been terminated as a result of the project, and constructing new access roads is not proposed.

standpoint. For example it would cost more to provide new access than to acquire the property. The disposition of landlocked parcels and uneconomic remnants will be addressed during final design.

5.4.3.4 Indirect Impacts

Farmland, forest, wetlands, and streams are the possible resources that the project's indirect land use changes would affect. However, further analysis of these resources in the induced growth traffic analysis zones (TAZs) [4] suggested that all of the induced growth near the US 231 will occur on agricultural land. In the other TAZs studied in Greene and Monroe counties approximately 60% of the induced growth will occur on agricultural land and approximately 40% will occur on forest land (See **Appendix CC**, *Indirect Impact Analysis*, for the analysis).

A total of 160.0 acres of induced growth is forecasted for each of the alternatives. This consists of 106 acres of induced growth in Greene County and 54 acres of induced growth in Monroe County. The induced growth is composed of 106 acres of agricultural land and 54 acres of forest land. The primary induced land use changes will occur in TAZs located near proposed interchanges. The 2001 USGS National Land Cover Database was used to identify the amount and types of land cover in the induced growth TAZs. Of the total 73,822 acres comprising the 55 TAZs that were studied for induced growth in Section 4, 18,913 acres (26%) were identified as "Agricultural/Other" (See **Table 5.4-6**). Indirect impacts are addressed in detail in Section 5.24, *Indirect and Cumulative Impacts.*

Table 5.4-6: USGS National Land Cover Database: Amount of Land Cover Types in Induced Growth TAZs

County (# TAZs represented)	Developed (acres)	Unusable (acres)	Ag/Other in Floodplain (acres)	Available Ag / Other (acres)	Forest in Floodplain (acres)	Available Forest (acres)	Total Acres In TAZs (Ag Land/Other as % of total)
US 231 Vicinity (12)	668	1	147	6237	146	5613	12,812 (50%)
Greene (39)	1,766	18	460	11,756	1,407	44,825	60,232 (20%)
Monroe (4)	127	0	32	282	35	302	778 (40%)
Totals	2,561 (3%)	19 (0.03%)	18,913 (26% of total TAZ acres)		52,328 (71%)		73,822 (26%)

Source: USGS 2001 National Land Cover Dataset for Zone 49.

Cover types:

Developed: Open Water; Developed, Open Space; Developed, Low Intensity; Developed, Medium Intensity; and Developed, High Intensity.

Unusable: Woody Wetlands; and Emergent Herbaceous Wetlands.

Agriculture Land/Other: Barren Land (Rock/Sand/Clay); Shrub/Scrub; Grassland/Herbaceous; Pasture/Hay; and Cultivated Crops.

Forest Land: Deciduous Forest; Evergreen Forest; and Mixed Forest.

[4] A traffic analysis zone (TAZ) is one of many small areas within a larger geographical study area that has been subdivided for purposes of obtaining socioeconomic and traffic data in a manageable fashion. The geographical scope of the Section 4 was identified as Monroe and Greene Counties. Growth induced by the I-69 Section 4 project (indirect impact) was predicted to occur in a total of 55 TAZs distributed within these two counties.

The induced changes would be the same for all of the alternatives because they are located within the same corridor, varying only slightly between the actual alignments, and include the same number and locations of interchanges. The forecasted amount of traffic, which creates much of the economic demand for the amount of indirect land use changes, is the same for each alternative. Combined, the interchange locations and traffic volumes generally affect the location and amount of indirect land use changes.

It is also anticipated that mitigation for impacts to forests, wetlands, and streams would involve the acquisition of additional farmland, which would be an indirect impact of the project. The reforestation and conversion of approximately 888 to 1,116 acres of farmland is proposed for such mitigation for Refined Preferred Alternative 2 using the low-cost design criteria and initial design criteria) (See Section *7.2 Major Mitigation Initiatives*).

5.4.4 Mitigation

Agricultural impacts in the form of permanent conversion of farmland to non-farmland use generally cannot be mitigated easily by the creation of new farmland elsewhere. For this reason, the mitigation of agricultural impacts tends to focus on those practices that assist in avoiding and/or minimizing conversion, or designing alignments to minimize disruption to existing agricultural patterns. General practices that were considered in developing alternatives for Section 4 included the following:

- When reasonable, alignments were developed to follow existing property lines and minimize dividing or splitting of large tracts of farmland.
- Agricultural property lines were followed as much as possible or fields were crossed at perpendicular angles to reduce point rows and the creation of uneconomic remnants.
- Where reasonable, access will be provided to parcels that would otherwise be landlocked as a result of the project. Overpasses were proposed at several locations (seven or eight, depending on the alternative) to maintain the connectivity of county roads, thereby facilitating access to farm fields and operations severed by the interstate.

Coordination is continuing with NRCS to determine the feasibility of participating in the Farm and Ranch Lands Protection Program (formerly known as the Farmland Protection Program) or another appropriate type of program. Local and regional farmland protection strategies may be incorporated into the I-69 Community Planning Program. In addition, FHWA and INDOT will provide financial and technical assistance for local land use planning through the I-69 Community Planning Program. This program will include grants to local governments to support land use and economic development planning. This program will assist local governments in developing plans that protect farmland.

5.4.5 Summary

Direct impacts to farmland anticipated to occur as a result of each alternative proposed in Section 4 are summarized in **Table 5.4-7**. As can be seen, the alternatives range in total agricultural acres to be acquired from 300 acres to 382 acres for Alternative 1 (low-cost design criteria and initial

design criteria) to 356 acres to 468 acres for Alternative 2 (low-cost design criteria and initial design criteria). Alternatives range in acres of cropland to be acquired from 200 acres to 255 acres for Alternative 1 (low-cost design criteria and initial design criteria) to 239 acres to 313 acres for Alternative 2 (low-cost design criteria and initial design criteria). In terms of annual receipt loss, Alternative 1 using the low-cost design criteria and initial design criteria has the least loss of $81,468 to $103,783 and Alternative 2 using the low-cost design criteria and initial design criteria has the highest loss of $97,132 to $127,374. The Preferred Refined Alternative 2 has a similar predicted loss at $97,215 and $126,015 for the low-cost design criteria and initial design criteria, respectively. Overall, Alternative 1 has the least impacts to farmland.

In general, the alternatives have somewhat similar impacts to farmland due primarily to the narrowness of the corridor in which the alternatives were developed and the resulting proximity of the alignments therein; the similarity of the proposed design features (i.e., number of lanes, right-of-way width, locations of interchanges and overpasses, etc.); and the efforts to minimize impacts to farmland where possible by following property lines to avoid/minimize severances, crossing fields at perpendicular angles to avoid/minimize point rows, providing access to parcels that would otherwise be landlocked; and maintaining the connectivity of county crossroads.

The project has been developed in compliance with the *Farmland Protection Policy Act of 1981*. Farmland Conversion Impact Rating forms for Corridor Type Projects have been prepared in coordination with the NRCS. Based on this analysis, neither alternative met the NRCS threshold for "higher levels of consideration for protection" (7 CFR 658.4 (c) (3)). The total acres of prime and unique farmland estimated to be converted within Section 4 for Alternatives using the low-cost design criteria and initial design criteria range from 378.8 acres to 488.7 acres for Alternative 4 to 446.6 acres to 548.0 acres for Alternative 2. The impact to acres of prime and unique farmland for the Preferred Refined Alternative 2 is expected to be generally the same as for Alternative 2.

Table 5.4-7: Summary of Direct Farmland Impacts With Section 4 Alternatives

Potential impacts	Alternatives									
	1		2		3		4		Refined Preferred Alterative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Total acres to be acquired for right-of-way	**1,468**	**1,836**	**1,457**	**1,830**	**1,454**	**1,831**	**1,457**	**1,830**	**1,456**	**1,809**
Total agricultural acres to be acquired	300	382	356	468	328	429	327	426	356	461
Acres of cropland to be acquired	200	255	239	313	214	279	221	287	239	310
Total number of farmland parcels in right-of-way	**171**	**176**	**191**	**196**	**186**	**192**	**179**	**184**	**191**	**196**
Total number of parcels after severance	252	249	278	271	274	263	264	260	277	271
0 – 4.99 acres	94	98	114	121	106	108	103	110	113	121
5 – 9.99 acres	44	36	44	35	47	36	43	36	44	36
10 or more acres	114	115	120	115	121	119	118	114	120	114
Number of uneconomic remnants	10	9	13	12	16	15	9	8	13	12
Number of parcels landlocked	13	13	18	16	16	15	15	13	18	16
Annual receipt loss and % of loss compared with total county receipts										
Greene County	$51,547 0.16%	$65,071 0.20%	$59,007 0.18%	$77,598 0.24%	$50,840 0.16%	$66,393 0.21%	$59,239 0.19%	$75,900 0.24%	$59,064 0.19%	$77,040 0.24%
Monroe County	$29,920 0.45%	$38,712 0.58%	$38,125 0.56%	$49,775 0.74%	$35,868 0.53%	$46,513 0.69%	$31,216 0.46%	$41,446 0.61%	$38,151 0.56%	$48,975 0.72%
Total receipt loss	$81,468	$103,783	$97,132	$127,374	$86,709	$112,906	$90,454	$117,346	$97,215	$126,015
Total acres prime +unique farmland*										
Greene County	250.9	335.4	238.1	309.5	251.8	309.7	250.4	322.1	--	--
Monroe County	169.4	208.3	208.5	238.5	182.4	226.5	128.4	166.6	--	--

** Source: USDA-NRCS Form NRCS-CPA-106, in **Appendix K**. These figures indicate the acres of prime + unique farmland NRCS has determined will be converted to transportation use as a result of the project.*

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5.5 Economic Impacts

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Section 5.5.2—Revised **Figure 5.5-1** (p 5-203) to identify and label the counties.
- Section 5.5.3.1— Added a discussion about the loss of timber production from mitigation land.
- Section 5.5.3.1— Updated harvested acres and crop production information. Also updated total project cost estimates.
- Section 5.5.3.1 and 5.5.3.3— Updated discussion of potential business displacements. Also, added a discussion to note that the Stillion Sawmill would not be a displacement under Refined Preferred Alternative 2 for either design criteria (low-cost or initial).
- Section 5.5.3.1— Updated discussion of the number of business surveys mailed.
- Sections 5.5.3.1 and 5.5.5— Added a discussion about a temporary signalized intersection that would be constructed in the interim until such time that the full SR 37 interchange and Section 5 improvements are constructed.
- Section 5.5.3.3—Revised **Table 5.5-4** and text with updated average annual crash costs projected within the five-county area. These updated rates showed a significant reduction in annual crashes in both the No-Build and Build cases, from what was shown in the DEIS.
- Section 5.5.3.4—Updated **Table 5.5-6** to include the tax base loss information for Refined Preferred Alternative 2.

5.5.1 Introduction

This section addresses the economic impacts, both positive and negative, which are anticipated to result from the Section 4 alternatives for I-69. The localized impacts need to be viewed in relation to the overall economic benefits that will accrue to all of Southwest Indiana when I-69 is completed between Evansville and Indianapolis. These benefits are documented in the Tier 1 FEIS in Section 3.4.4, *Economic Development Indicators*.

The methodologies for the analysis of localized impacts are described in Section 5.5.2. Section 5.5.3 documents both the positive and negative Section 4 impacts of the Evansville to Indianapolis project. These impacts include:

- Direct Economic Impacts (Section 5.5.3.1)

- Indirect Economic Impacts (Section 5.5.3.2)
- Business and Employment Impacts (Section 5.5.3.3)
- Effects on the Local Tax Base (Section 5.5.3.4)
- Effects on Local Property Values (Section 5.5.3.5)

Section 5.5.4 discusses mitigation measures to address negative economic impacts.

5.5.2 Methodology

Study Area

For most of the analyses in this chapter (and in this document as a whole) the Section 4 Study Area (See **Figure 5.5-1**, p. 5-203) is defined by the Year 2000 Census Block Groups that the project corridor traverses. The project corridor is located within Greene and Monroe counties. Existing conditions within this Study Area are detailed in Section 4.2.

The analyses of indirect economic impacts (5.5.3.2) and business and employment impacts (5.5.3.3) were based on Traffic Analysis Zone (TAZ) data rather than Census Block data; therefore, the boundaries of the Study Area for these analyses were different from the Year 2000 Census Block Group boundaries of the Study Area in other sections of this document. TAZs were used for the economic and business analysis because (1) compared to Census Blocks, TAZs are smaller in size, which permits more comprehensive data gathering and more detailed analysis, (2) future year socioeconomic data for the TAZs (including population and employment statistics) already were developed for forecasting traffic volumes, and (3) these analyses involve indirect impacts that may extend beyond the immediate vicinity of the project itself. Therefore, the Study Area was modified to follow TAZ boundaries rather than Census Block Group boundaries to analyze indirect impacts.

To analyze economic impacts, an Expert Land Use Panel[1] was established for Section 4. The panel identified the location and comparative order of magnitude of growth in population and employment induced by the project in Section 4 and that which would have occurred without the project. Section 5.24, *Cumulative Impacts*, contains a detailed discussion of the role of the Expert Land Use Panel and the indirect and cumulative impacts analyses employing the TAZ data. **Figure 5.5-2** (p. 5-204) depicts the TAZ analysis areas, showing both those forecasted and not forecasted to experience induced growth due to I-69.

[1] An Expert Land Use Panel was assembled to assist in forecasting future land use in Section 4 in the year 2030 with and without I-69. The panel was composed of representatives of agencies or organizations involved in development activities on a local or regional level. Members of the panel included representatives of the Greene County Commissioners, the Greene County Council, the Greene County Economic Development Corporation, and the Monroe County Engineering and Planning Departments, the Bloomington/Monroe County Metropolitan Planning Organization, and the Bloomington Board of Realtors.

Direct Economic Impacts

Localized direct economic impacts in the Section 4 Study Area include the loss of farm income resulting from the conversion of farmland for highway right-of-way and the impacts of the alternatives on existing adjacent businesses due to changed traffic volumes on existing roads. The value of loss of farm production for each alternative was estimated by multiplying the number of farmland acres taken for right-of-way by the USDA reported average production rates to determine the quantity of each crop taken out of production. These quantities were then multiplied by the average commodity prices for the years 2006 through 2008 for the state of Indiana.

Other direct impacts include the project cost; annual maintenance and operation costs; the overall impact on highway users, including operating cost differences and travel time modifications resulting from changes in the roadway network; changes in the local property tax base due to taking taxable property for public right-of-way; a possible temporary increase in the cost of construction materials due to increased demand during construction; and changes in property values due to improved or diminished access or exposure. Overall highway user impacts were estimated based on the total vehicle hours traveled (VHT) and the total vehicle miles traveled (VMT) projected for Greene and Monroe counties for the no-build and build scenarios.

Indirect Economic Impacts

Indirect economic impacts that can be quantified with less precision, but which nevertheless are real, include increases in business and employment associated with changes in land use due to development induced by improved access. While these indirect impacts produce a net increase in economic activity, they may have an adverse indirect impact on existing, competing businesses.

Business and Employment Impacts

Forecasts of employment from Tier 1 were obtained for the year 2030 by TAZ for both the no-build and build scenarios. Greene and Monroe county maps were created showing the no-build and build employment forecasts for the year 2030 for each TAZ. The maps were presented to a panel of land use experts made up of local officials for verification or revision, and to determine the probable location and order of magnitude of the growth in population and employment. For the purpose of evaluating potential impacts in this section on a consistent and conservative (most potential impacts due to growth) basis, interchanges were assumed at SR 45, the Greene/Monroe County Line, and SR 37. The interchange at US 231 was approved with the January 28, 2010, Section 3 ROD.

The Expert Land Use Panel for Section 4 was composed of representatives from the Greene County Commissioners, the Greene County Council, the Greene County Economic Development Corporation, and the Monroe County Engineering and Planning Departments, the Bloomington/Monroe County Metropolitan Planning Organization, and the Bloomington Board of Realtors. The study team used the Expert Land Use Panel input to assign future induced growth to appropriate TAZs. A total of 55 TAZs associated with the Section 4 project (51 in Greene County and 4 in Monroe County, as shown in **Figure 5.5-2**, p. 5-204) were identified as

likely to have induced changes in the number of jobs and/or residents because of the proposed project. The Expert Land Use Panel focused on the TAZs within the two counties to determine the order of magnitude of growth that can be expected in each TAZ. The overall level of growth in population and employment in the year 2030 was provided in Tier 1 by the REMI economic forecasts (see Tier 1 FEIS, Section S.3.2.2); the Expert Land Use Panel assisted in the determination of which TAZs this growth should be allocated to for the year 2030.

Local Property Tax Base and Property Value Impacts

Property tax impacts resulting from losses of residential property were estimated by taking the tax rate times the assessed valuation of the properties expected to be displaced in each subsection of the alternatives. These tax losses were then summed across all of the subsections making up each of the specific alternatives.

The agricultural property tax losses were estimated by applying the statewide agricultural land base rate value per acre to each alternative's agricultural land taking in each county and then multiplying the resulting numbers by the average county tax rates. The 2008 statewide agricultural land base rate value increased from $1,140 to $1,200 per acre. The average 2008 tax rate for Greene and Monroe counties are 2.3197 and 1.2713%, respectively, for an overall Study Area average of 1.7955%.

5.5.3 Analysis

5.5.3.1 Direct Economic Impacts

Direct economic impacts are those project effects that are a clear and immediate result of implementing the project, such as farmland and business property acquisitions, project cost (construction as well as long term maintenance expenditures), and roadway user costs affected by the project. These impacts are translated into dollar values to permit comparing the economic cost of one alternative with another.

Loss of Timber Income

Direct impacts to timber sales as a result of any build alternative are likely but minimal due to the amount of forest land being acquired for the Section 4 project. Direct forest land impacts from the alternatives using the low-cost design criteria and initial design criteria vary from approximately 872 acres to 1,087 acres (Refined Preferred Alternative 2) to 934 acres to 1,168 acres (Alternative 1) of upland forest. Indirect impacts to forest land caused by induced growth from the Section 4 project are anticipated to impact 54 acres of forest land under any build alternative. Refer to Section 5.20, *Forest Impacts*, **Figure 5.20-3** (p. 5-655), for an overview of the forest areas within the Section 4 corridor. Upland forest impacted by the I-69 Evansville to Indianapolis project will be mitigated at a 3 to 1 ratio (with the goal of 1 to 1 replacement and 2 to 1 preservation). The existing forest land that will be converted to conservation land also represents a loss of potential timber available for harvest. Areas converted to mitigation land will no longer be available for timbering activities. Therefore, these lands will be taken out of production of forest products. Per federal law, all land for the project will be purchased at fair

market value. In the case of mitigation land, the land must be purchased from willing sellers in accordance with FHWA policy.

A survey of Indiana's forests, 1999-2003, published by the USDA Forest Service identified a total of 256,800 acres of forest in the two counties in the Section 4 Study Area. The entire Section 4 corridor includes approximately 7,498 acres of land, most of which is forested (4,420 acres or 59% including upland and wetland forest on 146 separate tracts). While some forest land will be directly and indirectly impacted for this project the loss of available forest land represents only a small fraction (0.4% to 0.5%) of the existing forest land in Greene and Monroe counties.

Timber harvest by landowners likely displaced by the Section 4 project may accelerate due to the potential of the land being acquired for this project. The short-term increase in available timber could affect the demand for and price of timber in the local market place. In addition, timber salvage from the Section 4 construction project also could affect the local area timber demand and market price. Since these potential impacts are assumed minimal, and not quantifiable, no attempt is made to assess their costs in this section.

Loss of Farm Income

Based on crop production and price averages for the years 2006-2008, Refined Preferred Alternative 2 is estimated to result in an annual crop cash receipt loss of $97,000 to $126,000. Alternative 1 is estimated to result in an annual crop cash receipt loss of $81,000 to $104,000, depending upon the design criteria used. The similar range of farm income losses for other alternatives are Alternative 2 $97,000 to $127,000; Alternative 3 $87,000 to $113,000; and Alternative 4 $90,000 to $117,000. Section 5.4, *Farmland Impacts*, provides additional details of Section 4 farm production losses. **Table 5.4-7** uses these data to estimate the gross economic effect on the Section 4 counties and express it as a percentage of total receipts.

Table 5.5-1: Estimated Annual Crop Production Loss for Section 4 Alternatives, by County

Alternative		Total Harvested Acres	Total $ Loss	Receipts: County 3-Year $ Average	County % 3-Year $ Average
Greene County					
Refined Preferred Alt. 2	Low-Cost Design Criteria	135	$59,064	$31,896,667	0.19%
	Initial Design Criteria	176	$77,040	$31,896,667	0.24%
1	Low-Cost Design Criteria	118	$51,547	$31,896,667	0.16%
	Initial Design Criteria	149	$65,071	$31,896,667	0.20%
2	Low-Cost Design Criteria	135	$59,007	$31,896,667	0.18%
	Initial Design Criteria	178	$77,598	$31,896,667	0.24%
3	Low-Cost Design Criteria	117	$50,840	$31,896,667	0.16%
	Initial Design Criteria	152	$66,393	$31,896,667	0.21%
4	Low-Cost Design Criteria	136	$59,239	$31,896,667	0.19%
	Initial Design Criteria	174	$75,900	$31,896,667	0.24%
Monroe County					
Refined Preferred Alt. 2	Low-Cost Design Criteria	104	$38,151	$6,757,000	0.56%
	Initial Design Criteria	134	$48,975	$6,757,000	0.72%
1	Low-Cost Design Criteria	82	$29,920	$6,757,000	0.45%
	Initial Design Criteria	106	$38,712	$6,757,000	0.58%

2	Low-Cost Design Criteria	104	$38,125	$6,757,000	0.56%
	Initial Design Criteria	136	$49,775	$6,757,000	0.74%
3	Low-Cost Design Criteria	98	$35,868	$6,757,000	0.53%
	Initial Design Criteria	127	$46,513	$6,757,000	0.69%
4	Low-Cost Design Criteria	85	$31,216	$6,757,000	0.46%
	Initial Design Criteria	113	$41,446	$6,757,000	0.61%

Source: Based on 2006, 2007, and 2008 data from ***USDA, National Agricultural Statistics Services:*** *http://www.nass.usda.gov/Statistics_by_State/Indiana/Publications/Annual_Statistical_Bulletin/0708/08index.asp. Accessed March 15, 2010.* Acreages are prorated by percentage based on "Harvested Acres", Table 4.2-12.

Table 5.5-2: Estimated Annual Crop Production Loss for Section 4 Alternatives, Greene and Monroe Counties

Alternative (Greene + Monroe Cos.)		Total $ Production Loss		
		Greene County	Monroe County	Combined Total
Refined Preferred Alt. 2	Low-Cost Design Criteria	$59,064	$38,151	$97,215
	Initial Design Criteria	$77,040	$48,975	$126,015
1	Low-Cost Design Criteria	$51,547	$29,920	$81,468
	Initial Design Criteria	$65,071	$38,712	$103,783
2	Low-Cost Design Criteria	$59,007	$38,125	$97,132
	Initial Design Criteria	$77,598	$49,775	$127,374
3	Low-Cost Design Criteria	$50,840	$35,868	$86,709
	Initial Design Criteria	$66,393	$46,513	$112,906
4	Low-Cost Design Criteria	$59,239	$31,216	$90,454
	Initial Design Criteria	$75,900	$41,446	$117,346

Source: Based on 2006, 2007, and 2008 data from ***USDA, National Agricultural Statistics Services:*** *http://www.nass.usda.gov/Statistics_by_State/Indiana/Publications/Annual_Statistical_Bulletin/0708/08index.asp. Accessed March 15, 2010.* Acreages are prorated by percentage based on "Harvested Acres", Table 4.2-12.

Business and Institutional Displacements

For the purpose of evaluating potential business relocation impacts in this section on a consistent and conservative (most potential displacements) basis, interchanges were assumed at US 231, SR 45, the Greene/Monroe County Line, and SR 37. Under the initial design criteria, Alternatives 1, 2 and 4 would require the relocation of five businesses, and Alternative 3 would require six business relocations. Under the low-cost design criteria, all alternatives would displace 4 businesses except for Alternative 3 which would displace 5 businesses. Three of the six potential business displacements are located at the SR 45/SR 445 intersection in Greene County, two are located on Rockport Road in Monroe County, and the sixth is located on Victor Pike in Monroe County. Refined Preferred Alternative 2 reduces the number of potential business displacements to four for both the initial and low cost design criteria. Again, three of the four potential business displacements are located at the SR 45/SR 445 intersection in Greene County and the fourth is located on Rockport Road in Monroe County.

The first business enterprise relocation is JM Electronics with three full-time employees and one part-time employee. This business is an electronics repair shop operated from a commercial building located along the east side of SR 45 just south of the SR 45/SR 445 intersection. The owners responded to the survey of businesses, and in personal communications, that if the business is displaced they expect to relocate this business within the vicinity. The second business that would be relocated is the Bloomfield State Bank. This banking establishment is

located at the SR 45/SR 445 intersection. It employs 15 full-time employees. The bank president responded to the survey of businesses by letter that he expects to be able to acquire another suitable replacement parcel in the vicinity. The third business that would be relocated under any alternative that includes the SR 45 interchange and the Greene/Monroe County Line interchange South Connector Road is Crossroads Collectibles/Women's Fitness Center, which is an antiques/fitness retail business establishment.

The owners of the antiques business responded to the survey of businesses, and in personal communications, that if the business is displaced they expect to retire as opposed to relocating this business. The owners also stated that they own a seven-acre parcel adjacent to the business that would be largely unaffected by any alternative. This parcel would be made available for sale to the displaced business enterprise owners for their relocations if they so choose. The seven-acre parcel is in a desirable location along SR 45, it is oriented parallel to SR 45 with maximum frontage, and it would easily accommodate both the bank and the electronics business as the ground is flat and mostly cleared. There are no zoning regulations in Greene County that would prevent the relocation of these businesses to this or any another suitable nearby location. These three businesses would not be relocated under the Greene/Monroe County Line North Connector Road interchange scenario or the SR 45 interchange-only scenario. See Chapter 6, *Comparison of Alternatives* for cost, impact, and performance evaluation of the interchange alternatives.

The Stillion Sawmill on Rockport Road in Monroe County would have been relocated under any Section 4 Tier 2 DEIS initial cost criteria alternative. Further development of the right of way for Refined Preferred Alternative 2 eliminated the need to displace this business for either design criteria (low-cost or initial). This business has four full-time employees. All four DEIS alternatives would have encroached on the property and displaced this business and an adjoining residence for construction of any initial cost design criteria alternative. The owner has stated in personal communications that if the required right of way impacts the property as shown in preliminary plans, the business and residence could not be relocated on the remainder of the affected parcel after I-69 is constructed. This business would not be a displacement under Refined Preferred Alternative 2 for either design criteria (low-cost or initial).

Pic-A-Chic Farms/Grubb's Catering business would be a displacement under any build alternative or design criteria including Refined Preferred Alternative 2. This business is located south (and east) of Rockport Road and west of Lodge Road in Monroe County. The business has been at its current site for 30 years and has four full-time employees and ten part-time employees. All five alternatives would sever access from Rockport Road to the business structure and displace this business for construction of the mainline alignment. The property owner stated that he intends to relocate the business on the remaining (residual) property which would retain access to Rockport Road.

3D Stone, Inc. would be displaced for both the initial and low-cost design criteria Alternative 3 scenarios. This limestone fabrication mill employs 39 full-time workers and 6 part-time employees. In addition, this business is strategically located in the middle of their three biggest limestone suppliers. The owner also stated that the machinery in the plant would be very difficult and expensive to relocate. Furthermore, Monroe County has zoning restrictions in place that may prevent the relocation of this business to a suitable nearby location. 3D Stone, Inc.

would not be a displacement under Refined Preferred Alternative 2 for either design criteria (low-cost or initial).

Alternative 3 would displace the Monroe County Indian Creek Township Volunteer Fire Department (VFD) building located on CR 35N (Carmichael Road) within Greene County under either design criteria (low-cost or initial). This VFD's only staff is one driver, on weekdays from 7 AM to 5 PM. The building is a simple pole barn with few amenities. The Indian Creek Township VFD could be relocated to another suitable nearby location. However, there are existing zoning regulations in Monroe County that could possibly prevent the relocation of this institution to another suitable nearby location. There would be no institutions acquired for any other alternative.

The only church located within the Section 4 corridor is the Ashcraft Chapel. The Ashcraft Chapel is located in Greene County on CR 880E (Mineral to Koleen Road), just north of CR 425S and east of the town of Koleen. The Indiana Annual Conference of Methodist-Episcopal Churches abandoned the church in 1963. There are no members. There would be no direct impacts to this church or changes in access for visitors under any alternative.

Changes in Direct Access

None of the five Section 4 Tier 2 FEIS Alternatives would make any changes that would affect the direct access to public roadways for any existing commercial properties.

Impacts Due to Changes in Traffic Patterns

Business surveys were mailed on February 8, 2007, February 15, 2007, July 12, 2007, November 28, 2007, February 12, 2010, and February 23, 2010, to identify potential impacts to businesses within and near the project corridor. Potential impacts, both negative and beneficial, could include altered travel patterns, access to a business property, loss of drive-by customers, etc. In all, thirty (32) businesses were identified and sent surveys, and nineteen (19) responses were received. The survey and responses are located in **Appendix A**, *Business Needs Survey*.

Commercial businesses that may be impacted by changes in traffic patterns under the alternatives are generally located in three areas of the Section 4 Study Area. These are along SR 45 near the intersection with SR 445 in eastern Greene County, along Rockport Road in Monroe County, and near the SR 37/Victor Pike intersection in Monroe County. There are six businesses adjacent to SR 45 located immediately north of the current SR 45/SR 445 intersection that would not be displaced by either of the Greene/Monroe County Line interchange scenarios. The businesses include a gas station/convenience store, car wash, pizza parlor, hair salon, storage units complex, and automobile repair/used car sales business. These businesses could be adversely affected by changes in traffic volumes along SR 45 and a decrease of pass-by traffic. Traffic volumes along SR 45 north of the SR 45/SR 445 intersection are projected to decrease. Please refer to Chapter 6, *Comparison of Alternatives*, for local roadway traffic projections associated with construction of the various interchange alternatives. Predicted traffic volumes for the Greene/Monroe County Line interchange South Connector Road Alternative and No-Build Condition are shown in **Figure 5.5-3**, p. 5-181).

Stillion Sawmill and Fern Hills Club are located near the Rockport Road/West Evans Lane intersection. Access to these two properties from Rockport Road will be maintained, and no impacts due to changes in traffic patterns will occur. In addition, Pic-A-Chic Farms/Grubb's Catering is located at the Rockport Road/Duvall Road intersection, and this property would retain access under all five alternatives; however, the existing structure would be displaced under any alternative. If the Pic-A-Chic Farms/Grubb's Catering business is relocated on the residual portion of property that retains access to Rockport Road, no impacts due to changes in traffic patterns are anticipated.

In the SR 37/Victor Pike intersection area, there are about 20 businesses located in the Robinson Industrial Park (southwest quadrant), Old Capital Pike Business Park (southeast quadrant), and other individual properties near the intersection that could potentially be affected by the alternatives. These businesses include a wide range of retail, general business, building construction, material supply, and service type businesses. Under any alternative, Average Daily Traffic (ADT) along SR 37 in the vicinity of the Victor Pike intersection will be comparable to the future No-Build Condition (**Figure 5.5-3**, p. 5-205). However, ADT along Victor Pike is expected to increase over the No-Build Condition under any alternative. In the survey responses, some of the business owners indicated they depend upon pass-by traffic. Others responses indicated that the I-69 interchange access would likely reduce travel times to destinations and reduce transportation costs for their businesses. Some indicated that an increase in traffic in the vicinity of their business should result in more potential customers. The construction of an interchange at SR 37 just north of the SR 37/Victor Pike intersection should not impact travel patterns and accessibility to these businesses and potential beneficial impacts to existing and future businesses may occur in this area due to the retained accessibility via Victor Pike to SR 37 and regional access to I-69. Predicted traffic volumes for the alternatives and No-Build Condition are shown in **Figure 5.5-3** (p. 5-205).

Changes in travel patterns for quarry trucks from Victor Oolitic Limestone Company were identified as a potential impact during the early project development. Currently, the only route authorized by Monroe County for trucks from this quarry is along Victor Pike south of SR 37. Early project development for the SR 37 interchange included scenarios to either close the existing SR 37/Victor Pike at-grade intersection or constructing a grade separation on Victor Pike over SR 37. Either of these scenarios would result in an impact upon the trucking operations for Victor Oolitic Limestone Company. Further project development for the SR 37 interchange discarded these two scenarios and the existing SR 37/Victor Pike at-grade intersection will be maintained. No impacts to the trucking operations for this quarry will occur.

Independent Limestone Company is located adjacent to the west side of the Section 4 corridor north of Tramway Road. Trucks from this quarry use Tramway Road and Rockport Road (or Victor Pike) for access to SR 37. There is no impact to Independent Limestone Company's access to Tramway Road, Rockport Road, Victor Pike or SR 37 as a result of the Section 4 project. Possible travel pattern changes along Rockport Road for access to SR 37 by quarry trucks from Independent Limestone Company will be assessed in the Section 5 EIS.

It was decided that, in the interim time period between the completion of Section 4 and the completion of Section 5, a temporary signalized "T" intersection would be constructed at SR 37.

The interim intersection would maintain access at That Road to/from SR 37 until such time that the full SR 37 interchange and Section 5 improvements are constructed. This interim SR 37 intersection would not directly impact any businesses.

Project Costs

The alternatives will require the expenditure of funds for the design and construction of the project. Estimates of project cost for the Refined Preferred Alternative 2 in Year 2010 dollars range from a low of $535 million under the low-cost design criteria to a high of $735 million under the initial design criteria. These costs include design, construction, right-of-way, relocation, utilities, and mitigation. Section 6.4 discusses project cost estimates in more detail.

Highway User Costs

Highway user costs include the cost of operating a vehicle including fuel, maintenance, insurance, etc.; the cost of travel time; and the cost of crashes. The construction of I-69 will, in general, improve overall accessibility and safety within the region. However, there are localized situations where roads will be closed by the new I-69 right-of-way and travel patterns will necessarily change, sometimes resulting in a longer trip. For the purpose of evaluating potential highway user cost impacts in this section on a consistent and conservative (most potential impacts) basis, interchanges were assumed at US 231, SR 45, the Greene/Monroe County Line, and SR 37 (Interchange Option 1).

Highway user operating costs are directly related to the distance traveled. User time costs are directly related to the time required to make a trip. Highway user costs are also incurred due to crashes that result in fatalities, injuries, and/or property damage. Improvements in the overall condition of the region's roadway system can reduce these costs by providing a safer system which nevertheless increases overall travel speeds. The Build Alternative will result in more trips being made on a limited-access, multilane interstate highway where average travel speeds will be higher and the crash rates lower than on existing roadways in the region. The total vehicle miles traveled and total vehicle hours traveled and the total crashes expected in Greene, Lawrence, Martin, Monroe, and Owen counties in an average year has been forecast for the No-Build Condition and the Build Alternative in Year 2030. **Table 5.5-3** compares the average daily vehicle operating costs and average daily user time costs for the No-Build and Build Alternatives within the five-county area.

The user costs within the five-county traffic analysis area are forecasted to increase under the Build Alternative. The cost increase primarily reflects the increase in through traffic from outside of this area that will be attracted to I-69. Such through traffic represents trips that would be made on a route outside the five-county area if I-69 were not built. Therefore, the overall vehicle miles traveled and vehicle hours traveled on the road network in the five-county area in the year 2030 will increase along with the associated user costs as shown in **Table 5.5-3**, while those measures would decrease outside the five-county area. The average daily costs for vehicle miles traveled and time spent traveling within the five-county traffic analysis area of Greene, Lawrence, Martin, Monroe, and Owen counties in the year 2030 is estimated to increase approximately $940,000 per day compared to the No-Build Alternative due to the increased

volumes of traffic drawn to this area by I-69. For those highway users within the five-county area, average trip speeds will be improved and average crash rates will be reduced over the current averages as discussed in Section 3.3.1.3.

Table 5.5-3: Year 2030 Average Daily User Cost Analysis – Greene, Lawrence, Martin, Monroe, and Owen Counties

		No-Build		Build	
Vehicle Miles Traveled	**Operating Cost Per 1,000 Miles**	**Miles**	**Operating Cost Total**	**Miles**	**Operating Cost Total**
Auto Vehicle Miles Traveled	$398	5,069,500	$2,020,000	5,875,176	$2,340,000
Truck Vehicle Miles Traveled	$1,261	530,734	$670,000	806,895	$1,020,000
Cost Totals	---	---	$2,690,000	---	$3,360,000
Vehicle Hours Traveled	**Time Value Per Hour**	**Hours**	**Time Cost Total**	**Hours**	**Time Cost Total**
Auto Vehicle Hours Traveled	$16	106,719	$1,710,000	117,099	$1,870,000
Truck Vehicle Hours Traveled	$29	9,996	$290,000	13,864	$400,000
Cost Totals	---	---	$2,000,000	---	$2,270,000

Source: Vehicle miles traveled and time savings for Greene, Lawrence, Martin, Monroe, and Owen counties were calculated based on data provided by Bernardin-Lochmueller & Associates; vehicle operating cost and driver time savings cost were obtained from Transportation Research Circular E-C477, "Assessing the Economic Impact of Transportation Projects," October 1997. Cost rates were calculated based on the change in the Consumer Price Index for transportation from 2000 to 2010 and are in 2010 dollars.

Table 5.5-4 presents the average annual crash costs projected within the five-county area in the year 2030 for the No-Build and Build Alternatives scenarios. (Since crashes are a relatively infrequent occurrence, standard transportation planning practice analyzes them on an annual, rather than daily, basis.) Despite the slight increase in the number of accidents predicted for the Build Alternatives compared to the No-Build, overall costs within the five-county area are forecasted to decrease $299,000 per year with the Build Alternatives. The small cost decrease is due to the final alternatives diverting traffic from less safe rural highways to a safer interstate facility reducing the likelihood of travelers being involved in higher-cost serious crashes. The increase in the total number of accidents predicted for the Build Alternatives compared to the No-Build is due to the added through traffic from other interstates and principal arterials outside the five counties reported. However, as shown and discussed in Chapter 3.3.1.3, the crash frequency or crash rates will be reduced for the Build Alternative over the current No-Build averages.

Table 5.5-4: Year 2030 Average Annual Crash Cost Analysis –Greene, Lawrence, Martin, Monroe, and Owen Counties

		No-Build		Build	
Crashes	**Cost per Crash**	**Average Annual No. of Crashes**	**Average Annual Total Crash Cost**	**Average Annual No. of Crashes**	**Average Annual Total Crash Cost**
Fatal Crashes	$4,720,000	32	$151,040,000	32	$151,040,000
Injury Crashes	$103,000	1,322	$136,166,000	1,317	$135,651,000
Property Damage Crashes	$5,400	4,928	$26,611,200	4,968	$26,827,200
Total Annual User Costs	**---**	**---**	**$313,817,200**	**---**	**$313,518,200**

Source: Cost per Crash values were obtained from Economic Impacts of Indiana's Statewide Long Range Transportation Plan, Appendix A, Table A.7 *Cambridge Systematics and Bernardin, Lochmueller & Associates, Inc., July, 2004, and updated from Year 2007 $ to Year 2010 $ based on the change in the Consumer Price Index for all urban consumers from 2007 to 2010 and are in 2010 dollars.*

5.5.3.2 Indirect Economic Impacts

The Council on Environmental Quality (CEQ) Regulations defines indirect impacts as "effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." An indirect impact for I-69 would be the change in the use of a particular piece of property as a result of a project alternative. These changes in land use are anticipated to occur in currently undeveloped areas that have not been identified as part of a planned or proposed development. These changes would result from the improved accessibility and greater economic efficiency provided by the new highway. This increased attractiveness of the land within the Section 4 Study Area will draw new residential and business development to the area that would not otherwise occur. These induced developments are a result of the proposed action and are reasonably foreseeable as a response to the project.

Section 5.24, *Cumulative Impacts*, presents a detailed analysis of the indirect and cumulative impacts of the construction of I-69 and other actions that may take place in the project area. The forecasted induced population and employment changes are the same for any of the alternatives because each of the alternatives is located within the same corridor, varying only slightly between the actual alignments, and would have the same number and locations of interchanges. For the purpose of evaluating cumulative impacts in this section on a consistent and conservative (most potential impacts) basis, interchanges were assumed at SR 45, the Greene/Monroe County Line, and SR 37. The interchange at US 231 was approved with the January 28, 2010, Section 3 ROD. The location and number of interchanges are the features of the project which most directly affect the location of induced growth resulting from a new limited-access highway. The forecasted amount of traffic, which creates much of the economic demand for the amount of indirect land use changes, is also the same for each build scenario. Combined, the interchange locations and traffic volumes affect the location and amount of indirect population and employment changes.

Forecasts of population and employment were made in the Tier 1 study for the year 2030, for both the No-Build and Build Alternatives, for each TAZ identified for the Tier 2 studies. A traffic analysis zone is a geographic area that conforms to US Census geography, is consistent with the highway network, and is relatively homogeneous with respect to population demographics and land use. The traffic model regards trips on the highway network as originating and terminating within these TAZs. See Section 3.1.2, *Traffic Modeling*, for further discussion of TAZs.

Maps of the TAZs in Greene and Monroe counties were created which displayed the build and no-build population and employment forecasts for the year 2030 for each TAZ. The maps were presented to the Expert Land Use Panel, made up of local development officials. The panel verified and modified these forecasts to finalize the anticipated location of the growth in population and employment. See Section 5.24.3 for more detail on the expert land use panel and the process of allocating the predicted induced growth.

Through this process, a total of 55 TAZs were identified as forecasted to have induced changes in the number of jobs and/or households because of the proposed project. This anticipated induced growth in housing units and employment is presented in **Table 5.5-5**, and the locations

of the TAZs where this induced growth is expected to occur are shown in **Figure 5.5-2** (p. 5-204). This induced growth, expected only if I-69 is constructed, is based on a projected total of 476 new households requiring 113 acres of new residential development and 771 new jobs induced requiring 47 acres of development within Greene and Monroe counties. The Tier 1 economic analysis determined that within the Southwest Indiana region, (including Daviess, Greene, Martin, and Pike counties) the average number of dwelling units per acre was 3.96, while in Monroe County, the average number of dwelling units per acre was determined to be 4.82. The employees-per-acre, per-employment-type data were developed from the Institute of Transportation Engineer's (ITE) Code per Trip Generation 6th Edition. The average is 15.4 employees per acre for Greene County and 17.8 employees per acre for Monroe County. Refer to Section 5.24, *Cumulative Impacts*, 5.24.3, *Analysis* for detailed discussion of anticipated growth impacts. In order to fully disclose the impacts associated with the geographic scopes of each Tier 2 project, the geographic scopes of the cumulative impact analyses in adjacent sections will of necessity overlap. As a result, some actions will be disclosed as cumulative impacts in more than one Tier 2 EIS. For this reason, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS.

Table 5.5-5: Number of Jobs, Households, and Acres Induced With I-69

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing*	Induced Acres for Jobs**	Total Induced Acres Changes & % of Total TAZ Acres	Size of TAZ (acres)
Greene County (US 231 Vicinity*)**						
2800504	1	0	0.3	0.0	0.3	1,907
2800506	2	0	0.5	0.0	0.5	971
2800514	0	84	0.0	5.5	5.5	174
2801803	1	0	0.3	0.0	0.3	866
2801804	1	0	0.3	0.0	0.3	2,704
2801805	2	0	0.5	0.0	0.5	709
2801810	1	0	0.3	0.0	0.3	2,882
2802011	1	0	0.3	0.0	0.3	402
2802012	1	0	0.3	0.0	0.3	1,002
2802013	1	0	0.3	0.0	0.3	637
2803203	1	168	0.3	11.0	11.3	462
2803204	0	84	0.0	5.5	5.5	96
*Subtotals^*	12	336	3	22	25 (0.2%)	12,812
Greene County****						
2800601	7	0	1.8	0.0	1.8	3,586
2800602	9	0	2.3	0.0	2.3	2,366
2800603	5	0	1.3	0.0	1.3	263
2800604	1	0	0.3	0.0	0.3	91
2800605	32	0	8.1	0.0	8.1	1,822
2800606	1	0	0.3	0.0	0.3	97
2800607	1	0	0.3	0.0	0.3	277
2800608	8	0	2.0	0.0	2.0	952
2800801	1	0	0.3	0.0	0.3	1,122
2800802	1	0	0.3	0.0	0.3	487
2800803	2	0	0.5	0.0	0.5	420

Table 5.5-5: Number of Jobs, Households, and Acres Induced With I-69

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing*	Induced Acres for Jobs**	Total Induced Acres Changes & % of Total TAZ Acres	Size of TAZ (acres)
2800804	38	10	9.6	0.6	10.2	1,750
2800805	10	10	2.5	0.6	3.1	581
2800806	7	0	1.8	0.0	1.8	1,838
2800807	2	0	0.5	0.0	0.5	570
2800808	3	0	0.8	0.0	0.8	98
2800809	6	0	1.5	0.0	1.5	606
2800810	4	0	1.0	0.0	1.0	343
2800811	2	0	0.5	0.0	0.5	24
2800812	1	0	0.3	0.0	0.3	468
2800904	2	0	0.5	0.0	0.5	281
2800906	31	0	7.8	0.0	7.8	3,288
2801501	7	0	1.8	0.0	1.8	1,630
2801502	4	0	1.0	0.0	1.0	1,160
2801503	7	0	1.8	0.0	1.8	2,109
2801504	2	0	0.5	0.0	0.5	2,395
2801505	21	0	5.3	0.0	5.3	2,892
2801506	15	0	3.8	0.0	3.8	4,140
2801507	2	0	0.5	0.0	0.5	427
2801601	24	15	6.1	1.0	7.1	1,281
2801602	24	0	6.1	0.0	6.1	4,701
2802701	7	0	1.8	0.0	1.8	2,929
2802702	3	0	0.8	0.0	0.8	3,410
2802703	2	0	0.5	0.0	0.5	1,668
2803001	1	0	0.3	0.0	0.3	996
2803002	11	0	2.8	0.0	2.8	2,571
2803003	3	0	0.8	0.0	0.8	1,107
2803801	5	0	1.3	0.0	1.3	2,372
2803802	2	0	0.5	0.0	0.5	3,114
*Subtotals^*	314	35	79	2	81 (0.1%)	60,232
*Greene County Subtotals^*	326	371	82	25	106 (0.1%)	73,044
Monroe County****						
5300721	150	0	31.1	0.0	31.1	238
5300728	0	100	0.0	5.6	5.6	416
5300729	0	50	0.0	2.8	2.8	47
5303311	0	250	0.0	14.0	14.0	76
Monroe County Subtotals	150	400	31	22	54 (6.9%)	778
Total	**476**	**771**	**113**	**47**	**160 (0.2%)**	**73,822**

*Greene County utilized 3.96 units/acre; Monroe County used 4.82 units/acre.
***Greene County utilized 15.4 units/acre; Monroe County used 17.8 units/acre.*
***Induced growth in these TAZs was independently verified by the Section 4 Expert Land Use Panel and is anticipated to impact 100% agricultural/other land use (see ***Appendix* CC).**
****Induced growth in these TAZs was independently verified by the Section 4 Expert Land Use Panel and is anticipated to impact 40% forest / 60% agricultural land use (see ***Appendix* CC**).
^Subtotals have been rounded.

5.5.3.3 Business and Employment Impacts

Within Section 4, the Refined Preferred Alternative 2 initial design criteria would require the acquisition of four businesses under either design criteria (low-cost or initial). Three of these businesses are located near the SR 45/SR 445 intersection in Greene County and include an electronics repair service, a bank, and an antiques/fitness establishment. These three business properties will need to be acquired with any alternative that includes the Greene/Monroe County Line interchange South Connector Road scenario. Because of the nature of these businesses, the owners should have little trouble relocating within the vicinity should they desire.

A business identified in the Tier 2 DEIS that would have been acquired for Alternative 2 (under the initial design criteria) was a lumber mill located along Rockport Road. Further development of the right of way for Refined Preferred Alternative 2 eliminated the need to displace this business for either design criteria (low-cost or initial). This business could relocate; however, the owner was not sure if he would continue in business if impacted. In addition, Monroe County has zoning ordinances that may limit the relocation of this type of business in the vicinity of its present location. This business would not be displaced under Refined Preferred Alternative 2 under either design criteria (low-cost or initial).

Under both design criteria, Refined Preferred Alternative 2 would require the relocation of a catering service establishment located on Rockport Road. The owner has stated a desire to relocate the business structure to a new location on the portion of the residual property that would retain access to Rockport Road and which would not be impacted by the highway.

In the 55 TAZs forecasted with induced growth in the number of jobs and/or residents because of the proposed project, the number of jobs is expected to increase by 517 jobs under the No-Build Condition. An additional 771 jobs are anticipated due to economic growth induced by I-69 (1,288 total year 2030 jobs anticipated with I-69). **Figure 5.5-2** (p. 5-204) shows the traffic analysis zones analyzed in this study, and areas where induced growth is projected as a result of this project.

There will also be a short-term economic impact in the Section 4 vicinity during construction due to construction-related expenditures. Food, lodging, materials and supplies, and local labor and services will all be consumed during the construction period. It is expected that there will be direct economic benefits to local communities during the construction period due to construction-related activity.

5.5.3.4 Local Property Tax Base

The purchase of right-of-way for the project will convert taxable privately-owned land to a non-taxable status, reducing the local tax base and decrease property tax revenues.[2] **Table 5.5-6**

[2] As described above in Section 5.5.3.1, many businesses expect to have an increase in sales due to the construction of Section 4 of I-69. In time, these increases in sales probably will lead to increased assessed valuation of these commercial properties. Also, as described in Section 5.5.3.2, there will be indirect economic impacts that may be expected to result in additional increases in assessed valuation. And, as is described in Section 5.5.3.5, some properties are likely to experience significant increases in assessed valuation due to their proximity to I-69 interchanges. Assuming that property tax rates remain stable, these increases in assessed valuation eventually will occur and offset the losses described here. Given the great deal of

shows the estimated value of the property taken and the loss in tax base for each of the alternatives. The improvements on the land were estimated based on field observation and a review of transfers of similar properties in the project area. Based upon property sales listed at the Greene County Assessor's office, the value of forest and agricultural land was estimated as $2,000 per acre. Within Monroe County the value of forest and agricultural land was estimated as $4,500 per acre.[3] These estimates are used only to compare the economic impacts of alternatives and will not be used for appraisal purposes. These estimates may not be the same as those used by the tax assessor. A review of current assessments indicates a lack of uniformity in the assessment process in comparing townships and properties within townships. However, under current law, taxes are to be assessed based on "market value" and the prices shown in **Table 5.5-6** are an approximation of market value that has been uniformly applied to all properties for all alternatives. The average tax rate used in the table is a weighted average of the median net rates in each county[4] for 2008, per $100 valuation.

Table 5.5-6: Impact on Local Property Tax Base

Alternative		Land Value	Improvements Value	Total Estimated Value	Average Tax Rate	Loss In Tax Base
Section 4 Build Alternatives						
Refined Preferred Alt. 2	Low-Cost Design Criteria	$10,003,363	$9,061,100	$19,064,463	1.7955	$342,302
	Initial Design Criteria	$10,827,947	$9,505,600	$20,333,547	1.7955	$365,089
1	Low-Cost Design Criteria	$10,589,948	$10,821,500	$21,411,448	1.7955	$384,443
	Initial Design Criteria	$11,428,242	$11,293,500	$22,721,742	1.7955	$407,969
2	Low-Cost Design Criteria	$9,586,268	$8,441,000	$18,027,268	1.7955	$323,680
	Initial Design Criteria	$10,447,510	$9,063,000	$19,510,510	1.7955	$350,311
3	Low-Cost Design Criteria	$10,067,980	$12,658,500	$22,726,480	1.7955	$408,054
	Initial Design Criteria	$11,016,701	$13,503,500	$24,520,201	1.7955	$440,260
4	Low-Cost Design Criteria	$9,980,066	$9,229,000	$19,209,066	1.7955	$344,899
	Initial Design Criteria	$10,866,061	$9,851,000	$20,717,061	1.7955	$371,975

In the longer term, there is projected to be new residential and commercial development induced by the project, as discussed in Section 5.5.3.2, Indirect Economic Impacts. These improvements will cause these properties to increase in assessed value, adding to the local tax base. Also, some properties located near the proposed new I-69 interchanges are likely to become more valuable. The resulting increases in assessed valuation are expected to offset tax base losses due to the acquisition of right-of-way for the highway. Given the imprecision in assessing both the timing and magnitude of such increases in assessed valuation, no attempt is made to quantify them.

imprecision inherent in assessing both the timing and magnitude of these increases in assessed valuation, no attempt is made to quantify them.

[3] This is documented in memo in project files, dated 9-14-2009.

[4] Median net property tax rates for each county obtained from STATS Indiana, www.stats.indiana.edu/taxframe.html. Accessed on April 2, 2010.

5.5.3.5 Local Property Values

Near term corridor property values will be unchanged, for the most part, after the project is built. However, two circumstances could arise where the changes may be dramatic and occur during the construction of the project or immediately upon it being open to traffic. The first case includes those business properties that will be affected by a reduction in pass-by traffic, discussed in Section 5.5.3.1, above. The reduction in sales would lower the lease value of the specific location and therefore the valuation of the real estate.

The second potential case of a dramatic change in property values occurs for those properties located near the proposed interchanges where new access to large traffic volumes will occur when the project is complete. These properties will command a higher value than in their use as forest or agricultural land. Owners of existing forested or agricultural land probably will have opportunities to sell or lease that property for development. This would be especially true in the vicinity of the SR 45 interchange and also in the vicinity of the Greene/Monroe County Line interchange. In these two areas improved access to Bloomington will likely cause an increase in residential and commercial development and also result in indirect impacts.

Property values within the Study Area would likely increase over time as demand for land to accommodate housing and commerce increases. Long-term changes in land use and potential development induced by the project are discussed in Section 5.24, *Cumulative Impacts.*

5.5.4 Mitigation

The I-69 Community Planning Program assisted in the development of a regional strategy for providing resources to local communities to manage the growth and economic development associated with I-69. The grant application program was developed and grants were made available to eligible communities in two phases beginning in August 2007. On October 29, 2007, INDOT awarded $950,000 in grants to communities located along the I-69 corridor in Southwest Indiana. Greene, Lawrence and Monroe counties and the cities of Bedford, Bloomfield, Ellettsville, Linton and Bloomington were eligible for grants.

In the first phase, Greene County, the Town of Bloomfield, and the City of Linton together were awarded a grant for $150,000. Using this grant Greene County developed its Draft Comprehensive Plan on August 3, 2009. On February 1, 2008, Monroe County submitted an application for a $50,000 grant. The City of Bloomington was eligible for this program but chose not to participate.

In the second phase of the program, on July 30, 2008, a $100,000 grant was awarded to Monroe County and the City of Ellettsville. This grant was used for the preparation of the April 20, 2010, *Draft Monroe County Comprehensive Plan*. A transportation corridor plan for SR 37/I-69 also was developed by Monroe County in 2010 as a result of the grant program. In addition, the Lawrence County 2009 Strategic Plan and City of Bedford 2010 Comprehensive Plan also were developed as a result of the I-69 Planning Grant Program. Section 7.2, *Major Mitigation Initiatives*, describes the program in greater detail. See **Appendix T**, *I-69 Planning Grant Program Update*, for additional details on the Community Planning Program within Section 4.

5.5.5 Summary

The above analysis presented the localized economic impacts of the construction of I-69 within the corridor and the counties surrounding Section 4. The localized impacts include the following:

- There will be a loss in farm income by taking farmland for highway right-of-way. For the low-cost design criteria this loss is estimated to range from approximately $81,000 with Alternative 1 to $97,000 with Refined Preferred Alternative 2, and for the initial design criteria this loss ranges from $104,000 with Alternative 1 to $126,000 with Refined Preferred Alternative 2.

- Assuming both the SR 45 interchange and Greene/Monroe County Line interchange South Connector Road are selected, there would be four commercial displacements anticipated with Refined Preferred Alternative 2 under either design criteria (low-cost or initial). Alternatives 1, 2 and 4 would displace four commercial businesses under the low-cost design criteria and a fifth commercial business under the initial design criteria. Five commercial business displacements are anticipated with Alternative 3 under the low-cost criteria and six business displacements are anticipated for this alternative under the initial design criteria. Three of these include JM Electronics, Inc., Bloomfield State Bank, and Crossroads Collectibles/Women's Fitness Center, which are located in Greene County near the SR 45/SR 45 intersection. JM Electronics, Inc. has three full-time employees and one part-time employee and the Bloomfield State Bank has 15 full-time employees. One of the Crossroads Collectibles business owners is the only full-time employee. These three commercial businesses would not be displaced under the SR 45 only interchange, or the Greene Monroe County Line North Connector Road interchange only.

  The owners of the Crossroads Collectibles/Women's Fitness Center have stated that they would likely retire as opposed to relocating this business. However, the owners also have stated that they would be willing to sell approximately seven acres of property along the east side of SR 45 just north of the SR 45/SR 445 intersection. This property would be suitable and desirable for the relocation of the electronics repair business and the bank. The owners of these two businesses have stated that they would likely relocate within the vicinity. In addition, this property is only a short distance from the current locations of the potentially displaced businesses. There are no zoning restrictions in Greene County to prevent such relocations. These two business owners also have stated that they would likely be impacted in the short-term by their relocation.

  Stillion Sawmill would have been relocated under any DEIS initial design criteria alternative. This lumber mill has four full-time employees and is located in Monroe County southwest of the Rockport Road/West Evans Lane intersection. Further development of the right of way for Refined Preferred Alternative 2 eliminated the need to displace this business for either design criteria (low-cost or initial). The business owner has stated that he may retire if the business were displaced for this project.

Pic-A-Chic Farms/Grubbs' Catering business is located southeast of the Rockport Road/Lodge Road intersection in Monroe County. This business would be relocated under any build alternative. Pic-A-Chic Farms has four full-time employees and 11 part-time employees. The owner of this business has stated that a new business structure would likely be constructed on the remaining portion of the existing property that would retain access to Rockport Road. This owner also stated that the business would likely be impacted in the short-term by the relocation.

Alternative 3 would displace the 3D Stone, Inc. limestone fabrication business located within the corridor on the west side of Victor Pike in Monroe County with 39 full-time employees and six part-time employees. The owner stated that this business is located in the middle of their three biggest limestone suppliers. The owner also stated that the machinery in the plant would be very difficult and expensive to relocate. Furthermore, Monroe County has zoning restrictions in place that may prevent the relocation of this business to a suitable nearby location.

- Businesses within the corridor will probably be affected by the change in travel patterns, primarily those dependent upon traffic along SR 45 near the SR 45/SR 445 intersection in eastern Greene County and in the vicinity of SR 37/Victor Pike in Monroe County. Traffic forecasts for the alternatives and interchange options indicate that ADT on SR 45 north of the Greene/Monroe County Line interchange will be considerably less than ADT under the No-Build Condition. A reduction in pass-by traffic will likely occur for businesses located along SR 45 north of the Greene/Monroe County Line interchange. Conversely, businesses located in the vicinity of the SR 37/Victor Pike intersection may have more potential customers due to the increased traffic in the area provided by I-69.

- The direct cost of constructing Refined Preferred Alternative 2 in Year 2010 dollars is estimated to range from a low of $535 million for the low-cost design criteria to a high of $735 million for the initial design criteria. These costs include design, construction, right-of-way, relocation, utilities, and mitigation.

- Indirect economic impacts include the inducement of economic activity because of the improved access in the area. These impacts are expected to generate over 476 additional housing units and 771 jobs through the development of nearly 160 acres of land as a result of the construction of I-69.

- Taking taxable land for public right-of-way purposes will remove that land from the tax base and, in the short term, reduce the taxes collected. However, induced development and improved access to existing development is anticipated to increase property values and more than offset the short-term loss in tax base.

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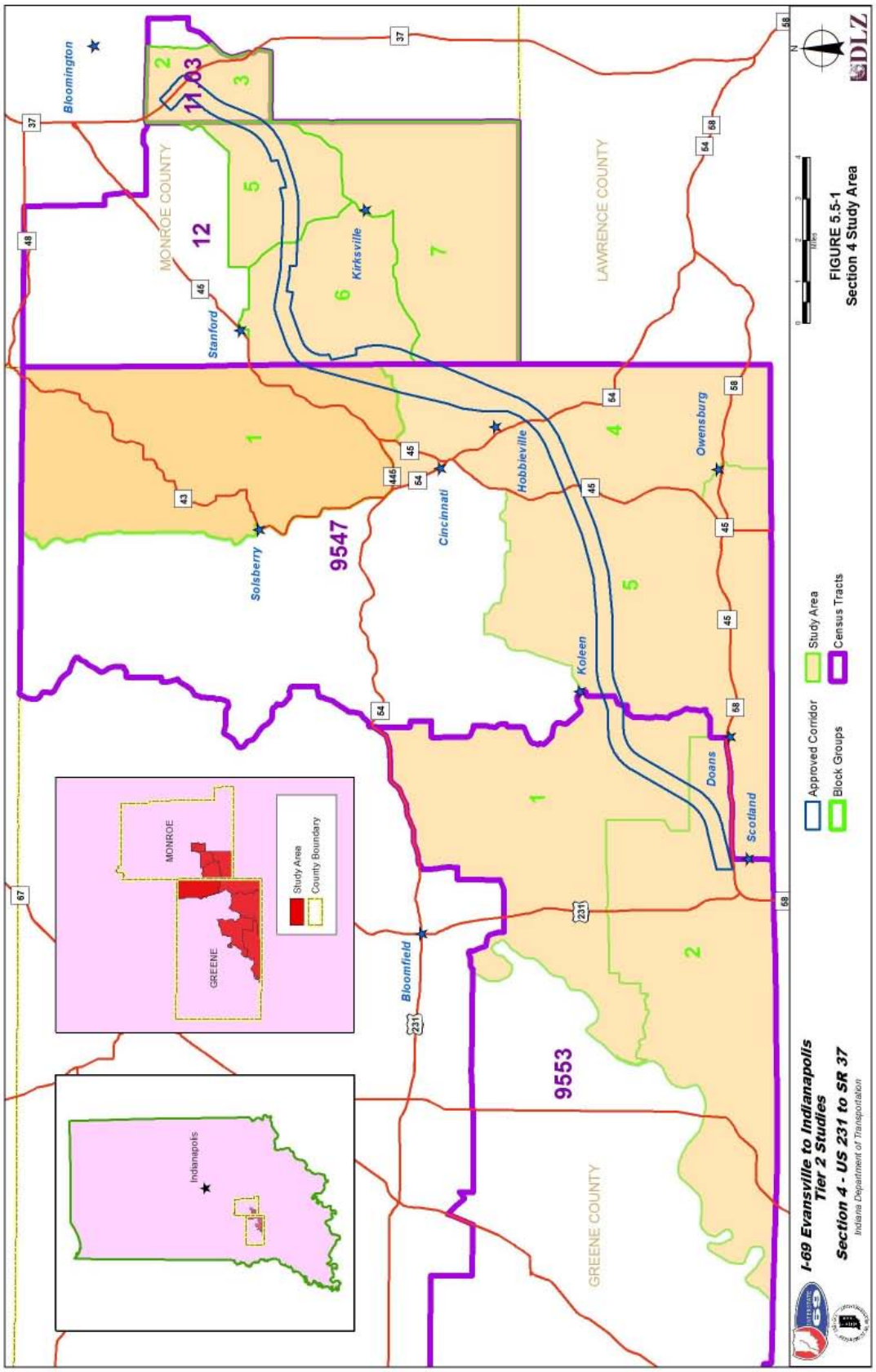

Bloomington
MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Stanford
Kirksville
Solsberry
Cincinnati
Hobbieville
Koleen
Owensburg
Doans
Scotland
Bloomfield
9547
9553
11.03
12
Indianapolis
MONROE
GREENE
Study Area
County Boundary
Approved Corridor
Block Groups
Study Area
Census Tracts
FIGURE 5.5-1
Section 4 Study Area
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ

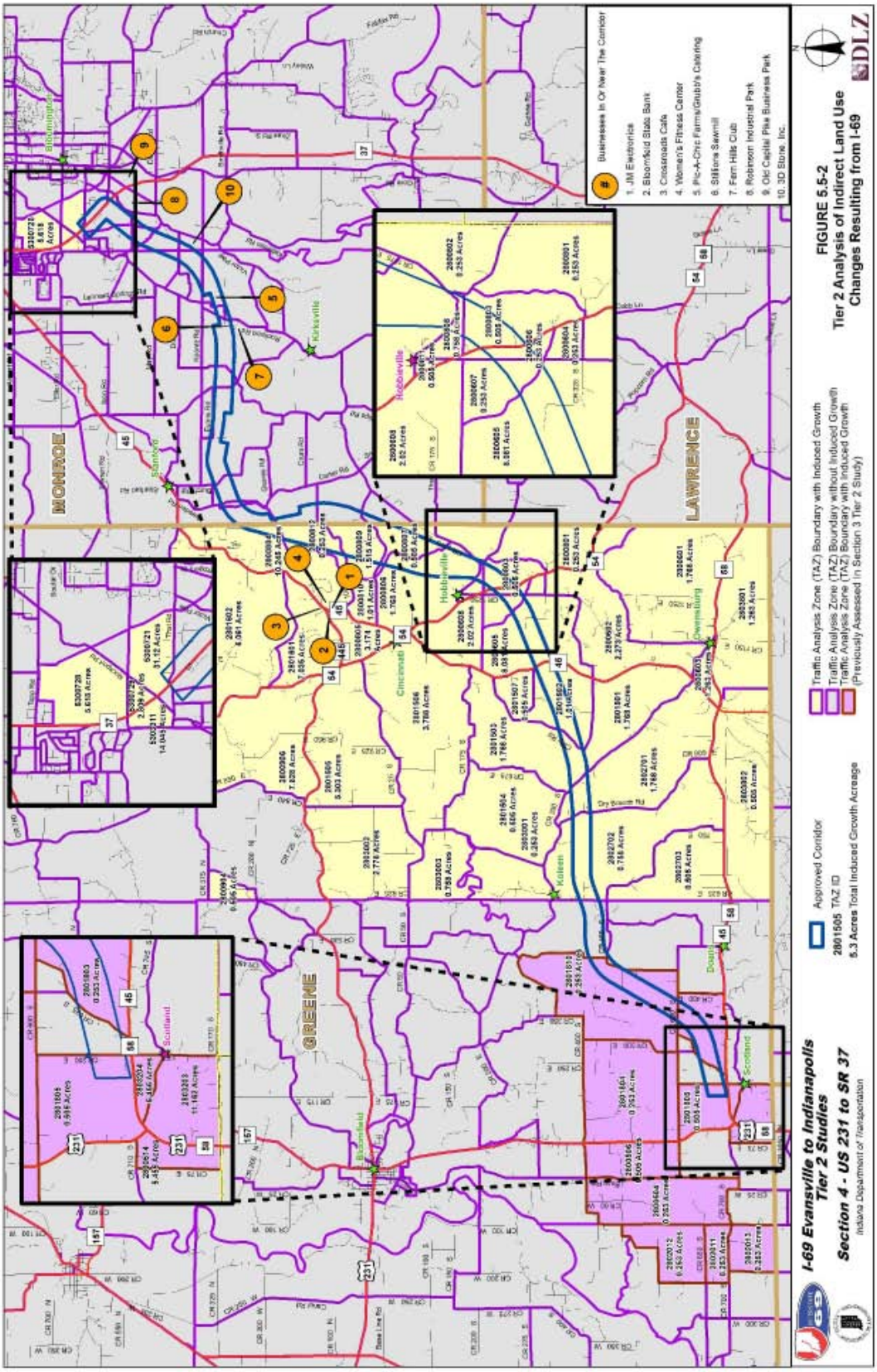
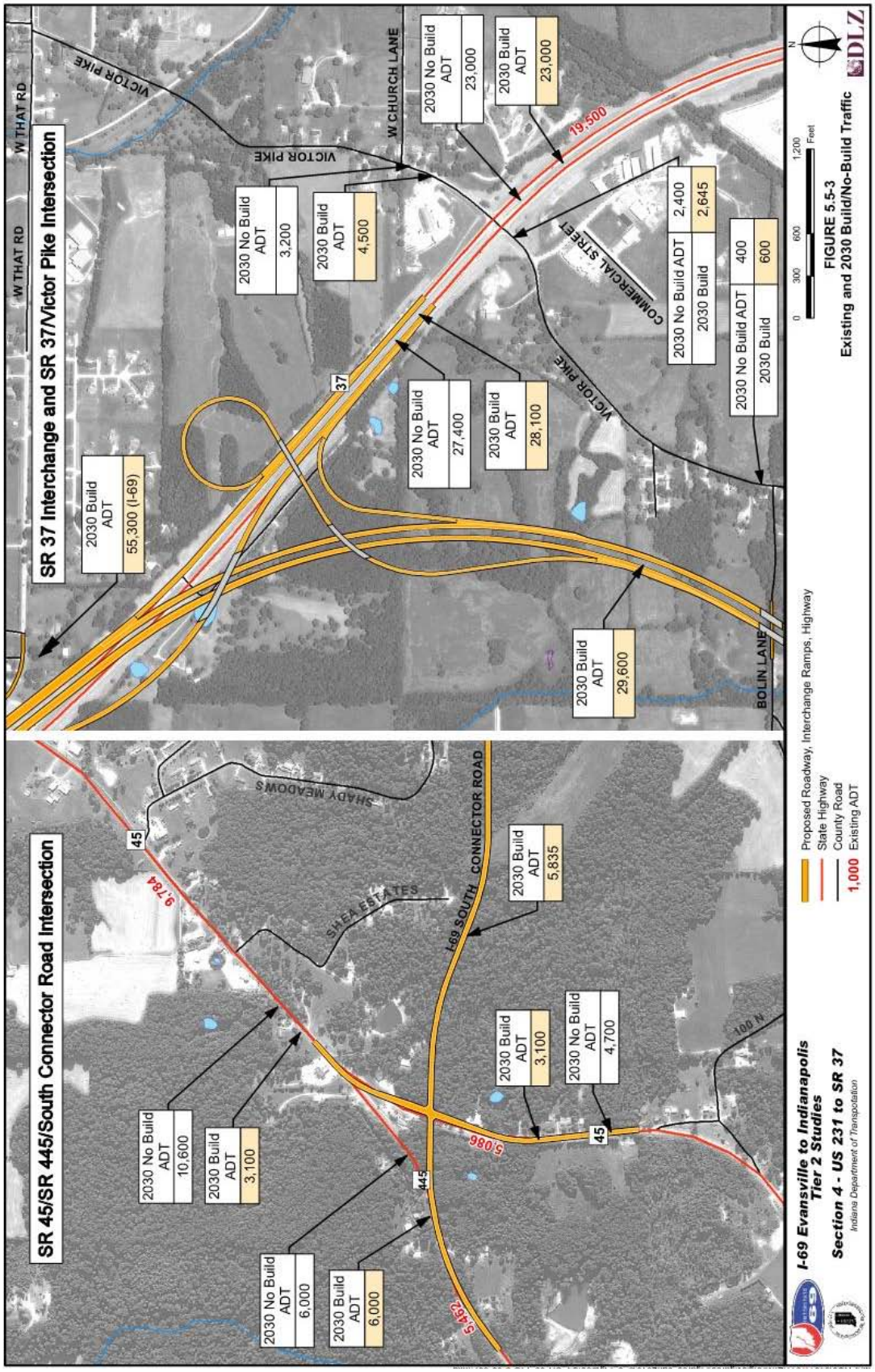


FIGURE 5.5-2
Tier 2 Analysis of Indirect Land Use Changes Resulting from I-69
Businesses In Or Near The Corridor
1. JM Electronics
2. Bloomfield State Bank
3. Crossroads Cafe
4. Women's Fitness Center
5. Pic-A-Chic Farms/Grubb's Catering
6. Stillions Sawmill
7. Fern Hills Club
8. Robinson Industrial Park
9. Old Capital Pike Business Park
10. 3D Store, Inc.
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed in Section 3 Tier 2 Study)
Approved Corridor
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
MONROE
LAWRENCE
GREENE
Bloomington
Ellettsville
Stinesville
Bloomfield
Scotland
Koleen
Cincinnati
Hobbs
Owensburg
Dogwood


SR 37 Interchange and SR 37/Victor Pike Intersection
W THAT RD
W THAT RD
VICTOR PIKE
VICTOR PIKE
W CHURCH LANE
VICTOR PIKE
COMMERCIAL STREET
BOLIN LANE
37
19,500
2030 Build ADT 55,300 (I-69)
2030 No Build ADT 3,200
2030 Build ADT 4,500
2030 No Build ADT 23,000
2030 Build ADT 23,000
2030 No Build ADT 27,400
2030 Build ADT 28,100
2030 Build ADT 29,600
2030 No Build ADT 2,400
2030 Build 2,645
2030 No Build ADT 400
2030 Build 600
SR 45/SR 445/South Connector Road Intersection
SHADY MEADOWS
SHEA ESTATES
I-69 SOUTH CONNECTOR ROAD
100 N
45
445
9,784
5,086
5,452
2030 No Build ADT 10,600
2030 Build ADT 3,100
2030 No Build ADT 6,000
2030 Build ADT 6,000
2030 Build ADT 5,835
2030 Build ADT 3,100
2030 No Build ADT 4,700
Proposed Roadway, Interchange Ramps, Highway
State Highway
County Road
1,000 Existing ADT
0 300 600 1,200 Feet
N
DLZ
FIGURE 5.5-3
Existing and 2030 Build/No-Build Traffic
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation

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5.6 Traffic Impacts

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Section 5.6.3.2 – Updated the level of service analysis of the South Connector Road intersection with SR 45 and SR 445 to include discussion of both a 2-way and 4-way stop controlled intersection.
- Section 5.6.3.2 – Updated **Tables 5.6-2 and 5.6-3** to include both a 2-way and 4-way stop controlled intersection level of service analysis of the South Connector Road intersection with SR 45 and SR 445.
- Section 5.6.3.2 – Updated access road descriptions and **Table 5.6-4** to incorporate Refined Preferred Alternative 2 access road additions and revisions.
- Section 5.6.3.2 – Revised local road access descriptions and **Table 5.6-5** to incorporate Refined Preferred Alternative 2 access decisions.
- Section 5.6.3.3 – In response to comments received for the DEIS, this FEIS provides additional analysis of the traffic impacts and safety of the existing SR 37 intersections in the interim condition (after Sections 1 – 4 of I-69 are completed, but prior to the completion of Sections 5 or 6).
- Section 5.6.3.3 – Added discussion of an interim SR 37 interchange design (prior to the completion of Section 5).

5.6.1 Introduction

This section examines the traffic impacts of the alternatives for the build condition. Traffic impacts are defined as undesirable increases in traffic on facilities other than I-69 that occur after the completion of I-69. "Undesirable" is defined as an increase in traffic that causes congested conditions (below Level of Service "C" for rural freeways, arterials and collectors and below Level of Service "D" for urban freeways, arterials, and collectors[1]). These are congested conditions that would ***not*** occur if I-69 were not constructed. For example, if a road would operate in uncongested conditions in the "No-Build" scenario, but becomes congested in the build scenario because traffic going to and from I-69 uses it, that congestion is considered a traffic impact of I-69.

This analysis of traffic impacts takes into account major transportation capital investments programmed by INDOT in its Long Range Transportation Plan, amended November 12, 2003,

[1] INDOT Design Manual Part 5 Road Design Volume II, Tables 53-1 through 53-9 specifies design criteria for rural and urban roads. The minimum level of service for rural freeways, arterials, and collectors is "C" with a desirable level of service of "B," and for freeways, arterials, and collectors in urban areas the minimum acceptable level of service is "D" with a desirable level of service of "C."

and the Metropolitan Planning Organizations' transportation plans that were applicable at that time.[2] The analysis also considers traffic conditions associated with the alternatives, access impacts (including the location and forecasted traffic volumes at interchanges, grade separations and local access roads), and mitigation actions (such as interchange crossroad improvements, additional grade separations or access roads to address congestion and circulation concerns). Additional information on the performance of the alternatives for the build condition relative to "accessibility" and "safety" measures may be found in Section 3.3.1, *Transportation Performance Indicators*.

5.6.2 Methodology

5.6.2.1 General

As described in Section 3.1.2, *Traffic Modeling,* the traffic impacts of each alternative for the build conditions were determined by modeling alternative roadway networks (and alternative land use patterns, if appropriate) in the I-69 Corridor Travel Demand Model. This corridor model has a much more detailed highway network than the statewide model used in the Tier 1 study. The corridor model predicts future daily and peak-hour traffic for the alternative roadway networks, including the mainline, interchanges and major intersections. These traffic assignments are translated into level of service (LOS) designations for comparison of the alternatives. For additional information regarding traffic forecasting methodology, please refer to **Appendix B**, *Traffic Modeling Technical Report*.

5.6.2.2 Future No-Build Condition

The Future No-Build (No-Action) Condition is represented by the existing roadway network plus programmed "capacity expansion" projects (i.e., new roadways, added through travel lanes, and new interchanges) as set forth in the adopted statewide Long-Range Transportation Plan, amended November 12, 2003 (pursuant to 23 CFR 135, Section 450.200), and metropolitan Long-Range Transportation Plans (i.e., Indianapolis, Bloomington and Evansville Metropolitan Planning Organizations pursuant to 23 CFR 135, Section 450.300). In June 2007 INDOT issued a new statewide long-range transportation plan (LRP) for 2030. Very little within the Section 4 "study area" (i.e., Greene, Lawrence, Martin, Monroe, and Owen counties) has been affected by the new LRP. The Indiana Statewide Travel Demand Model (ISTDM v4) was run for the year 2030 with all projects in Southwestern Indiana represented in the network as they are currently planned in the new LRP. The conclusion of this analysis is that the change in INDOT's Long Range Plan has no material effect on the long-range forecast traffic or level of service in Section 4 (See **Appendix U**, *INDOT Long Range Plan Update Sensitivity Analysis*).

For all of the I-69 Tier 2 studies, the Future No-Build Condition assumes the following: none of the six Tier 2 sections are completed for I-69 between Evansville and Indianapolis; the section of I-69 from Henderson, Kentucky, to Evansville, Indiana (SIU #4 of the National I-69 project) is not completed; and SR 37 between Bloomington and Indianapolis is not upgraded to a freeway.

[2] As described in Section 3.1.2, a sensitivity analysis was conducted to assess the effects of INDOT's Long Range Plan update of June, 2007. **Appendix U** provides the analysis which determined that the changes incorporated in this plan update have no material effect upon traffic forecasts in Section 4.

Further, the Future No-Build Condition does include INDOT and metropolitan "capacity expansion" projects.

5.6.2.3 Build Condition

The Build Condition Alternatives for I-69 Section 4 include interchanges at SR 45, Greene/Monroe County Line, and SR 37. This combination of intermediate interchanges had the highest predicted interchange volume and generally demonstrated the greatest congestion relief per the transportation performance measures analysis, for interchange alternatives carried forward for detailed study (see Section 3.3.1 and Section 3.4.2.) Since all of the alternatives in Section 4 have the same general beginning and ending points, the same type of interchanges at the same crossroads, and are basically the same length, there is no difference in the traffic volumes and LOS designations predicted by the models for the Section 4 Alternatives. Therefore, for the traffic analysis, the alternatives are referred to collectively, in this chapter, as the "Build Alternative."

The forecasted traffic volumes for the Build Alternative assume the following: all of the six Tier 2 sections are completed for I-69 between Evansville and Indianapolis; and the I-69 project between Henderson and Evansville is completed, including an additional Ohio River bridge in Evansville.

5.6.3 Analysis

5.6.3.1 Traffic Conditions

For the design year 2030, I-69 is forecasted to have average daily traffic (ADT) of 23,525 vehicles per day (VPD) for the section between US 231 and SR 45, 23,743 VPD between SR 45 and the Greene/Monroe County Line interchange, and 29,578 VPD between the Greene/Monroe County Line interchange and SR 37. I-69 is projected to operate at LOS A from US 231 to SR 37 for the design year 2030.

Table 5.6-1 compares traffic on state highways that cross or parallel the Section 4 corridor. These highways are:

- SR 45/SR 58 from east of US 231 to the SR 45/SR 58 intersection (at the Crane NSWC North Gate) in Greene County.
- SR 45 from the SR 45/SR 58 intersection in Greene County to SR 37 in Monroe County.
- SR 54 from north of the SR 58 Junction (south of the I-69 corridor) to west of SR 445 in Greene County.
- SR 445 between SR 45 and SR 54 in Greene County.
- SR 37 at the I-69 interchange and south of Victor Pike.

Table 5.6-1: State Highway Volumes and LOS – Current, Build, and No-Build

Roadway Section	Current (Yr. 2007)	Year 2030				
	ADT	No-Build Traffic (ADT)	Build Traffic (ADT)	Percent Variance	No-Build LOS	Build LOS
SR 45/58 E of CR 200E	2,479	4,901	3,599	-26.6%	D	B
SR 45/58 E of CR 900E	2,489	4,620	3,288	-28.8%	C	B
SR 45 N of SR 58	3,500	3,246	1,914	-41.0%	B	B
SR 45 S of I-69	3,500	3,529	2,757	-21.9%	B	B
SR 45 N of I-69	4,923	3,529	2,396	-32.1%	B	B
SR 54 N of SR 58	1,218	1,759	1,635	-7.0%	A	A
SR 54 S of Hobbieville Rd	1,034	2,385	2,268	-4.9%	B	B
SR 54 S of SR 45/SR 54 South Junction	1,748	2,574	2,563	-0.4%	B	B
SR 54/45	6,203	6,599	5,139	-22.1%	D	C
SR 54 W of SR 445	6,134	7,540	7,507	-0.4%	D	D
SR 445 W of SR 45	5,462	6,003	5,982	-0.4%	C	C
SR 45 S of SR 445	5,086	4,704	3,113	-33.8%	C	B
SR 45 N of SR 445	9,784	10,555	3,107	-70.6%	E	B
SR 45 W of Breeden Rd	11,631	12,524	5,194	-58.5%	E	C
SR 45 NE of Harmony Rd/Garrison Chapel Rd	15,407	16,025	8,602	-46.3%	E	D
SR 45 NE of W Leonard Springs Rd	15,407	14,913	10,037	-28.4%	E	A
SR 45 SW of Curry Pike/ S Leonard Springs Rd	19,849	17,770	12,537	-29.5%	E	A
SR 45 SW of SR 37	19,849	26,421	24,861	-5.9%	A	A
SR 37 S of Victor Pike	19,500	22,979	22,966	-0.1%	A	A

Sources: State Road traffic counts from INDOT website for year 2007
I-69 Corridor Travel Demand Model for year 2030 traffic

The traffic data in **Table 5.6-1** includes current (year 2007) ADT and forecasted year 2030 ADT and LOS for both the No-Build Condition and the Build Alternative. The traffic volumes forecasted for the design year 2030 are shown on **Figure 5.6-1** (p. 5-237) for the No-Build Condition and **Figure 5.6-2** (p. 5-238) for the Build Alternative.

Forecasted traffic volumes on all state highways that cross or parallel the Section 4 corridor would be reduced under the Build Alternative as compared to the future No-Build Condition. The most substantial traffic reductions would occur along SR 45, particularly for the segment of SR 45 between the SR 445 intersection in Greene County and Harmony Road/Garrison Chapel Road in Monroe County. Traffic in 2030 along this segment of SR 45 would be reduced by about 7,300 VPD to 7,500 VPD (about -50% to -70%) under the Build Alternative as compared to the No-Build Condition. Traffic reductions are also forecasted to carry into the more developed area along SR 45 from Harmony Road/Garrison Chapel Road to SR 37. Volume reductions of about 5,000 VPD (about -30%) are expected southwest of Curry Pike/Leonard Springs and a 6.0% reduction (about 1,500 VPD) is forecasted near the SR 37 junction. A considerable amount of this traffic reduction is due to traffic that would divert from SR 45 to I-69.

Other segments of SR 45, SR 45/SR 58, and SR 45/SR 54 in Greene County would have traffic reductions under the Build Alternative ranging from about 800 VPD to 1,500 VPD lower (about -22% to -41%) than the future No-Build Condition. SR 54 and SR 445 would experience minimal future traffic reductions under the Build Alternative. Forecasted traffic volumes on segments of these two state highways would generally be less than 100 VPD lower (about -0.4% to 7.0%) under the Build Alternative as compared to the No-Build Condition. Forecasted traffic on SR 37 immediately south of the new interstate would generally be unchanged under the Build Alternatives.

Level of Service (LOS) is quantitative measure describing the performance of a road based on its function. It is not a simple measure of traffic volume or congestion. More generally, these calculations attempt to reflect a driver's expectations about what constitute "reasonable" driving conditions, and differ in many material respects between urban and rural areas. In rural areas, which include most of the state highways and local roads in the Section 4 corridor, LOS D or worse is considered to be undesirable traffic flow conditions.[3] Rural state highways that would operate under LOS D or worse conditions for the 2030 No-Build Condition are:

- SR 45/SR 58 east of CR 200 E (LOS D).
- SR 45/SR 54 along their common alignment on the southeast side of Cincinnati (LOS D).
- SR 54 west of SR 445 (LOS D).
- SR 45 from SR 445 to W. Leonard Springs Road (LOS E).

Consistent with the traffic volume reductions discussed above, the segment of SR 45/SR 58 east of CR 200E would have a beneficial traffic impact, improving from LOS D under the No-Build Condition to LOS B under the Build Alternatives. The common route of SR 45/SR 54 southeast of Cincinnati would also be impacted beneficially with the LOS D under the No-Build Condition improving to LOS C under the Build Alternatives. SR 54 west of SR 445 would operate at an undesirable LOS D for both the future No-Build Condition and the Build Alternative with no significant change in forecasted traffic volumes.

The substantial traffic reductions along SR 45 between SR 445 in Greene County and Harmony Road/Garrison Chapel Road in Monroe County would also result in beneficial traffic impacts. The segment of SR 45 north of SR 445 in Greene County would improve from LOS E under the future No-Build Condition to LOS B for the Build Alternative. The segment of this state highway beginning in Greene County and continuing to Breeden Road in Monroe County would improve from LOS E under the future No-Build Condition to LOS C for the Build Alternative. This improvement in traffic flow is a result of the diversion of SR 45 traffic to I-69.

The easternmost segment of SR 45 which is still classified as a rural highway runs from Breeden Road to Leonard Springs Road outside of Bloomington. This segment would improve from LOS E under the future No-Build Condition to a still undesirable LOS D for the Build Alternative; traffic volumes would be reduced by about 7,300 VPD (-58%) under the Build Alternatives as compared to the future No-Build Condition.

[3] INDOT Design Manual Part 5 Road Design Volume II, Tables 53-1 through 53-9 specifies design criteria for rural and urban roads. The minimum level of service for rural freeways, arterials, and collectors is "C" with a desirable level of service of "B," and for freeways, arterials, and collectors in urban areas the minimum acceptable level of service is "D" with a desirable level of service of "C."

Beginning at W. Leonard Springs Road and continuing eastward into Bloomington, the classification of the area through which SR 45 runs changes from rural to urban. In moving from a rural area to a more dense urban area, driver expectations differ as do the guidelines for determining levels of service. SR 45 from W. Leonard Springs Road northeast to Curry Pike/S. Leonard Springs Road would operate under undesirable LOS E for the 2030 No-Build Condition. (In urban areas LOS D is considered the minimum acceptable level, while LOS E or worse is considered to be undesirable traffic flow conditions.) However, due to the reduction in traffic volumes on SR 45 resulting from the diversion of traffic to I-69, the level of service on these urban segments are forecasted to improve from a LOS E to a LOS A.

It should be noted that in traffic models, the delineation between rural and urban settings is quite precise and often follows federal roadway classifications. However, a driver on SR 45 probably would not note any appreciative differences in traffic levels or traffic congestion when crossing between an "urban" area and a "rural" area at S. Leonard Springs Road. Any apparent capacity deficiencies identified from this high-level, five-county analysis does not determine that any corrective action (such as adding roadway capacity) is needed. Rather, more detailed, roadway-specific capacity studies would be required to make such determinations.

Overall, there would be no adverse traffic flow impacts for state highways that cross or parallel the Section 4 corridor under the Build Alternatives.

Most of the local roads (county roads and residential streets) in the Section 4 project area would continue to have low traffic volumes and all would operate at uncongested traffic flow conditions in the year 2030. All local roads would operate at LOS A for the future No-Build Condition except:

- Rockport Road north of Koontz Road (LOS B).
- Victor Pike west of SR 37 (LOS B).
- Victor Pike east of SR 37 (LOS B).
- Church Lane east of Victor Pike (LOS B).

Many of the local roads would experience traffic volume increases under the Build Alternative; however, all local roads, would continue to operate at LOS A, except:

- Rockport Road north of Koontz Road (LOS B).
- Victor Pike west of SR 37 (LOS B).
- Victor Pike east of SR 37 (LOS C).
- Church Lane east of Victor Pike (LOS C).

The changes in traffic flow conditions from LOS B (future No-Build Condition) to LOS C (Build Alternative) for Victor Pike east of SR 37 and Church Lane east of Victor Pike are not adverse traffic impacts, as LOS B and LOS C are not congested operating conditions. Overall, there would be no adverse traffic flow impacts under the Build Alternative for local roads located within or near the Section 4 corridor.

5.6.3.2 Access

Levels of Service at Interchange Intersections

All of the Section 4 alternatives would have interchanges at SR 45, Greene/Monroe County Line, and SR 37. The SR 45 and Greene/Monroe County Line interchanges would have at-grade intersections at their ramp terminals with their respective intersecting state highway. **Table 5.6-2** and **Table 5.6-3** present the 2030 turning movement volumes and level of service analysis (LOS) for morning (AM) and afternoon (PM) peak hours for intersections associated with these interchanges.

The SR 45 interchange would have a standard rural-diamond configuration. This configuration would establish two new at-grade intersections at the ramp terminal junctions with SR 45. The northbound and southbound exit ramps from I-69 would be controlled by a stop sign at their junction with SR 45. Traffic movements along SR 45 at these two intersections would be uncontrolled. All alternatives would use the interchange shown in **Figure 5.6-3** (p. 5-239).

As shown in **Table 5.6-2** and **Table 5.6-3**, the eastbound approach (northbound I-69 to SR 45) would have LOS "B" for the PM left and right turn movements. All other traffic movements at the two new intersections would operate at LOS "A." No congested traffic movements would occur at the SR 45 interchange intersections.

The Greene/Monroe County Line interchange would have a three-leg rural-trumpet configuration. The northbound and southbound exit ramps for this interchange merge to form a new approximate 1 mile 2-lane roadway that intersects SR 45 near the current SR 45/SR 445 signalized intersection. This roadway, herein known as the South Connector Road, would have an at-grade intersection with SR 45/SR 445. Alternatives 1 and 4 would use the interchange shown in **Figure 5.6-4** (p. 5-240). Alternatives 2 and 3 would use the interchange shown in **Figure 5.6-5** (p. 5-241). The westernmost portion of the South Connector Road, including the SR 45/SR 445 intersection, would have the same design for all alternatives.

The proposed at-grade intersection was analyzed with a two-way stop controlled configuration with free-flowing movement along SR 445 and the connector road and the SR 45 approaches stop controlled. As shown in **Table 5.6-2** and **Table 5.6-3**, this configuration would operate at acceptable LOS C or higher. The northbound and southbound SR 45 through movements would have the highest delay with a LOS C; however, the higher volume through movements on SR 445 and the connector road would operate at LOS A. No congested traffic movements would occur at this intersection.

The two-way stop controlled configuration adequately addresses the needs of this intersection from a traffic standpoint; however, there are safety considerations that should also be examined. This will be the first traffic control a driver will come upon after exiting from the freeway. Providing a four-way stop would give the driver a clear indication that they are leaving a high-speed, access controlled facility for the lower speed facilities of Greene County. Therefore, the proposed intersection was also analyzed with a four-way stop controlled configuration. As shown in **Table 5.6-2** and **Table 5.6-3**, the eastbound and westbound approaches have the higher volumes and would experience the highest delay with a LOS B. Overall, the intersection would

perform at an acceptable LOS B. No congested traffic movements would occur with this intersection configuration either.

Both the two- and four-way stop conditions would provide an acceptable level of service for the proposed new intersection. The traffic control at this intersection will be more thoroughly analyzed during the design phase of the project and determined at that time.

The SR 37 interchange would have a design configuration that includes high-speed ramps for the major traffic movements (southbound I-69 to southbound SR 37 and northbound SR 37 to northbound I-69). Lower speed ramps would be used for the minor traffic movements (northbound I-69 to southbound SR 37 and northbound SR 37 to southbound I-69). All of the Section 4 alternatives would use the same configuration with only minor differences due to the I-69 mainline approach from the south (see **Figure 5.6-6**, p. 5-242 and **Figure 5.6-7**, p. 5-243).

Various design configurations were considered for the SR 37 interchange during the early engineering development. Some of the design configurations would result in the closing of the existing at-grade signalized intersection on SR 37 at Victor Pike or construction of a grade separation on Victor Pike over SR 37. Those alternative configurations, however, were discarded due to an adverse effect upon the Stipp-Bender historic property, potential adverse impacts for limestone quarry trucks using Victor Pike for access to SR 37, potential accessibility and economic impacts for businesses located in Robinson Industrial Park, and other impacts to nearby businesses using the existing SR 37/Victor Pike intersection.

A turning movement and LOS analysis was performed for the SR 37/Victor Pike intersection with the SR 37 interchange. As shown in **Table 5.6-2** and **Table 5.6-3**, this intersection would have a future LOS C for both the eastbound and westbound approaches on Victor Pike during the AM peak hour and a LOS B for the eastbound approach on Victor Pike during the PM peak hour. All other approaches, in both the AM and PM peak hours, would have a future LOS A. Those levels of service are acceptable and the intersection would operate with an overall future LOS A for both the AM and PM peak hour traffic conditions under all of the Section 4 alternatives.

Table 5.6-2: Ramp Terminal Intersection Capacity Analysis - AM Peak Hour (Year 2030)

CROSSROAD INTERSECTIONS	EB Approach			WB Approach			NB Approach			SB Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SR 45 Interchange (Standard Diamond Interchange Configuration)												
	NB Ramps						SR 45					
Peak-Hour volume	23	--	2	--	--	--	--	37	75	2	89	--
Number of Lanes*	1 LR	--	0	--	--	--	--	1 TR	0	0	1 LT	--
LOS	A	--	A	--	--	--	--	♦	♦	A	♦	--
	SB Ramps						SR 45					
Peak-Hour volume	--	--	--	50	--	0	6	54	--	--	41	71
Number of Lanes*	--	--	--	1 LR	--	0	0	1 LT	--	--	1 TR	0
LOS	--	--	--	A	--	A	A	♦	--	--	♦	♦
County Line South Connector Road/SR445 at SR 45 (SR 45: North-South)												
	SR 445			South Connector Road			SR 45					
Peak-Hour volume	85	217	2	24	96	0	3	57	94	0	47	45
Number of Lanes*	1	1 TR	0	1	1 TR	0	0	1 LT	1	0	1 LT	1
LOS (2-way stop)	A	♦	♦	A	♦	♦	--	C	B	--	C	A
LOS (4-way stop)	B			A			A			A		
Overall LOS (4-way)	B											
SR 37 at Victor Pike (Traffic Signal)												
	Victor Pike						SR 37					
Peak-Hour volume	57	12	6	6	23	167	17	1078	13	114	455	87
Number of Lanes*	0	1LTR	0	0	1LTR	0	1	2 TR	0	1	2 TR	0
LOS	C			C			A			A		
Overall LOS	A											

LR=shared lane for left/right turns *LT=shared lane for left turns/thru movements* ** "0" denotes shared lane.*
TR=shared lane for thru movements/right turns *♦ Movement is free flowing.*

Table 5.6-3: Ramp Terminal Intersection Capacity Analysis - PM Peak Hour (Year 2030)

CROSSROAD INTERSECTIONS	EB Approach			WB Approach			NB Approach			SB Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SR 45 Interchange (SR 45: North-South)												
	NB Ramps						SR 45					
Peak-Hour volume	62	--	5	--	--	--	--	52	53	0	98	--
Number of Lanes*	1 LR	--	0	--	--	--	--	1 TR	0	0	1 LT	--
LOS	A	--	A	--	--	--	--	♦	♦	A	♦	--
	SB Ramps						SR 45					
Peak-Hour volume	--	--	--	54	--	2	2	112	--	--	44	26
Number of Lanes*	--	--	--	1 LR	--	0	0	1 LT	--	--	1 TR	0
LOS	--	--	--	A	--	A	A	♦	--	--	♦	♦
County Line Connector Road/SR445 at SR 45 (SR 45: North-South) - Preferred												
	SR 445			South Connector Road			SR 45					
Peak-Hour volume	50	99	3	91	207	0	2	49	22	0	45	57
Number of Lanes*	1 L	1 TR	0	1 L	1 TR	0	0	1 LT	1 R	0	1 LT	1 R
LOS (2-way stop)	A	♦	♦	A	♦	♦	--	C	A	--	C	B
LOS (4-way stop)	A			B			A			A		
Overall LOS (4-way)	B											
SR 37 at Victor Pike (Traffic Signal)												
	Victor Pike						SR 37					
Peak-Hour volume	86	21	14	11	16	95	6	576	7	155	1005	64
Number of Lanes*	0	1LTR	0	0	1LTR	0	1	2 TR	0	1	2 TR	0
LOS	B			A			A			A		
Overall LOS	A											

LR=shared lane for left/right turns *LT=shared lane for left turns/thru movements* ** "0" denotes shared lane.*
TR=shared lane for thru movements/right turns *♦ Movement is free flowing.*

Local Road Access

With construction of I-69 as a limited access facility, many local roads would be severed by the new right-of-way and closed, relocated, or have a grade separation (overpass structure) to go over or under the new roadway. It would also be necessary, in certain locations, to construct short segments of roadway to provide access to properties whose access would be cut off by the new right-of-way. It is important to note that some access roads may not be necessary based on final land acquisition analysis. It may be more cost-effective and appropriate to landlock a parcel and acquire the entire property than to provide an access road. Final decisions concerning access roads and grade separations would be made during the detailed design and right-of-way acquisition.

Several proposed grade separations were presented in the DEIS and at the Public Hearing with an option to close the local road and eliminate the crossing. As described below, in Greene County the grade separations which were presented as optional are Dry Branch Road and Mineral-Koleen Road. In Monroe County the grade separations which were presented as optional are Burch Road, Evans Lane, Harmony Road, and Bolin Lane. Alternatives for closure of the local road could include maintaining access with additional access roads. Following the distribution of the DEIS, comments were received from the public and additional coordination was done with local transportation officials regarding proposed access. These public comments and the additional local transportation input were included in the continuing coordination that occurred with the Access Committee following the DEIS. Relevant Access Committee information and local access decisions can be found in **Appendix Z**, *Documentation of Local Access Decisions*.

The following paragraphs discuss the treatment of the local road access in the Section 4 corridor. **Figures 5.3-6** through **5.3-9** (pp. 5-138 through 5-161) show the alignments for the proposed alternatives. These figures include the proposed locations of interchanges, grade separations, access roads, and road closings associated with each alternative, as they were shown in the DEIS. **Figure 5.3-10** (pp. 5-162 through 5-167) shows Refined Preferred Alternative 2 and includes the access revisions made during the preparation of the FEIS. Additionally, the SR 45 interchange is shown in **Figure 5.6-3** (p. 5-239) (Alternatives 1, 2, 3, 4, and Refined Preferred Alternative 2), the Greene/Monroe County Line interchange is shown in **Figure 5.6-4** (p. 5-240) (Alternatives 1 and 4) and **Figure 5.6-5** (p. 5-241) (Alternatives 2 , 3, and Refined Preferred Alternative 2), and the SR 37 interchange is shown in **Figure 5.6-6** (p. 5-242) (Alternative 1) and **Figure 5.6-7** (p. 5-243) (Alternatives 2, 3, 4, and Refined Preferred Alternative 2).

Five access roads were required for the alternatives in the DEIS. **Table 5.6-4** has been modified to include two additional access roads which are included in Refined Preferred Alternative 2. Access Road 1 would be required for Refined Preferred Alternative, and Alternatives 2 and 3. Access Roads 2 through 5 would be developed at the same location for each of the alternatives. Access Roads 6 and 7 are included in Refined Preferred Alternative. The total length of access roads is approximately 3,450 feet for Alternatives 1 and 4 and 4,450 feet for Alternatives 2 and 3. Refined Preferred Alternative 2 has a total length of access roads of 4,550 feet.

Table 5.6-4: Description of Proposed Access Roads

Access Road (AR)	Description	Length (feet)	Length (miles)
AR 1	Proposed in the DEIS. On the north side of I-69, this road would connect CR475E with Taylor Ridge Cemetery. **Refined Preferred Alternative 2, and Alternatives 2 and 3**	1,000	0.19
AR 2	Proposed in the DEIS. On the north side of I-69, this road would realign the intersection connection between Pine Road (west leg) and Spruce Road (north leg) in the Clifty Hills Subdivision. **Alternatives 1, 2, 3, and 4**	1,250	0.24
AR 2a (revised)	Included in Refined Preferred Alternative 2 only in the FEIS. AR 2 as contained in the DEIS will be replaced by a modification of the existing cul-de-sac at the south end of Spruce Road. The new cul-de-sac will be constructed slightly north of the existing one with a new connection to Pine Road in the Clifty Hills Subdivision. **Refined Preferred Alternative 2**	150	0.03
AR 3	Proposed in the DEIS. On the south side of I-69, west of SR 45, a short access road is needed to provide access to two properties because of the limited access right-of-way associated with the I-69/SR 45 Interchange. **Refined Preferred Alternative 2, and Alternatives 1, 2, 3, and 4**	100	0.02
AR 4	Proposed in the DEIS. On the south side of I-69, this road connects CR 1250E to SR 54. CR 1250E would be closed on the north side of I-69 so this road provides north-south connectivity between communities on either side. **Refined Preferred Alternative 2, and Alternatives 1, 2, 3, and 4**	1,300	0.25
AR 5	Proposed in the DEIS. On the south side of I-69 and the east side of SR 54 this road provides access to several properties whose current access would be cut off by the construction of I-69. **Refined Preferred Alternative 2, and Alternatives 1, 2, 3, and 4**	800	0.15
AR 6	Included in Refined Preferred Alternative 2 only in the FEIS. On the north side of I-69, east of SR 45, a short access road is needed to provide access to two properties because of the limited access right-of-way associated with the I-69/SR 45 interchanges. **Refined Preferred Alternative 2**	150	0.03
AR 7	Included in Refined Preferred Alternative 2 only in the FEIS. On the south side of I-69, this road reconnects Glenview Drive to Bolin Lane. This road provides access from Glenview Drive to Bolin Lane along a modified alignment that retains the current connection to Wheaton Court. **Refined Preferred Alternative 2**	1,050	0.20

Grade separations would be constructed at various locations where I-69 would cross existing state highways and local roads. At some locations, local roads may be closed or relocated using an access road. **Table 5.6-5** summarizes state highway and local road access (overpasses, interchanges, road relocations, and road closures) for the alternatives and has been modified to include the recommendations of the Refined Preferred Alternative. Some local access differs from the local access identified in the DEIS, as well as recommended for the Tier 1 study and the Alternatives Carried Forward (See Chapter 3, Table 3-26, *Alternatives*). Decisions on the local access described below and shown in **Table 5.6-5** were made based upon the detailed engineering development of the highway, traffic volumes, travel patterns, comments and input from the public (including school bus and emergency vehicle access), resource and local agency comments, potential impacts, and costs. Final recommendations of local access are made in this Final EIS based on public comments, resource and local agency comments, and cost.

A summary of the state highway and local access is as follows. Unless otherwise noted, local access would be the same for all Section 4 alternatives.

CR 200E: This road was proposed to be grade separated at I-69 in the DEIS. However, public comments, including those from emergency responders, noted the road is less frequently traveled than the adjacent CR 215 E. While CR 200E provides north-south connectivity between CR 600S, north of the I-69 corridor, and SR 58, south of the I-69 corridor, it ends at CR 600S which does not provide adequate connectivity to CR 300E and areas north of the corridor. CR 215E

was recommended as providing better connectivity to the unincorporated community of Scotland, the Crane NSWC West Gate, and the WestGate @ Crane Technology Park.

- Refined Preferred Alternative 2 in the FEIS closes CR 200E at I-69 since there will be an overpass built at CR 215E approximately one-quarter mile to the east and an interchange built one mile to the west of this location. Traffic currently utilizing CR 200E for north-south travel is expected to divert to CR 215E and/or CR 400E.

CR 215E: The DEIS proposed that this road would be closed at the I-69 right-of-way. During Section 4's public involvement process, comments were received asking that the overpass shown at CR 200E be moved one-quarter mile to the east to CR 215E.

- Refined Preferred Alternative 2 in the FEIS includes a grade separation to provide connectivity between CR 300 E and areas north of I-69, with SR 58, the unincorporated community of Scotland, the Crane NSWC West Gate, and the WestGate @ Crane Technology Park.

CR 600S: This road would be closed at the I-69 right-of-way in both the DEIS and FEIS. A planned overpass at CR 215E is located approximately 1.25 miles west of the I-69/CR 600S crossing. The CR 215E grade separation would provided access to CR 600S from the west and CR 400E would continue to provide access to CR 600S on the east side of I-69.

Taylor Ridge Road: This road follows CR 440E, a short segment of CR 450S, and CR 475E. Taylor Ridge Cemetery is located along the north side of CR 450S just west of CR 475E.

Under Alternatives 2 and 3 in the DEIS, the mainline of the new highway would diagonally cross Taylor Ridge Road (from southwest to northeast) in the proximity of the existing CR 475E/CR 450S intersection (See **Figure 5.6-8**, p. 5-244). The new highway would close CR 440E and CR 450S. **Access Road 1** would maintain travel between CR 475E and CR 450S (west of CR 475E) and the current access to Taylor Ridge Cemetery. While CR 475E would not be closed, continuity of travel along CR 440E and CR 450S would be terminated. North-south travel in this area would require the use of other local roads including a combination of CR 500E, CR 650S, CR 600E and CR 260S to the east of the closed roads or a combination of CR 200E, CR 600S, CR 275E, CR 300E, and CR 410E to the west of the closed roads. The closing of CR 450S would also require the use of alternative local roads in the area south of the interstate highway for east-west travel.

Alternatives 1 and 4 in the DEIS would result in the closing of CR 475E at both the I-69 north and south rights-of-way (See **Figure 5.6-8**, p. 5-244). No changes to CR 440E, CR 450S, or access to Taylor Ridge Cemetery would occur under these alternatives. The same roads described for Alternatives 2 and 3 for north-south travel to the west would be used for Alternatives 1 and 4. North-south travel to the east would follow CR 450S and CR 600E. East-west travel along CR 450 S would not be affected by Alternatives 1 and 4.

- Refined Preferred Alternative 2 in the FEIS closes Taylor Ridge Road as described by Alternatives 2 and 3 above (See **Figure 5.6-8**, p. 5-244). Public comments from the Bloomfield School Corporation requested additional consideration for improvement of CR

475E due to steep grades along this road. The steep grades could prevent school bus access during inclement winter weather. To address these school bus travel concerns, Taylor Ridge Road would be paved by Greene County from the Plummer Creek Bridge to a point approximately 1.08 miles south of the bridge. An agreement between INDOT and Greene County is required.

CR 600E: This road would be grade separated in both the DEIS and the FEIS, maintaining north-south connectivity between Koleen and areas south of the I-69 corridor. I-69 would pass over CR 600E in conjunction with the Black Ankle Creek bridge crossing.

CR 400S: This road extends as a dead-end road to the east of CR 600E. In both the DEIS and the FEIS, CR 400S would be closed east of CR 600E and the right-of-way would be absorbed by the new highway.

Dry Branch Road (CR 750E and 900E): This road could be grade separated, maintaining north-south connectivity between Koleen and areas south of the I-69 corridor. I-69 would pass over Dry Branch Road in conjunction with the bridge crossing at the Dry Branch of Plummer Creek. Dry Branch Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Dry Branch Road based on public involvement, resource and local agency comments, and cost. If the determination is to remove the roadway-crossing portion of this grade separation, Dry Branch Road would terminate at I-69.

- Refined Preferred Alternative 2 in the FEIS includes a grade separation at Dry Branch Road.

Mineral-Koleen Road (CR 360S and CR 880E): Mineral-Koleen Road could be grade separated, maintaining north-south connectivity between Koleen and areas southeast of the I-69 corridor. I-69 would pass over Mineral-Koleen Road in conjunction with the bridge crossing of Plummer Creek. Mineral-Koleen Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Mineral-Koleen Road based on public involvement, resource and local agency comments, and cost. If the determination is to remove the roadway-crossing portion of this grade separation, Mineral-Koleen Road would terminate at I-69.

- Refined Preferred Alternative 2 in the FEIS includes a grade separation at Mineral-Koleen Road.

Spruce Road, Pine Road and Cedar Road: These are residential roads in the Clifty Hills Subdivision that merge as a three-way intersection with Spruce Road on the north leg, Cedar Road on the south leg, and Pine Road on the west leg of the intersection. The construction of I-69 would cut off the current intersection. **Access Road 2** as presented in the DEIS, would be constructed to maintain the connection between Spruce Road and Pine Road just north of the interstate right-of-way. Cedar Road would be closed. Properties that are accessed from Cedar Road would be acquired and existing residences would be relocated.

- Refined Preferred Alternative 2 in the FEIS includes a revised Access Road 2. AR 2 as proposed in the DEIS will be replaced in the FEIS by a modification of the existing cul-de-

sac at the south end of Spruce Road. The new cul-de-sac will be constructed slightly north of the existing one with a new connection to Pine Road.

Old Clifty Road (CR 920E and CR 975E): Old Clifty Road would be closed at the I-69 right-of-way in both the DEIS and the FEIS. North-south travel across I-69 in this area can be provided by Mineral-Koleen Road (about one mile to the west) and SR 45 (about 1.5 miles to the east). CR 415S provides access between Old Clifty Road and Mineral-Koleen Road south of the corridor. CR 400S/CR 425S provides access between Old Clifty Road and SR 45 south of the corridor. CR 275S/CR 300S provides access between Old Clifty Road and SR 45 north of the corridor.

SR 45: This state highway would have an interchange with I-69 (see **Figure 5.6-3**, p. 5-239) in both the DEIS and the FEIS. North-south connectivity along this major collector road would be maintained. Access to SR 45 would not be permitted within approximately 500 feet of the ramp terminals of the interchange. **Access Road 3** would be built on the west side of SR 45 to the south of I-69 to provide access to two residential properties.

- Refined Preferred Alternative 2 in the FEIS also includes Access Road 6 which would be built on the east side of SR 45 to the north of I-69 to provide access to one residential property and one undeveloped parcel.

CR 1250E: This road would be closed at the north right-of-way for I-69 for both the DEIS and the FEIS. In order to maintain north-south connectivity between Owensburg (to the south) and Hobbieville (to the north), CR 1250E south of I-69 would be relocated and connected to SR 54 via **Access Road 4** (see **Figure 5.6-9**, p. 5-245). The new access road would extend CR 1250E approximately 0.20 miles to the east and establish a new intersection with SR 54 on the south side of I-69.

- Refined Preferred Alternative 2 in the FEIS includes Access Road 4 as presented in the DEIS.

SR 54: In both the DEIS and the FEIS, this state highway would have a grade separation at I-69 and north-south travel along this major collector road would be maintained (see **Figure 5.6-9**, p. 5-245). No access to I-69 would be provided. **Access Road 5** is proposed to extend east from SR 54, on the south side of I-69, to provide access to properties whose current access would be terminated by the construction of I-69.

- Refined Preferred Alternative 2 in the FEIS includes Access Road 5 as presented in the DEIS.

Hobbieville Road (CR 1260E and CR 190S): Hobbieville Road would pass over I-69 in both the DEIS and the FEIS. Local travel between Eastern Greene County and Southwestern Monroe County/Northwestern Lawrence County would be maintained.

CR 35N: This road continues into Monroe County as Carmichael Road. It would be grade separated in both the DEIS and the FEIS. Local travel between Eastern Greene County and Southwestern Monroe County would be maintained.

CR 100N/CR 150N: This is an east-west road that continues into Monroe County as Carter Road.

CR 100N/CR 150N would remain open within Greene County under Alternatives 2 and 3 in the DEIS. A grade separation with the South Connector Road over CR 100N/CR 150N would be constructed to maintain travel within Greene County. CR 100N/CR 150N would, however, be closed at the Greene/Monroe County line and travel to/from Monroe County via Carter Road would be terminated.

Under Alternatives 1 and 4 in the DEIS, CR 100N/CR 150N would be closed at the west right-of-way of I-69. Greene County properties located east of I-69 that are currently accessed by CR 100N/CR 150N would require access through Monroe County via Carter Road. Emergency services and school buses from Greene County would be required to use CR 35N in Greene County and Carmichael Road, Rock East Road, Breeden Road, and Carter Road in Monroe County for access to the properties located east of the mainline alignment for Alternatives 1 and 4.

- Refined Preferred Alternative 2 in the FEIS includes a grade separation for CR 100N/CR 150N at the South Connector Road; however, it would be closed at the Greene/Monroe County Line as presented by Alternative 2 in the DEIS.

SR 45/SR 445 Intersection: The DEIS and the FEIS alternatives both include reconstructing this existing three-way, signalized intersection as a four-way unsignalized intersection (see **Figure 5.6-4**, p. 5-240 and **Figure 5.6-5**, p. 5-241). The existing radius on SR 45 will be modified to accommodate the new intersection with SR 445 and the South Connector Road, which would become the fourth leg of this intersection. SR 445 will also be relocated to the south to tie-in perpendicularly with SR 45 south of the existing intersection.

The proposed at-grade intersection was analyzed with both a two-way and four-way stop controlled configuration. The two-way stop condition would have the free-flowing movement on the SR 445 and South Connector Road approaches and stop controls on the SR 45 approaches. This configuration would operate at acceptable LOS C or higher with the major through movements along SR 445/South Connector Road operating at LOS A. The four-way stop configuration would perform at an acceptable LOS B for the overall intersection level of service.

While, the two-way stop controlled configuration adequately addresses the needs of this intersection from a traffic standpoint, there are safety considerations that should also be examined. For example, this will be the first traffic control a driver will come upon after exiting from the freeway. Providing a four-way stop would give the driver a clear indication that they are leaving a high-speed, access controlled facility for the lower speed facilities of Greene County. The traffic control at this intersection will be more thoroughly analyzed during the design phase of the project and determined at that time.

Carter Road: This Monroe County road continues west into Greene County as CR 150N. Carter Road would be closed along the I-69 east right-of-way under Alternatives 2 and 3 (see **Figure 5.6-5**, p. 5-241). This road closure would be near the Greene/Monroe County line. Carter Road would not be impacted by Alternatives 1 and 4 (see **Figure 5.6-4**, p. 5-240).

- Refined Preferred Alternative 2 in the FEIS closes Carter Road at the I-69 right-of-way, near the Greene/Monroe County Line as presented by Alternative 2 in the DEIS (see **Figure 5.6-5**, p. 5-241).

Breeden Road: This road would be grade separated to maintain north-south travel in both the DEIS and the FEIS.

Burch Road: This road could be grade separated to maintain north-south travel. If a grade separation is constructed, the curved alignment of Burch Road would be realigned, but this would not affect property access for those properties located outside of the proposed I-69 right-of-way. Burch Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Burch Road based on public involvement, resource and local agency comments, and cost. If the determination is to remove this grade separation and terminate the road at I-69, north-south travel across I-69 in this area can be provided by Breeden Road (to the west) and Rockport Road (to the east).

- Refined Preferred Alternative 2 in the FEIS includes a grade separation at Burch Road. DEIS comments were received from Monroe County and the Van Buren Township first responders proposing an EMS only access ramp from Burch Road to I-69. Final determination to include an EMS only access ramp to Burch Road will be made during the project design phase.

Evans Lane: This is a short (0.3 mile long) dead-end road serving approximately 16 properties south of I-69. A grade separation was proposed in the DEIS to maintain access to these properties. Evans Lane was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Evans Lane based on public involvement, resource and local agency comments, and cost. If the determination is to remove this grade separation and terminate the road at I-69, properties that are accessed from Evans Lane would be acquired and existing residents would be relocated.

- Refined Preferred Alternative 2 in the FEIS does not include a grade separation at Evans Lane. Properties that are currently accessed from Evans Lane would be acquired and existing residents would be relocated.

Harmony Road: This road could be grade separated to maintain north-south travel. Harmony Road was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Harmony Road based on public involvement, resource and local agency comments, and cost. If the determination is to

remove this grade separation and terminate the road at I-69, north-south travel across I-69 in this area can be provided by Breeden Road (to the west) and Rockport Road (to the east).

- Refined Preferred Alternative 2 in the FEIS includes a grade separation at Harmony Road.

Rockport Road: This road would be grade separated to maintain north-south travel in both the DEIS and the FEIS.

West Evans Road: This is a dead-end road that extends east and west of Rockport Road. In both the DEIS and the FEIS, the portion of West Evans Road to the west of Rockport Road would be removed by the I-69 right-of-way. East of Rockport Road, access to West Evans Road would be maintained.

Lodge Road: This is a dead-end road that extends south of Rockport Road and then, after crossing the I-69 corridor, turns east. Lodge Road provides access to approximately 16 properties. A grade separation would be constructed in both the DEIS and the FEIS, to maintain access to these properties.

Tramway Road: This road would be grade separated to maintain east-west travel in both the DEIS and the FEIS.

Bolin Lane: Bolin Lane could be grade separated to maintain connectivity from two subdivisions to both Rockport Road to the west and Victor Pike to the east. Bolin Lane was also identified as a possible closure in the Section 4 Tier 2 DEIS and Public Hearing with a recommendation to construct this grade separation or close Bolin Lane based on public involvement, resource and local agency comments, and cost. If the determination is to remove this grade separation Bolin Lane would terminate at I-69.

- Refined Preferred Alternative 2 in the FEIS includes a grade separation at Bolin Lane.

Farmers Drive: Farmers Drive is a residential street in the Farmers Field Acres Subdivision that intersects Bolin Lane from the north. None of the Section 4 Tier 2 DEIS alternatives would have closed the Farmers Drive to Bolin Lane connection. Several comments were received regarding Section 4 DEIS figures that showed a connection between Farmers Drive and Stansifer Lane to the north. The comments noted that there currently is no connection from Farmers Drive to Stansifer Lane. Further investigation and contact with Monroe County Highway Department officials determined that the connection was a planned and funded Monroe County project. This planned project will improve connectivity in the project area. There would be no impacts to Farmers Drive under any build alternative.

Crop Circle: Crop Circle is a residential street in the Farmers Field Acres Subdivision that intersects Bolin Lane from the north. Crop Circle would be closed at the west right-of-way for Alternative 1 but would remain open at Bolin Lane for Alternatives 2, 3, and 4.

- Refined Preferred Alternative 2 in the FEIS allows Crop Circle to remain open to Bolin Lane.

Glenview Drive: Glenview Drive is a residential street in the Rolling Glen Estates subdivision that intersects Bolin Lane from the south. The Section 4 Tier 2 DEIS recommended that Glenview Drive be closed at the east right-of-way for Alternatives 2, 3, and 4, but remain open at Bolin Lane for Alternative 1.

- Refined Preferred Alternative 2 in the FEIS includes Access Road 7 which reconnects Glenview Drive to Bolin Lane. This road provides access from Glenview Drive to Bolin Lane along a modified alignment that retains the current connection to Wheaton Court.

Wheaton Court: Wheaton Court is a residential street in the Rolling Glen Estates subdivision that connects to Glenview Drive. The Section 4 DEIS showed in error that the connection to Glenview Drive would be severed by Alternatives 2, 3 and 4.

- Refined Preferred Alternative 2 in the FEIS corrects this error and includes Access Road 7 which reconnects Glenview Drive to Bolin Lane and maintains the intersection of Glenview Drive and Wheaton Court.

SR 37: An interchange would be constructed at SR 37 (see **Figure 5.6-6**, p. 5-242 and **Figure 5.6-7**, p. 5-243) in both the DEIS and the FEIS.

- In response to comments received from local planning officials, consideration was given to an interim design for the SR 37/I-69 interchange. In the interim between the completion of Section 4 and the completion of Section 5, a temporary signalized "T" intersection would be constructed at SR 37, Section 5.6.3.3 – SR 37 Interim Traffic Conditions discusses this further.

Victor Pike: This road intersects SR 37 with an at-grade, signalized intersection just south of the SR 37 interchange. The SR 37/Victor Pike intersection would not be affected by the I-69 project.

Big Sky Lane: This is an existing residential access road on the west side of SR 37 with an at-grade crossing just north of the SR 37 interchange. The existing at-grade crossing would be closed and the four residences currently using Big Sky Lane for access to SR 37 would be displaced under any alternative.

That Road: In both the DEIS and the FEIS, the current at-grade crossing (and access) of That Road at SR 37 would be closed at the I-69 right-of-way. On the east side of I-69, however, a Frontage Road would extend That Road north to connect with Rockport Road. The proposed Frontage Road would be developed by Section 5 (see **Figure 5.6-6**, p. 5-242 and **Figure 5.6-7**, p. 5-243).

- An interim signalized "T" intersection will be constructed at the junction of I-69 and SR 37. The interim intersection would enable That Road to remain open at SR 37 until such time as the full SR 37 interchange and Section 5 improvements are constructed. Although the intersection of That Road and SR 37 currently operates safely, further analysis of the intersection is recommended to ensure the safety of future operations. The additional traffic introduced by I-69 Section 4 will make it difficult to cross SR 37 at unsignalized locations,

and given its proximity to Rockport Road, That Road is not a good candidate for signalization. Non-essential conflicting traffic movements could be eliminated to ensure safety for the movements that are preserved. However, removal of movements must be weighed against adverse travel that may result, particularly pertaining to access to/from the schools along That Road east of SR 37. Section 5.6.3.3 – SR 37 Interim Traffic Conditions further discusses the interim conditions at this intersection as well as alternative treatments that could be considered.

Table 5.6-5: Proposed Local Access – Grade Separations, Interchanges, Road Closures, and Road Relocations by Alternative

State / County Roads	County	Alternatives				
		Refined Preferred Alternative 2	1	2	3	4
CR 200E	Greene	Close	Overpass	Overpass	Overpass	Overpass
CR 215E	Greene	Underpass	Closed	Closed	Closed	Closed
CR 600S	Greene	Closed	Closed	Closed	Closed	Closed
CR 440E	Greene	Closed	Not Affected	Closed	Closed	Not Affected
CR 450S	Greene	Closed	Not Affected	Closed	Closed	Not Affected
CR 475E	Greene	Closed	Closed	Closed	Closed	Closed
CR 600E	Greene	Underpass	Underpass	Underpass	Underpass	Underpass
CR 400S	Greene	Closed	Closed	Closed	Closed	Closed
CR 750E/CR 900E (Dry Branch Road)	Greene	Underpass*	Underpass or Close	Underpass or Close	Underpass or Close	Underpass or Close
CR 360S/CR 880E (Mineral-Koleen Road)	Greene	Underpass*	Underpass or Close	Underpass or Close	Underpass or Close	Underpass or Close
Spruce Road-Pine Road	Greene	Relocated - Connected (AR 2 Rev.)	Relocated - Connected (AR 2)	Relocated - Connected (AR 2)	Relocated - Connected (AR 2)	Relocated - Connected (AR 2)
Cedar Road	Greene	Closed	Closed	Closed	Closed	Closed
CR 920E/CR 975E (Old Clifty Road)	Greene	Closed	Closed	Closed	Closed	Closed
SR 45	Greene	Interchange	Interchange	Interchange	Interchange	Interchange
CR 1250E	Greene	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)	North-Closed South-Relocated (AR 4)
SR 54	Greene	Underpass	Underpass	Underpass	Underpass	Underpass
CR 1260E/CR 190S (Hobbieville Road)	Greene	Overpass	Overpass	Overpass	Overpass	Overpass
CR 35N (Carmichael Rd)	Greene	Underpass	Overpass	Underpass	Underpass**	Underpass
CR 100N/CR 150N (Carter Rd)	Greene	Underpass	Closed	Underpass	Underpass	Closed
SR45/SR 445 Intersection	Greene	Relocated	Relocated	Relocated	Relocated	Relocated
Carter Rd (CR 100N/CR 150N)	Monroe	Closed	Not Affected	Closed	Closed	Not Affected

Table 5.6-5: Proposed Local Access – Grade Separations, Interchanges, Road Closures, and Road Relocations by Alternative

State / County Roads	County	Alternatives				
		Refined Preferred Alternative 2	1	2	3	4
Breeden Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass
Burch Road	Monroe	Overpass*	Overpass or Close	Overpass or Close	Overpass or Close	Overpass or Close
Evans Lane	Monroe	Close*	Overpass or Close	Overpass or Close	Overpass or Close	Overpass or Close
Harmony Road	Monroe	Overpass*	Overpass or Close	Overpass or Close	Overpass or Close	Overpass or Close
Rockport Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass
West Evans Road	Monroe	West-Closed East-Not Affected	West-Closed East-Not Affected	West-Closed East-Not Affected	West-Closed East-Not Affected	West-Closed East-Not Affected
Lodge Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass
Tramway Road	Monroe	Underpass	Underpass	Underpass	Underpass	Underpass
Bolin Lane	Monroe	Underpass*	Underpass or Close	Underpass or Close	Underpass or Close	Underpass or Close
Farmers Drive	Monroe	Not Affected	Not Affected	Not Affected	Not Affected	Not Affected
Crop Circle	Monroe	Not Affected	Closed	Not Affected	Not Affected	Not Affected
Glenview Drive	Monroe	Relocated (AR 7)	Not Affected	Closed	Closed	Closed
Wheaton Court	Monroe	Relocated (AR 7)	Not Affected	Closed	Closed	Closed
SR 37	Monroe	Interchange	Interchange	Interchange	Interchange	Interchange
Victor Pike	Monroe	Not Affected	Not Affected	Not Affected	Not Affected	Not Affected
Big Sky Lane	Monroe	Closed	Closed	Closed	Closed	Closed
That Road[4]	Monroe	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)	West-Closed East-Relocate (Section 5 Frontage Road)

** Final determination of local access was based on public involvement, resource and local agency comments, and cost. See **Appendix Z** for more information*
*** Overpass under the Low-Cost Scenario.*

5.6.3.3 SR 37 Interim Traffic Conditions

Due to the tiered approach of the six sections of the I-69 Tier 2 studies and the staging of construction along the 142-mile I-69 improvement, it is recognized that the new freeway in

[4] Table 5.6-5 represents the ultimate recommended access treatment of That Road when SR 37 is upgraded to I-69. The Interim condition, between the completion of I-69 with a northern terminus on SR 37 (Section 4) and completion of the upgrade of SR 37 to interstate standards (Section 5), could include reduced access at SR 37 and That Road. Alternatives at That Road include: retaining the current design, closing the intersection, closing the median to allow only right-in/right-out access, or reconfiguring the median to allow only southbound left-turns.

Sections 1, 2, 3, and 4 will be complete and open to traffic before Sections 5 and 6 are constructed. Additional traffic modeling was performed to evaluate the potential effects that this new link from Evansville to Bloomington will have on the existing SR 37 roadway in and around the City of Bloomington.

The interim traffic condition assumes the following: Tier 2 Sections 1, 2, 3, and 4 are completed for I-69 between Evansville and the southwest side of Bloomington with a northern terminus on SR 37 between Victor Pike and That Road; Sections 5 and 6 are not complete, meaning SR 37 between Bloomington and Indianapolis is not upgraded to a freeway; and the I-69 project between Henderson and Evansville is completed, including an additional Ohio River bridge in Evansville. The interim traffic was projected to the design year 2030 to be consistent with all other Tier 2 forecasts and represent a worst-case scenario, but this should not be construed to mean that Sections 5 and 6 will not be constructed within that timeframe.

Roadway Segments

Table 5.6-6 shows the traffic data for the current (year 2007) ADT and forecasted year 2030 ADT and LOS for the No-Build Condition and Interim Build Condition on segments of SR 37 from Victor Pike up to the Walnut Street interchange. As expected, the new freeway draws additional traffic to SR 37 and the forecasts reflect this with an increase in traffic for the Interim Condition compared to the No-Build. The largest increases in traffic occur between That Road and Rockport Road with a projected 15,260 VPD (about 55%) increase in traffic and between SR 46 and Kinser Pike with a 9,730 VPD (about 53%) increase in volume.

Table 5.6-6: SR 37 Interim Traffic Volumes and LOS

Roadway Section	Current (Yr. 2007)	Year 2030			
		No-Build Traffic		Interim Build Traffic	
	ADT	ADT	LOS	ADT	LOS
SR 37 S of Victor Pike	19,500	22,980	A	18,520	A
SR 37 N of That Road	19,500	27,590	B	42,850	C
SR 37 N of Rockport Road	32,053	27,480	B	40,330	B
SR 37 N of Fullerton Pike	32,053	30,950	B	41,740	C
SR 37 N of W Tapp Road	32,053	39,510	B	49,740	C
SR 37 N of SR 45/W Bloomfield Rd	32,053	46,220	B	52,980	B
SR 37 N of SR 48/ W 3rd Street	40,851	48,870	C	54,380	C
SR 37 N of W Vernal Pike	21,289	44,520	B	51,310	C
SR 37 N of SR 46/SR 45	18,720	18,270	A	28,000	A
SR 37 N of Kinser Pike	17,460	18,040	A	27,850	A
SR 37 N of Walnut Street	33,000	31,430	B	39,650	C

Sources: State Road traffic counts from INDOT website for year 2007
I-69 Corridor Travel Demand Model for year 2030 traffic

Although traffic volumes would increase on SR 37 in the Bloomington area, the existing roadway has additional capacity and is projected to continue to operate at acceptable and even high levels of service. Several segments of SR 37 would have no decrease in level of service including the segments: south of Victor Pike (LOS A); Rockport Road to Fullerton Pike (LOS B); SR 45 to Vernal Pike (LOS B and C); and SR 46 to the Walnut Street Interchange (LOS A). The increased traffic volumes would have slight traffic impacts on several segments of SR 37

where the level of service would decrease from a LOS B to a still acceptable LOS C including the segments: That Road to Rockport Road; Fullerton Pike to SR 45; Vernal Pike to SR 46; and north of the Walnut Street interchange.

Overall the Interim Traffic Model demonstrates that, although traffic volumes would increase, there will be no significant level of service issues on the existing SR 37 roadway segments prior to completion of Sections 5 and 6.

Intersection Analysis

In response to comments received for the DEIS, particularly concerns raised by the Bloomington/Monroe County Metropolitan Planning Organization's (BMCMPO), this FEIS provides additional analysis of the traffic impacts and safety of the existing SR 37 intersections after the completion of Section 4 (and prior to completion of Section 5). This intersection analysis is provided in **Appendix QQ**, *SR 37 Operational and Safety Analysis,* and is presented in three parts, a safety analysis, LOS analysis, and interim recommendations. The study intersections – listed below – include those along SR 37 from Old SR 37 south of Bloomington to Vernal Pike in Bloomington:

- SR 37 & Old SR 37
- SR 37 & Dillman Road
- SR 37 & Victor Pike
- SR 37 & That Road
- SR 37 & Rockport Road
- SR 37 & Fullerton Pike
- SR 37 & Tapp Road
- SR 37 NB & Bloomfield Road
- SR 37 SB & Bloomfield Road
- SR 37/45 NB & 3rd Street
- SR 37/45 SB & 3rd Street
- SR 37/45 & Vernal Pike

The purpose of this study was to identify locations along the SR 37 corridor that currently exhibit high crash frequencies or severities and determine if any safety and/or capacity improvements would be needed to accommodate additional traffic resulting from the completion of Sections 1 through 4 of Interstate 69 south of Bloomington and prior to the completion of I-69 Section 5 upgrading SR 37 to interstate standards through Bloomington.

Safety Assessment

Safety assessments were prepared for each intersection using the analytical methods specified in the Indiana Department of Transportation's (INDOT) Hazard Elimination Program (HEP) and referencing information published by the American Association of State Highway & Transportation Officials in the *Highway Safety Manual*. It should be emphasized that these assessments should not be construed as detailed safety audits and should be used only to

comparatively identify intersections that may have a safety problem and warrant further investigation in the form of a detailed safety audit and engineer's report.

The initial step in the safety assessment was to obtain and summarize five years of crash records (2005 through 2009) to identify the number of crashes at each intersection and to classify crashes by severity (property damage only versus injury/fatality). To appropriately compare intersections and determine if any qualify as high crash locations, the crash amounts were normalized by the volume of traffic entering the intersection from all approaches. This takes into consideration the exposure risk or the potential for crashes (based on actual vehicle interactions). Based on the crash data both an index of crash frequency and an index of crash cost were calculated for each intersection.

An analysis of the indices of crash frequency and crash cost led to the following conclusions:

- The at-grade intersections analyzed along SR 37 have low indices of crash frequency except for SR 37 SB and Bloomfield Road and for SR 37 and Vernal Pike. The intersections at the 3rd Street interchange (with the SR 37 ramps) show moderate indices of crash frequency. A lower index of crash frequency indicates that the number of reported crashes is consistent with the estimated expected crashes.
- Victor Pike and Fullerton Pike have higher indices of crash cost indicating, that the severity of crashes exceeds expectations. These locations are on the threshold of being considered hazardous on this basis and consideration of safety improvements is warranted.
- The significantly higher crash indices at SR 37 SB and Bloomfield Road suggest that safety may be an issue at this location. Closer inspection revealed a surprising number of rear end crashes, including numerous with injuries which may be attributable to large right-turn radii, and an awkward "double" median on the south leg. The large right-turn radii, to/from the north, could be creating driver expectancy of a "free-flow" condition, when in fact these movements are yielding, causing unsuspecting motorists to rear-end motorists that do yield. Actual crash reports should be reviewed in an effort to more accurately pinpoint crashes at these locations before further actions are taken.
- High crash indices were calculated for the intersection of SR 37 with Vernal Pike. Contrary to driver expectations, this signalized intersection is located between two interchanges and along the most heavily traveled section of SR 37. The high traffic speeds along SR 37 in combination with heavy traffic volumes may result in vehicles following too closely, which could increase the severity of a crash should motorists suddenly stop for a changing traffic signal. However, no fatal crashes were reported here. Based on the crash index calculations for intersection of SR 37 and Vernal Pike, it is evident that improvements should be investigated in order to enhance safety.
- Given the nature of SR 37 as a high-speed divided expressway, it is not surprising that a higher than expected proportion of crashes (at select locations) involve injuries. In that regard, opportunities to improve safety should be explored. Adding treatments throughout the corridor such as advanced warning signage/beacons, traffic signal back plates, lighting, improved pavement markings, advanced directional signage, etc. would improve awareness and visibility as drivers approach and pass through intersections.

Level of Service Analysis

Forecasted conditions with respect to safety and traffic operations were evaluated for two horizon scenarios – 2015 and 2020. Both assume Interstate 69 Sections 1 through 4 would be complete south of Bloomington with a northern terminus on SR 37 between Victor Pike and That Road. Traffic operations were evaluated during the AM and PM peak hours of a typical weekday. If intersections can accommodate traffic volumes during these critical time periods, adequate capacity would be available throughout the remainder of the day. Intersection capacity is represented by Level of Service (LOS), which is defined by the average delay incurred by motorists traveling through an intersection. LOS C, normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity and is an appropriate benchmark for peak period traffic conditions in rural areas. Level D is generally considered acceptable for peak conditions in urban areas.

Table 5.6-7 lists the study intersections and the corresponding potential improvements along SR 37. These improvements are based on both the safety assessment and the level of service analysis which were performed.

The intersections of SR 37 and Old SR 37 would operate at an overall intersection LOS B for both the AM and PM peak hours. SR 37 and Dillman Road would operate with approach LOS ranging from LOS A to LOS C. No improvements are recommended at these two intersections.

Based upon the safety assessment, it is recommended that INDOT consider upgrading permissive mainline left-turn movements at the intersection of SR 37 with Victor Pike to protected-only left-turn traffic signal phasing. This improvement would marginally reduce the intersection's efficiency reducing the overall delays from LOS A to LOS B.

Delays on That Road at SR 37 are expected to worsen with LOS E predicted on the westbound approach. The additional traffic introduced by I-69 Section 4 will leave relatively few gaps in the stream of traffic, making it difficult to cross SR 37 safely at unsignalized locations. Moreover, given its proximity to Rockport Road, That Road is not a good candidate for signalization. Therefore, although the intersection currently operates safely, reducing conflicting movements could help ensure safety in the future.

It is recommended that INDOT consider modifying the median on SR 37 at That Road to enable southbound left-turns only, restricting all other left-turn movements and the east-west through movements. The southbound left-turn movement from SR 37 could remain to facilitate access from eastbound Rockport Road to eastbound That Road, which may be vital to preventing increased travel times between schools on That Road and residential areas along Rockport Road to the west. By eliminating high risk eastbound and westbound left-turns and through movements, this alternative would address the most pronounced safety concerns and provide for favorable operations in 2020 with a predicted LOS B. Alternatively, the median could be closed completely to allow only right-in, right-out access at That Road.

Construction of a traffic signal and left-turn lanes on Rockport Road at SR 37 should also be considered based upon the capacity analysis. A significant increase in mainline right turns and

side-street left turns is expected at the intersection of SR 37 and Rockport Road following the completion of I-69. The minor street approaches to the existing unsignalized intersection would have unacceptable LOS F delays, with excessive queues persisting during both peak hours. Providing a left-turn lane on both Rockport Road approaches to the intersection and installing a traffic signal would improve the overall intersection level of service to LOS B with 2020 traffic volumes.

A protected-only left-turn signal phasing at SR 37 and Fullerton Pike is recommended based on an increase in mainline left-turn traffic. Upgrading the permissive mainline left-turn movements to protected-only would eliminate left-turn conflicts with opposing vehicles and improve safety by reducing the incidence of right-angle crashes.

Construction of a second southbound left-turn lane on SR 37 at Tapp Road and the addition of a westbound right-turn overlap signal phase on Tapp Road at SR 37 are recommended for consideration. This is based on a capacity analysis that indicates that significant delays, LOS D on the eastbound and westbound approaches, and lengthy queues would occur with just a single left-turn lane. Furthermore, the PM peak hour traffic projections fall within a range that's appropriate for a second left-turn lane. Similarly, demand for the westbound right-turn movement from Tapp Road onto SR 37 is expected to grow by 2020. A westbound right-turn signal would facilitate more efficient use of the existing westbound right-turn lane, thereby achieving a significant reduction in delay and queuing for that movement.

Access to SR 37, within the access-controlled section between Tapp Road and Vernal Pike, is provided at two grade-separated interchanges – one at Bloomfield Road (SR 45) and one at 3rd Street (SR 48). A capacity analysis at the signalized ramp terminals of both interchanges indicates that they would operate at LOS B overall during peak hours. Therefore, it was determined that each intersection would continue to operate favorably in 2020 without modifications to geometry or traffic control.

The signalized intersection at Vernal Pike is unique in that it's the only at-grade intersection on SR 37 between interchanges at Bloomfield Road, 3rdStreet, and SR 46. Despite heavy traffic volumes, the intersection could operate at LOS D or better during peak hours in 2020 as currently configured. However, to preserve the LOS D threshold for all approaches, the through movements on SR 37 would be subject to frequent stops and lengthy queues. To improve traffic flow it is recommended that adjustments to the signal timing, to favor mainline SR 37, be considered. It is also recommended that certain low-volume movements be prohibited which would achieve a significant reduction in delays and queues, at the expense of reduced access.

The alternative carried forward for further study as part of I-69 Section 5 proposes grade-separation for Vernal Pike[5]. It would also be advantageous to accelerate a grade-separation at Vernal Pike to alleviate delays as well as safety concerns and possible driver expectancy violations. Further analysis is recommended to identify a preferred course of action

[5] See Section 5 Preliminary Alternatives Analysis and Screening Report, available on the I-69 web site at http://www.i69indyevn.org/reports.html. Table 6 on p. 71 of the cited report shows access treatments, including an underpass for Vernal Pike.

at SR 37 and Vernal Pike including a benefit/cost analysis and conducting an update of the turning movement counts to identify the relative importance of the various movements.

Interim Recommendations

The analysis resulted in the following findings:

- Current safety problems in the SR 37 corridor through Bloomington are relatively limited. However, based on current conditions, two intersections (SR 37 & Vernal Pike and SR 37 SB Ramp & Bloomfield Road) warrant further consideration of action.
- The completion of I-69 to the south would not necessarily result in a significant degradation of safety in the SR 37 corridor. Safety and traffic operation concerns related to additional I-69 traffic were generally minor and able to be addressed with minor intersection improvements.

The report recommends that INDOT consider the following investigations and potential improvements to the corridor to minimize the impact of increased traffic and improve traffic flow and safety.

- Implement protected-only left-turn signal phasing for mainline left-turn movements at SR 37 and Victor Pike;
- Install a traffic signal at SR 37 & Rockport Road and add left-turn lanes on the minor approaches;
- Implement protected-only left-turn signal phasing for mainline left-turn movements at SR 37 and Fullerton Pike; and
- Construct a second southbound left-turn lane on SR 37 at Tapp Road and add a westbound right-turn overlap signal phase on Tapp Road at SR 37.
- In view of the current elevated crash severity, perform a detailed safety audit at Bloomfield Road and the SR 37 SB Ramps, including a field visit, review of crash reports and signal timings, sight distance verification, etc. in order to confirm potential countermeasures and address the safety concerns at that location.
- In view of forecast traffic increases and currently moderately elevated crash severity, perform a safety audit of the SR 37 interchange at 3rd Street, including a field visit, detailed review of crash reports, sight distance verification, etc., in order to more clearly identify the nature and cause of the more severe crashes at this location and appropriate countermeasures to address them.
- Given the nature of SR 37 as a high-speed divided expressway, additional opportunities to improve safety should be explored, such as advanced warning signage/beacons, traffic signal back plates, lighting, improved pavement markings, advanced directional signage, etc.
- At That Road and SR 37, conflicting left-turn and through movements on the minor approaches should be eliminated if not necessary to maintain access. Options include retaining the current design, closing the intersection, closing the median to allow only right-

in/right-out access, or reconfiguring the median to allow only southbound left-turns. Further analysis could help identify the most beneficial tradeoff between safety and access.

- Evaluate options for improving the SR37 and Vernal Pike intersection, such as advancing the grade separation of Vernal Pike and eliminating the median opening on SR 37. Alternatively, various minor movements may be eliminated or additional signage may be added in the short term. Some action is warranted based on safety and capacity considerations.

The above analysis and recommendations, and as contained in **Appendix QQ**, *SR 37 Operational and Safety Analysis,* are not final recommendations for the interim condition. No improvements or only minor improvements, such as turn lane modifications or traffic signal optimizations, are recommended for most of the SR 37 intersections and interchanges. The Bloomington/Monroe County MPO and INDOT must concur with the prescribed recommendations and coordinate to complete the recommended follow-up evaluations (e.g., safety audits, counts, benefit/cost analyses). If there is concurrence, a plan of action could reasonably be developed within approximately one year. It is then conceivable that the plan of action could be implemented within approximately three years to coincide with the completion of I-69 Section 4 and ensure that safe and efficient traffic operations are maintained in the SR 37 corridor prior to the completion of Section 5. Any SR 37 intersection improvement that is tentatively recommended in **Appendix QQ** study and which is subsequently advanced to design/construction shall have an appropriate NEPA review performed in accordance with INDOT requirements. It is anticipated that most of the improvements can be processed under NEPA as a Categorical Exclusion. An opportunity for public review will be provided for each project in accordance with INDOT public involvement procedures.

Table 5.6-7: SR 37 Summary of Potential Improvements

Intersection	Potential Improvements
SR 37 & Old SR 37	No improvements
SR 37 & Dillman Road	No improvements
SR 37 & Victor Pike	Add mainline protected left-turn phases
SR 37 & That Road	Modify access & restrict movements
SR 37 & Rockport Road	Signalize and add side-street left-turn lanes
SR 37 & Fullerton Pike	Add mainline protected left-turn phases
SR 37 & Tapp Road	Add second left-turn lane & overlap phase
SR 37 NB & Bloomfield Road	No improvements
SR 37 SB & Bloomfield Road	No improvements
SR 37 NB & 3rd Street	No improvements
SR 37 SB & 3rd Street	No improvements
SR 37 & Vernal Pike	Potential alternatives (See discussion)

Interim SR 37 Interchange

The construction of the full interchange at SR 37 is anticipated to be deferred until construction of the southern portion of the Section 5 upgrade of SR 37 to interstate standards. In the interim

between the completion of Section 4 and the completion of Section 5, a temporary signalized "T" intersection would be constructed at SR 37, see **Appendix PP**, *Interim SR 37 Interchange Design*. This proposed design would provide an immediate lower cost option than construction of the full interchange at SR 37 while providing minimal disruption of traffic during construction. The interim connection would also help facilitate future maintenance of traffic for the full interchange construction. Another advantage of the signalized intersection is that it would serve as an indicator to drivers on the Interstate that they are leaving the access controlled interstate for a lower speed, non-access controlled facility.

A level of service analysis was completed for the Interim SR 37 intersection based on the interim 2030 projected traffic volumes. This analysis indicated that the intersection would operate at acceptable levels of service of B in the morning peak hour and C in the afternoon peak hour. See **Appendix PP** for additional information.

The interim interchange results in a short-term deferral of $17.2 to $18.2 million in construction costs. INDOT intends to purchase the right-of-way for the full build out of the SR 37 interchange regardless of whether the interchange construction is deferred.

5.6.4 Mitigation

During the scoping process, and in meetings with the Community Advisory Committee (CAC), road closures and the provision of adequate access to all sectors of the Study Area for emergency equipment were discussed. As a result of these discussions, local roads that would be closed by I-69 construction and those crossing the facility were carefully selected with input from local officials. In many cases, access roads and grade separations have been provided to avoid land locking properties. The final decision to provide access would be made as a result of the final right-of-way acquisition analysis.

Possible grade separations and road closures proposed for each alternative were presented to the CAC at the conclusion of the selection of Alternatives Carried Forward process. No potential access roads, however, were ever identified for Section 4 at that time. Additional detailed analysis of the access roads, grade separations and road closures was included in the DEIS along with recommendations for treatment which differed from that previously presented to the public. As discussed in Section 5.3.4.2, *Travel Patterns and Local Public Road Connectivity,* based upon the feedback received from regulatory agencies, emergency responders, the public, and Section 4 CAC members, grade separations recommendations between local roads and I-69 have been revised for Refined Preferred Alternative 2 in this FEIS.

5.6.5 Summary

As a result of the construction of the Build Alternatives, traffic volumes on state highways and local roads in the Section 4 Study Area would change as traffic is diverted from these highways to I-69. As part of the analysis, 2030 traffic volumes on 19 segments of the state highways in the Study Area were examined. Forecasted traffic volumes would be reduced on all segments of these state highways under the Build Alternatives as compared to the future No-Build Condition. The greatest traffic volume reductions would occur along SR 45 from SR 445 in Greene County

to Harmony Road/Garrison Chapel Road in Monroe County. Traffic along this segment of SR 45 would be 33.8% to 70.6% lower under the Build Alternatives.

Level of Service was reviewed to identify undesirable or congested traffic flow conditions. No adverse traffic flow impacts would occur along the state highways or local roads in the Study Area under the Build Alternatives. However, beneficial traffic impacts would occur under the Build Alternatives for SR 45 from SR 445 in Greene County to Harmony Road/Garrison Chapel Road in Monroe County, for SR 45/SR 58 east of CR 200E in Greene County, and along the short segment of common route for SR 45/SR 54 southeast of Cincinnati in Greene County. These beneficial impacts would occur where congested conditions under the future No-Build Condition would become uncongested under the future Build Alternatives. A limited beneficial impact would also occur along SR 54 west of SR 445 and SR 45 from Harmony Road/Garrison Chapel Road to Curry Pike in Monroe County under the Build Alternatives.

For the design year 2030, I-69 in Section 4 is forecasted to have average daily traffic ranging from 23,525 VPD to 29,578 VPD and is projected to operate at LOS A from just east of US 231 to SR 37 for the design year 2030. Traffic movements at all intersections associated with the SR 45, Greene/Monroe County Line, and SR 37 interchanges would operate at uncongested conditions during peak traffic hours.

Refined Preferred Alternative 2 includes grade separations at thirteen (13) local roads, SR 45,and SR 54 in order to maintain existing traffic flow. Eleven (11) local roads are proposed to be closed to through access across I-69 with three (3) additional local roads being eliminated by the construction. Seven (7) access roads are also proposed for Refined Preferred Alternative 2 in order to maintain current travel patterns or for property access. Additionally, a frontage road, planned by Section 5, would provide for continuity of travel to the north for That Road to Rockport Road on the east side of I-69.

Additional traffic modeling was performed to evaluate traffic conditions on SR 37 upon completion of I-69 in Sections 1, 2, 3, and 4, prior to upgrading the roadway to a freeway as part of the Section 5 project. The completion of I-69 to the south would not necessarily result in a significant degradation of safety in the SR 37 corridor. Safety and traffic operation concerns related to additional I-69 traffic were generally minor and able to be addressed with minor intersection improvements. It is also recommended that further options be evaluated for improving the SR 37 and Vernal Pike intersection, and safety audits at the SR 37 interchanges with Bloomfield Rd (SR 45) and 3rd Street (SR 48).

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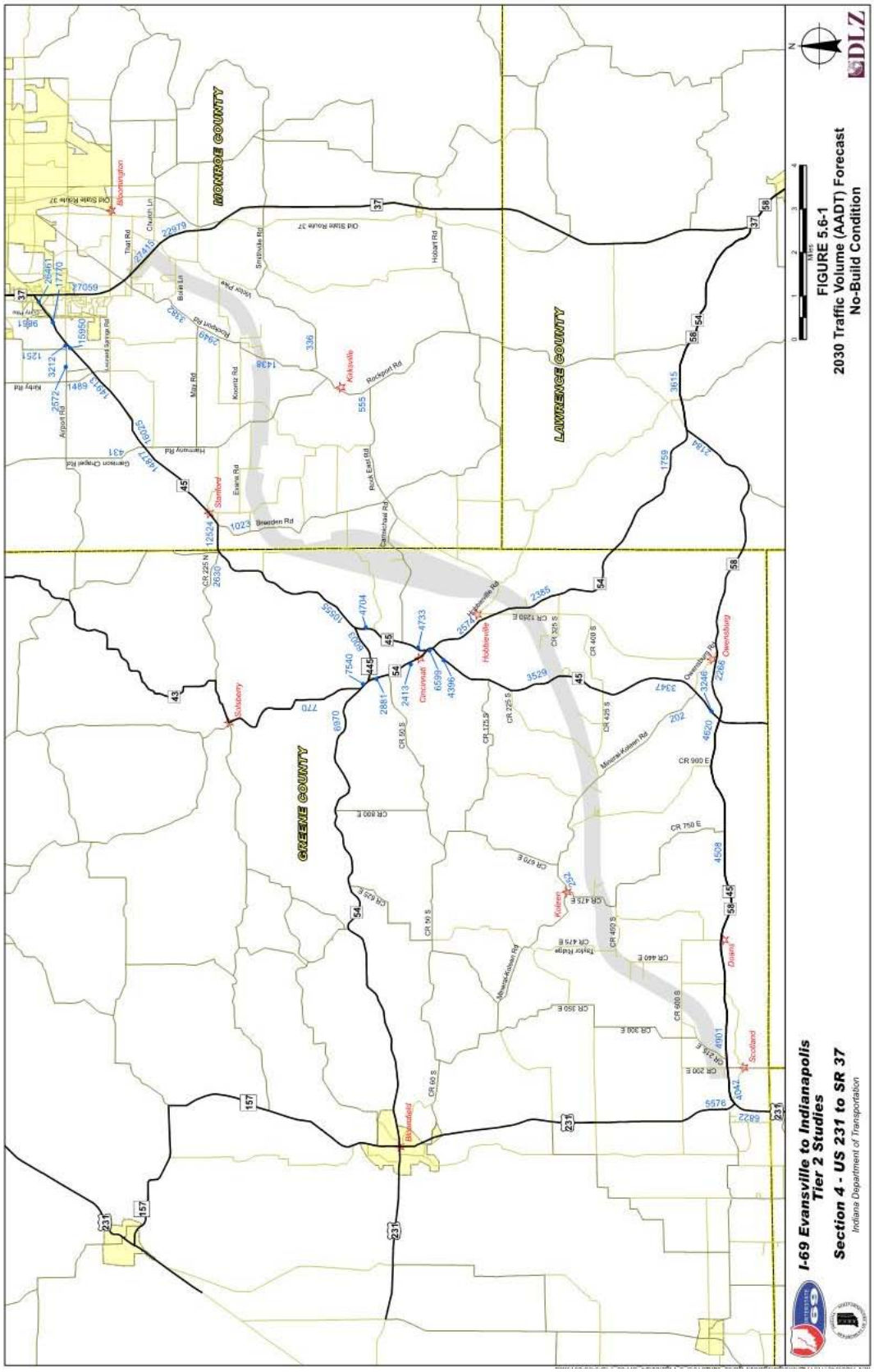
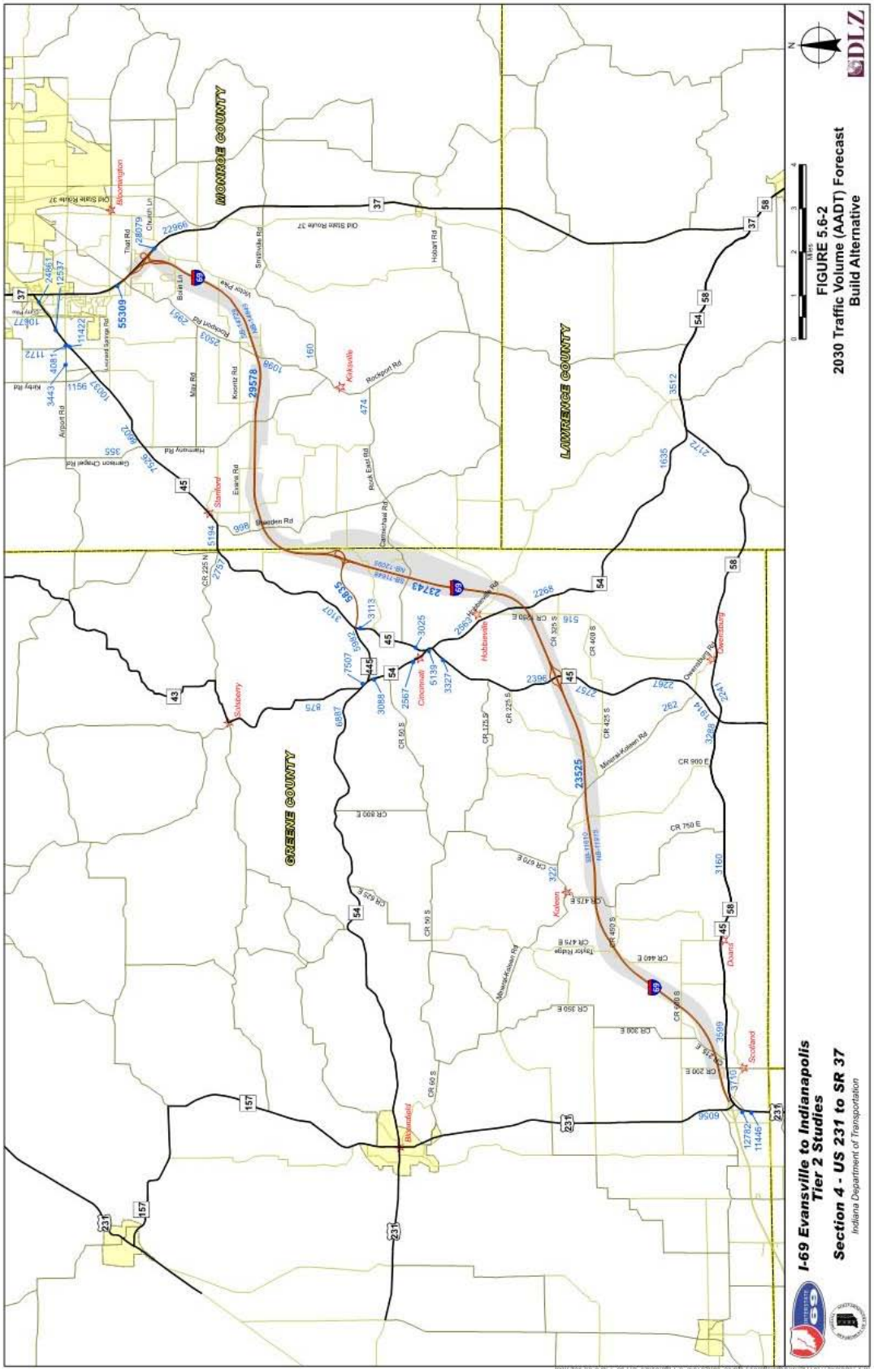
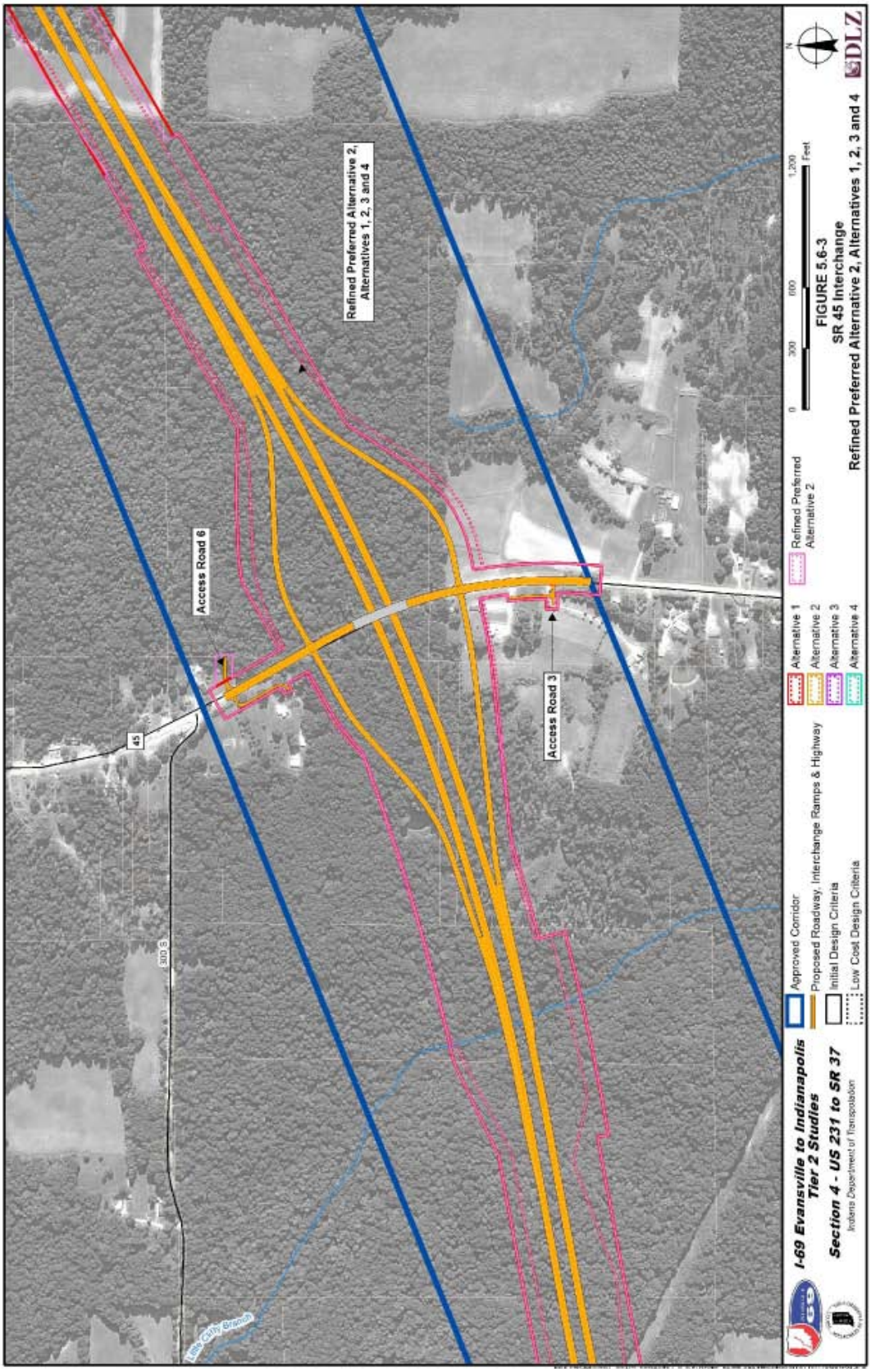
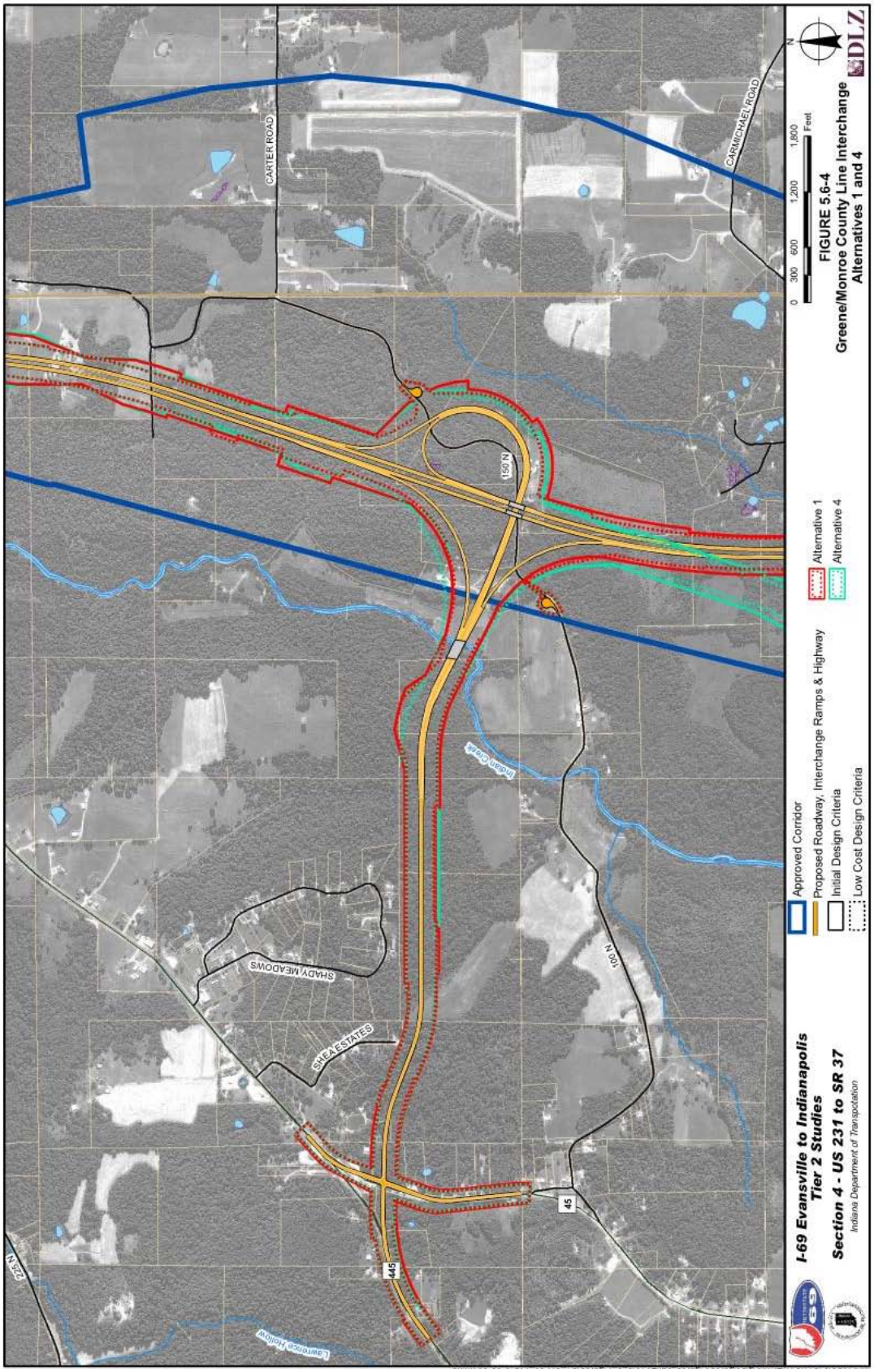

MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Bloomington
Stinesville
Harrodsburg
Smithville
Ellettsville
Stanford
Sulphur
Cincinnati
Hobbieville
Owensburg
Koleen
Dixon
Scotland
Bloomfield
Old State Route 37
Church Ln
Trail Rd
Smithville Rd
Hobart Rd
Kirkwood Rd
Rockport Rd
Airport Rd
Kirby Rd
Max Rd
Koontz Rd
Evans Rd
Breeden Rd
Pluck Eaton Rd
Damschad Rd
Hobbieville Rd
Owensburg Rd
Mineral-Kokomo Rd
Taylor Ridge
CR 225 N
CR 225 S
CR 125 S
CR 60 S
CR 400 S
CR 900 E
CR 750 E
CR 200 E
CR 300 E
CR 350 E
CR 440 E
CR 800 E
CR 625 E
CR 475 E
CR 425 E
CR 175 E
CR 250 E
CR 325 E
CR 400 E
CR 425 E
CR 475 E
CR 575 E
CR 625 E
CR 670 E
CR 800 E
37
45
54
58
43
157
231
FIGURE 5.6-1
2030 Traffic Volume (AADT) Forecast
No-Build Condition
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


MONROE COUNTY
GREENE COUNTY
LAWRENCE COUNTY
Bloomington
Stinesville
Ellettsville
Stanford
Smithville
Hobbieville
Cincinnati
Koleen
Bloomfield
Scotland
Owensville
Oscar
Lyons
Taylor Ridge
Rockport Rd
Bloomington Rd
Airport Rd
Kirby Rd
Matney Rd
Kooms Rd
Evans Rd
Hobbieville Rd
Cincinnati Rd
Koleen Rd
Bloomfield Rd
Owensville Rd
Oscar Rd
Old State Route 37
Hobart Rd
Smithville Rd
Camerhart Rd
Rock East Rd
Hillsboro Rd
Mount Pleasant Rd
Taylor Ridge Rd
Lucas Springs Rd
Thatt Rd
Church Ln
Bass Ln
Victor Pike
Gerrison Chapel Rd
Hemmerly Rd
Bowden Rd
CR 225 N
CR 50 S
CR 125 S
CR 225 S
CR 425 S
CR 400 S
CR 900 E
CR 750 E
CR 475 E
CR 450 S
CR 460 E
CR 350 E
CR 300 E
CR 200 E
CR 100 E
CR 625 E
CR 60 S
CR 325 S
CR 390 E
CR 475 S
Mount Pleasant Rd
Mikes-Koleen Rd
Taylor Ridge Rd
Mikes-Koleen Rd
SR 11810
HB-11810
SR-7208
HB-7208
37
45
54
58
43
445
157
231
69
55309
29578
23743
23525
22966
28079
24861
12537
10677
11422
4081
1172
3443
1156
10937
1099
2951
2503
160
474
3512
1636
2172
355
7536
6802
906
5194
2757
6835
3107
3113
7507
6988
3025
6139
3327
2563
2268
516
2396
2767
2267
262
1914
3288
2241
3160
3599
3709
6058
12792
11446
3089
2567
6887
875
322
2567
2267
2241
Mapping Data © 2010 Tele Atlas, Rel. 9.2
Mapping Data © 2010 Tele Atlas, Rel. 9.2
N
0 1 2 3 4
Miles
DLZ
FIGURE 5.6-2
2030 Traffic Volume (AADT) Forecast
Build Alternative
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation


Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Access Road 6
Access Road 3
45
300 S
Little Crooked Creek
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Approved Corridor
Proposed Roadway, Interchange Ramps & Highway
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0
200
600
1,200
Feet
N
DLZ
FIGURE 5.6-3
SR 45 Interchange
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4


CARTER ROAD
CARMICHAEL ROAD
150 N
Indian Creek
SHADY MEADOWS
SHEA ESTATES
100 N
45
445
225 N
Lamborn Hollow
0 300 600 1,200 1,800 Feet
N
FIGURE 5.6-4
Greene/Monroe County Line Interchange
Alternatives 1 and 4
DLZ
Approved Corridor
Proposed Roadway, Interchange Ramps & Highway
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation

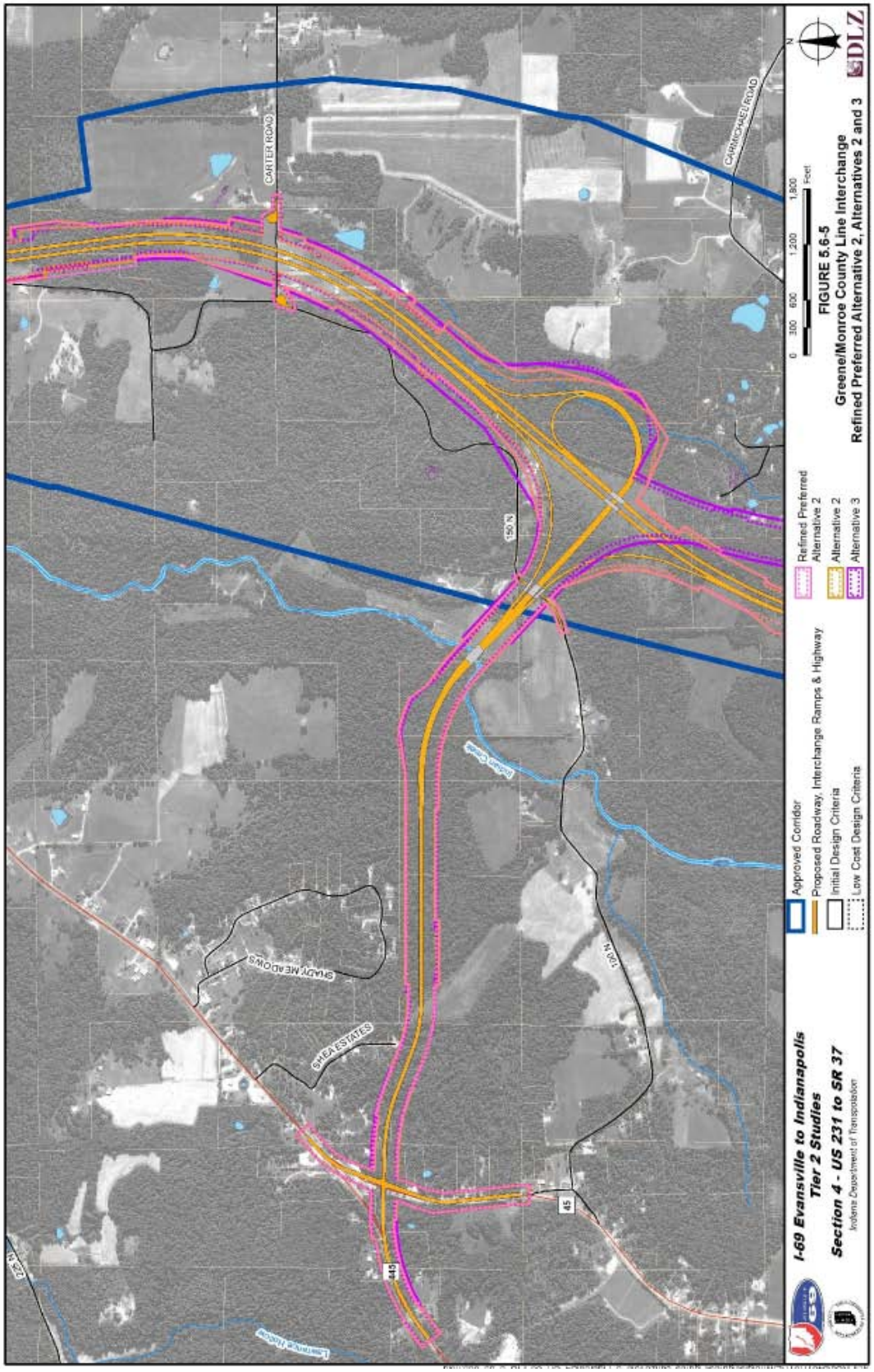
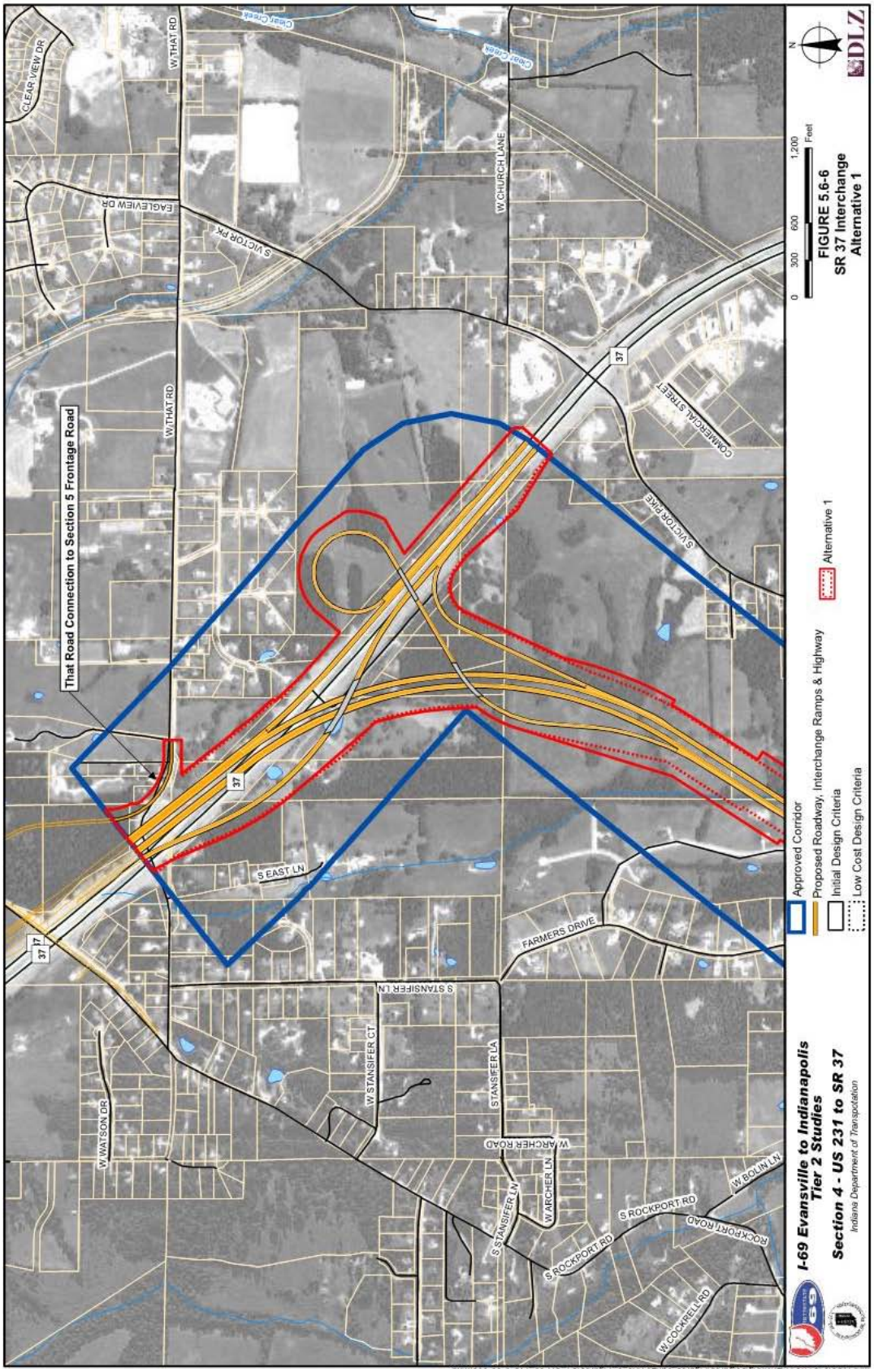
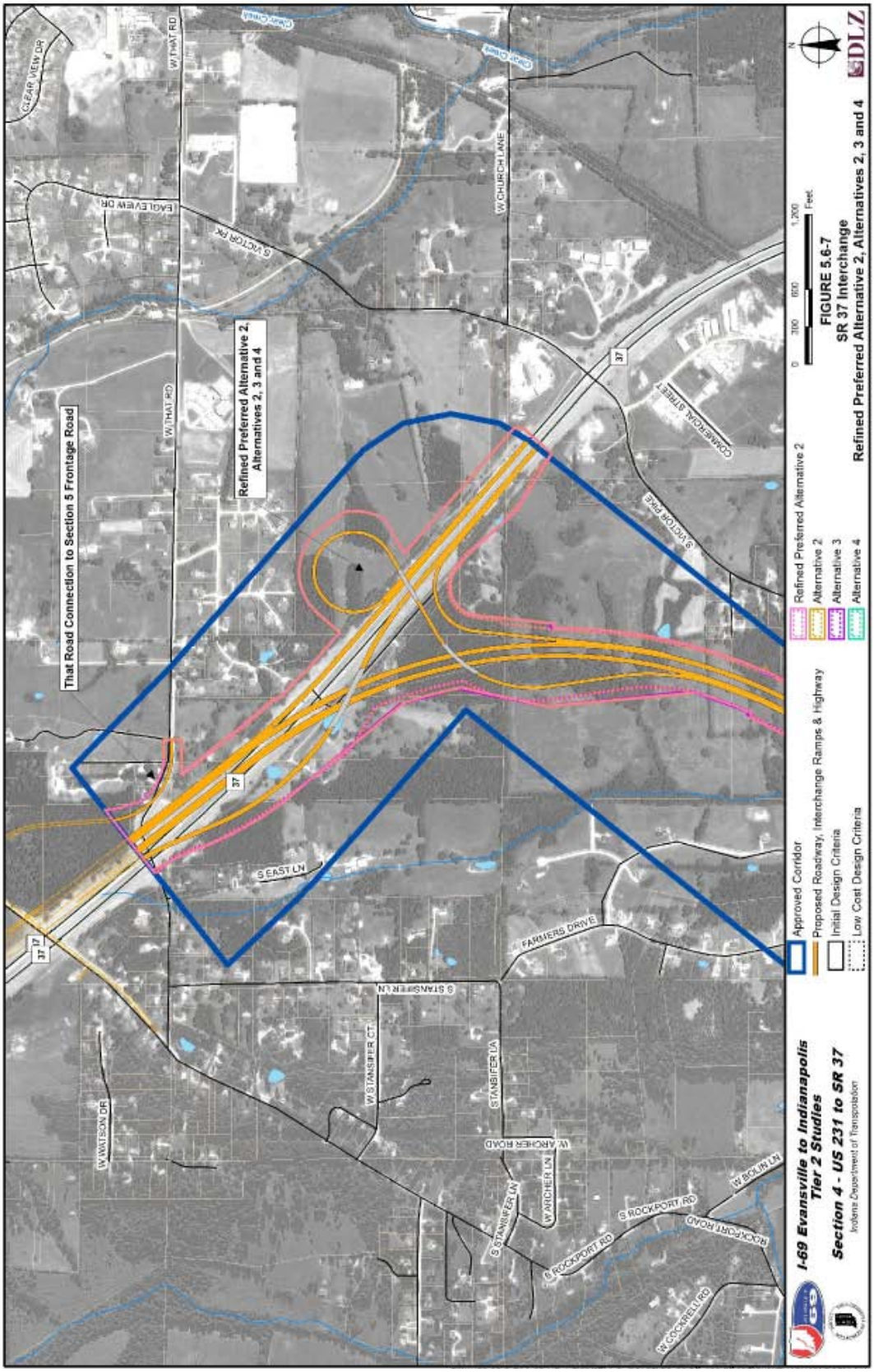
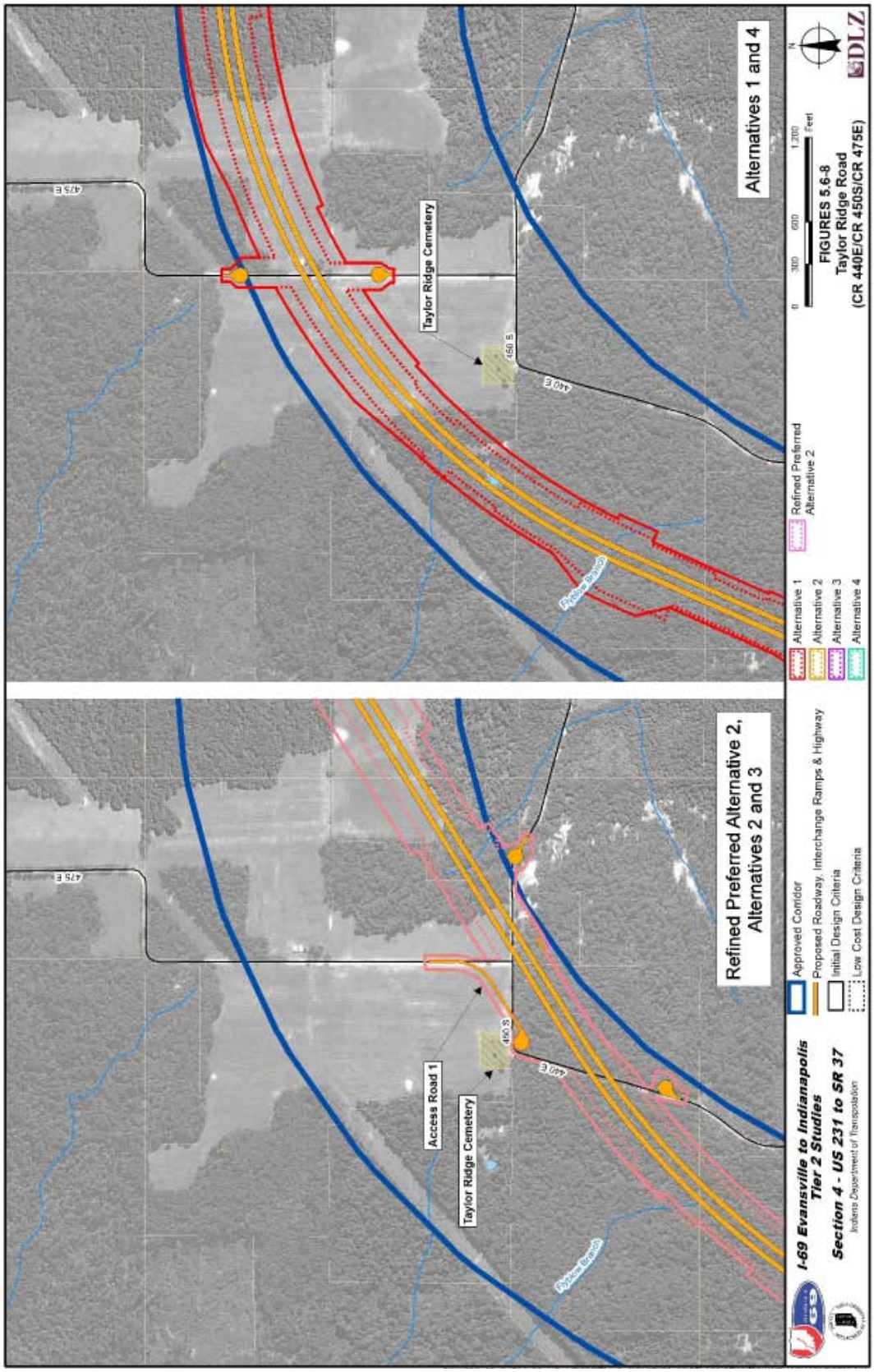
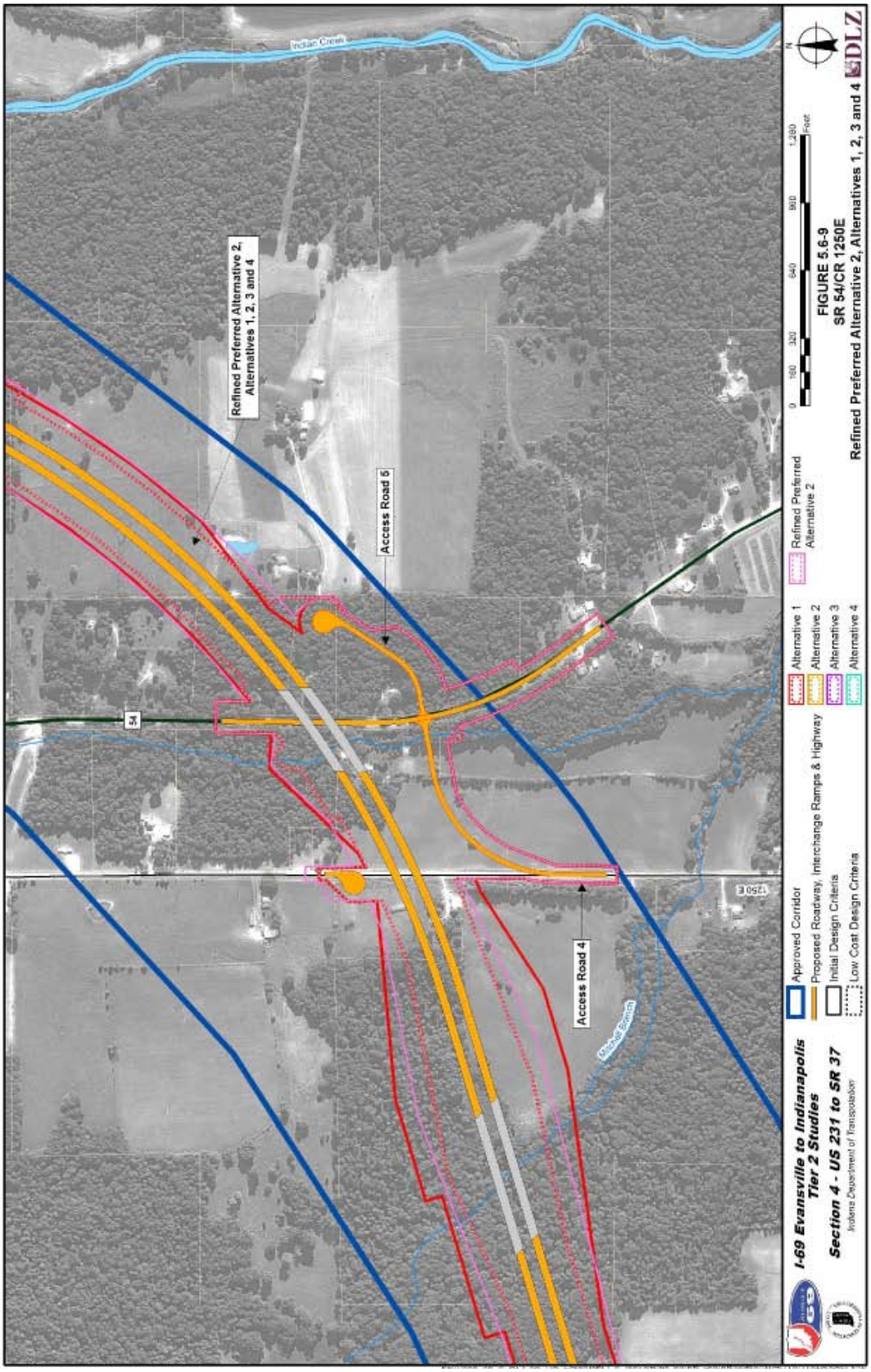


FIGURE 5.6-5
Greene/Monroe County Line Interchange
Refined Preferred Alternative 2, Alternatives 2 and 3


That Road Connection to Section 5 Frontage Road
CLEAR VIEW DR
W THAT RD
EAGLEVIEW DR
S VICTOR PK
Cedar Creek
W CHURCH LANE
COMMERCIAL STREET
S VICTOR PIKE
37
S EAST LN
FARMERS DRIVE
S STANSIFER LN
W STANSIFER CT
STANSIFER LA
W ARCHER ROAD
W ARCHER LN
S STANSIFER LN
S ROCKPORT RD
ROCKPORT ROAD
W BOLIN LN
W COCKRELL RD
W WATSON DR
17
0 300 600 1,200 Feet
FIGURE 5.6-6
SR 37 Interchange
Alternative 1
N
DLZ
Approved Corridor
Proposed Roadway, Interchange Ramps & Highway
Alternative 1
Initial Design Criteria
Low Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation


I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Approved Corridor
Proposed Roadway, Interchange Ramps & Highway
Initial Design Criteria
Low Cost Design Criteria
Refined Preferred Alternative 2
Alternative 2
Alternative 3
Alternative 4
0 300 600 1,200 Feet
FIGURE 5.6-7
SR 37 Interchange
Refined Preferred Alternative 2, Alternatives 2, 3 and 4
DLZ
That Road Connection to Section 5 Frontage Road
Refined Preferred Alternative 2, Alternatives 2, 3 and 4
W THAT RD
EAGLE VIEW DR
CLEAR VIEW DR
G VICTOR PK
W CHURCH LANE
COMMERCIAL STREET
S VICTOR PIKE
S EAST LN
FARMERS DRIVE
S STANSIFER LN
W STANSIFER CT
STANSIFER LN
W ARCHER ROAD
W ARCHER LN
S STANSIFER LN
S ROCKPORT RD
ROCKPORT ROAD
W BOLIN LN
W COCKRELL RD
W WATSON DR
37


Alternatives 1 and 4
Taylor Ridge Cemetery
450 S
440 E
475 E
Pigeon Branch
Refined Preferred Alternative 2
Alternative 1
Alternative 2
Alternative 3
Alternative 4
0 1500 3000 6000 1 200 Feet
FIGURES 5.6-8
Taylor Ridge Road
(CR 440E/CR 450S/CR 475E)
DLZ
Refined Preferred Alternative 2, Alternatives 2 and 3
Access Road 1
Approved Corridor
Proposed Roadway, Interchange Ramps & Highway
Initial Design Criteria
Low Cost Design Criteria
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation


Indian Creek
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Access Road 5
Access Road 4
54
1250 E
Approved Corridor
Proposed Roadway, Interchange Ramps & Highway
Initial Design Criteria
Low Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
0 160 320 640 960 1,280 Feet
FIGURE 5.6-9
SR 54/CR 1250E
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ

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5.7 Visual and Aesthetic Impacts

Since publication of the Draft Environmental Impact Statement (DEIS), the following substantive change has been made to this section:

- Section 5.7.3.2 – Revised discussion about potential roadway lighting.
- **Figure 5.7-10** – Revised figure name.

5.7.1 Introduction

Visual resources of the proposed I-69 include both the "view from the road" and the "view of the road." Impacts to these resources are considered in the design quality, art, and architecture aspects of the project planning. These considerations are particularly important for facilities in sensitive environmental settings.

The construction of I-69 will result in both temporary and permanent visual impacts. Temporary impacts include the sighting of construction equipment and the clearing of areas to construct the highway. These will be mitigated by the control of clearing to the area in the construction limits and quick re-vegetation upon completion of construction. Permanent impacts include the conversion of forests, wetlands, farmland, and rural landscapes to an interstate highway.

5.7.2 Methodology

In an analysis of visual impacts of alternative roadway alignments, consideration is given "aesthetic" appeal as it pertains to both the "view from the road" and "view of the road." "Aesthetics" refers to the visual qualities and scenic nature of an area. The methodology for evaluating visual impacts of the I-69 project in Section 4 followed guidelines set forth in the *Visual Impact Assessment of Highway Projects* handbook (FHWA, 1988).

5.7.3 Background Information

Figure 5.7-1 – Crawford Upland Outcrop

Section 4 is a rural, sparsely developed corridor with a viewshed dominated by forest, occasional farmland (mostly pasture), and scattered residential development. The visual resources of the corridor are characterized by physical features associated with the landform, water, and vegetative resources and, to a lesser extent, developed land uses. The landform of the corridor is consistent with the Crawford Upland and Mitchell Plateau physiographic divisions. The Crawford Upland, which extends east from the south corridor terminus near US 231 to the vicinity of Harmony Road in Monroe County, is an unglaciated, rugged highland with considerable relief and varied elevations. The terrain ranges from nearly level bottomlands to gently/moderately sloping

ridges. Some of the ridges in the Crawford Upland are deeply dissected by stream valleys that have steep to very steep walls. Rock outcrops are present at various locations throughout the Crawford Upland (**Figure 5.7-1**, p.5-247). Many karst features are located along the Greene/Monroe County line and north into Monroe County. Both the lowest point of the corridor (Doans Creek adjacent to the south corridor terminus at elevation 514 feet above mean sea level (AMSL)) and the highest point of the corridor (just east of Harmony Road at 972 feet AMSL) are located within the Crawford Upland.

The Mitchell Plateau is located at the northernmost end of the corridor. This physiographic division is an unglaciated, somewhat flat to rolling plain underlain by Mississippian limestone (**Figure 5.7-2**, p. 5-248). This landform also has some highly dissected areas along streams.

Figure 5.7-2– Mitchell Plateau

Various water features are found throughout the Section 4 corridor. These include riparian wetlands, man-made farm ponds, and streams. Most of the wetlands are emergent though there are some forested wetlands. The main perennial stream within the corridor is Indian Creek which flows from north to south generally along the Greene/Monroe County line (**Figure 5.7-3**, p. 5-248). Many intermittent streams and ephemeral drains occur in the undulating terrain throughout the corridor. Springs can be found at many locations in the corridor with the largest pool spring being Rankin Spring southwest of the unincorporated community of Koleen in Greene County.

Figure 5.7-3 – Indian Creek

Forest is the predominant visual resource of the corridor (**Figure 5.7-4**, p. 5-249). Continuous forest can be found from south of Koleen to SR 45 in Greene County and along most of the Greene/Monroe County line. Forests that are occasionally broken by pasture, small farms, or rural residences extend southwest from Koleen in the area locally referred to as Taylor Ridge. Similar land cover also occurs between SR 45 and to the east of Hobbieville in Greene County, and for most of the corridor in Monroe County. Small woodlots and wooded fencerows situated amid agricultural lands are prevalent near the south corridor limits and at the extreme northern end of the corridor. Vegetation in the corridor is primarily a deciduous upland forest with common trees being oak, hickory, beech, maple, and tulip-popular. Vegetation in the bottomlands and riparian wetlands include box elder, red maple, silver maple, sycamore, sedges and rushes. Except for some row crops in the area between US 231 and Taylor Ridge in Greene County, east of Hobbieville along the Greene/Monroe County line, and at the very north end of

the corridor, most of the agricultural land is pasture that is either mowed for hay production or used for livestock and horse grazing (**Figure 5.7-5**, p. 5-249).

Figure 5.7-4– Typical Forest Land

Figure 5.7-5 – Typical Pasture Land

Developed land uses in the corridor are widely scattered with most being rural residences, rural and suburban subdivisions, and a few farmsteads. There are ten residential subdivisions within and adjacent to the corridor (**Figure 5.7-6**, p. 5-249). These range in overall size from 8 lots (Sierra Hills along Bolin Lane in Monroe County) to 50 lots (Shady Meadows near Cincinnati in Greene County) and have individual lot sizes ranging from 0.25 acres (Victor Heights along Victor Pike in Monroe County) to 32 acres (Clifty Hills in Greene County). The other residences in the corridor are located along state highways and rural roads or on large parcels that are set back from the highways and roads.

Figure 5.7-6 – Monroe County Subdivision

There are only a few commercial businesses within and adjacent to the Section 4 corridor. The greatest concentrations are along SR 45 in the unincorporated community of Cincinnati (**Figure 5.7-7**, p. 5-249) in eastern Greene County and in Monroe County in the vicinity of the SR 37/Victor Pike intersection near the north terminus. There are no incorporated communities within the corridor. Scotland, located south of the south terminus in Greene County, is distantly visible from the corridor across the wide Doans Creek valley near the south corridor terminus. Cincinnati is located

Figure 5.7-7 – SR 45/SR 445 Intersection

at the west terminus of the connector road between SR 45 and the proposed Greene/Monroe County Line interchange. The corridor passes near the unincorporated communities of Koleen and Hobbieville in Greene County, however, these communities are generally not visible from the corridor.

5.7.3.1 View from the Road

Alternatives 1, 2, 3, and 4 either use common mainline alignments or have alignments that are within close proximity to each other. As such, views from the road will generally be similar for each of the alternatives. The Refined Preferred Alternative 2 is a variation of Alternative 2 from the DEIS.

In the visual analysis of the views from the road, three distinct visual characteristics were identified. First, views from the road will be obstructed in many locations due to either the roadway's position and design within the existing terrain and/or the dense adjacent forest. Second, opportunities to view the visual resources of the corridor from the road will primarily only be possible in those areas that have flat to slightly rolling terrain (versus hilly terrain) and less extensive vegetation adjacent to the road. Finally, some panoramic vistas will be created by the road construction at certain locations along the corridor. Unlike close-up views of vegetation, farmland, and the built environment that are possible from existing, slower speed state highways and county roads in the corridor, most views from the road will be distant views.

The rugged terrain combined with the many elevation changes that occur along most of the Section 4 corridor will require numerous cuts and fills to meet geometric design criteria and to balance the overall quantities of earthwork. As such, views from the road will be obstructed by highway sideslopes for considerable distances at many locations. Excavations ranging from 30 feet to over 90 feet will occur in the following areas:

- Immediately east and west of CR 475E in Greene County (Taylor Ridge).
- Just east of CR 600E to Plummer Creek south/southeast of Koleen in Greene County.
- In the area southeast of Hobbieville from just north of SR 54 to just north of CR 1260E/CR 190S (Hobbieville Road) in Greene County.
- In the vicinity of CR 100N (Carter Road) along the west side of the Greene/Monroe County Line.
- Just north of the middle crossing of Indian Creek along the Greene/Monroe County Line.
- East and west of Harmony Road in Monroe County.
- Just east/northeast of Lodge Road in Monroe County.

Landcover in most of these areas is primarily forest. Trees will be removed and the remaining trees will likely only be visible at the upper margins of the cut sections or on the slopes of ridges where the highway crosses narrow valleys and other locations with moderate to substantial fills. With the removal of trees, the viewshed will be replaced by exposed bedrock as the primary view from the road. The exposed bedrock will provide a view of limestone that is a prominent natural and industrial resource in this part of Indiana. Existing SR 37 between Victor Pike and That Road has excavated rock walls that are representative of the deep excavations that may be developed along parts of the future highway (**Figure 5.7-8**, p. 5-251).

In some areas that will have lesser grade excavations, distant views will still be limited by dense vegetation adjacent to the road. These include the area southwest of Taylor Ridge in Greene County, between Plummer Creek and SR 45 in Greene County, south and north of Carter Road along the Greene/Monroe County line, and from just east of Harmony Road to Rockport Road in Monroe County.

Figure 5.7-8 – Exposed Bedrock along SR 37

Between the south corridor terminus to southwest of Taylor Ridge (north of CR 600S) in Greene County and from just north of CR 35N (Carmichael Road) to just south of Carter Road along the Greene/Monroe County line, the highway cuts and fills will generally be less than 20 feet and brief views of the adjacent rolling pastures and woodlots will be visible (**Figure 5.7-9**, p. 5-251). From just south of Tramway Road to SR 37 in Monroe County, the rolling terrain with distant pastures, small woodlots, wooded fencerows, and the beginning of the built environment of the greater Bloomington area will be visible from the road (**Figure 5.7-10**, p. 5-251).

Figure 5.7-9 – Open Rolling Terrain

Figure 5.7-10 –Tributary to Clear Creek

Panoramic vistas provide an aesthetic amenity for highway travel. Some vistas of the surrounding land will be visible while traveling along I-69. The most prominent vista will be the northbound and southbound approaches into the Black Ankle Creek valley where the highway will drop nearly 90 feet onto a bridge that will extend over 1000 feet across the valley. The entire north to south width of the wetland and pasture dominated valley will be visible. Other vistas will occur at:

- The northbound approach across Mitchell Branch in Greene County which will be over 120 feet above the creek and riparian habitat.
- The northbound and southbound approaches at the middle crossing of Indian Creek along the Greene/Monroe County line. Forested and riparian habitats will be visible at this crossing.
- The southbound approach to Breeden Road and a view of the north reach of Indian Creek.

- Northbound travel from Tramway Road toward the rolling terrain on the fringe of the built-up area of southwest Bloomington.

Beginning about one-half mile north of Hobbieville Road in Greene County, the highway will run parallel to Indian Creek for about two miles toward CR 35N (Carmichael Road). In this area, the highway will be from 100 to 150 feet above the adjacent floodplain. Panoramic views from the road to the east down upon the creek, adjacent farm fields, woodlots, fencerows, and farmsteads will be possible.

Another interesting view will be for northbound travel from Harmony Road to the east across Rockport Road and Lodge Road in Monroe County. In this area, the road will be built along an approximate two and one-half mile gradual downgrade with minor amounts of fill above the adjacent terrain. Trees will line the highway for most of this straight, narrow vista with a view toward a wooded hilltop east of Lodge Road.

Figure 5.7-11– Abandoned Limestone Quarry

The two small abandoned quarries near Tramway Road in Monroe County are located in dense forests and are surrounded by piles of remnant dimensional limestone blocks (**Figure 5.7-11**, p.-252). The scattered limestone blocks at the perimeter of the quarry south of Tramway Road may be visible from Alternative 3, especially for southbound travel. This view, however, will be limited by seasonal vegetation and slightly higher elevations between the road and the edge of the quarry. The pool in the quarry will most likely not be visible. The quarry north of Tramway Road will be directly impacted by Alternative 2 (Preferred) and Alternative 4. Remnant limestone blocks are currently being reclaimed at this quarry and its future disposition and visual impacts cannot be determined.

Figure 5.7-12 – Monroe County Farmland

Because of the many cuts and fills and the extensive forested areas, most residences in the corridor will not be visible from the road. Travel between Tramway Road and SR 37 in Monroe County is one area in which the nearby residences will be visible. Views of Rolling Glen Estates and Farmers Field Acres subdivisions and other residences along Bolin Lane and Victor Pike as well as the open pastureland set among these residential areas will be possible in this area (**Figure 5.7-12**, p. 5-252).

The new highway will cross over SR 54 and several of the local roads within the corridor. Brief views of nearby residences located along these crossroads will be possible from the elevated bridges along I-69. Crossovers of the local roads are as follows. These views will be the same for all alternatives except as noted.

- CR 600E in Greene County.
- CR 750E/CR 900E (Dry Branch Road) in Greene County.
- CR 360S/CR 880E (Mineral-Koleen Road) in Greene County.
- CR 35N (Carmichael Road) for Alternatives 2, 3, and 4.
- Breeden Road in Monroe County.
- Rockport Road in Monroe County.
- Lodge Road in Monroe County.
- Tramway Road in Monroe County.
- Bolin Lane in Monroe County.

The commercial businesses near the SR 37/Victor Pike intersection will only be visible from the elevated ramps at the SR 37 interchange. Stillion Sawmill and Fern Hills Club, located west of Rockport Road in Monroe County, will be visible to the south of the mainline alignments. Stipp-Bender Farmstead will be visible from the elevated ramps for the SR 37 interchange. This historic property will not be visible from the mainline alignments. The Maurice Head House will be screened by adjacent residences and wooded parcels and will not be visible from the alternatives including the Preferred Alternative.

The highway will be built in minor (less than 20 feet) cuts and fills in the rolling terrain immediately east of US 231. Near CR 200E, just north of the unincorporated community of Scotland, the highway will primarily be in a cut section. A short fill section will provide a very brief elevated view from the road south across rolling terrain and then the Doans Creek floodplain toward Scotland. The two historic properties in this unincorporated community are not anticipated to be highly visible from the road. The residential and commercial development in the unincorporated community of Cincinnati will be visible from the south Greene/Monroe County line connector road intersection at SR 45.

5.7.3.2 View of the Road

Direct views of the road from adjacent properties for all of the alternatives will be obstructed in many areas. Direct views of the road from most of the residences located in the areas near CR 475E, from just east of CR 600E (east of Black Ankle Creek valley) to near SR 45, and from just east of SR 45 to near CR 1250E (just west of SR 54) in Greene County will be obstructed by the deep excavations required to develop the highway grade and/or by intervening vegetation and terrain. Similar direct visual obstructions from residences due to deep roadway excavations and/or vegetation will also occur from just north of CR 35N (Carmichael Road) to near Breeden Road along the Greene/Monroe County line, and from Evans Lane to Rockport Road and the area from just east of Lodge Road to just south of Tramway Road in Monroe County.

In areas that have a rolling landscape, some direct views of the road from nearby residences will occur for all of the alternatives. These views, however, will still be partially obstructed by minor

highway excavations, vegetation, intervening terrain, and limitations due to distance. Such limited views will occur from just east of US 231 to near Taylor Ridge (north of CR 600S), and from near Breeden Road to near Evans Lane, Rockport Road to just east of Lodge Road, and north of Tramway Road to SR 37 in Monroe County. Except for the area north of Tramway Road, most of these areas have sparse development and thus will only affect a limited number of residences. The many residences located along Bolin Lane and Victor Pike as well as those located in the Sierra Hills, Rolling Glen Estates, Farmers Field Acres, Victor Heights, and Bailey West/Glenview subdivisions north of Tramway Road will have direct views of the road. Also, residents along CR 100N (Carter Road) in Greene County, along SR 45 in Cincinnati, and in the Shady Meadows and Shea Estates subdivisions will have views of the SR 45 South Connector Road for the Greene/Monroe County Line interchange.

Direct views of the road will also occur for all alternatives where CR 200E and Hobbieville Road in Greene County and Burch Road, Evans Lane, and Harmony Road in Monroe County cross the highway. Direct views of the road will occur for users of CR 600E and the few residents located in this area where the highway passes above the Black Ankle Creek valley. Motorist using local roads will also have views from beneath the overhead bridges where the road passes high over Dry Branch Road and Mineral-Koleen Road in Greene County, and Breeden Road, Rockport Road, and Lodge Road in Monroe County. For Alternatives 2 and 3, direct views from beneath the overhead bridge will occur where CR 35N (Carmichael Road) passes under the connector road for the Greene/Monroe County Line interchange.

The SR 45 interchange will be visible for motorists using SR 45 and from nearby residences while the Greene/Monroe County Line interchange will be visible from residences located along CR 150N (Carter Road) in Greene County. Residents located near the SR 37 interchange will have views of this interchange, especially the elevated ramps, for all of the alternatives. The elevated interchange ramps for this interchange will be visible from the Stipp-Bender farmstead, however, this view is not considered to be an adverse effect for this historic property (see Section 5.13, *Historic Impacts*). Both the SR 45 and SR 37 interchanges may have lighting. Any lights installed will be at least 40 feet above the highway in order to avoid collisions between bats and vehicles. Non-diffuse lighting will be used when possible. Details of lighting will be identified during the final design.

During construction, there will be several temporary visual impacts along the eastern portion of the corridor. These include exposed earth, jobsite equipment, and vegetation loss.

The alignment for the Section 4 Refined Preferred Alternative 2 will be developed using the initial design criteria and consideration will be given during the subsequent design phase for use of certain low-cost design criteria as a measure to possibly reduce direct impacts and/or construction costs (See Section 5.1*, Introduction and Methodology*). Potential impacts upon visual resources were determined per the right-of-way and development of Refined Preferred Alternative 2 based upon the initial design criteria. Implementation of some or all of the low-cost design criteria will not change the impacts identified within this chapter.

5.7.4 Mitigation

INDOT's policy is to incorporate context sensitive solutions into the development, construction and maintenance process for improvements to the state jurisdictional transportations system.[1] Section 7.3.6, *Visual Impacts*, summarizes mitigation measures that will be used to address impacts on visual resources. The establishment of context sensitive solutions incorporates accepted effective design practices. Context sensitive solutions (CSS) consider the preservation of historic places, scenic trails, natural environmental enhancement, and community values along with the objectives of mobility, safety, and economics. (See Section 7.2, *Major Mitigation Initiatives*, for details regarding INDOT's policy regarding CSS.)

Context sensitive solutions will be taken into consideration within the project. An example of this may be roadside ditch enhancements with wetland and wildflower plantings. Outside the clear zone,[2] plantings of shrubs and trees may be considered in the project design to help screen the roadway for nearby residents. In addition, non-diffuse lighting will be considered, where appropriate.

INDOT will address visual and aesthetic resource issues in greater detail through continuing consultation with local groups and/or communities during the design phase.

5.7.5 Summary

Section 4 is a rural and sparsely developed corridor. It is dominated by rolling to rugged terrain with extensive areas of forest. Pasture is the primary agricultural use and is generally located at the south and north ends of the corridor. Several streams, including Indian Creek, flow through the corridor. While development is generally sparse, there are many rural residences, some farmsteads, and a few subdivisions, especially at the north end of the corridor.

Visual impacts will occur, however, views from the road will be greatly limited by the roadway's position and design within the existing terrain and/or dense vegetation. Numerous excavations, some of which may be greater than 90 feet below the existing ground, will be required to meet geometric criteria and thus will result in many visual barriers for views from the road. In areas that have rolling terrain, views of the adjacent landscape will be possible, though vegetation, intervening terrain, and distance will limit such views. Some panoramic vistas will be created along the road, especially at the crossing of the Black Ankle Creek valley near Koleen in Greene County.

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[1] Context sensitive solutions (CSS) is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist.

[2] A clear zone is the unobstructed, relatively flat area provided beyond the edge of the traveled way. The clear zone is intended to allow errant vehicles to stop or maneuver without striking any fixed objects. The clear zone includes any shoulders and auxiliary lanes.

Due to the extensive amount of excavation that will be needed along most of the road, views of the road from adjacent residences will also be limited. The road will be visible from residences in the area north of Tramway Road in Monroe County. It will also be visible at certain locations that have rolling terrain and from the bridges that pass over the road. The elevated ramps at the SR 37 interchange will be visible from the Stipp-Bender farmstead, however, this view is not considered to be an adverse effect for this historic property.

Mitigation measures will be implemented to reduce impacts. Such measures will include context sensitive solutions.

5.8 Title VI / Environmental Justice

Since the Draft Environmental Impact Statement (DEIS), there have been no substantive changes to this section.

5.8.1 Introduction

All federal agencies must comply with Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The Executive Order states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects, including social and economic effects, on Minority Populations and Low-Income Populations." Pursuant to Executive Order 12898, FHWA has adopted FHWA Order 6640.23, FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, December 2, 1998. In terms of transportation policy, environmental justice contains three fundamental principles:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations;
- To ensure the full and fair participation by all potentially affected minority and low-income communities in the transportation decision making process; and
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits to minority and low-income populations.

5.8.2 Methodology

Under FHWA Order 6640.23, minority and low-income populations must be considered in an analysis of environmental justice issues. The FHWA Order defines these terms as follows:

- **Minority** means a person who is:

  Black – persons having origins in any of the black racial groups of Africa.

  Hispanic – persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

  Asian – persons having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent.

  American Indian and Alaskan Native – persons having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition.

  Native Hawaiian or Other Pacific Islander – persons having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

- **Low-income** means a household income at or below the Department of Health and Human Services poverty guidelines.

- **Minority populations** or **low-income populations** are any readily identifiable groups of minority or low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who would be similarly affected by a proposed FHWA program, policy, or activity.

Compliance with environmental justice requirements was assessed by identifying and analyzing minority and low-income populations within the Study Area for Section 4. The approach included basic information-gathering such as data collection from the U.S. Census Bureau's Year 2000 Census and FHWA's Environmental Justice web page,[1] public participation, and a thorough assessment of communities, i.e., a Community Impact Assessment. This effort included a staffed project office within the project area for Section 4. This office has been open to the public from the early stages of the Tier 2 study. Public information meetings were held to provide additional opportunities to learn more about the potentially affected communities and people along the corridor. In conducting the assessment, available data on population demographics, taken from the U.S. Census and other sources, were utilized. The Section 4 Study Area was defined by the Census Block Groups traversed by the project corridor (See **Figure 5.8-1**, p. 5-264), thereby providing a statistically identifiable geographic area for the data gathering effort.

After the preliminary data collection, specific effects on minority and low-income populations were evaluated. This included field analysis and an investigation of populations and potential impacts to these populations. The information gathered for Section 4 includes the population in the Study Area by race and ethnicity, age, employment, and income; and the potential number of residential relocations and business displacements that could result from the project. Chapter 4, Section 4.2, *Human Environment (Community Impact Assessment)*, details the population and employment characteristics of the Study Area, and Chapter 5, Section 5.2, *Social Impacts*, identifies the potential residential relocation and business impacts associated with the project.

To ensure that programs, policies and activities are in compliance with Executive Order 12898 requirements, the following techniques were used to plan and develop the project:

- A strong public involvement process.
- A systematic interdisciplinary approach.
- Attempts to identify, avoid, minimize, and mitigate adverse effects and impacts.

[1] www.fhwa.dot.gov/environment/ej2000.htm

Table 5.8-1: Comparative Population Characteristics—Race and Ethnicity

GEOGRAPHIC AREA	Total Population	One Race							Population of Two or More Races	Hispanic or Latino Origin
		Population of One Race	White Alone	Black or African American Alone	American Indian & Alaska Native Alone	Asian Alone	Native Hawaiian & Other Pacific Islander Alone	Some Other Race Alone		
United States	281,421,906	274,595,678	211,460,626	34,658,190	2,475,956	10,242,998	398,835	15,359,073	6,826,228	35,305,818
Percent	100.0%	97.6%	75.1%	12.3%	0.9%	3.6%	0.1%	5.5%	2.4%	12.5%
Indiana	6,080,485	6,004,813	5,320,022	510,034	15,815	59,126	2,005	97,811	75,672	214,536
Percent	100.0%	98.8%	87.5%	8.4%	0.3%	1.0%	0.0%	1.6%	1.2%	3.5%
Greene County	33,157	32,955	32,691	26	104	72	5	57	202	268
Percent	100.0%	99.4%	98.6%	0.1%	0.3%	0.2%	0.1%	0.2%	0.6%	0.8%
Monroe County	120,563	118,596	109,510	3,615	317	4,067	56	1,031	1,967	2,235
Percent	100.0%	98.4%	90.8%	3.0%	0.3%	3.4%	0.1%	0.9%	1.6%	1.9%
STUDY AREA										
Greene County										
CT 9547, BG 1	2,852	2,840	2,824	3	12	1	0	0	12	13
Percent	100.0%	99.6%	99.0%	0.1%	0.4%	0.1%	0.0%	0.0%	0.4%	0.5%
CT 9547, BG 4	1,912	1,902	1,880	0	10	0	0	12	10	36
Percent	100.0%	99.5%	98.3%	0.0%	0.5%	0.0%	0.0%	0.6%	0.5%	1.9%
CT 9547, BG 5	978	968	967	0	1	0	0	0	4	6
Percent	100.0%	99.0%	99.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.4%	0.6%
CT 9553, BG 1	1,067	1,066	1,056	1	6	2	0	1	1	2
Percent	100.0%	99.9%	98.9%	0.1%	0.6%	0.2%	0.0%	0.1%	0.1%	0.2%
CT 9553, BG 2	879	875	870	1	2	1	0	1	4	7
Percent	100.0%	99.5%	99.0%	0.1%	0.2%	0.1%	0.0%	0.1%	0.5%	0.8%
Monroe County										
CT 11.03, BG 2	823	821	805	9	1	3	0	3	0	2
Percent	100.0%	99.8%	97.8%	1.1%	0.1%	0.4%	0.0%	0.4%	0.0%	0.2%
CT 11.03, BG 3	556	552	539	6	1	3	1	2	4	5
Percent	100.0%	99.3%	96.9%	1.1%	0.2%	0.5%	0.2%	0.4%	0.7%	0.9%
CT 12, BG 5	794	785	784	0	0	1	0	0	3	6
Percent	100.0%	98.8%	98.7%	0.0%	0.0%	0.1%	0.0%	0.0%	0.4%	0.8%
CT 12, BG 6	773	768	763	0	5	0	0	0	4	1
Percent	100.0%	99.4%	98.7%	0.0%	0.6%	0.0%	0.0%	0.0%	0.5%	0.1%
CT 12, BG 7	486	478	471	1	2	4	0	0	8	1
Percent	100.0%	98.4%	96.9%	0.2%	0.4%	0.8%	0.0%	0.0%	1.6%	0.2%
Study Area Total	11,120	11,055	10,959	21	40	15	1	19	50	79
Percent	100.0%	99.4%	98.6%	0.2%	0.4%	0.1%	0.1%	0.2%	0.4%	0.7%

Source: U.S. Bureau of the Census, Year 2000 Census. ***CT*** *= Census Tract.* ***BG*** *= Block Group within a Census Tract.*

5.8.3 Analysis

Following the procedures identified in Section 5.8.2, data gathered on the minority and low-income populations in the Section 4 Study Area was analyzed to determine the potential impacts of the project on those populations. The following sections present the result of the analysis.

5.8.3.1 Minority Population—Race

The Year 2000 Census was notable as the first census to allow respondents to identify themselves as having more than one race.[1] The 2000 data (**Table 5.8-1**) shows that the Study Area had a lower concentration of minorities than did the state. While, among those reporting one race only, the percentage of whites in the State of Indiana was 87.5%, whites comprised anywhere from 96.9% to 99.0% of the population in Greene and Monroe counties.

Blacks or African-Americans, alone, comprised 8.4% of the state's population, while they comprise 0.1% and 3.0% of the population in Greene and Monroe counties, respectively. Four Block Groups in the Study Area had a lower percentage of Blacks or African-Americans (0.0%) than the State of Indiana, Greene County, and Monroe County. The remaining six Block Groups ranged from 0.1% to 1.1%.

In other categories, the Study Area racial populations ranged from 0.0% to 0.6% American Indian/Alaska Native, 0.0% to 0.8% Asian, 0.0% to 0.2% Native Hawaiian/Other Pacific Islander, and 0.0% to 0.6% Some Other Race. Those reporting Hispanic or Latino Origin ranged from 0.1% to 1.9%, with the overall average being 0.7%. The highest Hispanic/Latino concentration was in Greene County Census Tract 9547-BG 4 (1.9%)—which was higher than that of Greene County (0.8%), but equal to Monroe County and below the level for Indiana (3.5%) and the nation (12.5%).

There are no clusters of minority residences in the Section 4 Study Area and no indication that minorities would comprise a significant percentage—much less a disproportionate percentage—of the residents who would be relocated as part of this project. Therefore, no disproportionate impacts to minority populations are anticipated as a result of the project.

5.8.3.2 Low-income Populations

Low-income populations consist of those people living below the poverty level, as defined in the U.S. Department of Health and Human Services Poverty Level Guidelines. Poverty by age data was used to determine overall poverty levels. For each Block Group, each age group (from 0 to 75+) of those living in poverty was added together, divided by the total Block Group population and calculated a percentage. **Table 5.8-2** shows the per capita income and the median household income of the nation, the state, and Greene and Monroe counties, and the income ranges for the

[1] The Year 2000 Census form gave persons the opportunity to select more than one racial category to indicate multi-racial heritage. Previous censuses permitted persons to select only one racial category. Therefore, the current census's population-by-race data cannot be compared with that of the previous censuses.

Study Area. **Table 5.8-3** shows the data for the individual Block Groups in the Study Area. One location in the Study Area—Census Tract 11.03-BG 2, in Monroe County—recorded a higher median household income, and higher median family income ($53,929, and $59,940, respectively) than the other areas in the comparison. Monroe County Census Tract 11.03-BG 3 recorded a higher per capita income ($26,294) than the other areas in the comparison.

Table 5.8-2: 1999 Comparative Median Household Income, Per Capita Income, and Percent Living Below Poverty Level

	United States	Indiana	Greene County	Monroe County	Study Area Range of Values
Median Household Income					
Total	$41,994	$41,567	$33,998	$33,311	$29,619 - $53,929
Median Family Income					
Total	$50,046	$50,261	$41,523	$51,058	$36,250 - $59,940
Per Capita Income					
Total	$21,587	$20,397	$16,834	$18,534	$16,731 - $26,294
Percent Living Below Poverty Level					
Total (Individuals)	12.4%	9.5%	11.0%	18.9%	0.0 - 15.8%
% of All Youths (Ages 0-17) Below Poverty Level	16.6%	12.2%	15.0%	12.4%	0.0 – 24.5%
% of All Elderly (Ages 65+) Below Poverty Level	9.9%	7.7%	9.5%	6.9%	0.0 – 23.5%

Source: U.S. Bureau of the Census, Year 2000 Census Summary File 3 (SF 3), based on data from a sample population.

Table 5.8-3: Comparative Median Household Income, Per Capita Income, and Percent Living Below Poverty Level—Study Area, Only

Subject	Greene County					Monroe County				
	CT 9547			CT 9553		CT 11.03		CT 12		
	BG 1	BG 4	BG 5	BG 1	BG 2	BG 2	BG 3	BG 5	BG 6	BG 7
Total Population	2,852	1,912	978	1,067	879	823	556	794	773	486
Age (Percent)										
Youths (0-17)	27.5%	26.6%	23.8%	25.8%	25.4%	32.2%	26.8%	28.3%	26.5%	28.8%
Adult (18-64)	64.2%	66.0%	65.2%	63.3%	62.6%	60.8%	63.9%	63.6%	66.4%	64.8%
Senior (65+)	8.3%	7.4%	11.0%	10.9%	12.1%	7.0%	9.4%	8.1%	7.1%	6.4%
Median Household Income Total	$39,298	$37,685	$29,619	$39,125	$32,938	$53,929	$43,333	$43,958	$51,200	$33,875
Median Family Income Total	$41,361	$47,250	$36,250	$45,515	$36,406	$59,940	$45,500	$45,391	$52,150	$37,000
Per Capita Income Total	$17,233	$16,731	$16,798	$18,666	$18,065	$18,824	$26,294	$18,824	$23,645	$22,127
Percent Living Below Poverty Level										
Percent of Total Population (Individuals) Below Poverty Level	9.2%	10.4%	15.1%	5.6%	15.8%	2.7%	3.2%	5.4%	0.0%	9.5%
% of All Youths (Ages 0-17) Below Poverty Level	9.9%	14.6%	24.5%	1.8%	12.9%	2.1%	0.0%	9.8%%	0.0%	15.8%
% of All Elderly (Ages 65+) Below Poverty Level	8.7%	11.8%	18.4%	11.8%	19.0%	9.6%	23.5%	0.0%	0.0%	0.0%

Source: U.S. Bureau of the Census, Year 2000 Census Summary File 3 (SF 3), based on data from a sample population.
CT = Census Tract **BG** = Block Group within a Census Tract

As noted in Section 4.2.1.4, *Population Trends*, Tract 11.03-BG 2 also had the second highest percentage of owner-occupied housing, a younger population, and the highest average household size and average family size of all locations in the Study Area. For the most part, Tract 11.02-BG 2 is rural and sparsely populated; however, near its northeastern edge between That Road and Gordon Pike, there are three interconnected residential areas comprised of single-family, ranch style or two-story brick houses ranging in age from approximately 40 years to new, and ranging in condition from good to excellent. These factors correlate with the income data and identify a relatively affluent suburban-style grouping (in an otherwise agricultural/mineral area) near the main commercial corridor (SR 37) in Monroe County.

The percentage of the total Study Area population living below the poverty level was highest in Census Tract 9553-BG 2 (15.8%) and Tract 9547-BG 5 (15.1%). The national and state percentages are 12.4% and 9.5% and those for Greene and Monroe counties are 11.0% and 18.9%, respectively. It should be noted that Tract 9553-BG 2 surrounds and incorporates Newberry.

The percentage of youths younger than 18, living below poverty level was highest in Census Tract 9547-BG 5 (24.5%)—notably higher than other Study Area locations. This exceeds both the Greene and Monroe county percentages (15.0% and 12.4%, respectively), and the national and state percentages (16.6% and 12.2%, respectively).

The percentage of elderly people living below poverty exceeded the nation, state or counties in seven of the ten Study Area Block Groups. Monroe County Census Tract 11.03 BG 3 had the highest percentage (23.5%), followed by Greene County Tract 9553-BG 2 (19.0%). At the other end of the spectrum, Monroe County Tracts 12-BG 5, 12-BG 6 and 12-BG 7 had 0.0% of elderly below poverty level, and Greene County Tract 9547-BG 1 had 8.7%.

The national and/or state percentages are not exceeded for low-income populations where relocation could occur within the right-of-way of any alternative. All of the residences are well-maintained, medium priced houses showing no indication the residents are living below the poverty level.

There are no clusters of low-income residences in Section 4 Study Area and no indication that residents who could be impacted by the project are living below the poverty level. No disproportionate impacts to low-income populations are anticipated as a result of the project.

5.8.3.3 Disproportionately High and Adverse Effects Analysis

Field reviews, analyses of census data, public comment and discussions with local officials confirm the absence of minority communities or concentrations of minority and low-income populations within the Section 4 Study Area. Overall, disproportionately high and adverse human health or environmental effects are not expected to affect minority or low-income populations because no such concentrations are located within the Study Area. Therefore, none of the five alternatives under consideration is expected to have any specific disproportionately adverse effect on any distinct social group or groups.

Altered Travel Patterns

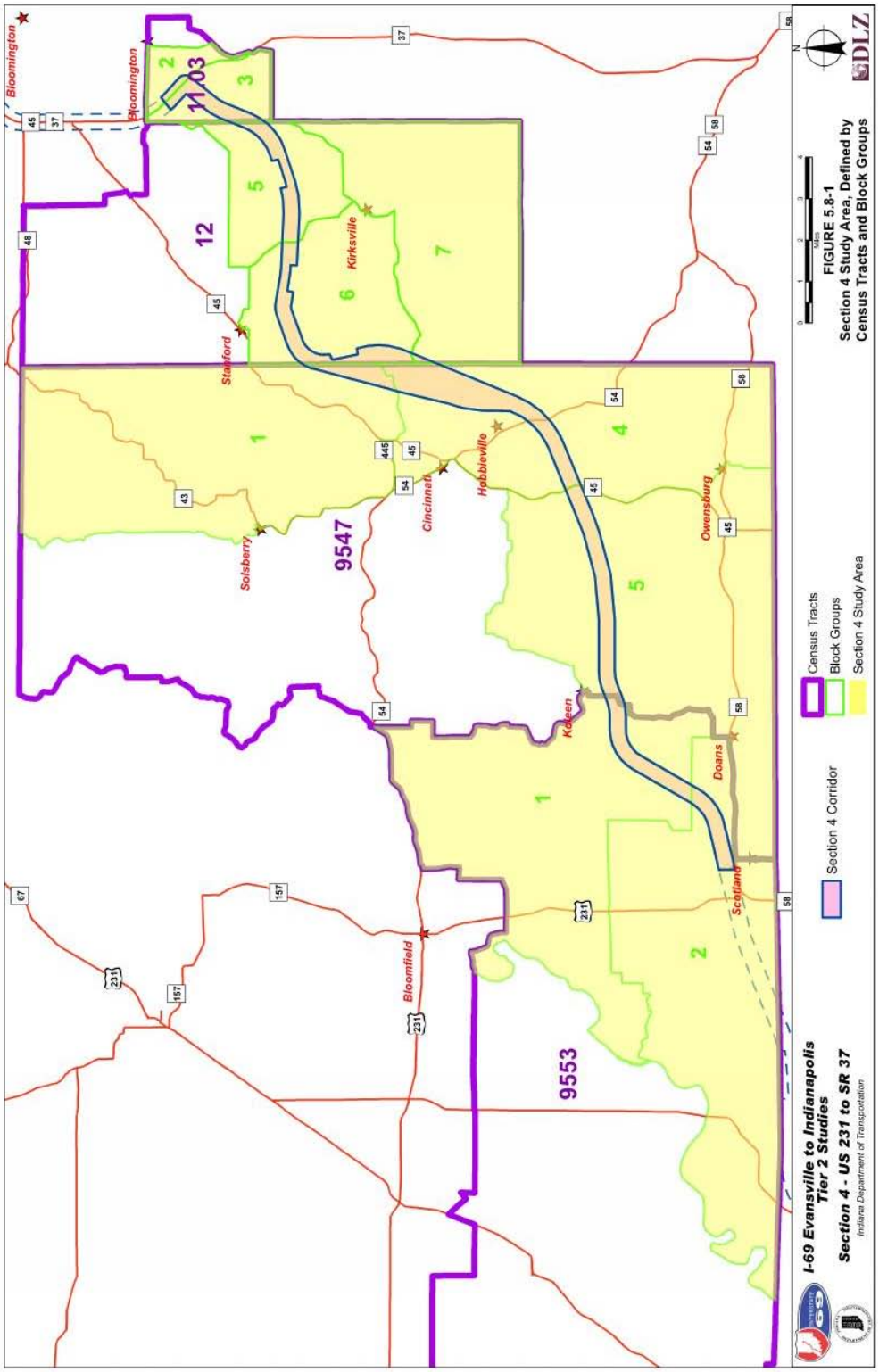
The alteration of travel patterns is not anticipated to have a disproportionate impact to low-income or minority populations in the Section 4 Study Area. Where the connectivity of existing public roads would be severed by I-69 in Section 4, connectivity would be maintained via overpasses or road relocations, or on other routes that are within a reasonable distance of the severed roadway. Motorists will be able to access I-69 at US 231 (southern Section 4 terminus) in Greene County and SR 37 (northern Section 4 terminus) in Monroe County. Additionally, other possible access points to I-69 will include SR 45 in Greene County and/or SR 45/SR 445 via the Greene/Monroe County Line interchange just east of the unincorporated community of Cincinnati. Because I-69 parallels SR 45 along most of Section 4, using I-69 instead of SR 45 to/from Bloomington, Bloomfield, or Crane NSWC would only slightly alter motorists' established travel patterns while improving the travel time to their destination.

Comparisons of traffic impacts as a result of the future No-Build Condition and build alternatives are discussed in Section 5.6, *Traffic Impacts*. Section 5.3.4.2, *Travel Patterns and Local Public Road Connectivity*, provides a detailed discussion of access issues related to the project, including a listing of road closings, relocations, and overpasses proposed for each build alternative.

The alignment for the Section 4 Preferred Alternative will be developed using the initial design criteria and consideration will be given during the subsequent design phase for use of certain low-cost design criteria as a measure to possibly reduce direct impacts and/or construction costs (See Section 5.1, *Introduction and Methodology*). Potential impacts upon minority and low-income populations were determined per the right of way and development of the Refined Preferred Alternative per the initial design criteria. Implementation of some or all of the low-cost design criteria will not change the impacts identified within this chapter.

5.8.4 Summary

In its comment letter on the Tier 1 DEIS, the USEPA concurred "the initial environmental review shows that none of the alternatives would have a disproportionately high and adverse effect on minority and low-income populations in the Study Area." (See the Tier 1 FEIS, Section 5.4.6.) After completing further environmental justice review for Tier 2 Section 4, it was determined that none of the alternatives for Section 4 would have a disproportionately high or adverse effect on minority or low-income populations in the Section 4 Study Area.


Bloomington
Bloomington
Stanford
Kirksville
Solsberry
Cincinnati
Hobbieville
Owensburg
Koleen
Doans
Scotland
Bloomfield
11.03
12
9547
9553
1
2
3
4
5
6
7
Census Tracts
Block Groups
Section 4 Study Area
Section 4 Corridor
FIGURE 5.8-1
Section 4 Study Area, Defined by
Census Tracts and Block Groups
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ

5.9 Air Quality

Since publication of the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Section 5.9.2 – Traffic volumes have been updated.
- Section 5.9.3 – The need for performing an additional CO hot-spot analysis for a potential interim signalized 'T' intersection at I-69/SR 37 is described.
- Section 5.9.6 – The results of the updated air quality modeling for the project-level CO hot-spot and free-flow analyses are presented and described. This includes the 2020 CO hot-spot analysis for the interim signalized 'T' intersection at I-69/SR 37 (Interim SR 37 Build Alternative) as well as updated emission estimates from corrected emissions rates.
- Section 5.9.7 – The conformity demonstration for Greene County's 8-hour ozone maintenance area for I-69 Tier 2 Section 4 is discussed. A reference to **Appendix MM**, *Greene County Air Conformity*, is provided.
- **Figure 5.9.2** (p. 5-280) – Link/Receptor Map for the SR 37/I-69 Interim Intersection has been added.

5.9.1 Introduction

The air quality analysis for the Tier 1 Final Environmental Impacts Statement (FEIS) generated comparative emissions data for each of the corridor alternatives and identified any Alternatives that might have a high likelihood of placing the air quality conformity status of either Indianapolis or Evansville in jeopardy. The Tier 1 FEIS found that there were minor differences in the area wide ozone impacts of the alternatives, but that none of the final alternatives (including Preferred Alternative 3C) would place the air quality conformity status of Indianapolis or Evansville in jeopardy.

The alternatives under the build condition for Tier 2 Section 4 are located within a corridor that is generally 2,000 feet wide and which is located in a predominantly rural setting. The corridor does narrow to approximately 1,200 feet at two locations in Monroe County and widens to about 5,400 feet along the Greene/Monroe County line. The air quality conformity analysis in Tier 2 used the Preferred Alternative, Alternative 2 for Section 4, and showed that it conforms to the purpose of the SIP by not causing or contributing to any new violations of the National Ambient Air Quality Standards (NAAQS), increasing the frequency or severity of NAAQS violations, or delaying the timely attainment of the NAAQS or any interim milestones, in accordance with requirements of Section 176(c) of the Clean Air Act (CAA). Under NEPA for CO and MSATs, a build versus no-build analysis was completed because these air quality impacts are not substantially different among the build alternatives, including Refined Preferred Alternative 2, due to the close proximity of their alignments and their rural setting.

The regional conformity issues in Section 4 involve the Greene County 8-hour ozone maintenance area. Because Bloomington and Monroe County are attainment areas for the

National Ambient Air Quality Standards (NAAQS), there are no air quality conformity analysis requirements applicable to Bloomington and Monroe County. Because Greene and Monroe counties are attainment areas for carbon monoxide (CO) and particulate matter (PM), hot-spot analyses are not required for conformity demonstration at the project level. Nonetheless, a CO hot-spot analysis was completed for Section 4 to disclose impacts under NEPA.

This chapter also addresses the issue of Mobile Source Air Toxics (MSATs) and the health effects related to MSATs. For the reasons given below, a detailed analysis of MSAT emissions is not required for this project.

Finally, this chapter also addresses the emerging issue of greenhouse gases. For the reasons given below, a detailed analysis of greenhouse gas emissions is not required for this project.

5.9.2 Regulatory Setting

Conformity Requirements

The Clean Air Act (CAA) requires the United States Environmental Protection Agency (USEPA) to establish NAAQS for pollutants that are considered to be harmful to the public health and environment.

Under the Clean Air Act, USEPA set forth NAAQS for six principal pollutants—PM, sulfur dioxide (SO_2), CO, ozone, nitrogen dioxide (NO_2), and lead. Generally, when levels of pollutants do not exceed the annual average standards and do not exceed the short-term standards more than once per year, an area is considered in attainment of the NAAQS. An area that does not meet the NAAQS for one or more pollutants will be designated by the USEPA as a "nonattainment area." An area that was formerly in nonattainment and now meets the NAAQS is known as a "maintenance area" for a period of 20 years after coming into attainment. Under the CAA, each state is required to establish a plan for achieving the NAAQS in nonattainment areas and maintaining the NAAQS in maintenance areas. This plan is known as the State Implementation Plan (SIP).

Section 176 of the CAA prohibits federal agencies from approving, funding, or supporting in any way actions in nonattainment or maintenance areas unless the federal agency determines that the action "conforms" to the applicable SIP for that area. Regional and project-level requirements must be met before a record of decision can be issued for federal transportation projects. At the regional level a project must be included in a regional emission analysis which demonstrates that future emissions from the transportation system are below the SIP budget for any pollutants contributing to the designation of an area as nonattainment or maintenance for NAAQS. At the project level CO and/or PM "hot spot" analyses are required if the project falls in a nonattainment or maintenance area for these pollutants. This is done to demonstrate that emission concentrations adjacent to the new roadway are below the USEPA health standard.

Monroe County is attainment for all the NAAQS. Since Greene County has been designated an 8-hour Ozone Maintenance Area, a regional-level conformity analysis must demonstrate that emissions with the I-69 Section 4 project are below the SIP budgets for volatile organic compounds (VOCs) and NO_x, which are the major precursors to ozone. Since Greene County is

attainment for CO and PM, project-level "hot spot" analyses are not required for a transportation conformity determination for the proposed project in Section 4. Nevertheless, a CO "hot spot" was performed for information purposes to demonstrate that there are no local air quality impacts associated with CO under NEPA.

Given that there is no Metropolitan Planning Organization (MPO) associated with Greene County, the regional conformity demonstration must be made in conjunction with FHWA's project approval (I-69 Section 4 EIS/ROD). A joint FHWA/Federal Transit Administration (FTA) policy memorandum of May 20, 2003, provides guidance concerning air quality conformity requirements for projects in nonattainment or maintenance areas requiring Environmental Impacts Statements (EIS). For a copy of this memorandum, see **Appendix L**, *Policy Memorandum: Air Quality Conformity*. The memorandum states that, in general, any required conformity determination should be made by the time of the FEIS, but in any event, "the conformity determination must be made prior to the issuance of the Record of Decision (ROD)." Therefore, the conformity requirements for Section 4 must be completed before the Tier 2 ROD for Section 4 can be signed. See Section 5.9.7 for conformity analysis information.

Mobile Source Air Toxics (MSATs)

On September 30, 2009, FHWA issued an interim guidance update to the February 3, 2006, interim guidance on addressing MSATs in National Environmental Policy Act (NEPA) documents. The guidance is considered interim because MSAT analysis research is still ongoing. As the science progresses, FHWA will update the guidance.

In addition to the NAAQS, USEPA also regulates air toxics. The Clean Air Act Amendments (CAAA) of 1990 identified 188 air toxics, also known as hazardous air pollutants. USEPA has assessed this expansive list of toxics and identified a group of 93 compounds as mobile source air toxics, which are set forth in the latest USEPA rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007).* USEPA also extracted a subset of this list of 93 that it now labels as the seven priority MSATs. These are *acrolein, benzene, 1,3-butadiene, diesel particulate matter/diesel exhaust organic gases, formaldehyde, naphthalene,* and *polycyclic organic matter.* Some of these toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics result from engine wear or from impurities in oil or gasoline. While these MSATs are considered the priority transportation toxics, USEPA stresses that the lists are subject to change and may be adjusted in future revisions to the rules.

The 2007 USEPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis, the total annual emission rate for the priority MSAT will be reduced even if vehicle-miles of travel increase.

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure

remain limited. These limitations impede FHWA's ability to evaluate how mobile source health risks should factor into project-level decision-making under NEPA. In addition, USEPA has not established regulatory concentration targets for the seven relevant MSAT pollutants appropriate for use in the project development process. Given the emerging state of the science and of project-level analysis techniques, there are no established criteria for determining when MSAT emissions should be considered a significant issue in the NEPA context.

Nonetheless, air toxics concerns continue to be raised on transportation projects during the NEPA process. As the science emerges, FHWA is increasingly expected by the public and other agencies to address MSAT impacts in its environmental documents. FHWA has issued an interim guidance on how MSATs should be addressed in NEPA documents for highway projects while research is ongoing to try to more clearly define potential risks from MSAT emissions associated with transportation projects. FHWA will continue to monitor the developing research in this emerging field.

The FHWA has developed a three tiered approach for analyzing MSAT in NEPA documents, depending on specific project circumstances. For the design year 2030, I-69 is forecasted to have an average daily traffic (ADT) of 23,525 vehicles per day (VPD) for the section between US 231 and SR 45, 23,743 VPD for the section between SR 45 and the county line interchange and 29,578 from the county line interchange to SR 37. As traffic for the design year 2030 falls below 140,000 to 150,000 ADT, I-69 falls into the second analysis level involving a qualitative analysis for projects with low potential MSAT effects.[18]

USEPA has existing and newly promulgated mobile source control programs that include the reformulated gasoline program, national low emission vehicle standards, Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, heavy duty engine and vehicle standards, and on-highway diesel fuel sulfur control requirements. Thus, USEPA regulations for vehicles engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with USEPA's MOBILE 6.2 model forecasts a combined reduction of 72% in the total annual emission rate for the priority MSAT from 1999 to 2050 while vehicle-miles of travel are projected to increase by 145%. [19] The U.S. Department of Transportation (USDOT) and FHWA are currently working with USEPA to develop and evaluate the technical tools necessary to perform air toxics analysis, including improvements to emissions models and air quality dispersion models. FHWA's ongoing work in air toxics includes a research program to determine and quantify the contribution of mobile sources to air toxic emissions, the establishment of policies for addressing air toxics in environmental reports, and the assessment of scientific literature on health impacts associated with motor vehicle toxic emissions.

Availability of Information for Project Specific MSAT Impact Analysis

As noted, the science and modeling of project specific MSAT impacts has not developed to the point where there is certainty or scientific community acceptance on predicting the impacts from

[18] See FHWA's Memorandum, September 30, 2009: *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* (http://www.fhwa.dot.gov/environment/airtoxic/100109guidmem.htm) for description of levels of MSAT analysis.
[19] ibid.

transportation projects. Accordingly, information on MSAT impacts on any of the alternatives evaluated in this Final Environmental Impact Statement (FEIS) is not available, and the means to obtain this information are not currently known. When this is the case, 40 CFR 1502.22(b) requires FHWA to address four provisions: (1) a statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. These provisions are addressed in the *Analysis* section (Section 5.9.6).

Greenhouse Gases

From a policy standpoint, FHWA's current approach on the issue of carbon emissions is as follows: To date, no national standards have been established regarding greenhouse gases, nor has the USEPA established criteria or thresholds for greenhouse gas emissions. FHWA does not believe it is informative at this point to consider greenhouse gas emissions in an EIS. FHWA is actively engaged in many activities with the USDOT Center for Climate Change to develop strategies to reduce transportation's contribution to greenhouse gases in particular CO_2 emissions, and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. FHWA will review and update its approach to climate change at both the project and policy level as more information emerges and as policies and legal requirements evolve. Discussions regarding greenhouse gas emissions are ongoing. The project will comply with new FHWA guidelines.

5.9.3 Methodology

The primary source of air pollutants associated with either the construction of a new highway, or the improvement of an existing highway, is motor vehicle use. This chapter analyzes project level air emissions associated with CO. While MSATs are not subject to conformity requirements, they are considered in this chapter in accordance with applicable FHWA guidance. Both CO and MSATs are examined for information purposes under NEPA.

Carbon Monoxide (CO)

A major pollutant emitted by motor vehicles is CO, which originates as a byproduct from the combustion of fuel. In general, CO emissions are associated with large volumes of slow-moving traffic, such as exists at highly congested intersections. Areas experiencing high levels of CO are referred to as CO "hot spots." A hot-spot analysis for CO is a standard part of the NEPA process for highway projects to demonstrate that no local air quality impact concerns exist, even if the area is in attainment for CO. A hot-spot analysis is known as a "microscale" analysis because it focuses on a relatively small geographic area.

The purpose of a CO hot-spot analysis is to determine if CO emissions generated by a proposed project would cause or contribute to an exceedance of the air quality standard for CO as promulgated by USEPA. The state and federal ambient air quality standards for CO are:

One hour: 35 parts per million (ppm) or 40 milligrams per cubic meter (mg/m^3)

Eight hour: 9 ppm or 10 mg/m^3

These concentration values may not be exceeded more than once per year. Any computer-modeled concentration that occurs above either the 1-hour or 8-hour standard is considered a violation. Since CO is a product of combustion, is relatively inert, and is emitted near the ground surface, the highest concentrations are typically found near the source. CO concentrations were evaluated at locations 10 feet, 50 feet, 100 feet, and 150 feet from the edge of the roadway.

For the Tier 2 study, a CO hot-spot analysis comparing existing, future build, and future no-build conditions was performed for the interchange carrying the highest predicted traffic volume in the corridor and which also includes a proposed traffic signal or stop controlled intersection on a ramp junction (worst case scenario). The selected location for the CO hot-spot analysis was on SR 45 at the location of the proposed intersection with SR 445 and the South Connector Road for the Greene/Monroe County Line interchange. This intersection was selected because it has the highest traffic volumes of any intersection in the project area.

In addition to the hot-spot analysis, a free-flow analysis of the proposed roadway section carrying the highest predicted volume of traffic was also conducted (worst case scenario). The free flow analysis was performed for the future build condition along the Subsection 4H-2/4H-3 alignment between Bolin Lane and the southernmost SR 37 interchange ramp merge (NB SR 37 to SB I-69). This segment was selected because it has the highest traffic volumes of any segment in the project area.

An additional CO hot-spot analysis was conducted for the SR 37 Interchange. This involved analysis of a proposed signalized 'T' intersection at I-69/SR 37 that may be implemented during the interim time period until the I-69 Tier 2 Study and construction is completed for Section 5. As discussed in Section 5.6.3.3, the full SR 37 interchange cannot be built because some of the I-69 mainline lanes and ramps are inseparable from the Section 5 improvements. Therefore, an interim intersection is being considered. A 2020 CO hot-spot analysis was conducted for the interim intersection (Interim SR 37 Build Alternative) to ensure it would not cause or contribute to an exceedence of the air quality standard for CO as promulgated by the USEPA. Additional information about the interim intersection is included in Section 5.6.3.3.

The dispersion of CO in the Study Area was simulated using CAL3QHC, a dispersion model developed to predict the level of CO, or other inert pollutant concentrations, from motor vehicles traveling near roadway intersections. CAL3QHC is the standard model used by USEPA for these types of analyses. Traffic input parameters included peak-hour volumes and speeds. The analysis was conducted under simulated meteorological conditions designed to yield "worst-case" CO concentrations. In accordance with the I-69 project guidance and USEPA guidance, the following input values were used in the analysis:

- stability class: D (neutral)
- wind speed: 1.0 meter per second
- wind angle: 0 to 360° in 10° increments
- surface mixing height: 1,000 meters (3,280 feet)
- surface roughness: 108 cm (single-family residential area) for the hot-spot analysis and 0.75 cm (long grass area) for the free-flow analysis
- one-hour background CO concentration: 2.0 ppm
- eight-hour background CO concentration: 1.2 ppm
- persistence factor: 0.7

Additionally, receptor locations were modeled at 10, 50, 100 and 150 feet from the edge of the roadway. One-hour and 8-hour concentrations were calculated to permit comparison with air quality standards for CO, which are described above.

Figures 5.9-1 and 5.9-2 (p. 5-279 and 5-280) show the hot-spot locations, and **Figure 5.9-3** (p. 5-281) shows the free-flow analysis locations. The results of the analyses conducted for the hot-spot analysis under the Existing Condition, Interim SR 37 Build Alternative, Future No-Build Condition, and Build Alternative and for the free-flow analysis under the Build Alternative are presented in Section 5.9.6 and summarized in **Table 5.9-1** The forecast year used in this analysis for the Build Alternative and the Future No-Build condition was 2030 and 2020 for the Interim SR 37 Build Alternative, which is consistent with the forecast year used for other analyses in this Tier 2 study.

$PM_{2.5}$

USEPA issued guidance for completion of qualitative (hot-spot) analysis of $PM_{2.5}$ on March 29, 2006. Qualitative $PM_{2.5}$ assessments are only required for projects of air quality concern within $PM_{2.5}$ nonattainment areas. All of the Section 4 study area is in attainment for $PM_{2.5}$ so a hot-spot analysis is not required.

MSAT

As noted in Section 5.9.2, a qualitative analysis of mobile air toxics (MSAT) is required for Section 4 of I-69 as the forecasted daily traffic volumes do not reach the significantly higher threshold level requiring a quantitative analysis. The qualitative analysis for projects with low potential MSAT effects involves a comparison of the VMT for the Build and No Build conditions because the amount of MSATs emitted is proportional to VMT (the results of this comparison are documented in Section 5.9.6).

5.9.4 Air Quality Status

Ozone

On April 30, 2004, the USEPA designated Greene County as nonattainment for 8-hour ozone. This designation was based on monitoring data from 2001-2003. On July 15, 2005, Indiana requested that USEPA re-designate Greene County to attainment based on more recent

monitoring data (2002-2004). USEPA agreed and re-designated Greene County from nonattainment to attainment "maintenance" for 8-hour ozone on December 29, 2005.

Greene County is a rural county with low population density. Its ozone levels are mainly due to regional power plant emissions. Regional emission reductions affect ozone levels in Greene County far more so than emission reductions within the county itself.[20]

Because of the maintenance designation, the I-69 project (Sections 3 and 4) in Greene County is subject to transportation conformity requirements found in 40 CFR Part 93 as amended. The USEPA determined that Greene County can use the motor vehicle emission budgets from the 8-hour ozone redesignation request and maintenance plan for future conformity determinations, effective November 4, 2005. The mobile vehicle emission budgets in the maintenance plan for Greene County for year 2015, the maintenance year, are 1.46 tons/day of VOC and 1.54 tons/day of NOx. These budgets are based on 2015 VMT and emissions estimated by IDEM and include a 10% margin of safety. The conformity determination requirements for the I-69 Tier 2 project in Greene County will be made after further interagency consultation. Consultation will be completed prior to the Record of Decision (ROD).

5.9.5 Air Quality Modeling

As previously discussed, Greene County is a maintenance area for 8-hour ozone. Mobile sources (cars and trucks) contribute to the generation of ozone by emitting hydrocarbons (also known as volatile organic compounds or VOCs), and NOx. Air quality modeling is required to demonstrate that the projects in the Indiana Statewide Transportation Improvement Program (INSTIP) and Statewide Long-Range Transportation Plan in Greene County (including the I-69 Preferred Alternative 3C) conform to the 8-hour Ozone Maintenance SIP Budget for Greene County. Conformity has been demonstrated, and additional discussion is provided in section 5.9.7.

5.9.6 Analysis

Table 5.9-1 presents the results of the air quality modeling for the project-level hot-spot and free-flow analyses. A technical report on this modeling analysis is included as **Appendix J**, *Air Quality Technical Report*.

[20] The source of the text is the Indiana Department of Environmental Management's Request for Redesignation and Maintenance Plan for Ozone Attainment in the 8-Hour Ozone Basic Nonattainment Area, Greene County, Indiana, September 2005.

Table 5.9-1: Maximum 1-Hour and 8-Hour CO Concentrations

Modeled Segment	Modeled Location	Distance from Edge of Pavement (feet)	Existing Roadway Network (ppm)		Future No-Build Year 2030 (ppm)		Build Alternative Year 2030 (2020 SR 37 Interim) (ppm)	
			1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.
Intersections	SR 45/SR 445/South Connector Road for Greene/Monroe County Line interchange (Existing, Future No-Build & Build)	10	4.8	3.2	2.6	1.6	2.2	1.3
		50	2.8	1.8	2.1	1.3	2.1	1.3
		100	2.4	1.5	2.1	1.3	2.0	1.2
		150	2.4	1.5	2.0	1.2	2.0	1.2
	Maximum Values (ppm)		4.8	3.2	2.6	1.6	2.2	1.3
	SR 37 (Interim Build)	10	n/a	n/a	n/a	n/a	2.3	1.4
		50	n/a	n/a	n/a	n/a	2.1	1.3
		100	n/a	n/a	n/a	n/a	2.0	1.2
		150	n/a	n/a	n/a	n/a	2.0	1.2
	Maximum Values (ppm)		n/a	n/a	n/a	n/a	2.3	1.4
Freeflow	I-69 Between Bolin Lane and NB SR 37 to SB I-69 Ramp Merge (Build)	10	n/a	n/a	n/a	n/a	2.3	1.4
		50	n/a	n/a	n/a	n/a	2.1	1.3
		100	n/a	n/a	n/a	n/a	2.0	1.2
		150	n/a	n/a	n/a	n/a	2.0	1.2
	Maximum Values (ppm)		n/a	n/a	n/a	n/a	2.3	1.4

National Ambient Air Quality Standards: 1-hour: 35.0 parts per million (ppm); 8-hour: 9.0 ppm
Background CO Concentrations: 1-hour: 2.0 ppm; 8-hour: 1.2 ppm
n/a: no analysis performed since road segment does not exist under Existing and No Build scenarios

CO Hot -Spot Analysis

SR 45/SR 445/South Connector Road Existing Condition. The results of the Existing Condition analysis indicate that the highest predicted 1-hour concentration of CO is 4.8 ppm, while the highest 8-hour concentration is 3.2 ppm. These concentrations occur at receptor Site17 located at the mixing zone boundary (10 feet from the edge of pavement along South Connector intersection).

SR 45/SR 445/South Connector Road Future No-Build Condition. The results of the Future No-Build Condition analysis indicate that the highest predicted 1-hour concentration is 2.6 ppm, while the highest 8-hour concentration is 1.6 ppm. These concentrations occur at receptor Site 17 located at the mixing zone boundary (10 feet from the edge of pavement along the east side of SR 445 north of the intersection). When compared to the Existing Condition, the predicted 1-hour and 8-hour CO concentrations for the Future No-Build Condition are decreased at all receptor sites.

SR 45/SR 445/South Connector Road Build Alternative. The results of the Build Alternative analysis indicate that the highest 1-hour concentration is 2.2 ppm, while the highest 8-hour concentration is 1.3 ppm. These concentrations occur at receptor Site 12. When compared to the Existing Condition, the 1-hour and 8-hour CO concentrations for the Build Alternative are predicted to decrease at all receptor sites. When compared to the Future No-Build Condition, the 1-hour and 8-hour CO concentrations for the Build Alternative are the same at almost all receptor sites. For those receptors where minor differences occur, all concentrations are within 0.3 ppm of the other scenario.

Interim SR 37 Build Alternative. The maximum 1-hour CO concentration for the Interim SR 37 Build Alternative is 2.3 ppm, while the highest 8-hour concentration is 1.4 ppm. These concentrations occur at receptor Site 2, located just beyond the proposed southbound right-of-way limits. None of the CO values pertaining to I-69, either now or in 2020 exceeds the ambient air quality standards mandated by USEPA.

Free-Flow Section Analysis

The maximum 1-hour CO concentration for the Build Alternative is 2.3 ppm, while the highest 8-hour concentration is 1.4 ppm. These concentrations occur at receptor Site 18, located just beyond the proposed southbound right-of-way limits. None of the CO values pertaining to I-69, either now or in 2030, exceeds the ambient air quality standards mandated by USEPA.

Project Specific MSAT Impact Analysis

This FEIS includes a qualitative analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable prediction of the project-specific health impacts of the emission changes associated with the alternatives in this DEIS. Due to these limitations, the following information[21] is included in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

> ***Information that is Unavailable or Incomplete.*** *In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more the uncertainly introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.*
>
> - *Emissions. The methodologies for forecasting health impacts include emissions modeling; dispersion modeling and exposure modeling; and the final determination of health impacts – each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 years) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable. The results produced by the EPA's MOBILE 6.2 model, the California EPA's Emfac2007 model, and the EPA's MOVES model in forecasting MSAT emissions are inconsistent. Indications from the development of the MOVES model are that MOBILE 6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.*

[21] The source of the text is http://www.fhwa.dot.gov/environment/airtoxic/100109guidmem.htm .

- *Dispersion.* *Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gove/scram001/dispersion_alt.htm#hyroad) which documents poor model performance at ten sites across the country – three where intensive monitoring conducted plus an additional seven with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating the congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with National Ambient Air Quality Standards for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location.*

- *Exposure Levels and Health Effects.* *There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by the Health Effects Institute (HEI) (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA and HEI have not established a basis for quantitative risk assessment of diesel PM in ambient settings.*

  There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this two-step process do not guarantee that cancer risks from exposure to air toxins are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in million. In a June 2008 decision, the US Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs. *The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The US EPA is in the continual process of assessing human effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects. Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels for lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.*

Other organizations are also active in the research and analyses of the human effects of MSAT, including the Health Effects Institute (HEI). Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current concentrations or in the future as vehicle emissions substantially decrease.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of impacts based upon theoretical approaches or research methods generally accepted in the scientific community. *Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.*

In this document, FHWA provides a qualitative assessment that acknowledges that the project Alternatives may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain. Because of this uncertainty, the health effects from these emissions cannot be estimated.

MSAT Qualitative Analysis

Because there are no established criteria for determining when MSAT emissions should be considered a significant issue in the NEPA context, the FHWA recommends a qualitative analysis of emissions to compare or differentiate among proposed project alternatives.

For the Build Alternative, the amount of MSATs emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each

alternative. The Build Alternative results in additional miles of roadway; therefore, three of the five counties result in an increase in annual VMT over the No-Build Condition on a county-wide basis. The Build Alternative also diverts through traffic from other interstates and principal arterials outside the five counties reported, which also contributes to the higher VMT for the Build Alternative in three of the five counties reported. A comparison of 2030 VMT estimates for the Build Alternative in Section 4 with the No-Build Condition in the five county Section 4 study area defined for purpose and need (see **Figure 2-4**, p. 2-21) is shown in **Table 5.9-2.** The purpose and need study area was used for this analysis, since it represents the geographic area within which the most significant shifts in VMT will occur due to the construction of Section 4.

Table 5.9-2: Modeled Vehicle Miles Traveled in the Year 2030 by Alternative

County	No-Build Condition	Build Alternative	
	Annual VMT (millions)	Annual VMT (millions)	% Change Over No-Build
Greene	267	416	55.7%
Lawrence	295	291	-1.1%
Martin	140	151	7.5%
Monroe	933	1,137	21.9%
Owen	213	210	-1.6%
Total	1,848	2,205	19.3%

Because the Greene County VMT, Martin County VMT, Monroe County VMT, and Total 5-County VMT estimates for the Build Alternative are higher than for the No-Build Condition, higher levels of regional MSATs are expected for the Build Alternative compared to the No-Build. In Lawrence County and Owen County, the estimated VMTs are expected to decrease slightly under the Build Alternative. Regardless of the Alternative chosen, emissions will likely be at or lower than present levels in the design year as a result of USEPA's national control programs that are projected to reduce MSAT emissions by 72% from 1990 to 2050.[22]

It is also possible that localized increases and decreases in MSAT emissions may occur. However, even if these increases do occur, they, too, will be substantially reduced in the future due to implementation of USEPA's vehicle and fuel regulations.

In sum, estimated increases in MSAT emissions in Greene County, Martin County, Monroe County, and the Total 5-County region plus localized increases in MSAT emissions would be expected for the Build Alternative versus the No-Build Condition because of the projected increase in VMT in the future. However, MSAT emissions are projected to decrease substantially in the future as a result of new USEPA programs to reduce MSAT emissions nationwide. As a result, the I-69 Section 4 project is expected to result in low potential MSAT effects. Additionally, the I-69 Section 4 corridor is situated in a rural setting (the closest communities to the Preferred Alternative are the unincorporated communities of Scotland and Hobbieville, which are about one-half mile away), which would tend to lessen any impact from MSAT emissions.

[22] See FHWA's Memorandum, September 30, 2009: *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* (http://www.fhwa.dot.gov/environment/airtoxic/100109guidmem.htm) for description of levels of MSAT analysis.

5.9.7 Conformity Findings

A conformity demonstration for Greene County, Indiana's 8-hour ozone maintenance area for the I-69 Tier 2 Section 4 Final Environmental Impact Statement (FEIS) was completed in December 2010. The conformity demonstration found that the I-69 Section 4 Tier 2 FEIS demonstrates conformity to the State Implementation Plan budgets as required by the conformity rule. FHWA, IDEM and the US EPA completed their reviews and found that the analyses and documentation meet the criteria outlined in the conformity rule. For more details regarding the analysis and FHWA, IDEM and the USEPA comments see **Appendix MM**, *Greene County Air Conformity***.**

5.9.8 Mitigation

Air quality analyses indicate that mitigation is not required for the project. Ozone is addressed at the regional level, with the project's inclusion in the regional emissions analysis for Greene County (see 5.9.7) The project-level CO analysis for the highest traffic volume intersection and the CO free-flow analysis for the highest traffic volume segment of the mainline show no exceedances of the NAAQS. The forecasted future traffic volumes result in low potential MSAT effects that will be lower in future years than the present even with the project.

5.9.9 Summary

Pursuant to the 1990 CAA Amendments, Greene County has been designated a maintenance area for the 8-hour ozone standard. The county is currently in attainment of the standard and is under an approved maintenance plan. The emissions analysis found that the I-69 Section 4 Tier 2 FEIS demonstrates conformity to the State Implementation Plan budgets as required by the conformity rule.

Section 4 passes through CO attainment areas for NAAQS, and a conformity demonstration is not required at the regional-level or project-level. However, results of project level CO hotspot and the free-flow section analyses (which were measured at the worst case scenario locations) for the Build Alternative indicate no violation of the CO NAAQS. This demonstrates that there are no local air quality impacts of concern for CO.

Because Greene and Monroe counties are in attainment of the fine PM standard, fine particulate matter emissions were not identified as an air quality concern at the regional or project level based on the required interagency consultation meetings.

Finally, although regional and localized increases in MSAT emissions are expected for the Build Alternative over the No-Build Alternative Condition, total MSAT emissions are projected to decrease substantially in the future compared to the present because of new USEPA programs to reduce MSAT emissions nationwide. Thus, the I-69 Section 4 project is expected to result in low potential MSAT effects, and the rural setting (the closest communities to the Preferred Alternative are the unincorporated communities of Scotland and Hobbieville, which are about one-half mile away) would tend to lessen any impact from MSAT emissions.

Figure 5.9-1: Link / Receptor Map – SR 45 /South Connector Road Intersection

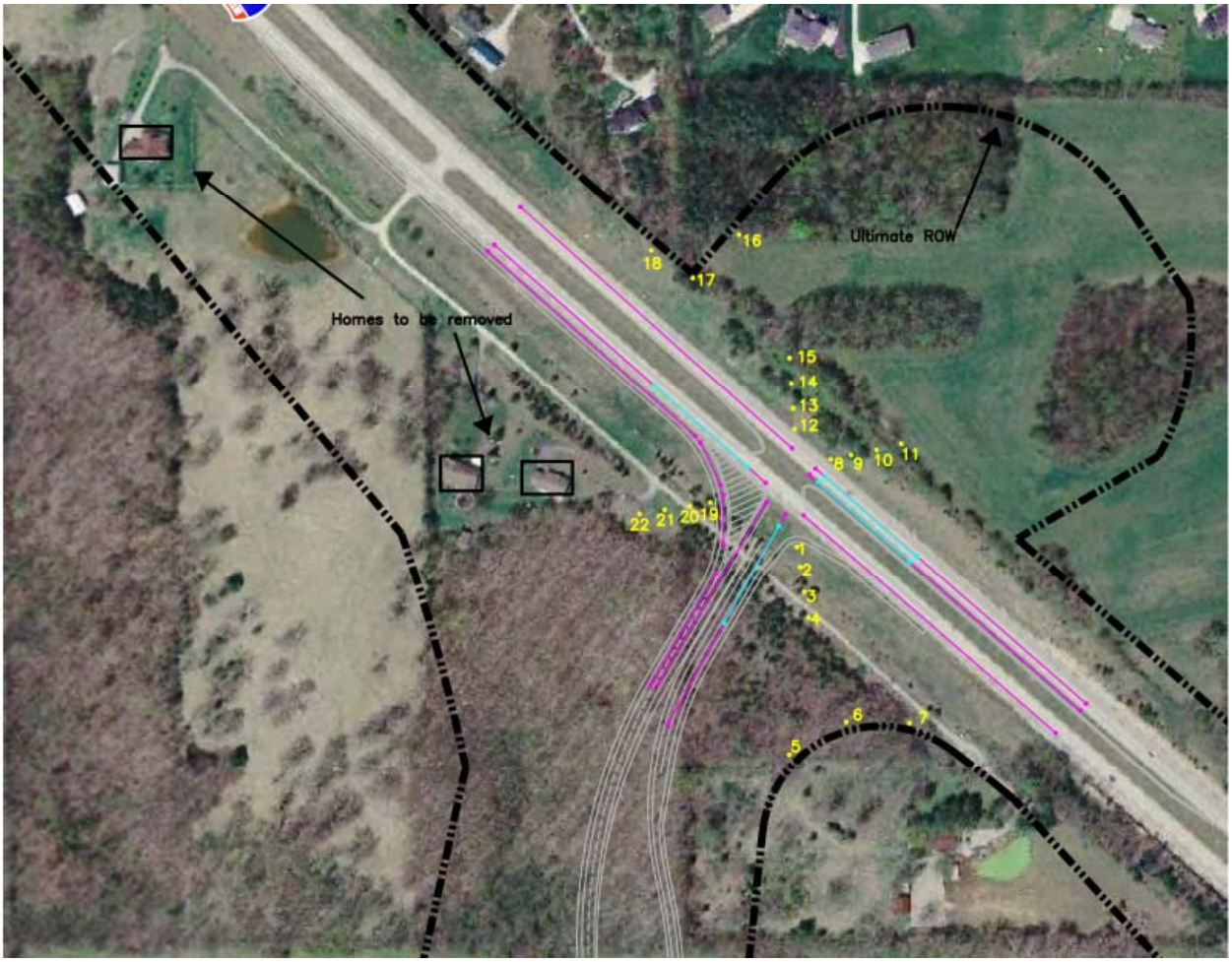


Figure 5.9-2: Link / Receptor Map – SR 37 / I-69 Interim" Intersection

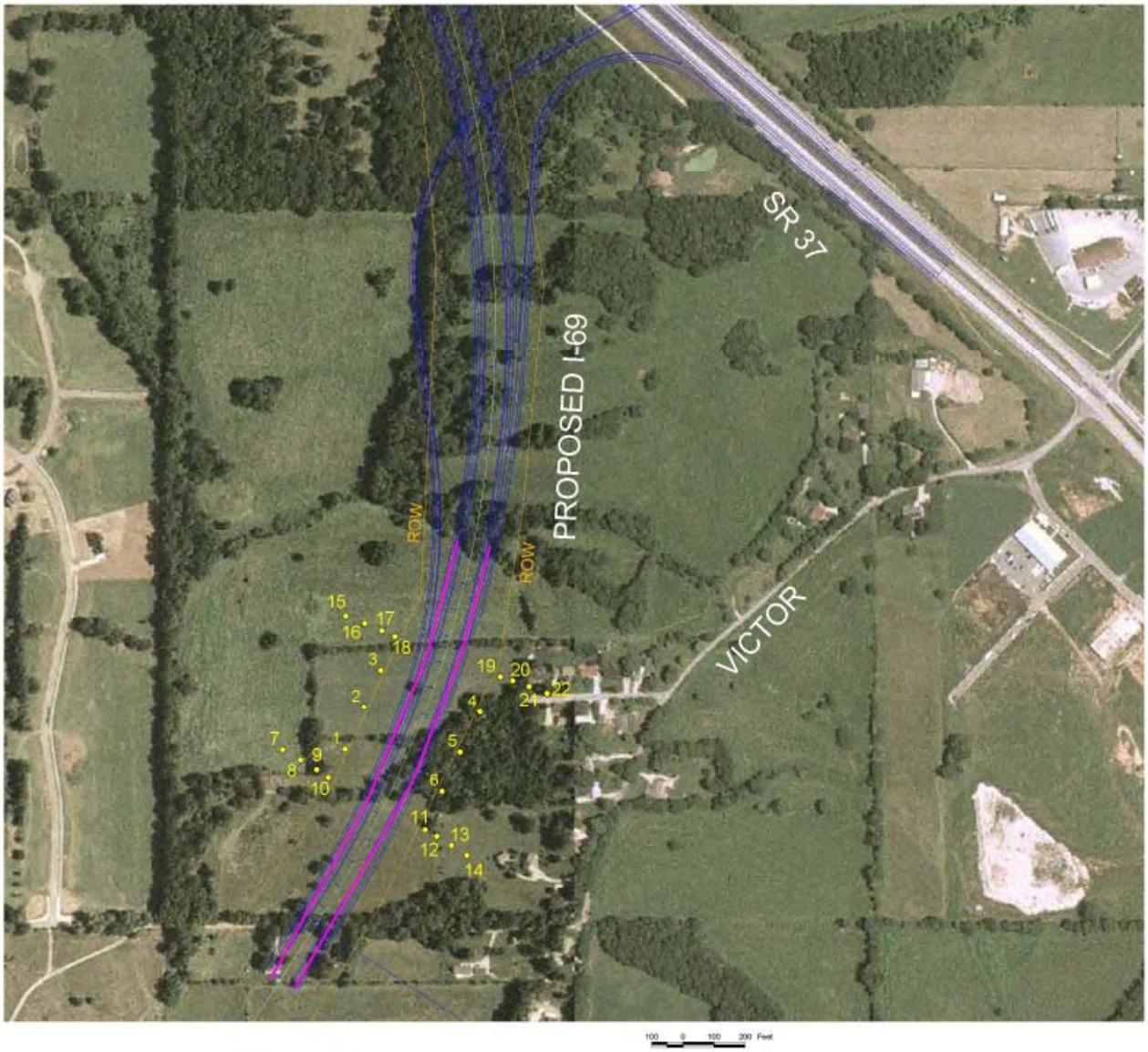


Figure 5.9-3: Link / Receptor Map – SR 37 / I-69 Free Flow Link

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5.10 Highway Noise

Since the release of the DEIS, INDOT has finalized revisions to their Traffic Noise Policy, dated 2007 and have submitted this policy to FHWA for approval. The Traffic Noise Policy, dated 2007 was revised in response to a FHWA published Notice to Proposed Rulemaking (NPRM) on September 17, 2009 (74 FR 47762) that would amend 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise effective July 13, 2011. As part of the final rule, each state was required to revise its noise policy to incorporate all of the changes that were made to 23 CFR 772. Each state was required to submit their revised noise policy to FHWA for approval by January 13, 2011 and then implement their approved policy by July 13, 2011.

Since a Record of Decision will not be signed by the effective date of this final rule, INDOT reviewed the findings presented in the DEIS and evaluated how the changes to 23 CFR 772 and the *INDOT Traffic Noise Analysis Procedure (2011)* would affect this project. It was determined that the noise study performed for the four Section 4 alternatives performed using the *INDOT Traffic Noise Policy (2007)* would remain as presented in the DEIS and that the Refined Preferred Alternative 2 would be evaluated in accordance with the requirements of the *INDOT Traffic Noise Analysis Procedure (2011)*. However, as a result, it would not be possible to effectively compare the Refined Preferred Alternative 2 to the original four Section 4 alternatives presented in the DEIS, so the Refined Preferred Alternative 2 was also evaluated using the *INDOT Traffic Noise Policy (2007)*. This evaluation was performed only for comparison purposes. Noise impacts and abatement analysis of the noise impacts was based on the evaluation of the Refined Preferred Alternative 2 using the *INDOT Traffic Noise Analysis Procedure (2011)*. A discussion of the evaluation of the Refined Preferred Alternative 2 in accordance with the *INDOT Traffic Noise Analysis Procedure (2011)* is located in Section 5.10.6.

Substantive changes to this section since the DEIS are as follows:

- Section 5.10.3.2 was updated with the correct design year traffic volume (VPD) between the Greene/Monroe County line interchange and SR 37 interchange.

- **Table 5.10-2** was updated with the revised number of residences represented by ambient location M-56. The change in the number of residences is a result of a misinterpretation of the algorithm to determine the number of residences at the Fern Hills Club, Inc. The basis of the algorithm was corrected and the number of residences was re-calculated. The table was also updated to include the addition of a new residence in the M-22 group, the M-25 group, the M-36 group and the M-38 group.

- **Table 5.10-4** was updated to include the predicted year 2030 noise levels for the Refined Preferred Alternative 2.

- **Table 5.10-4** was updated with a revised impact total for M-8 for Alternatives 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria as a result of the re-modeling of one of the receiver locations (R-49) represented by this Site I.D.[22]

- **Table 5.10-4** was updated with a revised displacement total for M-8 for Alternative 2 (Initial Design Criteria), a revised displacement total for M-54 for all alternatives, and a revised displacement total for M-56.

- **Table 5.10-4** was updated to include a new residence under sites M-22, M-25, M-36, and M-38 for Alternatives 1 through 4.

- **Table 5.10-4** was updated to correct the impacts and displacements for site M-25.

- **Table 5.10-4** was updated with the revised impact total for M-56 for Alternatives 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria.

- **Table 5.10-5** was updated to include the predicted year 2030 noise levels for the Refined Preferred Alternative 2.

- **Figures 5.10-2** through **5.10-5** were updated with revised impact data for Alternatives 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria as a result of the change in the number of residences represented by M-22, M-25, M-36, M-38 and M-56.

- Section 5.10.4.2 was updated with a discussion of predicted year 2030 noise levels for the Refined Preferred Alternative 2.

- **Table 5.10-6** was updated with the results of the re-modeling of R-49 for Alternative 1, 2, 3, and 4 using both the low-cost design criteria and initial design criteria.

- **Table 5.10-6** was updated with the revised impact totals for Alternatives 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria as a result of the change in the number of residences represented by M-36, M-38 and M-56.

- **Table 5.10-6** has been updated to include the impact totals for Refined Preferred Alternative 2 using the low-cost design criteria and the initial design criteria.

- **Table 5.10-7** was updated to include the results of the re-modeling of R-49 for Alternative 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria.

[22] "Site ID" is the column heading in Table 5.10-4 that represents the ambient reading that is used to represent the multiple receiver locations.

- **Table 5.10-7** was updated with the revised impact totals for Alternatives 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria as a result of the change in the number of residences represented by M-36, M-38 and M-56.

- **Table 5.10-7** was updated to include the Refined Preferred Alternative 2 using the low-cost design criteria and the initial design criteria.

- Section 5.10.4.3 was updated to include the results of the re-modeling of R-49 for Alternatives 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria.

- Section 5.10.4.3 was updated with the revised impact totals for Alternatives 1, 2, 3, and 4 using both the low-cost design criteria and the initial design criteria as a result of the change in the number of residences represented by M-36, M-38 and M-56.

- Section 5.10.4.3 was updated to include the results for the Refined Preferred Alternative 2.

- Section 5.10.5.2 was updated with revised ranges for the cost per benefitted receiver under Alternative 1, 2, 3, and 4 for the barriers that do not meet the "reasonable" criteria using the low-cost design criteria and the initial design criteria.

- Section 5.10.5.2 was updated with the revised cost per benefited receiver under Alternative 1, 2, 3, and 4 for Barrier G-1 as a result of the re-calculation of the number of residences that were used at the Fern Hills Club, Inc.

- Section 5.10.5.2 was updated with a discussion of the results of the barrier analysis for the Refined Preferred Alternative 2.

- **Tables 5.10-8** through **5.10-11** were updated to reflect the most current version of the barrier analysis using both the initial design criteria and the low-cost design criteria for Barrier E-1 and Barrier F-3.

- **Tables 5.10-9** through **5.10-11** were updated to reflect the most current version of the barrier analysis using both the initial design criteria and the low-cost design criteria for Barrier H-2.

- **Tables 5.10-8** through **5.10-11** were updated to reflect the most current version of the barrier analysis for Alternatives 1, 2, 3 and 4 using both the initial design criteria and the low-cost design criteria for Barrier G-1 as a result of the re-calculation of the number of residences that were used at the Fern Hills Club, Inc.

- **Table 5.10-12** was inserted and contains the results of the barrier analysis for the Refined Preferred Alternative 2 under the *INDOT Traffic Noise Policy (2007)*.

- Section 5.10.5 was updated with the results for the Refined Preferred Alternative 2.

- Section 5.10.6 was added to evaluate the Refined Preferred Alternative using the *INDOT Traffic Noise Analysis Procedure (2011)*. Key modifications which the 2011 policy contains with comparison to the 2007 policy include separately modeling each lane of traffic, considering receptors as only those within 800 feet of the highway, considering as receptors only those properties which exhibit use as of the date of public knowledge, and surveying property owners representing receptors that would be benefitted from potential mitigation measures.

- Section 5.10.8 Summary was substantially modified to reflect the changes made in Sections 5.10-1 through 5.10-5 and to incorporate the findings for the Refined Preferred Alternative 2 using the *INDOT Traffic Noise Analysis Procedure (2011)*.

5.10.1 Introduction

As Indiana's transportation system expands and the traffic volumes increase, the communities through which these facilities run experience higher levels of highway-related noise. Highway noise is becoming a growing environmental concern, especially in high-density urban settings and outlying urban/suburban areas. FHWA is cognizant of the potential for such adverse off-site effects associated with Type I[23] projects and has taken measures to assess these impacts in noise sensitive environments and establish mitigation procedures, as mandated by the Federal-Aid Highway Act.

FHWA requires that all states have an approved policy to identify and address highway traffic noise impacts. The *INDOT Traffic Noise Policy* (INDOT, 2007) was developed to implement the requirements of 23 CFR 772 and the noise-related requirements of the National Environmental Policy Act of 1969. FHWA approved the INDOT policy on February 26, 2007. The structure of the policy is based on FHWA's "Highway Traffic Noise Analysis and Abatement: Policy and Guidance" (USDOT, 1995) and focuses on seven principal elements:

1. Identification of Noise-Sensitive Land Uses.

2. Determination of Existing Noise Levels.

3. Prediction of Future Noise Levels.

4. Identification of Traffic Noise Impacts.

5. Identification and Consideration of Abatement.

6. Consideration of Construction Noise.

7. Coordination with Local Government Officials.

[23] For purposes of evaluating noise impacts, a Type I project is one that (1) proposes to construct a highway on a new location, or (2) significantly changes the alignment and/or number of through-traffic lanes of an existing highway.

The following sections document the project's compliance with FHWA and INDOT policies regarding highway noise.

5.10.2 Regulatory Policy, INDOT *Traffic Noise Policy (2007)*

The *INDOT Traffic Noise Policy* adopts the noise abatement criteria (NAC) established by FHWA (23 CFR 772) for determining noise impacts for a variety of land uses. The land-use Activity Categories along with the criteria are presented in **Table 5.10-1**.

Table 5.10-1: FHWA Noise Abatement Criteria, INDOT *Traffic Noise Policy 2007*

Hourly A-Weighted Sound Level - Decibels (dBA)			
Activity Category	**Leq(h)**	**L10(h)**	**Description of Activity**
A	57 (Exterior)	60 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties, or activities not included in categories A or B.
D	--	--	Undeveloped lands.
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

Source: Federal Highway Administration

In accordance with the *INDOT Traffic Noise Policy*, traffic noise impacts occur when a receiver[24] meets either of the two following conditions: 1) predicted noise levels approach or exceed the Noise Abatement Criteria (NAC) for the particular "activity category"; or, 2) predicted traffic noise levels substantially exceed the existing noise level. The *INDOT Highway Traffic Noise Policy*, defines "approach or exceed" to mean that future levels are higher than 1 dBA Leq(h) below the appropriate NAC. "Substantially exceed" means the predicted traffic noise levels exceed existing noise levels by 15 dBA or more. Severe noise impacts are defined as predicted noise levels that are expected to be 15 dBA or more over the NAC.

5.10.3 Methodology, INDOT *Traffic Noise Policy (2007)*

A Highway Traffic Noise Analysis for the Section 4 project (**Appendix X**, *Final Noise Technical Report*) was performed to determine the likely traffic noise impacts under both the initial design criteria and the low-cost design criteria for the Section 4 alternatives. Refined Preferred Alternative 2 is the Section 4 FEIS preferred alternative. The Highway Traffic Noise Analysis provides a comprehensive description and evaluation of the existing noise levels, the predicted Future No-Build noise levels, and the predicted year 2030 noise levels for each of the alternatives, as well as a detailed Highway Noise Mitigation Assessment for the predicted traffic noise impacts associated with all the alternatives.

[24] A receiver represents a point where noise levels are measured or modeled for each applicable Activity Category land use classification located within the limits of the noise analysis.

5.10.3.1 Determination of Existing Noise Levels

Existing noise levels is defined in 23 CFR Part 772 - Procedures for Abatement of Highway Traffic Noise and Construction Noise as the noise, resulting from the natural and mechanical sources and human activity, considered to be usually present in a particular area during the period of the noise analysis. In accordance with the *INDOT Traffic Noise Policy Chapter II.C – Determination of Existing Noise Levels*, the existing noise levels are to be determined by the measurements taken at a time of the day that reflects the loudest hourly highway traffic noise levels occurring on a regular basis under normal traffic conditions at each receiver or representative set of receivers. Since there were more than 500 receivers located within the Section 4 corridor, it was determined that existing measurements would be collected at representative sets of receivers. The representative sets were developed based on an evaluation of the topography, the level of service of the existing local roadway and highways, and the density and proximity of the receivers to the local roadways and highways. The number and location of the existing noise level measurement sites was established and existing measurements were obtained prior to the development of any of the proposed alternative alignments. The existing noise level measurement locations and the number of receivers and the land-use activity category description being represented by that location are shown on **Figure 5.10-1** (p. 5-355) and described in **Table 5.10-2** (p. 5-289). Only the existing noise level measurement locations that represented receivers within the limits of the noise analysis for the alignments of the Alternatives are identified on the figure and included in the table. The existing noise level measurement locations and representative sets of receivers not shown on **Figure 5.10-1** (p. 5-355) and not included in **Table 5.10-2** (p. 5-289) are those that are within or adjacent to the corridor, but are not near enough to any of the proposed alternatives to warrant inclusion in the analysis.

Prior to collecting the noise level measurements, an evaluation of the level of service for the roadways within the Section 4 corridor was performed to determine when the anticipated loudest hourly traffic noise levels may occur under normal traffic conditions. It was determined that this condition would most likely occur on SR 45, SR 54, SR 445, and SR 37 during the normal A.M. and/or P.M. peak hour traffic periods between the time frames of the Monday P.M peak hour through the Friday A.M. peak hour. The A.M. and P.M. peak hour traffic for these types of roadways typically occurs between 7:00 AM to 9:00 AM and 4:00 P.M. to 6:00 P.M, respectively. The weekend days along with the Monday A.M. and Friday P.M. were excluded since traffic volumes during these times may have the potential to be elevated and not indicative of the normal traffic conditions.

For the remaining roadways located within the Section 4 corridor, it was determined that based on their rural setting and the anticipated low daily traffic counts, that these roadways did not have a peak period of the day that would represent the loudest hourly traffic noise levels. The existing noise level measurements recorded along these roadways were collected from Monday through Friday between approximately 7:00 AM through 6:00 PM.

Measurement of the existing noise levels at the representative sites were collected during the week of February 13 – 17, 2006, and on March 26, 2006, using a Quest 2900 Type II meter. Additional existing noise level measurements were collected at nine new locations on March 15,

2010, using a Quest SoundPro DL Type II meter. The additional existing noise level measurements were warranted in portions of the Section 4 corridor where representative sets of receivers were further sub-divided into smaller groupings based upon further evaluation of the topographic conditions and the proximity of the receivers to the roadways. There were no known festivals, events, or other extra-ordinary circumstances occurring on these dates that would have the potential to result in abnormal traffic conditions that would be undesirable for assessing traffic noise impacts.

The Quest SoundPro DL Type II meter used to record the March 15, 2010, measurement is a newer version of the Quest 2900 Type II meter and was used since the Quest 2900 Type II meter was no longer readily accessible. The Quest SoundPro DL meter utilizes digital circuitry and was developed to replace the analog circuitry used in the Quest 2900 meter. However, both meters are type II meters, use the same microphone, and record and calculate the sound pressure level and equivalent sound exposure levels the same way.

Traffic data was simultaneously recorded during the noise measurements and classified into four vehicle types — buses, automobiles, medium trucks (two-axles with six wheels), and heavy trucks (three or more axles) — for subsequent entry into the TNM 2.5 noise prediction computer model.

Table 5.10-2: Existing Noise Level Measurement Locations

Site No.	Site Description and Land Use Category Classification
M-2	The front yard of a residence located approximately 100 feet from SR 45/58, 2100 feet from Alternatives 1, 2, and 4, and 2,620-2,670 feet from Alternative 3. Land use category B: 3 residences
M-3	The front yard of a residence located approximately 120 feet from County Road 200 E, 40-90 feet from Alternative 3 and (60-70 feet from the S-line for County Road 200 E), and 300-350 feet from Alternatives 1,2, and 4 (125-140 feet from the S-line for County Road 200 E). Land use category B: 3 residences.
M-4	The front yard of a residence located approximately 190 feet from County Road 625 S, 370-410 feet from Alternatives 3, and 450-490 feet from Alternatives 1, 2, and 4. Land use category B: 7 residences and 2 cemeteries (Hasler Cemetery and the Shoptaw Cemetery)
M-8	The front yard of a residence located approximately 70 feet from County Road 450 S, 1250-1360 feet from Alternatives 1 and 4 (1020 feet from the S-line for Taylor Ridge Road), and is located within the right-of-way of Alternatives 2 and 3. Land use category B: 31 residences and 2 cemeteries (Taylor Ridge Cemetery and Cooper Cemetery).
M-11	The front of Ashcraft Chapel and Cemetery located approximately 40 feet from County Road 360 S, and 615-840 feet from the Alternatives. Land use category B: Ashcraft Chapel and Cemetery.
M-12	The front yard of a residence located approximately 40 feet from County Road 920 S (Old Clifty Road), and 910-925 feet from the Alternatives. Land use category B: 8 residences
M-15	The front yard of a residence located approximately 30 feet from State Route 45, and is located inside the right-of-way of the Alternatives. Land use category B: 14 residences

Table 5.10-2: Existing Noise Level Measurement Locations

Site No.	Site Description and Land Use Category Classification
M-18	The front yard of a residence located approximately 60 feet from County Road 1250 E, and 150-200 feet from the Alternatives (50 feet from the S-line for County Road 1250 E). Land use category B: 7 residences
M-19	The front yard of a residence located approximately 65 feet from State Route 54, and is located inside the right-of-way of the Alternatives. Land use category B: 10 residences
M-21	Adjacent to a seasonal residence located on a private drive approximately 2200 feet from County Road 1375 E. The site is 90 feet from Alternatives 1 and 3, and 620-685 feet from Alternatives 2 and 4. Land use category B: 13 residences and 1 cemetery (Storm Cemetery) Land use category C: 1 commercial business.
M-22	The front yard of a residence located approximately 35 feet from Carmichael Road, located inside the right-of-way of Alternatives 1 and 3, 650-800 feet from Alternative 2 and 4 (365-390 feet from the S-line for Carmichael Road). Land use category B: 8 residences and 1 cemetery (Carmichael Cemetery)
M-23	The front yard of a residence located in Whippoorwill Estates. This site is approximately 1200 feet from Carmichael Road, approximately 955-970 feet from Alternative 1, 770-860 feet from Alternative 3, 1410-1475 feet from Alternative 4, and 1380 feet from Alternative 2. Land use category B: 21 residences Land use category C: 1 commercial business
M-25	The front yard of a residence located approximately 90 feet from Carter Road, 1650-1680 feet from Alternative 1, 1665-1700 feet from Alternative 4, and is located inside the right-of-way of Alternatives 2 and 3. Land use category B: 20 residences
M-27	The front yard of a residence located approximately 70 feet from Breeden Road, and 270-340 feet from the Alternatives (130 feet from the S-Line for State Breeden Road.) Land use category B: 6 residences
M-28	The front yard of a residence located approximately 45 feet from Burch Road, and is located inside the right-of-way of the Alternatives. Land use category B: 8 residences
M-31	The front yard of a residence located approximately 45 feet from West Evans Road, and 390-465 feet from the Alternatives. Land use category B: 7 residences
M-32	The front yard of a residence located approximately 55 feet from Harmony Road, and is located inside the right-of-way of the Alternatives. Land use category B: 14 residences
M-36	The back yard of a residence located approximately 40 feet from Rockport Road, and is located inside the right-of-way of the Alternatives. Land use category B: 11 residences
M-38	The front yard of a residence located approximately 110 feet from Lodge Road, and 540-610 feet from the Alternatives. Land use category B: 7 residences
M-40	The front yard of a residence located approximately 90 feet from Tramway Road, 165-190 feet from Alternative 1, 740 -785 feet from Alternatives 2 and 4, and 1610-1700 feet from Alternative 3. Land use category B: 2 residences
M-42	The front yard of a residence located approximately 45 feet from Bolin Lane, 245-310 feet from Alternative 1, and 875-975 feet from Alternatives 2, 3, and 4. Land use category B: 8 residences

Table 5.10-2: Existing Noise Level Measurement Locations

Site No.	Site Description and Land Use Category Classification
M-43	The front yard of a residence in Farmers Field subdivision located approximately 1350 feet from Bolin Lane, 365-440 feet from Alternative 1, and 1085 feet from Alternatives 2, 3, and 4. Land use category B: 33 residences
M-44	The front yard of a residence located approximately 65 feet from Victor Pike Drive, 1050-1100 feet from Alternative 1, and 595-610 feet from Alternatives 2, 3, 4. Land use category B: 10 residences
M-45	The back yard of a residence located on Jeremy Drive, approximately 135 feet from State Route 37, and 30 feet from the Alternatives. Land use category B: 7 residences
M-46	The front yard of a residence located on Big Sky Lane, approximately 240 feet from State Route 37, and is located within the right-of-way of the Alternatives. Land use category B: 9 residences
M-47	The front yard of a residence located approximately 80 feet from Hobbieville Road, 650-700 feet from Alternatives 1 and 3, and 565 feet from Alternatives 2 and 4 (60-75 feet from the S-line for Hobbieville Road). Land use category B: 12 residences
M-49	The back yard of a residence located on Nicole Drive, approximately 495 feet from State Route 37, and 245 feet from the Alternatives. Land use category B: 11 residences
M-50	The front yard of a residence located approximately 75 feet from That Road, and is 765-780 feet from the Alternatives. Land use category B: 2 residences
M-53	The back yard of a residence located approximately 100 feet from County Road 350 N, approximately 950-1000 feet from Alternatives 1 and 4, and 1150-1200 feet from Alternatives 2 and 3. Land use category B: 13 residences and 1 cemetery (Sparks Cemetery).
M-54	The front yard of a residence located approximately 50 feet from County Road 920 S (Old Clifty Road), and 145-190 feet from the Alternatives (30 feet from the S-line for County Road 920 S). Land use category B: 1 residence
M-55	An un-built lot in the Rolling Glen subdivision located approximately 860 feet from Victor Pike Drive, 530-655 feet from Alternatives 2, 3, and 4 and 1330-1360 feet from Alternative 1. Land use category B: 58 residences
M-56	Adjacent to the playground at the Fern Hills Club Campground and is located approximately 1,110 feet from Rockport Road, and is located 575-730 feet from the Alternatives. Land use category B: 7 residences Land use category C: 1 commercial operation
M-57	The front yard of a residence located approximately 250 feet from Evans Rd, and is located 885-965 feet from the Alternatives. Land use category B: 7 residences
M-58	The front yard of a residence located approximately 640 feet from Tramway Rd, and is within the right-of-way limits for Alternative 1, 340-350 feet from Alternatives 2 and 4, and 1095 feet from Alternative 3. Land use category B: 1 residence
M-59	The front yard of a residence located approximately 370 feet from Bolin Lane, and is located 60-110 feet from Alternative 1, and 790-865 feet from Alternatives 2, 3, and 4. Land use category B: 4 residences
M-60	The front yard of a residence located approximately 475 feet from Victor Pike, and is located 620-680 feet from Alternative 1, and 135 feet from Alternatives 2, 3, and 4. Land use category B: 4 residences

Table 5.10-2: Existing Noise Level Measurement Locations

Site No.	Site Description and Land Use Category Classification
M-61	The front yard of a residence located approximately 800 feet from That Rd. and 1030 feet from SR 37, and is located 270 feet from the Alternatives. Land use category B: 12 residences
M-62	The front yard of a residence located approximately 2,400 feet from State Route 45 (north of State Route 445), and is located 155-175 feet from the Alternatives. Land use category B: 12 residences
M-63	The front yard of a residence located approximately 980 feet from Carmichael Road, and is located 380 feet from the Alternatives. Land use category B: 3 residences and 1 cemetery (Adams Cemetery)
M-64	The front yard of a residence located approximately 1,290 feet from Evans Lane, and is located 310-340 feet from the Alternatives. Land use category B 8 residences
C-1	The front yard of a residence located approximately 60 feet from State Route 45 (south of State Route 445), and is located inside the right-of-way of the Alternatives. Land use category B: 1 residence
C-2	The front yard of a residence located in Shea Estates. This site is approximately 1430 feet from State Route 45, 70 feet from the south connector road of the Alternatives. Land use category B: 10 residences
C-3	The front yard of a residence located in Shady Meadows. This site is approximately 610 feet from State Route 45, 1970 feet from the south connector road of the Alternatives. Land use category B: 7 residences
C-4	The front yard of a residence located approximately 125 feet from State Route 45 (north of State Route 445), and 2990 feet from the south connector road of the Alternatives. Land use category B 18 residences Land use category C: 4 commercial operations

Note: Only the existing condition noise measurement locations that were within the limits of the noise analysis with regards to the final horizontal alignment of the Alternatives are included in this table.

5.10.3.2 Prediction of Future Noise Levels

The future noise levels for the Future No-Build[25] and the Section 4 alternatives were performed using the FHWA Traffic Noise Model (TNM), Version 2.5. The FHWA TNM was first released in March 1998. Version 2.5 of the model was released in April 2004. It is the latest approved version of the model.

The FHWA TNM estimates vehicle noise emissions based on mean (average) noise emission levels for four classes of vehicles: automobiles and light trucks, buses, medium trucks, and heavy trucks. The predicted noise levels for the Future No-Build Condition and four alternatives was based on average daily traffic (ADT) and design hourly volume (DHV) projections for the year 2030 (See Section 3.1, *Alternative Development Overview*, for a discussion of I-69 Tier 2 traffic modeling methodology). The traffic data utilized for the alternatives were based on the interchange option that has interchanges at SR 45 and the Greene/Monroe County Line interchange (with the South Connector). The traffic associated with this interchange option is

[25] The Future No-Build refers to the forecasts for the baseline alternative for the design year (2030), which assumes that all other committed projects are constructed, but that I-69 is not constructed.

forecasted to be 23,619 vehicles per day (VPD) between the US 231 and SR 45 interchanges, 24,101 VPD between the SR 45 interchange and Greene/Monroe County Line interchange, and 29,578 VPD between the Greene/Monroe County line interchange and SR 37 interchange.

Terrain and other roadway features were input in to TNM. These inputs include roadway widths and elevations, receiver elevations and distances from the roadway(s), intervening terrain and ground cover. In accordance with *INDOT's Traffic Noise Policy, dated 2007* all receivers located within 500 feet of the edge of pavement of all reasonable alternatives were assessed for traffic noise impacts. Based on evaluation of the existing topography and the proposed horizontal and vertical alignments of the alternatives, additional receivers located at distances greater than 500 feet from the edge of pavement for the alternatives were included in the model so as to define the extent of the receivers predicted to experience a substantial increase impact[26].

Based on all this input data, TNM uses its acoustic algorithms to predict noise levels at receiver locations by taking into account sound propagation variables such as atmospheric absorption, divergence, intervening ground, barriers, building rows, and vegetation.

5.10.3.3 TNM 2.5 Program Model Validation

Model validation is a process for testing a model to ensure that it produces reliable results and to confirm that traffic noise is the predominant noise source at the receiver locations. In general, validation involves comparing actual noise measurements with the noise levels predicted by the model for existing conditions at the same location. The model is considered to be verified if the model results are within ±3 dBA of the field measurements recorded at the site for the same conditions. In rural situations where there is no nearby traffic or traffic volumes are very low even under peak hour conditions, validation of TNM 2.5 by this method is not possible since non-traffic existing noises not accounted for in the model (e.g. birds chirping, insects, tree leaves rustling in the wind, dogs barking, air conditioner condenser units, etc.) are the predominant noise component, rather than roadway traffic.

5.10.3.4 Abatement Assessment

Noise abatement for the Section 4 alternatives will be evaluated for all receivers that are predicted to experience noise impacts (as defined in Section 5.10.2) in design year 2030. The *INDOT Traffic Noise Policy* is consistent with the FHWA guidelines to determine the feasibility and reasonableness of noise abatement measures for all major highway projects. The term "feasible" means that it is structurally and acoustically possible to achieve a substantial noise reduction of at least 7 dBA for (50% +1) of the impacted first row receivers in the design year. In other words, a barrier design must be capable of providing a 7 dBA reduction for at least one more than half of the total number of first row receivers along a highway section where noise impacts occur. The term "reasonable" means that based on consideration of several factors (including the number of benefited receivers, the cost of abatement, the severity of the noise impact, the timing of development near a project, and the views of impacted residents), that a barrier can be built in a cost-effective manner and can be fit into the surrounding land-uses.

[26] The updated INDOT Traffic Noise Policy (2011) limits the extent of the noise study to a maximum distance of 800 feet from the outer edge of the nearest travel lane.

In 23 CFR Part 772, FHWA has identified a number of measures to abate or eliminate noise impacts. The primary means of mitigating noise impacts, as identified by FHWA, are:

- Traffic management measures (e.g., traffic control devices and signing to prohibit certain vehicle types, modified speed limits, and exclusive lane designations).
- Alteration of horizontal and vertical alignments.
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development that would be adversely impacted by traffic noise.
- Construction of noise barriers within the highway right-of-way.
- Noise insulation of public use or non-profit institutional structures.
- Coordination among local authorities to govern future development along the selected corridor.

5.10.4 Analysis, INDOT *Traffic Noise Policy (2007)*

5.10.4.1 Existing Condition Noise Levels and TNM Validation

The measured and modeled existing noise levels for each representative receiver location are contained in **Table 5.10-3.** The existing measured L_{eq} noise levels within the project corridor ranged from 66.1 dBA at Site C-1 to 33.2 dBA at Site M-64. The existing measured L_{eq} for Site C-1 (located along SR 45 near SR 445) approaches the NAC of 67 dBA and is considered an existing traffic noise impact as defined by the INDOT *Highway Traffic Noise Policy*. None of the other existing noise levels recorded at the representative measurement sites approach or exceed the NAC.

Based on field observations collected during the existing noise level measurements, ambient sounds such as birds chirping, insects, tree leaves rustling in the wind, and occasional barking dogs were considered to be the dominant source of noise at the measurements locations M-4, M-8, M-11, M-12, M-21, M-23, M-25, M-27, M-38, M-42, M-47, M-50, M-53, M-54, M-55, M-56, M-57, M-58, M-59, M-62, M-63, M-64, C-2, and C-3. The measured noise levels recorded at these 24 locations were all more than 3 dBA greater than the corresponding modeled noise level. Based on these results, the noise model confirms that the predominant noise component at these representative existing noise measurements sites is the ambient conditions. Because the model is designed to analyze traffic noise, the modeled results do not take into account the existing ambient noise produced by birds chirping and leaves rustling in the wind. Thus, the modeled noise at these sites, which is limited to traffic noise, is lower than the measured ambient noise levels themselves.

A comparison of the existing measure readings and the corresponding modeled results for the remaining 20 representative existing conditions measurement sites where the ambient noise levels were not identified as the predominant noise component, indicated that 20 of the 21 sites

had predicted noise level within ±3 dBA of the measured readings. The one site where the predicted noise level was not within ±3 dBA of the measured level was at representative Site C-1, which was located along SR 45 near SR 445. The difference between the two readings is believed to be a result of noise being generated by traffic on the nearby SR 445 roadway, which could not be accurately accounted for in the model since a traffic volume for this roadway was not confirmed during the existing measurement period. As a result, the noise model is confirming that the predominant source of noise at these existing noise measurement sites is related to traffic noise.

Table 5.10-3: Existing Noise Levels and TNM Validation Results

Site No.	Activity Category	Noise Abatement Criterion	Existing Measured L_{eq} (dBA)	Existing Modeled L_{eq} (dBA)	Measured Minus Modeled Leq (dBA)	Dominant Noise Source at Site
M-2	B	67	59.2	59.3	-0.1	Traffic noise from SR 45 / SR 58
M-3	B	67	42.2	39.3	2.9	Traffic noise from SR 45 / SR 58
M-4	B	67	41.3	31.7	9.6	Ambient noise and traffic noise from SR 45 / SR 58
M-8	B	67	38.9	0.0(1)	38.9	Ambient noise; No traffic during reading
M-11	B	67	43.1	32.2	10.9	Ambient noise; Airplane flew overhead during reading
M-12	B	67	42.9	38.7	4.2	Ambient noise; Dog barking on adjoining property
M-15	B	67	61.8	59.6	2.2	Traffic noise from SR 45
M-18	B	67	49.5	50.9	-1.4	Traffic noise from CR 1250E & SR 54
M-19	B	67	57.3	55.7	1.6	Traffic noise from SR 54
M-21	B/C	67/72	39.7	9.7 (2)	30.0	Ambient noise; No traffic (approx. 2,220 ft from road)
M-22	B	67	46.5	44.4	2.1	Traffic noise from Carmichael Rd
M-23	B/C	67/72	40.9	30.4	10.5	Ambient noise; 1 vehicle observed during reading
M-25	B	67	39.3	33.7	5.6	Ambient noise; 1 vehicle observed during reading
M-27	B	67	50.1	44.7	5.4	Traffic noise from Breeden Rd
M-28	B	67	37.5	37.2	0.3	Traffic Noise from Burch Rd; 1 vehicle observed during reading
M-31	B	67	44.3	47.1	-2.8	Traffic noise from West Evans Rd
M-32	B	67	49.6	48.8	0.8	Traffic noise from Harmony Rd
M-36	B	67	49.7	51.9	-2.2	Traffic noise from Rockport Rd
M-38	B	67	40.7	35.8	4.9	Ambient noise (quarry background noise)
M-40	B	67	43.2	45.9	-2.7	Traffic noise from Tramway Rd
M-42	B	67	52.0	47.1	4.9	Ambient noise & traffic noise from Bolin Lane
M-43	B	67	43.0	41.3	1.7	Traffic noise from SR 37

Table 5.10-3: Existing Noise Levels and TNM Validation Results

Site No.	Activity Category	Noise Abatement Criterion	Existing Measured L_{eq} (dBA)	Existing Modeled L_{eq} (dBA)	Measured Minus Modeled Leq (dBA)	Dominant Noise Source at Site
M-44	B	67	53.7	54.6	-0.9	Traffic noise from Victor Pike
M-45	B	67	61.2	61.6	-0.4	Traffic noise from SR 37
M-46	B	67	57.4	58.3	-0.9	Traffic noise from SR 37
M-47	B	67	40.5	36.9	3.6	Ambient noise; 1 vehicle observed during reading
M-49	B	67	54.4	53.7	0.7	Traffic noise from SR 37
M-50	B	67	60.8	51.3	9.5	Ambient noise (talking) & traffic noise from That Rd & SR 37
M-53	B	67	39.0	34.7	4.3	Ambient noise
M-54	B	67	43.9	35.8	8.1	Ambient noise; Dog barking on adjoining property
M-55	B	67	40.0	34.7	5.3	Ambient noise & traffic noise from Victor Pike Dr.
M-56	B	67	43.6	33.2	10.4	Ambient noise (birds and construction work on Rockport Road)
M-57	B	67	42.3	32.9	9.4	Ambient noise (barking) and traffic noise From Evans Road
M-58	B	67	57.9	37.6	20.3(3)	Very noisy ambient sounds (dogs barking, chickens, birds)
M-59	B	67	44.7	40.2	4.5	Ambient noise (birds) and traffic from Bolin Lane, Farmers Field Drive and SR 37 in the distance
M-60	B	67	43.2	44.0	-0.8	Traffic noise from Victor Pike
M-61	B	67	47.3	48.7	-1.4	Traffic noise from That Road and SR 37
M-62	B	67	52.1	37.1	15.0	Ambient noise (dogs barking, and kids playing outside) with SR 45 audibly in the distance
M-63	B	67	45.0	34.1	10.9	Traffic noise on Breeden Road with SR 45 audibly in the distance
M-64	B	67	33.2	16.8 (2)	16.4	Ambient noise (wind); No traffic during reading
C-1	B	67	**66.1**	61.0	5.1	Ambient noise & traffic noise from SR 45
C-2	B	67	50.4	39.4	11.0	Ambient noise
C-3	B	67	50.7	42.0	8.7	Ambient noise & traffic noise from SR 45
C-4	B/C	67/72	61.3	64.3	3.0	Traffic noise from SR 45

L_{eq} values in bold indicate sites where the measured ambient approaches or exceeds the Category B NAC of 76 dBA.
(1): This site was unable to be modeled since there was no existing traffic observed during the ambient reading.
(2): There was no traffic observed during the reading at this location; as a result, the predicted noise level at this location is a result of traffic located on the distant roadway.
(3): The large difference between the measured reading and modeled reading is a result of the site being located approx. 640 ft from the roadway and the fact that the model could not calculate the ambient component of the overall measured noise level.

5.10.4.2 Design Year Noise Results

This section provides a comparison of the design year noise results for the Future No-Build Condition with those of the Section 4 alternatives using both the initial design criteria and the low-cost design criteria. Following the distribution of the DEIS, Build Alternative 2 was further refined into the Refined Preferred Alternative 2 in the FEIS. Revisions incorporated into the Refined Preferred Alternative 2 are described in Section 5.6 of the FEIS. **Table 5.10-4** summarizes the data associated with these results.

Future No-Build Condition: The results of the noise analysis conducted for the Future No-Build Condition at the existing noise monitoring locations (see **Table 5.10-4**) indicate that year 2030 predicted noise levels would range from 15.3 dBA L_{eq} at Site M-21 to 66.5 dBA L_{eq} at Site C-4. The modeled design year no-build noise levels are shown to be more than 3 dBA lower than measured existing levels at 21 of the representative sites. The decrease in the modeled predicted no-build results can be attributed to two possible factors: (1) the traffic volume experienced at the time of the existing condition measurement might be greater than the predicted hourly traffic data available from the traffic model used as input into TNM to determine the Future No-Build 2030 levels, and (2) the ambient component observed during the existing noise level measurements could not be taken into account in the noise model for the year 2030 no-build condition.

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Table 5.10-4: Design Year 2030 Predicted Noise Levels Evaluated Using INDOT Traffic Noise Policy, Dated 2007

Site No	Number of Receivers Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)									
							Alternatives									
							1		2		3		4		Refined Preferred Alt 2 (INDOT Noise Policy 2007)	
							Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]
M-2	2	B	59.2	67	74.2	60.9	46.6 dBA Impacts: 0	47.3 dBA Impacts: 0	46.6 dBA Impacts: 0	47.3 dBA Impacts: 0	"-" Impacts: 0	"-" Impacts: 0	46.6 dBA Impacts: 0	47.3 dBA Impacts: 0	47.2 dBA Impacts: 0	47.3 dBA Impacts: 0
M-3	3	B	42.2	67	57.2	40.6	54.9-56.5 dBA Impacts: 0	56.2-59.6 dBA Impacts: 1	54.9-56.5 dBA Impacts: 0	56.2-59.6 dBA Impacts: 1	55.6-65.0 dBA Impacts: 1 Displacements: 1	54.8-64.4 dBA Impacts: 1 Displacements: 1	54.9-56.5 dBA Impacts: 0	56.2-59.6 dBA Impacts: 1	55.7-57.2 dBA Impacts: 1	56.1-59.6 dBA Impacts: 1
M-4	9	B	41.3	67	56.3	36.5	53.7-64.9 dBA Impacts: 7	55.4-66.6 dBA Impacts: 8	53.7-64.9 dBA Impacts: 7	55.4-66.6 dBA Impacts: 8	54.2-62.9 dBA Impacts: 6 Displacements: 1	54.4-62.0 dBA Impacts: 6 Displacements: 1	53.7-64.9 dBA Impacts: 7	55.4-66.6 dBA Impacts: 8	54.4-65.6 dBA Impacts: 8	55.3-66.6 dBA Impacts: 8
M-8	33	B	38.9	67	53.9	31.2	44.7-66.5 dBA Impacts: 19 Displacements: 6	43.0-67.6 dBA Impacts: 20 Displacements: 5	45.7-66.5 dBA Impacts: 21 Displacements: 6	46.1-67.6 dBA Impacts: 21 Displacements: 6	45.7-66.5 dBA Impacts: 21 Displacements: 6	46.1-67.6 dBA Impacts: 21 Displacements: 5	44.7-66.5 dBA Impacts: 19 Displacements: 6	43.0-67.6 dBA Impacts: 20 Displacements: 5	47.7-66.6 dBA Impacts: 21 Displacements: 6	50.1-67.6 dBA Impacts: 21 Displacements: 6
M-11	1	B	43.1	67	58.1	40.4	57.6 dBA Impacts: 0	57.8 dBA Impacts: 0	57.6 dBA Impacts: 0	57.8 dBA Impacts: 0	57.6 dBA Impacts: 0	57.8 dBA Impacts: 0	57.6 dBA Impacts: 0	57.8 dBA Impacts: 0	57.0 dBA Impacts: 0	57.8 dBA Impacts: 0
M-12	8	B	42.9	67	57.9	41.6	48.1-63.7 dBA Impacts: 2 Displacements: 1	47.5-63.4 dBA Impacts: 2 Displacements: 1	48.1-63.7 dBA Impacts: 2 Displacements: 1	47.5-63.4 dBA Impacts: 2 Displacements: 1	48.1-63.7 dBA Impacts: 2 Displacements: 1	47.5-63.4 dBA Impacts: 2 Displacements: 1	48.1-63.7 dBA Impacts: 2 Displacements: 1	47.5-63.4 dBA Impacts: 2 Displacements: 1	48.3-64.0 dBA Impacts: 2 Displacements: 1	47.5-63.4 dBA Impacts: 2 Displacements: 1
M-15	14	B	61.8	67	76.8	59.4	52.4-60.8 dBA Impacts: 0 Displacements: 2	51.6-61.2 dBA Impacts: 0 Displacements :2	52.4-60.8 dBA Impacts: 0 Displacements: 2	51.6-61.2 dBA Impacts: 0 Displacements: 2	52.4-60.8 dBA Impacts: 0 Displacements: 2	51.6-61.2 dBA Impacts: 0 Displacements: 2	52.4-60.8 dBA Impacts: 0 Displacements: 2	51.6-61.2 dBA Impacts: 0 Displacements: 2	52.3-60.8 dBA Impacts: 0 Displacements: 2	52.2-60.9 dBA Impacts: 0 Displacements: 2
M-18	7	B	49.5	67	64.5	42.5	53.6-65.4 dBA Impacts: 1 Displacements: 2	54.6-68.3 dBA Impacts: 1 Displacements: 2	53.6-65.4 dBA Impacts: 1 Displacements: 2	54.6-68.3 dBA Impacts: 1 Displacements: 2	53.6-65.4 dBA Impacts: 1 Displacements: 2	54.6-68.3 dBA Impacts: 1 Displacements: 2	53.6-65.4 dBA Impacts: 1 Displacements: 2	54.6-68.3 dBA Impacts: 1 Displacements: 2	54.3-65.7 dBA Impacts: 1 Displacements: 2	54.0-65.8 dBA Impacts: 1 Displacements: 2
M-19	10	B	57.3	67	72.3	57.8	54.8-59.1 dBA Impacts: 0 Displacements: 3	55.8-59.5 dBA Impacts: 0 Displacements: 3	54.8-59.1 dBA Impacts: 0 Displacements: 3	55.8-59.5 dBA Impacts: 0 Displacements:3	54.8-59.1 dBA Impacts: 0 Displacements: 3	55.8-59.5 dBA Impacts: 0 Displacements: 3	54.8-59.1 dBA Impacts: 0 Displacements:3	55.8-59.5 dBA Impacts: 0 Displacements: 3	55.3-59.6 dBA Impacts: 0 Displacements: 3	55.3-59.3 dBA Impacts: 0 Displacements: 3
M-21	14	B	39.7	67	54.7	15.3	54.7-68.1 dBA Impacts: 11 Displacements: 3	55.3-67.9 dBA Impacts: 11 Displacements: 3	58.1-68.1 dBA Impacts: 10 Displacements: 2	57.8-67.9 dBA Impacts: 10 Displacements: 2	53.2-68.1 dBA Impacts: 9 Displacements: 3	55.4-67.9 dBA Impacts: 11 Displacements: 3	58.1-68.1 dBA Impacts: 10 Displacements: 2	57.8-67.9 dBA Impacts: 10 Displacements: 2	58.0-68.4 dBA Impacts: 10 Displacements: 2	57.8-68.4 dBA Impacts: 10 Displacements: 2
	1	C	39.7	72	54.7	15.3	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1
M-22	9	B	46.5	67	61.5	51.3	56.1-59.5 dBA Impacts: 0 Displacements: 3	57.2-61.7 dBA Impacts: 1 Displacements: 3	57.3-59.4 dBA Impacts: 0	57.5-59.2 dBA Impacts: 0	55.3-58.8 dBA Impacts: 0 Displacements: 3	57.6-59.0 dBA Impacts: 0 Displacements: 4	57.2-59.2 dBA Impacts: 0	57.6-59.3 dBA Impacts: 0	57.3-61.3 dBA Impacts: 0	57.5-60.9 dBA Impacts: 0

Table 5.10-4: Design Year 2030 Predicted Noise Levels Evaluated Using INDOT Traffic Noise Policy, Dated 2007

Site No	Number of Receivers Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)									
							Alternatives									
							1		2		3		4		Refined Preferred Alt 2 (INDOT Noise Policy 2007)	
							Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]
M-23	21	B	40.9	67	55.9	41.2	41.5-63.0 dBA Impacts: 11 Displacements: 2	44.2-65.2 dBA Impacts: 11 Displacements: 2	53.3-60.2 dBA Impacts: 6 Displacements: 1	53.2-59.7 dBA Impacts: 7 Displacements: 1	54.5-62.0 dBA Impacts: 12 Displacements: 3	55.4-63.9 dBA Impacts: 15 Displacements: 3	53.0-60.0 dBA Impacts: 4	49.2-59.4 dBA Impacts: 5	52.9-60.2 dBA Impacts: 6 Displacements: 1	53.1-59.7 dBA Impacts: 7 Displacements: 1
	1	C	40.9	72	55.9	41.2	59.2 dBA Impacts: 1	61.4 dBA Impacts: 1	"-" Impacts: 0	"-" Impacts: 0	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1	"-" Impacts: 0	"-" Impacts: 0	"-" Impacts: 0	"-" Impacts: 0
M-25	20	B	39.3	67	54.3	30.9	43.8-57.6 dBA Impacts: 1 Displacements: 11	42.3-55.4 dBA Impacts: 1 Displacements: 11	53.1-65.4 dBA Impacts: 10 Displacements: 8	52.4-66.1 dBA Impacts: 8 Displacements: 9	52.6-65.2 dBA Impacts: 9 Displacements: 7	48.9-65.0 dBA Impacts: 3 Displacements: 9	43.2-58.7 dBA Impacts: 1 Displacements: 11	41.8-58.6 dBA Impacts: 1 Displacements: 11	53.5-66.1 dBA Impacts: 9 Displacements: 8	52.0-65.6 dBA Impacts: 8 Displacements: 9
M-27	6	B	50.1	67	65.1	50.3	53.8-61.7 dBA Impacts: 0 Displacements: 2	54.2-61.9 dBA Impacts: 0 Displacements: 2	54.1-61.4 dBA Impacts: 0 Displacements: 1	54.2-61.6 dBA Impacts: 0 Displacements: 1	54.4-61.6 dBA Impacts: 0 Displacements: 1	53.9-61.2 dBA Impacts: 0 Displacements: 1	54.2-61.6 dBA Impacts: 0 Displacements: 2	54.3-61.8 dBA Impacts: 0 Displacements: 2	54.2-61.5 dBA Impacts: 0 Displacements: 1	54.0-61.9 dBA Impacts: 0 Displacements: 1
M-28	8	B	37.5	67	52.5	39.6	50.9-60.0 dBA Impacts: 5 Displacements: 2	48.9-60.2 dBA Impacts: 5 Displacements: 2	50.9-60.0 dBA Impacts: 5 Displacements: 2	48.9-60.2 dBA Impacts: 5 Displacements: 2	50.9-60.0 dBA Impacts: 5 Displacements: 2	48.9-60.2 dBA Impacts: 5 Displacements: 2	50.9-60.0 dBA Impacts: 5 Displacements: 2	48.9-60.2 dBA Impacts: 5 Displacements: 2	51.2-59.7 dBA Impacts: 5 Displacements: 2	51.2-59.7 dBA Impacts: 5 Displacements: 2
M-31	7	B	44.3	67	59.3	51.8	53.4-62.4 dBA Impacts: 3 Displacements: 1	49.7-58.1 dBA Impacts: 0 Displacements: 1	53.4-62.4 dBA Impacts: 3 Displacements: 1	49.7-58.1 dBA Impacts: 0 Displacements: 1	53.4-62.4 dBA Impacts: 3 Displacements: 1	49.7-58.1 dBA Impacts: 0 Displacements: 1	53.4-62.4 dBA Impacts: 3 Displacements: 1	49.7-58.1 dBA Impacts: 0 Displacements: 1	53.4-62.1 dBA Impacts: 2 Displacements: 1	53.2-62.1 dBA Impacts: 2 Displacements: 1
M-32	14	B	49.6	67	64.6	41.1	50.3-63.9 dBA Impacts: 0 Displacements: 4	45.4-59.2 dBA Impacts: 0 Displacements: 6	50.3-63.9 dBA Impacts: 0 Displacements: 4	45.4-59.2 dBA Impacts: 0 Displacements: 6	50.3-63.9 dBA Impacts: 0 Displacements: 4	45.4-59.2 dBA Impacts: 0 Displacements: 6	50.3-63.9 dBA Impacts: 0 Displacements: 4	45.4-59.2 dBA Impacts: 0 Displacements: 6	50.8-63.3 dBA Impacts: 0 Displacements: 4	51.3-60.2 dBA Impacts: 0 Displacements: 6
M-36	11	B	49.7	67	64.7	49.6	59.5-67.9 dBA Impacts: 3 Displacements: 3	59.8-66.1 dBA Impacts: 3 Displacements: 4	59.5-67.9 dBA Impacts: 3 Displacements: 3	59.8-66.1 dBA Impacts: 3 Displacements: 4	59.5-67.9 dBA Impacts: 3 Displacements: 3	59.8-66.1 dBA Impacts: 3 Displacements: 4	59.5-67.9 dBA Impacts: 3 Displacements: 3	59.8-66.1 dBA Impacts: 3 Displacements: 4	59.4-68.3 dBA Impacts: 3 Displacements: 3	59.9-68.2 dBA Impacts: 3 Displacements: 4
M-38	7	B	40.7	67	55.7	46.1	51.9-65.8 dBA Impacts: 5 Displacements: 1	54.7-65.4 dBA Impacts: 5 Displacements: 1	51.2-65.7 dBA Impacts: 5 Displacements: 1	52.0-65.5 dBA Impacts: 5 Displacements: 1	47.6-65.8 dBA Impacts: 4 Displacements: 1	47.3-65.8 dBA Impacts: 4 Displacements: 1	51.2-65.7 dBA Impacts: 5 Displacements: 1	52.0-65.5 dBA Impacts: 5 Displacements: 1	51.1-65.6 dBA Impacts: 5 Displacements: 1	52.2-65.3 dBA Impacts: 5 Displacements: 1
M-40	2	B	43.2	67	58.2	32.2	66.4 dBA Impacts: 1 Displacements: 1	67.1 dBA Impacts: 1 Displacements: 1	58.6-63.3 dBA Impacts: 2	60.4-64.6 dBA Impacts: 2	54.0-56.4 dBA Impacts: 0	54.7-57.1 dBA Impacts: 0	58.6-63.3 dBA Impacts: 2	60.4-64.6 dBA Impacts: 2	58.5-63.3 dBA Impacts: 2	60.4-64.5 dBA Impacts: 2
M-42	8	B	52.0	67	67.0	40.6	57.1-65.6 dBA Impacts: 0 Displacements: 2	59.8-67.1 dBA Impacts: 2 Displacements: 2	53.0-63.1 dBA Impacts: 0 Displacements: 1	55.8-64.9 dBA Impacts: 0 Displacements: 1	51.9-63.0 dBA Impacts: 0 Displacements: 1	55.8-65.0 dBA Impacts: 0 Displacements: 1	53.0-63.1 dBA Impacts: 0 Displacements: 1	55.8-64.9 dBA Impacts: 0 Displacements: 1	52.8-63.2 dBA Impacts: 0 Displacements: 1	55.8-65.8 dBA Impacts: 0 Displacements: 1

Table 5.10-4: Design Year 2030 Predicted Noise Levels Evaluated Using INDOT Traffic Noise Policy, Dated 2007

Site No	Number of Receivers Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)									
							Alternatives									
							1		2		3		4		Refined Preferred Alt 2 (INDOT Noise Policy 2007)	
							Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]
M-43	33	B	43.0	67	58.0	41.1	52.2-66.2 dBA Impacts: 17 Displacements: 5	56.5-66.8 dBA Impacts: 22 Displacements: 5	46.5-62.7 dBA Impacts: 5	50.7-63.8 dBA Impacts: 11	43.1-62.7 dBA Impacts: 5	50.9-63.8 dBA Impacts: 11	46.5-62.7 dBA Impacts: 5	50.7-63.8 dBA Impacts: 11	46.6-63.0 dBA Impacts: 3	50.7-63.3 dBA Impacts: 10
M-44	10	B	53.7	67	68.7	50.9	54.1-58.4 dBA Impacts: 0	56.5-60.1 dBA Impacts: 0	57.1-62.6 dBA Impacts: 0	57.7-64.4 dBA Impacts: 0	57.1-62.6 dBA Impacts: 0	57.6-64.5 dBA Impacts: 0	57.1-62.6 dBA Impacts: 0	57.7-64.4 dBA Impacts: 0	54.5-60.7 dBA Impacts: 0	57.9-64.7 dBA Impacts: 0
M-45	7	B	61.2	67	76.2	62.8	57.0-63.8 dBA Impacts: 0 Displacements: 3	58.0-65.3 dBA Impacts: 0 Displacements: 3	58.1-64.6 dBA Impacts: 0 Displacements: 3	58.6-64.8 dBA Impacts: 0 Displacements: 3	58.6-65.2 dBA Impacts: 0 Displacements: 3	58.6-64.9 dBA Impacts: 0 Displacements: 3	58.1-64.6 dBA Impacts: 0 Displacements: 3	58.6-64.8 dBA Impacts: 0 Displacements: 3	58.9-65.7 dBA Impacts: 0 Displacements: 3	59.9-66.0 dBA Impacts: 1 Displacements: 3
M-46	9	B	57.4	67	72.4	60.0	52.5-57.7 dBA Impacts: 0 Displacements: 5	52.3-56.9 dBA Impacts: 0 Displacements: 5	52.5-57.8 dBA Impacts: 0 Displacements: 5	52.9-56.8 dBA Impacts: 0 Displacements: 5	52.3-57.1 dBA Impacts: 0 Displacements: 5	52.9-57.2 dBA Impacts: 0 Displacements: 5	52.5-57.8 dBA Impacts: 0 Displacements: 5	52.9-56.8 dBA Impacts: 0 Displacements: 5	52.5-58.9 dBA Impacts: 0 Displacements: 5	53.7-58.6 dBA Impacts: 0 Displacements: 5
M-47	12	B	40.5	67	55.5	38.0	45.7-58.7 dBA Impacts: 3 Displacements: 3	45.1-57.9 dBA Impacts: 3 Displacements: 3	46.8-59.4 dBA Impacts: 2 Displacements: 3	46.4-60.4 dBA Impacts: 2 Displacements: 3	44.4-57.3 dBA Impacts: 1 Displacements: 3	44.7-58.3 dBA Impacts: 3 Displacements: 3	46.9-59.3 dBA Impacts: 2 Displacements: 3	46.3-60.1 dBA Impacts: 2 Displacements: 3	46.7-58.9 dBA Impacts: 2 Displacements: 3	46.9-59.6 dBA Impacts: 2 Displacements: 3
M-49	11	B	54.4	67	69.4	55.0	51.0-63.0 dBA Impacts: 0	51.5-63.8 dBA Impacts: 0	52.4-64.1 dBA Impacts: 0	53.2-64.5 dBA Impacts: 0	51.6-64.8 dBA Impacts: 0	53.2-64.5 dBA Impacts: 0	52.4-64.1 dBA Impacts: 0	53.2-64.5 dBA Impacts: 0	52.7-65.0 dBA Impacts: 0	53.7-65.6 dBA Impacts: 0
M-50	2	B	60.8	67	75.8	52.8	58.3 dBA Impacts: 0	54.0 dBA Impacts: 0	53.6 dBA Impacts: 0	53.6 dBA Impacts: 0	53.2 dBA Impacts: 0	53.7 dBA Impacts: 0	53.6 dBA Impacts: 0	53.6 dBA Impacts: 0	54.0 dBA Impacts: 0	54.5 dBA Impacts: 0
M-53	14	B	39.0	67	54.0	51.1	52.9-65.9 dBA Impacts: 10 Displacements: 3	52.4-65.0 dBA Impacts: 10 Displacements:3	52.5-67.6 dBA Impacts: 13	52.2-64.1 dBA Impacts: 13	52.3-67.8 dBA Impacts: 13	50.7-63.8 dBA Impacts: 13	52.9-65.8 dBA Impacts: 10 Displacements: 3	53.2-65.4 dBA Impacts: 10 Displacements: 3	52.4-67.7 dBA Impacts: 13	52.6-68.4 dBA Impacts: 13
M-54	1	B	43.9	67	58.9	37.6	57.7 dBA Impacts: 0 Displacements: 0	57.4 dBA Impacts: 0 Displacements: 0	57.7 dBA Impacts: 0 Displacements: 0	57.4 dBA Impacts: 0 Displacements: 0	57.7 dBA Impacts: 0 Displacements: 0	57.4 dBA Impacts: 0 Displacements: 0	57.7 dBA Impacts: 0 Displacements: 0	57.4 dBA Impacts: 0 Displacements: 0	57.4 dBA Impacts: 0 Displacements: 0	57.3 dBA Impacts: 0 Displacements: 0
M-55	58	B	40.0	67	55.0	35.2	50.3-60.8 dBA Impacts: 27	52.6-61.6 dBA Impacts: 46	53.0-69.0 dBA Impacts: 48 Displacements: 5	55.3-67.5 dBA Impacts: 50 Displacements: 6	50.4-67.5 dBA Impacts: 41 Displacements: 5	52.9-67.5 dBA Impacts: 51 Displacements: 6	53.0-69.0 dBA Impacts: 48 Displacements: 5	55.3-67.5 dBA Impacts: 50 Displacements: 6	53.0-69.2 dBA Impacts: 48 Displacements: 5	55.5-68.2 dBA Impacts: 50 Displacements: 6
M-56	7	B	43.6	67	58.6	26.4	54.2-63.4 dBA Impacts:4 Displacements: 2	54.1-60.6 dBA Impacts: 3 Displacements: 2	54.2-63.4 dBA Impacts: 4 Displacements: 2	54.1-60.6 dBA Impacts: 3 Displacements: 2	54.2-63.4 dBA Impacts: 4 Displacements: 2	54.1-60.6 dBA Impacts: 3 Displacements: 2	54.2-63.4 dBA Impacts: 4 Displacements: 2	54.1-60.6 dBA Impacts:3 Displacements: 2	54.2-64.1 dBA Impacts: 4 Displacements: 2	54.4-63.5 dBA Impacts: 4 Displacements: 2
	1	C	43.6	72	58.6	26.4	60.4 dBA Impacts:1	Displacements: 1	60.4 dBA Impacts:1	Displacements: 1	60.4 dBA Impacts:1	Displacements: 1	60.4 dBA Impacts:1	Displacements: 1	60.3 dBA Impacts:1	60.2 Impacts: 1
M-57	7	B	42.3	67	57.3	38.6	53.4-60.3 dBA Impacts: 4 Displacements: 1	50.8-54.7 dBA Impacts: 0 Displacements: 2	53.4-60.3 dBA Impacts: 4 Displacements: 1	50.8-54.7 dBA Impacts: 0 Displacements: 2	53.4-60.3 dBA Impacts: 4 Displacements: 1	50.8-54.7 dBA Impacts: 0 Displacements: 2	53.4-60.3 dBA Impacts: 4 Displacements: 1	50.8-54.7 dBA Impacts: 0 Displacements: 2	52.8-60.2 dBA Impacts: 2 Displacements: 1	52.7-57.3 dBA Impacts: 1 Displacements: 2

Table 5.10-4: Design Year 2030 Predicted Noise Levels Evaluated Using INDOT Traffic Noise Policy, Dated 2007

Site No	Number of Receivers Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)									
							Alternatives									
							1		2		3		4		Refined Preferred Alt 2 (INDOT Noise Policy 2007)	
							Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]	Low Cost Design Criteria[4]	Initial Design Criteria[4]
M-58	1	B	57.9	67	72.9	23.5	"-" Impacts: 0 Displacements: 1	"-" Impacts: 0 Displacements: 1	63.2 dBA Impacts: 0	63.9 dBA Impacts: 0	55.2 dBA Impacts: 0	55.9 dBA Impacts: 0	63.2 dBA Impacts: 0	63.9 dBA Impacts: 0	63.2 dBA Impacts: 0	64.0 dBA Impacts: 0
M-59	4	B	44.7	67	59.7	39.8	59.2-68.1 dBA Impacts: 2 Displacements: 1	61.1-65.4 dBA Impacts: 3 Displacements: 1	55.7-59.3 dBA Impacts: 0	57.1-61.7 dBA Impacts: 2	55.4-58.9 dBA Impacts: 0	57.1-61.7 dBA Impacts: 2	55.7-59.3 dBA Impacts: 0	57.1-61.7 dBA Impacts: 2	54.9-63.2 dBA Impacts: 0	57.1-61.7 dBA Impacts: 2
M-60	4	B	43.2	67	58.2	44.3	58.3-59.3 dBA Impacts: 4	60.0-61.2 dBA Impacts: 4	61.2-64.8 dBA Impacts: 4	63.2-66.3 dBA Impacts: 4	61.1-64.8 dBA Impacts: 4	63.3-67.0 dBA Impacts: 4	61.2-64.8 dBA Impacts: 4	63.2-66.3 dBA Impacts: 4	58.3-61.4 dBA Impacts: 4	63.3-66.9 dBA Impacts: 4
M-61	12	B	47.3	67	62.3	50.2	45.0-51.3 dBA Impacts: 0	46.5-52.6 dBA Impacts: 0	45.8-52.4 dBA Impacts: 0	46.6-53.1 dBA Impacts: 0	45.4-51.7 dBA Impacts: 0	46.8-53.0 dBA Impacts: 0	45.8-52.4 dBA Impacts: 0	46.6-53.1 dBA Impacts: 0	46.0-52.7 dBA Impacts: 0	47.0-53.8 dBA Impacts: 0
M-62	12	B	52.1	67	67.1	40.7	47.2-56.9 dBA Impacts: 0	47.4-56.5 dBA Impacts: 0	47.2-56.9 dBA Impacts: 0	47.4-56.5 dBA Impacts: 0	47.2-56.9 dBA Impacts: 0	47.4-56.5 dBA Impacts: 0	47.2-56.9 dBA Impacts: 0	47.4-56.5 dBA Impacts: 0	47.4-57.0 dBA Impacts: 0	47.3-56.5 dBA Impacts: 0
M-63	4	B	45.0	67	60.0	33.8	57.6-60.1 dBA Impacts: 1	58.0-60.0 dBA Impacts: 1	57.9-60.7 dBA Impacts: 1	58.3-61.3 dBA Impacts: 2	57.9-60.6 dBA Impacts: 1	57.8-60.5 dBA Impacts: 1	57.8-59.5 dBA Impacts: 0	58.1-60.0 dBA Impacts: 1	57.8-60.7 dBA Impacts: 1	57.8-61.0 dBA Impacts: 2
M-64	8	B	33.2	67	48.2	33.6	49.5-63.1 dBA Impacts: 7 Displacements: 1	45.2-62.1 dBA Impacts: 5 Displacements: 1	49.5-63.1 dBA Impacts: 7 Displacements: 1	45.2-62.1 dBA Impacts: 5 Displacements: 1	49.5-63.1 dBA Impacts: 7 Displacements: 1	45.2-62.1 dBA Impacts: 5 Displacements: 1	49.5-63.1 dBA Impacts: 7 Displacements: 1	45.2-62.1 dBA Impacts: 5 Displacements: 1	Displacements: 8	Displacements: 8
C-1	1	B	**66.1**	67	81.1	62.1	Displacements: 1	Displacements: 1	Displacements: 1	Displacements: 1	Displacements: 1	Displacements: 1	Displacements: 1	Displacements: 1	Displacements: 1	Displacements: 1
C-2	10	B	50.4	67	65.4	42.6	48.2-56.9 dBA Impacts: 0	48.2-56.4 dBA Impacts: 0	48.2-56.9 dBA Impacts: 0	48.2-56.4 dBA Impacts: 0	48.2-56.9 dBA Impacts: 0	48.2-56.4 dBA Impacts: 0	48.2-56.9 dBA Impacts: 0	48.2-56.4 dBA Impacts: 0	48.2-57.3 dBA Impacts: 0	48.1-56.3 dBA Impacts: 0
C-3	7	B	50.7	67	65.7	47.1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.8-60.0 dBA Impacts: 0 Displacements: 1	44.7-60.0 dBA Impacts: 0 Displacements: 1	44.7-60.0 dBA Impacts: 0 Displacements: 1
C-4	18	B	61.3	67	76.3	66.5[5]	50.3-63.5 dBA Impacts: 0 Displacements: 6	50.0-63.6 dBA Impacts: 0 Displacements: 6	50.3-63.5 dBA Impacts: 0 Displacements: 6	50.0-63.6 dBA Impacts: 0 Displacements: 6	50.3-63.5 dBA Impacts: 0 Displacements: 6	50.0-63.6 dBA Impacts: 0 Displacements: 6	50.3-63.5 dBA Impacts: 0 Displacements: 6	50.0-63.6 dBA Impacts: 0 Displacements: 6	50.5-63.5 dBA Impacts: 0 Displacements: 6	50.4-63.6 dBA Impacts: 0 Displacements: 6
	4	C	61.3	72	76.3		60.2 dBA Impacts: 0 Displacements: 3	60.2 dBA Impacts: 0 Displacements: 3	60.2 dBA Impacts: 0 Displacements: 3	60.2 dBA Impacts: 0 Displacements: 3	60.2 dBA Impacts: 0 Displacements: 3	60.2 dBA Impacts: 0 Displacements: 3	60.2 dBA Impacts: 0 Displacements: 3	60.2 dBA Impacts: 0 Displacements: 3	59.3 dBA Impacts: 0 Displacements: 3	59.2 dBA Impacts: 0 Displacements: 3

[1] These noise levels represent a combination of highway traffic noise and non-highway noise (i.e. birds, insects, residential noise, etc.) as measured in the field.
[2] Substantial means the predicted traffic noise levels exceed existing noise levels by 15 dBA or more.
[3] These noise levels represent design-year model results predicting noise levels attributed solely to highway traffic and does not account for ambient conditions.
[4] In cases where two or less receivers were modeled, a full range of sound levels (Leq) were not able to be represented. If all the non-displaced represented receivers were too distant to model, the range is represented as a "-".
[5] While this ambient noise site represents 22 receivers, the future no-build sound level that is reported only represents the Leq at the location the ambient measurement was taken. In the future no-build discussion, only 3 of the 22 receivers of this group are identified as impacted. One is the ambient location C-4 and the other two are modeled receivers at non- ambient locations...
Yellow highlights indicate noise levels that approach or exceed the applicable Noise Abatement Criterion, or result in a substantial noise level increase or both (See Table 5.10-1).

Alternatives

Within an alternative, the total number of receivers modeled using the initial design criteria may differ from the total number of receivers modeled using the low-cost design criteria since the vertical alignments and the right-of-way limits for the two design criteria are different. Refined Preferred Alternative 2 is the Section 4 FEIS Preferred Alternative.

A summary of the range of predicted year 2030 noise levels for the Section 4 alternatives and a summary of the range of the predicted year 2030 noise levels for the Section 4 alternatives compared to the existing condition noise levels is contained in **Table 5.10-5**.

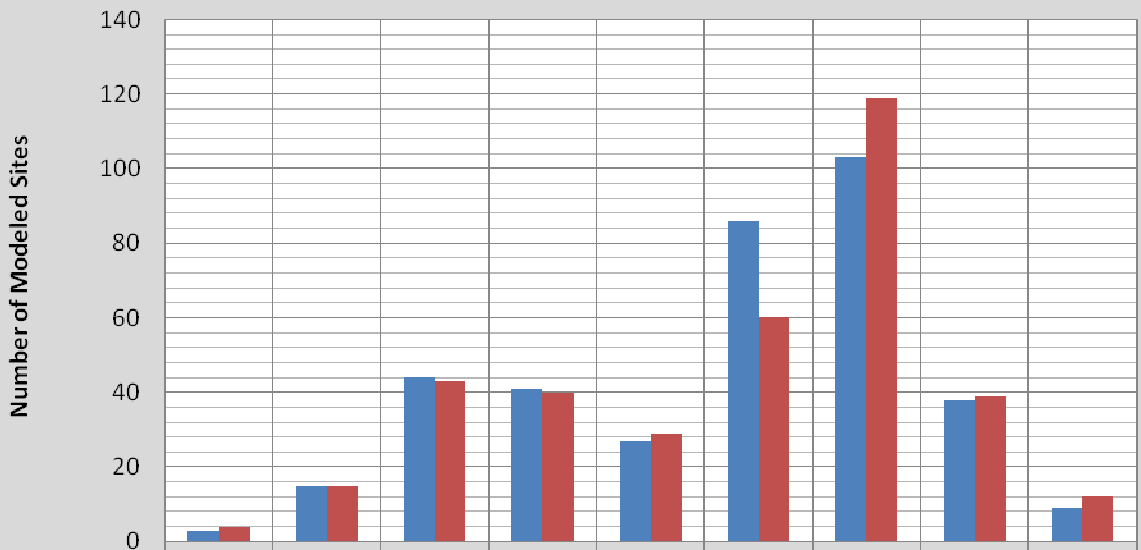
Table 5.10-5: Summary of Future Noise Level Ranges by Alternative

Alternative	Design Criteria	Range of Predicted Noise Levels	Range of Between Predicted Noise Levels to Existing Noise Levels
Alternative 1	Low-Cost Design Criteria	41.5 dBA to 68.1 dBA	-12.6 dBA to 29.9 dBA
	Initial Design Criteria	42.3 dBA to 68.3 dBA	-11.9 dBA to 28.9 dBA
Alternative 2	Low-Cost Design Criteria	44.8 dBA to 69.0 dBA	-12.6 dBA to 29.9 dBA
	Initial Design Criteria	44.8 dBA to 68.3 dBA	-11.9 dBA to 28.9 dBA
Alternative 3	Low-Cost Design Criteria	43.1 dBA to 68.7 dBA	-11.0 dBA to 29.9 dBA
	Initial Design Criteria	44.7 dBA to 68.3 dBA	-11.3 dBA to 28.9 dBA
Alternative 4	Low-Cost Design Criteria	43.2 dBA to 69.0 dBA	-12.6 dBA to 29.9 dBA
	Initial Design Criteria	41.8 dBA to 68.3 dBA	-11.9 dBA to 28.9 dBA
Refined Preferred Alternative 2	Low-Cost Design Criteria	44.7 dBA to 69.2 dBA	-12.0 dBA to 29.2 dBA
	Initial Design Criteria	44.7 dBA to 68.4 dBA	-11.9 dBA to 28.7 dBA

Alternative 1

Results for the year 2030 proposed noise levels for the build condition would range from 42.3 dBA L_{eq} to 68.3 dBA L_{eq} (41.5 dBA L_{eq} to 68.1 dBA L_{eq}).[27] These predicted noise levels represent a difference from existing noise levels ranging from -11.9 dBA L_{eq} to +28.9 dBA L_{eq} (-12.6 dBA L_{eq} to +29.9 dBA L_{eq}). **Figure 5.10.2** (p. 5-304) summarizes the number of receivers that are expected to experience increases and decreases from existing noise levels in 5 dBA increments. The decrease in predicted noise levels when compared to existing noise levels is attributed to a decrease of traffic volumes on the local roads and the fact that background noise components are not included in the model results for each modeled site.

Figure 5.10.2 Summary of Alternative 1 Predicted Noise Levels Compared to Existing Levels (dBA)



	-15 to -10.1	-10 to -5.1	-5 to -0.1	0 to 4.9	5 to 9.9	10 to 14.9	15 to 19.9	20 to 24.9	25 to 29.9
Low Cost	3	15	44	41	27	86	103	38	9
Initial Standard	4	15	43	40	29	60	119	39	12

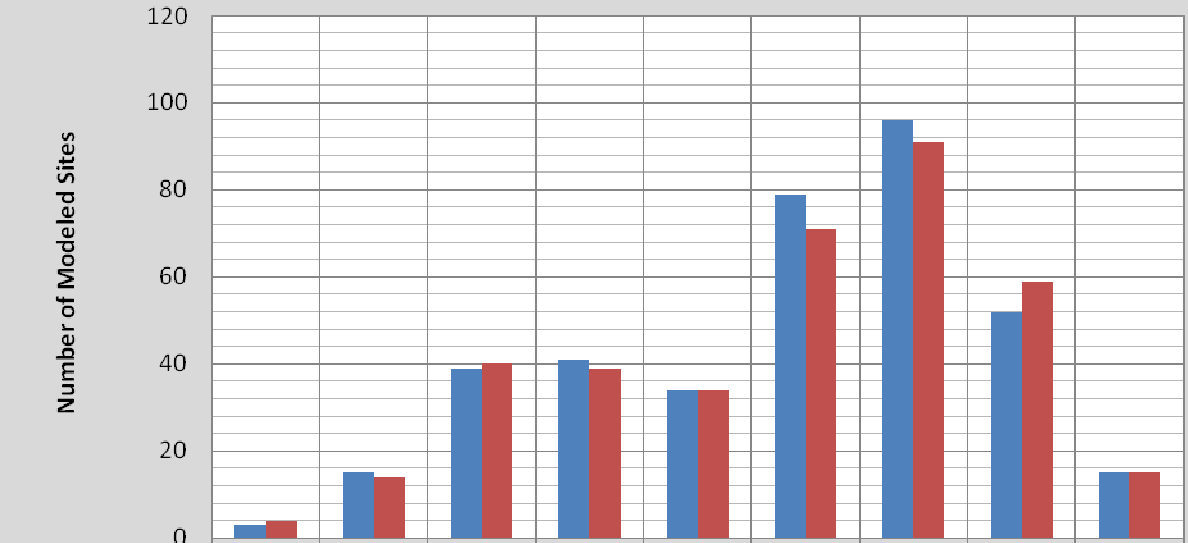
Alternative 2

The results of the noise analysis indicate that the year 2030 proposed noise levels would range from 44.8 dBA L_{eq} to 68.3 dBA L_{eq} (44.8 dBA L_{eq} to 69.0 dBA L_{eq}). These predicted noise levels represent a difference from existing noise levels ranging from -11.9 dBA L_{eq} to +28.9 dBA L_{eq} (-12.6 dBA L_{eq} to +29.9 dBA L_{eq}). **Figure 5.10.3** (p. 5- 305) summarizes the number of receivers that are expected to experience increases and decreases from existing noise levels in 5 dBA increments. The decrease in predicted noise levels when compared to existing noise levels is

[27] For the purpose of the following discussion, results of the noise analysis associated with the Initial Design Criteria are discussed first and then followed by the results of the noise analysis for the Low Cost Design Criteria in parentheses.

attributed to a decrease of traffic volumes on the local roads and the fact that background noise components are not included in the model results for each modeled site.

Figure 5.10.3 Summary of Alternnative 2 Predicted Noise Levels Compared to Existing Noise Levels (dBA)

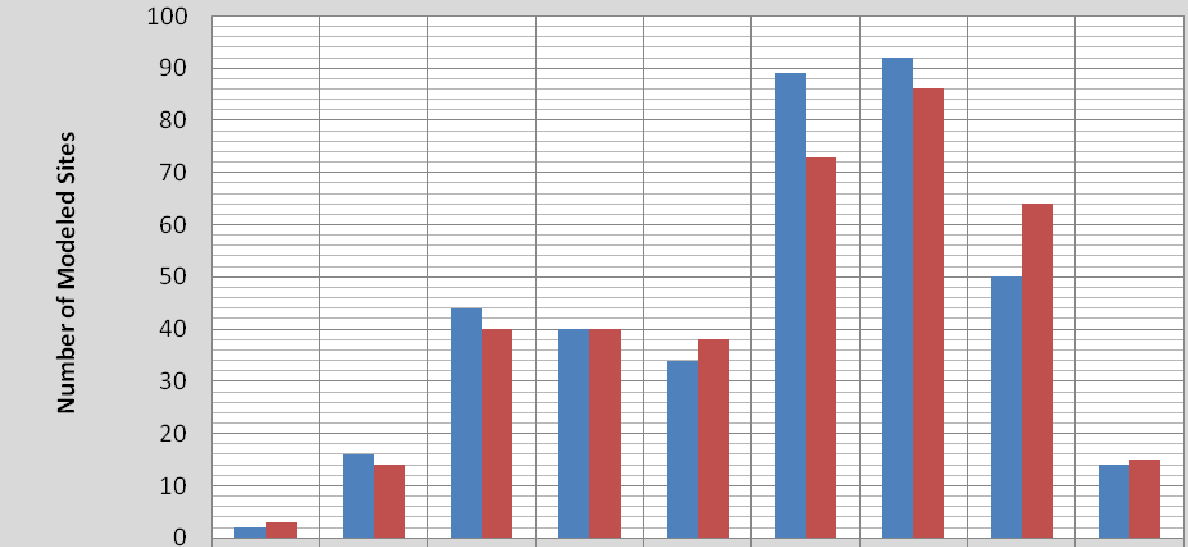


	-15 to -10.1	-10 to -5.1	-5 to -0.1	0 to 4.9	5 to 9.9	10 to 14.9	15 to 19.9	20 to 24.9	25 to 29.9
Low Cost	3	15	39	41	34	79	96	52	15
Initial Standard	4	14	40	39	34	71	91	59	15

Alternative 3

The results of the noise analysis indicate that the year 2030 proposed noise levels would range from 44.7 dBA L_{eq} to 68.3 dBA L_{eq} (43.1 dBA L_{eq} to 68.7 dBA L_{eq}). These predicted noise levels represent a difference from existing noise levels ranging from -11.3 dBA L_{eq} to +28.9 dBA L_{eq} (-10.9 dBA L_{eq} to +29.9 dBA L_{eq}). **Figure 5.10-4** (p. 5-306) summarizes the number of receivers that are expected to experience increases and decreases from existing noise levels in 5 dBA increments. The decrease in predicted noise levels when compared to existing noise levels is attributed to a decrease of traffic volumes on the local roads and the fact that background noise components are not included in the model results for each modeled site.

Figure 5.10-4 Summary of Alternative 3 Predicted Noise Levels Compared to Existing Noise Levels (dBA)

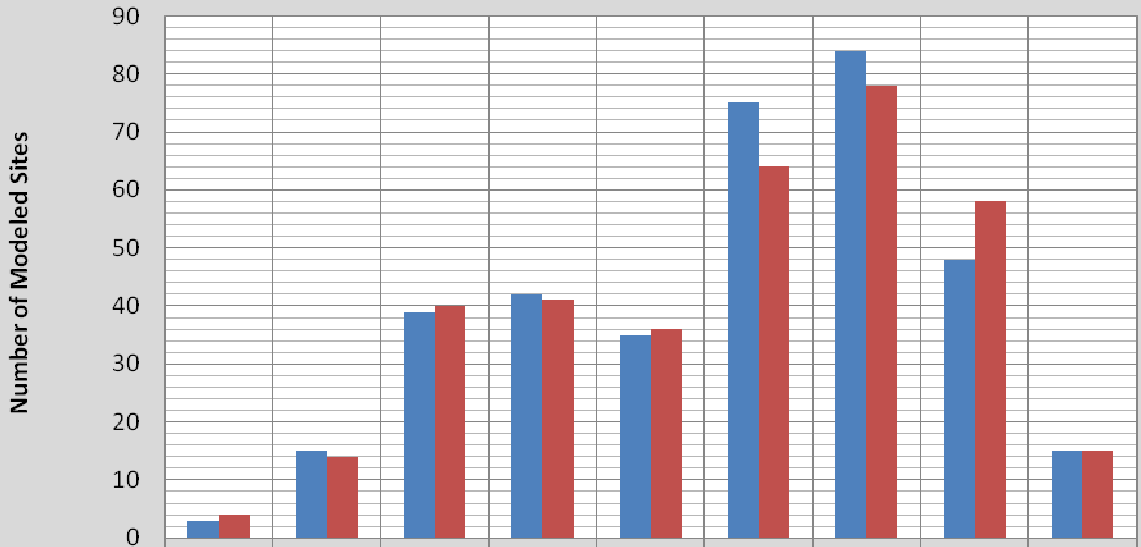


	-15 to -10.1	-10 to -5.1	-5 to -0.1	0 to 4.9	5 to 9.9	10 to 14.9	15 to 19.9	20 to 24.9	25 to 29.9
Low Cost	2	16	44	40	34	89	92	50	14
Initial Standard	3	14	40	40	38	73	86	64	15

Alternative 4

The results of the noise analysis indicate that the year 2030 proposed noise levels would range from 41.8 dBA L_{eq} to 68.3 dBA L_{eq} (43.2 dBA L_{eq} to 69.0 dBA L_{eq}). These predicted noise levels represent a difference from existing noise levels ranging from -11.9 dBA L_{eq} to +28.9 dBA L_{eq}. (-12.6 dBA L_{eq} to +29.9 dBA L_{eq}). **Figure 5.10.5** (p. 5-307) summarizes the number of receivers that are expected to experience increases and decreases from existing noise levels in 5 dBA increments. The decrease in predicted noise levels when compared to existing noise levels is attributed to a decrease of traffic volumes on the local roads and the fact that background noise components are not included in the model results for each modeled site.

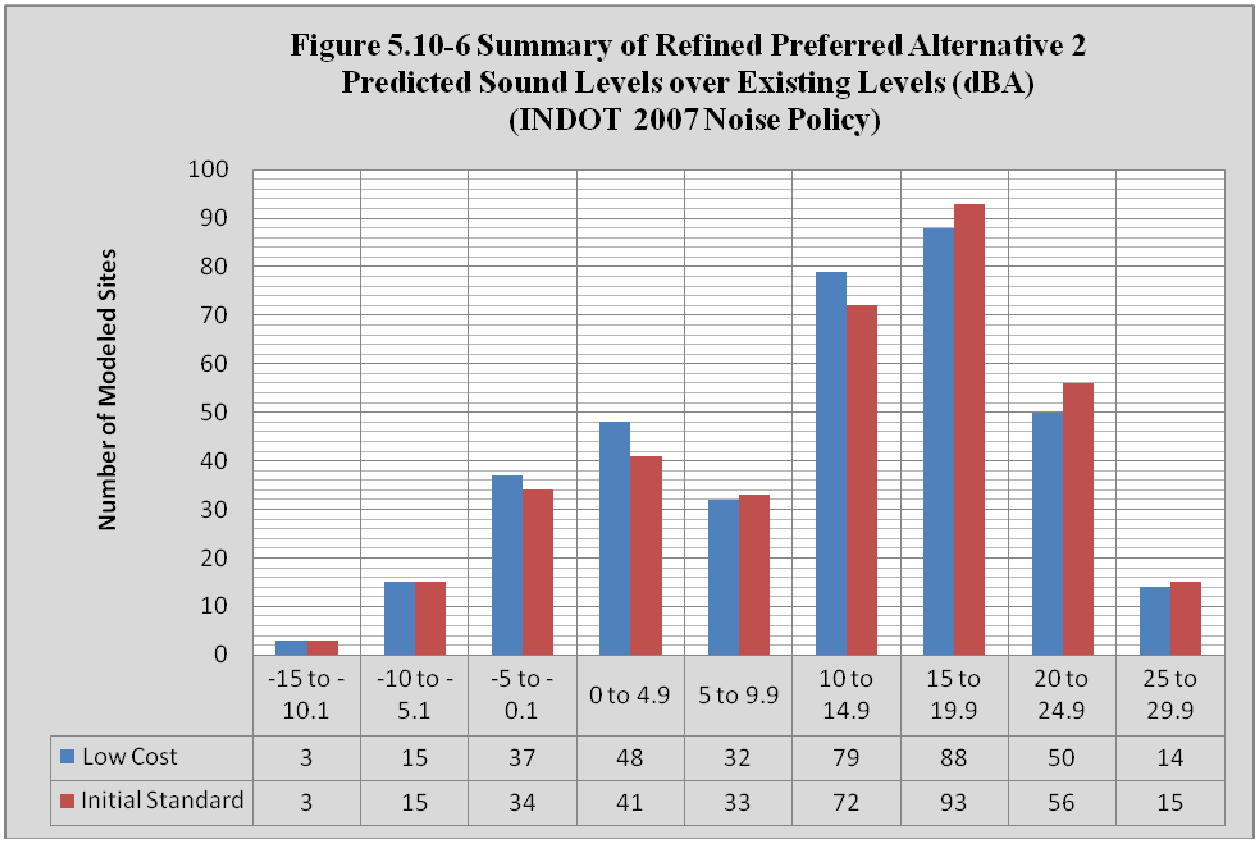
Figure 5.10.5 Summary of Alternative 4 Predicted Noise Levels Compared to Existing Noise Levels (dBA)



	-15 to -10.1	-10 to -5.1	-5 to -0.1	0 to 4.9	5 to 9.9	10 to 14.9	15 to 19.9	20 to 24.9	25 to 29.9
Low Cost	3	15	39	42	35	75	84	48	15
Initial Standard	4	14	40	41	36	64	78	58	15

Refined Preferred Alternative 2

The results of the noise analysis for the Refined Preferred Alternative 2 using the INDOT *Noise Policy, 2007* indicate that the year 2030 proposed noise levels would range from 44.7 dBA L_{eq} to 68.4 dBA L_{eq} (44.7 dBA L_{eq} to 69.2 dBA L_{eq}). These predicted noise levels represent a difference from existing noise levels ranging from -11.9 dBA L_{eq} to +28.7 dBA L_{eq} (-12.0 dBA L_{eq} to +29.2 dBA L_{eq}). **Figure 5.10-6** (p. 5- 308) summarizes the number of receivers that are expected to experience increases and decreases from existing noise levels in 5 dBA increments. The decrease in predicted noise levels when compared to existing noise levels is attributed to a decrease of traffic volumes on the local roads and the fact that background noise components are not included in the model results for each modeled site.



5.10.4.3 Identification of Predicted Traffic Noise Impacts

The noise level impacts identified for the No-Build and the Section 4 alternatives per the build condition are described below and summarized in **Table 5.10-6**.

Table 5.10-6: Noise Level Impacts by Land Use — Future No-Build Condition and Alternatives

Receiver Type	2030 Noise Level Impacts (All calculated using INDOT 2007 Noise Policy)										
	Future No-Build Condition	Alternatives									
		1		2		3		4		Refined Preferred Alt 2	
		Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
Residences	2	143	164	158	161	151	160	142	147	147	160
Churches	0	0	0	0	0	0	0	0	0	0	0
Cemeteries	0	5	5	4	4	4	5	4	4	4	4
Schools	0	0	0	0	0	0	0	0	0	0	0
Parks	0	0	0	0	0	0	0	0	0	0	0
Historic Sites	0	0	0	0	0	0	0	0	0	0	0

Table 5.10-6: Noise Level Impacts by Land Use — Future No-Build Condition and Alternatives

Receiver Type	2030 Noise Level Impacts (All calculated using INDOT 2007 Noise Policy)										
	Future No-Build Condition	Alternatives									
		1		2		3		4		Refined Preferred Alt 2	
		Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
Nat'l. Historic Landmarks	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	2	1	1	0	1	0	1	0	1	1
Industrial	0	0	0	0	0	0	0	0	0	0	0
Total	**2**	**150**	**170**	**163**	**165**	**156**	**165**	**147**	**151**	**152**	**165**

Future No-Build Condition: Two of the modeled sites are anticipated to have noise levels that approach or exceed the NAC of 67 dBA L_{eq}. The two future no-build impacts are located along State Route 45, just north of the SR 45/SR 445 intersection and are both residences that have an Activity Category B Classification.

Alternatives

Within an alternative, the total number of traffic noise impacts may vary between the two design criteria since the vertical alignments and the right-of-way limits for the two design criteria are different. Since the criteria have different right-of-way-limits, the number of displacements may also be different.

A summary of the type of impacts for the predicted year 2030 Section 4 alternatives is contained in **Table 5.10-7**. Refer to **Appendix X** for more detailed information regarding the predicted impacts.

Table 5.10-7: Noise Level Impact Summary

Receiver Type	2030 Noise Level Impacts (All calculated using INDOT 2007 Noise Policy)									
	Alternatives									
	1		2		3		4		Refined Preferred Alt 2	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
NAC Impact	0	1	0	0	0	0	0	0	0	1
NAC & Substantial Increase Impact	8	11	9	13	9	11	8	12	10	12
Substantial Increase Impact (15-20 dBA)	103	118	97	91	93	86	85	78	88	93
Substantial Increase Impact (20-25 dBA)	38	39	52	59	49	64	48	58	50	56
Substantial Increase Impact (>25 dBA)	9	12	14	15	14	15	14	15	14	15
Total	**150(1)**	**170(1)**	**163(1)**	**165(1)**	**156(1)**	**165(1)**	**147(1)**	**151(1)**	**152(1)**	**165(1)**

(1): The NAC and Substantial Increase Impact number is not included in the total number of impacts because this number has been included in the breakdown of the substantial increase impact numbers.

Alternative 1

This alternative will result in 170 (150)[28] noise impacts. Of these, 158 (142) are substantial increase impacts only, 1 (0) is a NAC impact only, and 11 (8) are both NAC and substantial increase impacts. An evaluation of the substantial increase impacts indicate that 118 (103) receivers will experience a substantial increase between 15 and 20 dBA, 39 (38) between 20 and 25 dBA, and 12 (9) with impacts 25 dBA or greater. Since none of these impacted receivers exceed the NAC by 15 dBA or more, they are not considered to be severely impacted.

Alternative 2

This alternative will result in 165 (163) traffic noise impacts. Of these, 152 (154) are substantial increase impacts only and 13 (9) are both NAC and substantial increase impacts. An evaluation of the substantial increase impacts indicate that 91 (97) of the impacts will experience a substantial increases between 15 and 20 dBA, 59 (52) of the impacts have substantial increases between 20 and 25 dBA, and 15 (14) of the impacts have substantial increases of 25 dBA or

[28] For the purpose of the following discussions, traffic noise impacts associated with the Initial Design Criteria are discussed first and then followed by the traffic noise impacts for the Low Cost Design Criteria in parentheses.

greater. Since none of these impacted receivers exceed the NAC by 15 dBA or more, they are not considered to be severely impacted.

Alternative 3

This alternative will result in 165 (156) traffic noise impacts. Of these, 154 (147) are substantial increase impacts only and 11 (9) are both NAC and substantial increase impacts. An evaluation of the substantial increase impacts indicate that 86 (93) of the impacts will experience a substantial increases between 15 and 20 dBA, 64 (49) of the impacts have substantial increases between 20 and 25 dBA, and 15 (14) of the impacts have substantial increases of 25 dBA or greater. Since none of these impacted receivers exceed the NAC by 15 dBA or more, they are not considered to be severely impacted.

Alternative 4

This alternative will result in 151 (147) traffic noise impacts. Of these, 139 (139) are substantial increase impacts only and 12 (8) are considered both NAC and substantial increase impacts. An evaluation of the substantial increase impacts indicate that 78 (85) of the impacts will experience a substantial increases between 15 and 20 dBA, 58 (48) of the impacts have substantial increases between 20 and 25 dBA, and 15 (14) of the impacts have substantial increases of 25 dBA or greater. Since none of the impacted receivers exceed the NAC by 15 dBA or more, they are not considered to be severely impacted.

Refined Preferred Alternative 2

The Refined Preferred Alternative 2 using the INDOT *Noise Policy, 2007* will result in 165 (152) traffic noise impacts. Of these, 152 (142) are substantial increase impacts only, 1 (0) is a NAC impact only and 12 (10) are both NAC and substantial increase impacts. An evaluation of the substantial increase impacts indicate that 93 (88) of the impacts will experience a substantial increases between 15 and 20 dBA, 56 (50) of the impacts have substantial increases between 20 and 25 dBA, and 15 (14) of the impacts have substantial increases of 25 dBA or greater. Since none of these impacted receivers exceed the NAC by 15 dBA or more, they are not considered to be severely impacted.

5.10.5 Mitigation, INDOT (Using *Traffic Noise Policy (2007)*)

Possible mitigation measures were considered for sites where noise impacts were predicted to occur. Mitigation was assessed in terms of its feasibility and reasonableness. For the purposes of assessing noise mitigation strategies, "feasible" means that it is structurally and acoustically possible to reduce noise occurring at a receiver by at least 7 dBA L_{eq}(h) for the majority (50%+1) of the impacted first row receivers in the design year. "Reasonableness" means that INDOT believes abatement of traffic noise impacts is prudent based on all of the following factors:

- Cost effectiveness. Abatement will be considered cost effective if the estimated cost of constructing abatement divided by the number of benefited receivers is $25,000 or less. Barrier cost is calculated using a unit cost (determined by INDOT to be $30 per square foot) to the square footage of the noise barrier. Benefited receivers include those sites which are

predicted to experience at least a 5 dBA L_{eq}(h) reduction at the noisiest hour conditions, and may include receivers that are not impacted. In situations where the majority (50%+1) of the receivers were in place prior to construction of the highway, the cost effective criteria will be $30,000 per benefitted receiver.

- Severe noise impacts (those where the predicted Leq(h) exceeds the NAC by greater than 15 dBA) may merit abatement beyond the standard cost criteria and may include measures that are not normally considered.

- The views of impacted and benefited receivers. Residents and businesses that qualify for noise abatement (i.e., cost effective) will be given the opportunity to express their opinion and may elect to decline such mitigation if they believe the positive benefits outweigh the potential negative impacts of noise barriers (i.e., unsightliness, shortened daylight, poor air circulation, degradation by weather, reduced safety, vandalism, and restriction of access for emergency vehicles.

5.10.5.1 Noise Abatement Considerations

The following strategies were considered for permanent noise impacts.

Traffic Management Measures: Traffic management measures were not considered reasonable and feasible for abating noise impacts for any receiver. Measures such as installation of additional traffic control devices, prohibition of vehicle types, time-use restrictions, speed limit reductions, and exclusive lane designations would be detrimental to the proposed project's ability to function as a freeway and major north-south route.

Alteration of Horizontal and Vertical Alignments: The final design of the preferred alternative may include shifting the alternative both vertically and horizontally, wherever feasible, to minimize impacts to adjacent land uses. Both vertical and horizontal alignments may be altered to minimize noise impacts where other factors are not prohibitive.

Acquisition of Property Rights or Acquisition of Property: The purchase of property and/or buildings for noise barrier construction or the creation of a "buffer zone" to reduce noise impacts was considered. The amount of property required for this option to be effective would create significant additional impacts (*e.g.*, in terms of residential displacements), which were determined to outweigh the benefits of land acquisition.

Noise Insulation of Public Use or Nonprofit Institutional Structures: This noise abatement measure option applies only to public and institutional use buildings. Since no public use or institutional structures are anticipated to have interior noise levels exceeding FHWA's interior NAC, this noise abatement option will not be applied.

Coordination Among Local Planning Authorities. Since a portion of the proposed project would be located on a new roadway, the potential does exist for local officials and developers to help minimize adverse noise impacts through the use of careful land use planning. With regard to currently undeveloped land, the creation of a "buffer zone" or locating noise sensitive developments a reasonable distance away from the project would help minimize future noise

impacts. Local planning authorities will be provided with the 66 dBA noise contour mapping and can utilize it to develop noise compatible land uses outside the 66 dBA buffer zone. The 66 dBA contour map is contained in **Appendix II**, *Noise Contour Mapping*, of the FEIS. Copies of this FEIS will be provided to Greene and Monroe county officials for use in noise-sensitive land use planning.

Construction of Noise Barriers: The construction of noise barriers between the shoulder and the right-of-way limits is generally one of the most feasible and/or reasonable abatement measures available. For those receivers experiencing a noise impact, the feasibility and reasonableness of noise abatement were evaluated using INDOT's noise policy.

5.10.5.2 Noise Mitigation Assessment

Using INDOT's *Traffic Noise Policy*, receivers that were categorized as having design year (2030) traffic noise impacts for the four alternatives were assessed to determine if the construction of noise barriers would be a feasible and reasonable form of noise abatement. As part of the barrier analysis, the location of the impacted receivers along with the topographic conditions and surrounding land uses were taken into consideration. Based on this evaluation, it was determined that a majority of the impacted receivers were located in sparsely populated areas. Although a noise barrier may be feasible for these sites, it would not be reasonable because any effective noise barrier would fail to meet the cost-effectiveness criterion. However, there were several locations where there was a grouping of impacted receivers. In those locations, a barrier analysis was performed to determine if the construction of a noise barrier was a feasible and reasonable form of noise mitigation.

A final determination on noise abatement for the Refined Preferred Alternative will be made during the design phase. At that time, additional noise analysis will be performed to more accurately determine barrier performance, barrier characteristics (length and height), and the optimal barrier location for any potential noise barriers that may be recommended for noise abatement. At this time, if noise abatement is still determined to be feasible and cost-effective, then potentially affected property owners will be surveyed in accordance with the requirements set forth in the *INDOT Traffic Noise Policy* to determine whether they do or do not want noise abatement.

Collectively, noise barrier analysis was conducted at seven locations for the Section 4 alternatives. The areas where barrier analyses were performed are depicted in **Figure 5.10-7** (p. 5-361). Barrier Area E-1 involves impacted receivers along Pine Road off of Old Clifty Road. Barrier Area F-1 involves impacted receivers along Carter Road. Barrier Area F-3 involves impacted receivers along CR350. Barrier Area G-1 involves impacted receivers at Fern Hills Club and east of Rockport Road. Barrier Area G-2 involves impacted receivers off of Evans Lane. Barrier Area H-1 involves impacted receivers at Farmers Field Subdivision. Barrier Area H-2 involves impacted receivers at Rolling Glen Subdivision.

Alternative 1

The results of the barrier analysis per the initial design criteria and the low-cost design criteria are shown in **Table 5.10-8**. Five of the six evaluated noise barrier walls (Barrier Areas E-1, F-3, G-1, H-1 and H-2) meet INDOT's criterion for "feasibility" for both sets of design criteria. Barrier Area G-2 does not meet the feasibility criteria since it was not structurally and acoustically capable of providing a 7 dBA reduction in noise levels to 50% + 1 of the first row receivers.

The cost per benefited receiver for Barrier Area H-2 was $35,224 ($35,794) and is above INDOT's cost per benefited criterion of $30,000 for both design criteria, but only exceeds the criteria by approximately $5,000 per benefitted receiver. If final design information results in a significant change in the preliminary design information that was used in the barrier analysis, then the noise barriers shall be re-evaluated. The cost per benefitted receiver for the other four barrier areas that do not meet the cost-effectiveness "reasonable" criteria, range from $94,782 to $225,939 for the low-cost design criteria and $92,977 to $190,114 for the initial design criteria. None of these evaluated barriers were close to meeting INDOT's cost per benefitted receiver criteria (**Table 5.10-8**).

Alternative 2

The results of the barrier analysis per the initial design criteria and the low-cost design criteria are shown in **Table 5.10-9**. Six of the seven evaluated noise barrier walls (Barrier Areas E-1, F-1, F-3, G-1, H-1 and H-2) meet INDOT's criterion for "feasibility" for both sets of design criteria. Barrier Area G-2 does not meet the feasibility criteria since it was not structurally and acoustically capable of providing a 7 dBA reduction in noise levels to 50% + 1 of the first row receivers.

The cost per benefited receiver for Barrier Area H-2 was $36,058 ($45,764) and is above INDOT's cost per benefited criterion of $30,000 for both design criteria. If final design information results in a significant change in the preliminary design information that was used in the barrier analysis, then the noise barriers shall be re-evaluated. The cost per benefitted receiver for the other five barrier areas that do not meet the cost effectiveness "reasonable" criteria, range from $74,555 to $230,529 for the low cost design criteria and $79,571 to $342,057 for the initial design criteria. None of these evaluated barriers were close to meeting INDOT's cost per benefitted receiver criteria (**Table 5.10-9**).

Alternative 3

The results of the barrier analysis per the initial design criteria and the low-cost design criteria are shown in **Table 5.10-10**. Six of the evaluated noise barrier walls (Barrier Areas E-1, F-3, G-1, G-2, H-1, and H-2) were analyzed using the initial design criteria and seven evaluated noise barrier walls (Barrier Area E-1, F-1, F-3, G-1, G-2, H-1 and H-2) were analyzed using the low cost design criteria. Barrier analysis for Barrier Area F-1 under the initial design criteria was not required because there were no impacted receivers associated with this alternative scenario.

Barrier Area G-2 did not meet INDOT's criteria for "feasibility" since it was not structurally and acoustically capable of providing a 7 dBA reduction in noise levels to 50% + 1 of the first row receivers for either the low cost or initial design criteria.

The cost per benefitted receiver for the five (initial design criteria) and six (low cost design criteria) barrier areas that do not meet the cost effectiveness "reasonable" criteria, range from $47,317 to $245,232 for the low cost design criteria and $41,904 to $182,273 for the initial design criteria. None of these evaluated barriers were close to meeting INDOT's cost per benefitted receiver criteria (**Table 5.10-10**).

Alternative 4

The results of the barrier analysis per the initial design criteria and the low-cost design criteria are shown in **Table 5.10-11**. Five of the six evaluated noise barrier walls (Barrier Areas E-1, F-3, G-1, H-1 and H-2) meet INDOT's criterion for "feasibility" for both sets of design criteria. Barrier Area G-2 does not meet the feasibility criteria since it was not structurally and acoustically capable of providing a 7 dBA reduction in noise levels to 50% + 1 of the first row receivers.

The cost per benefited receiver for Barrier Area H-2 was $36,058 ($45,764) and is above INDOT's cost per benefited criterion of $30,000 for both design criteria. If final design information results in a significant change in the preliminary design information that was used in the barrier analysis, then the noise barriers shall be re-evaluated. The cost per benefitted receiver for the other barrier areas that do not meet the cost effectiveness "reasonable" criteria, range from $86,527 to $225,939 for the low cost design criteria and $120,782 to $182,273 for the initial design criteria. None of these evaluated barriers were close to meeting INDOT's cost per benefitted receiver criteria (**Table 5.10-11**).

Refined Preferred Alternative 2

The results of the barrier analysis using the initial design criteria and the low-cost design criteria for the Refined Preferred Alternative 2 using the INDOT *Noise Policy, 2007* are shown in **Table 5.10-12**. Six of the seven evaluated noise barrier walls (Barrier Areas E-1, F-1, F-3, G-1, H-1 and H-2) meet INDOT's criterion for "feasibility" for both sets of design criteria. Barrier Area G-2 does not meet the feasibility criteria since it was not structurally and acoustically capable of providing a 7 dBA reduction in noise levels to 50% + 1 of the first row receivers.

The cost per benefited receiver for Barrier Area H-2 was $34,590 ($43,105) and is above INDOT's cost per benefited criterion of $30,000 for both design criteria. If final design information results in a significant change in the preliminary design information that was used in the barrier analysis, then the noise barriers shall be re-evaluated. The cost per benefitted receiver for the other five barrier areas that do not meet the cost effectiveness "reasonable" criteria, range from $62,649 to $307,666 for the low cost design criteria and $93,270 to $273,329 for the initial design criteria. None of these evaluated barriers were close to meeting INDOT's cost per benefitted receiver criteria (**Table 5.10-12**).

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Table 5.10-8: Alternative 1 Noise Barrier Abatement Analysis

Proposed Barrier Location	Total Barrier Length (feet)		Average Height (feet)		No. of Impacted Receivers		Impacts Benefitted		Additional Benefits		No. of Benefited Receivers		Feasibility Criteria Met?		Cost of Barrier ($30/sq ft)		Cost per Benefited Receiver	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
E-1	5682	6053	17	16	15	16	11	14	2	2	13	16	Yes	Yes	$2,937,207	$2,916,378	$225,939	$182,273
F-3	1228	1932	18	19	9	9	6	5	1	1	7	6	Yes	Yes	$663,477	$1,140,687	$94,782	$190,114
G-1	3202	2602	12	12	8	8	6	5	4	3	10	8	Yes	Yes	$1,159,242	$966,259	$115,924	$120,782
G-2	-	-	-	-	7	6	0	0	0	0	0	0	No	No	-	-	-	-
H-1	3377	2732	13.5	13	16	24	10	12	2	0	12	12	Yes	Yes	$1,492,243	$1,115,719	$124,354	$92,977
H-2	3577	3141	15	17	27	46	22	40	25	7	47	47	Yes	Yes	$1,682,329	$1,655,515	$35,794	$35,224

Table 5.10-9: Alternative 2 Noise Barrier Abatement Analysis

Proposed Barrier Location	Total Barrier Length (feet)		Average Height (feet)		No. of Impacted Receivers		Impacts Benefitted		Additional Benefits		No. of Benefited Receivers		Feasibility Criteria Met?		Cost of Barrier ($30/sq ft)		Cost per Benefited Receiver	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
E-1	5682	6053	17	16	15	16	11	14	2	2	13	16	Yes	Yes	$2,937,207	$2,916,378	$225,939	$182,273
F-1	3768	4438	15	14	5	4	5	4	2	2	7	6	Yes	Yes	$1,613,707	$2,052,341	$230,529	$342,057
F-3	1233	1129	18	19	11	11	8	7	1	1	9	8	Yes	Yes	$671,000	$636,572	$74,555	$79,571
G-1	3202	2602	12	12	8	8	6	5	4	3	10	8	Yes	Yes	$1,159,242	$966,259	$115,924	$120,782
G-2	-	-	-	-	7	6	0	0	0	0	0	0	No	No	-	-	-	-
H-1	3543	3805	16.5	14	3	12	3	10	15	5	18	15	Yes	Yes	$1,826,188	$1,935,623	$101,455	$129,042
H-2	4104	4000	17	14	51	53	42	46	2	1	44	47	Yes	Yes	$2,013,621	$1,694,714	$45,764	$36,058

Table 5.10-10: Alternative 3 Noise Barrier Abatement Analysis

Proposed Barrier Location	Total Barrier Length (feet)		Average Height (feet)		No. of Impacted Receivers		Impacts Benefitted		Additional Benefits		No. of Benefited Receivers		Feasibility Criteria Met?		Cost of Barrier ($30/sq ft)		Cost per Benefited Receiver	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
E-1	5682	6053	17	16	15	16	11	14	2	2	13	16	Yes	Yes	$2,937,207	$2,916,378	$225,939	$182,273
F-1	3511	*	16.5	*	4	*	4	*	3	*	7	*	Yes	*	$1,716,624	*	$245,232	*
F-3	1130	1124	18	18	11	11	8	7	1	1	9	8	Yes	Yes	$523,678	$557,727	$58,186	$69,716
G-1	3202	2602	12	12	8	8	6	5	4	3	10	8	Yes	Yes	$1,159,242	$966,259	$115,924	$120,782
G-2	-	-	-	-	7	6	0	0	0	0	0	0	No	No	-	-	-	-
H-1	3656	3876	15.5	16.5	3	10	3	9	22	13	25	22	Yes	Yes	$1,808,429	$2,072,149	$72,337	$94,189
H-2	4103	4592	18	14	43	52	38	45	10	1	48	46	Yes	Yes	$2,271,203	$1,927,600	$47,317	$41,904

** This barrier was not modeled because there were no noise impacts that warranted abatement*

Table 5.10-11: Alternative 4 Noise Barrier Abatement Analysis

Proposed Barrier Location	Total Barrier Length (feet)		Average Height (feet)		No. of Impacted Receivers		Impacts Benefitted		Additional Benefits		No. of Benefited Receivers		Feasibility Criteria Met?		Cost of Barrier ($30/sq ft)		Cost per Benefited Receiver	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
E-1	5682	6053	17	16	15	16	11	14	2	2	13	16	Yes	Yes	$2,937,207	$2,916,378	$225,939	$182,273
F-3	1328	2034	17	18	9	9	7	7	1	1	8	8	Yes	Yes	$692,216	$1,122,680	$86,527	$140,335
G-1	3202	2602	12	12	8	8	6	5	4	3	10	8	Yes	Yes	$1,159,242	$966,259	$115,924	$120,782
G-2	-	-	-	-	7	6	0	0	0	0	0	0	No	No	-	-	-	-
H-1	3543	3805	16.5	14	3	12	3	10	15	5	18	15	Yes	Yes	$1,826,188	$1,935,623	$101,455	$129,042
H-2	4104	4000	17	14	51	53	42	46	2	1	44	47	Yes	Yes	$2,013,621	$1,694,714	$45,764	$36,058

Table 5.10-12: Refined Preferred Alternative 2 Noise Barrier Abatement Analysis (INDOT *Traffic Noise Policy, 2007*)

Proposed Barrier Location	Total Barrier Length (feet)		Average Height (feet)		No. of Impacted Receivers		Impacts Benefitted		Additional Benefits		No. of Benefited Receivers		Feasibility Criteria Met?		Cost of Barrier ($30/sq ft)		Cost per Benefited Receiver	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
E-1	3287	5386	18	16	15	16	10	13	3	2	13	15	Yes	Yes	$1,821,897	$2,685,982	$140,146	$179,065
F-1	3490	3839	16	13.5	6	5	6	5	1	1	7	6	Yes	Yes	$1,643,088	$1,639,974	$234,726	$273,329
F-3	1021	1634	18	17	11	11	8	8	1	1	9	9	Yes	Yes	$563,842	$839,433	$62,649	$93,270
G-1	2001	2100	14	14	8	8	4	4	4	4	8	8	Yes	Yes	$876,286	$888,048	$109,535	$111,006
G-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H-1	3404	3819	17	16.5	3	10	1	9	5	6	6	15	Yes	Yes	$1,845,996	$1,912,875	$307,666	$127,525
H-2	3896	3800	17	14	51	51	46	46	1	1	47	47	Yes	Yes	$2,025,948	$1,625,745	$43,105	$34,590

* Barrier G-2 was not modeled since the receivers located in this area are being acquired.

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5.10.6 Refined Preferred Alternative 2 Highway Noise Evaluation, Using INDOT *Traffic Noise Analysis Procedure, 2011*

5.10.6.1 Introduction

As discussed in the first two paragraphs of Section 5.10 (p. 5-283), this section discusses the findings of the Highway Noise Study for the Refined Preferred Alternative 2 based on an evaluation utilizing the INDOT *Traffic Noise Analysis Procedure (2011)*. Only the portions of Section 5.10.1 through Section 5.10.5 that were affected by the changes made to the INDOT *Traffic Noise Analysis Procedure (2011)* have been modified and included in this section.

5.10.6.2 Regulatory Policy

The *INDOT Traffic Noise Analysis Procedure (2011)* adopts the noise abatement criteria (NAC) established by FHWA (23 CFR 772) for determining noise impacts for a variety of land uses. The land-use Activity Categories along with the criteria presented in **Table 5.10-1** have been revised and are presented in **Table 5.10-13**.

Table 5.10-13: FHWA Noise Abatement Criteria, INDOT *Traffic Noise Analysis Procedure, 2011*

Hourly A-Weighted Sound Level - Decibels (dBA)		
Activity Category	**Leq(h)**	**Description of Activity**
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Residential
C	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or not profit institutional structures, radio studios, recording studios, recreation areas, Section (4F) sites, schools, television studios, trails and trail crossings
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public and not profit institutional structures, radio studios, recording studios, schools, and television studios
E	72 (Exterior)	Hotels, motels, offices, restaurant/bars and other developed lands, properties, or activities not included in A-D or F
F	-(-)	Agriculture, airports, bus yards, emergency services, industrial logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	-(-)	Undeveloped lands that are not permitted
Source: FHWA 23 CFR Part 772		

In accordance with the *INDOT Traffic Noise Analysis Procedure, dated 2011* traffic noise impacts occur when a receptor[29] meets either of the two following conditions: 1) predicted noise levels approach or exceed the Noise Abatement Criteria (NAC) for the particular "activity category"; or, 2) predicted traffic noise levels substantially exceed the existing noise level. The

[29] A receptor represents a point where noise levels are measured or modeled for each applicable Activity Category land use classification located within the limits of the noise analysis. The 2007 policy refers to these locations as "receivers."

INDOT Highway Traffic Noise Analysis Procedure, defines "approach or exceed" to mean that future levels are higher than 1 dBA Leq(h) below the appropriate NAC. "Substantially exceed" means the predicted traffic noise levels exceed existing noise levels by 15 dBA or more.

5.10.6.3 Methodology

A Highway Traffic Noise Analysis for the Section 4 project was performed to determine the likely traffic noise impacts under both the initial design criteria and the low-cost design criteria for the Refined Preferred Alternative 2 evaluated based on the INDOT *Traffic Noise Analysis Procedure (2011)* (**Appendix X,** Sub Appendix Q). The Highway Traffic Noise Analysis provides a comprehensive description and evaluation of the existing noise levels, the predicted Future No-Build noise levels, and the predicted year 2030 noise levels, and a detailed Highway Noise Mitigation Assessment for the predicted traffic noise impacts associated with the Refined Preferred Alternative 2.

5.10.6.3.1 Determination of Existing Noise Levels

The methodology utilized to determine the existing noise levels presented in Section 5.10.3.1 is consistent with the requirements set forth in the *INDOT Traffic Noise Analysis Procedure (2011)*. The Activity Category Classifications and the number of receptors represented by the ambient measurement Site No. identified in **Table 5.10-2** have been revised based on changes to the Activity Category Classifications and the maximum distance from the edge of the nearest travel lane to be included in the noise study area. The changes were made to only the existing condition noise measurement locations and the associated receptors that were within the limits of the noise analysis with regards to the final horizontal alignment of the Refined Preferred Alternative 2 and are contained **Table 5.10-14**.

Table 5.10-14: Existing Noise Level Measurement Locations (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No.	Site Description and Land Use Category Classification
M-2	The front yard of a residence located approximately 100 feet from SR 45/58, 2100 feet from Alternatives 1, 2, and 4, and 2,620-2,670 feet from Alternative 3. Land use category B: 1 residence
M-3	The front yard of a residence located approximately 120 feet from County Road 200 E, 40-90 feet from Alternative 3, and 300-350 feet from Alternatives 1, 2, and 4. Land use category B: 2 residences
M-4	The front yard of a residence located approximately 190 feet from County Road 625 S, 370-410 feet from Alternatives 3, and 450-490 feet from Alternatives 1, 2, and 4. Land use category B: 5 residences Land use category C: Hasler and Shoptaw cemeteries
M-8	The front yard of a residence located approximately 70 feet from County Road 450 S, 1250-1360 feet from Alternatives 1 and 4, and is located within the right-of-way of Alternatives 2 and 3. Land use category B: 13 residences Land use category C: Taylor Ridge Cemetery

Table 5.10-14: Existing Noise Level Measurement Locations (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No.	Site Description and Land Use Category Classification
M-12	The front yard of a residence located approximately 40 feet from County Road 920 S (Old Clifty Road), and 910-925 feet from Alternatives 1, 2, 3, and 4. Land use category B: 1 residence
M-15	The front yard of a residence located approximately 30 feet from State Route 45, and is located inside the right-of-way of Alternatives 1, 2, 3, and 4. Land use category B: 14 residences
M-18	The front yard of a residence located approximately 60 feet from County Road 1250 E, and 150-200 feet from Alternatives 1, 2, 3, and 4. Land use category B: 7 residences
M-19	The front yard of a residence located approximately 65 feet from State Route 54, and is located inside the right-of-way of Alternatives 1, 2, 3, and 4. Land use category B: 10 residences
M-21	Adjacent to a seasonal residence located on a private drive approximately 2200 feet from County Road 1375 E. The site is 90 feet from Alternatives 1 and 3, and 620-685 feet from Alternatives 2 and 4. Land use category B: 12 residences Land use category E: 1 business
M-22	The front yard of a residence located approximately 35 feet from Carmichael Road, located inside the right-of-way of Alternatives 1 and 3, 650-800 feet from Alternative 2 and 4. Land use category B: 3 residences
M-23	The front yard of a residence located in Whippoorwill Estates. This site is approximately 1200 feet from Carmichael Road, approximately 955-970 feet from Alternative 1, 770-860 feet from Alternative 3, 1410-1475 feet from Alternative 4, and 1380 feet from Alternative 2. Land use category B: 7 residences
M-25	The front yard of a residence located approximately 90 feet from Carter Road, 1650-1680 feet from Alternative 1, 1665-1700 feet from Alternative 4, and is located inside the right-of-way of Alternatives 2 and 3. Land use category B: 19 residences
M-27	The front yard of a residence located approximately 70 feet from Breeden Road, and 270-340 feet from Alternatives 1, 2, 3, and 4. Land use category B: 4 residences
M-28	The front yard of a residence located approximately 45 feet from Burch Road, and is located inside the right-of-way of Alternatives 1, 2, 3, and 4. Land use category B: 6 residences
M-31	The front yard of a residence located approximately 45 feet from West Evans Road, and 390-465 feet from Alternatives 1, 2, 3, and 4. Land use category B: 6 residences
M-32	The front yard of a residence located approximately 55 feet from Harmony Road, and is located inside the right-of-way of Alternatives 1, 2, 3, and 4. Land use category B: 12 residences
M-36	The back yard of a residence located approximately 40 feet from Rockport Road, and is located inside the right-of-way of Alternatives 1, 2, 3, and 4. Land use category B: 11 residences

Table 5.10-14: Existing Noise Level Measurement Locations (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No.	Site Description and Land Use Category Classification
M-38	The front yard of a residence located approximately 110 feet from Lodge Road, and 540-610 feet from Alternatives 1, 2, 3, and 4. Land use category B: 6 residences
M-40	The front yard of a residence located approximately 90 feet from Tramway Road, 165-190 feet from Alternative 1, 740 -785 feet from Alternatives 2 and 4, and 1610-1700 feet from Alternative 3. Land use category B: 1 residence
M-42	The front yard of a residence located approximately 45 feet from Bolin Lane, 245-310 feet from Alternative 1, and 875-975 feet from Alternatives 2, 3, and 4. Land use category B: 2 residences
M-43	The front yard of a residence in Farmers Field subdivision located approximately 1350 feet from Bolin Lane, 365-440 feet from Alternative 1, and 1085 feet from Alternatives 2, 3, and 4. Land use category B: 3 residences
M-44	The front yard of a residence located approximately 65 feet from Victor Pike, 1050-1100 feet from Alternative 1, and 595-610 feet from Alternatives 2, 3, 4. Land use category B: 9 residences
M-45	The back yard of a residence located on Jeremy Drive, approximately 135 feet from State Route 37, and 30 feet from Alternatives 1, 2, 3, and 4. Land use category B: 7 residences
M-46	The front yard of a residence located on Big Sky Lane, approximately 240 feet from State Route 37, and is located within the right-of-way of Alternatives 1, 2, 3, and 4. Land use category B: 9 residences
M-47	The front yard of a residence located approximately 80 feet from Hobbieville Road, 650-700 feet from Alternatives 1 and 3, and 565 feet from Alternatives 2 and 4. Land use category B: 5 residences
M-49	The back yard of a residence located on Nicole Drive, approximately 495 feet from State Route 37, and 245 feet from Alternatives 1, 2, 3, and 4. Land use category B: 11 residences
M-50	The front yard of a residence located approximately 75 feet from That Road, and is 765-780 feet from Alternatives 1, 2, 3, and 4. Land use category B: 1 residence
M-53	The back yard of a residence located approximately 100 feet from County Road 350 N, approximately 950-1000 feet from Alternatives 1 and 4, and 1150-1200 feet from Alternatives 2 and 3. Land use category B: 5 residences Land use category C: Sparks Cemetery
M-54	The front yard of a residence located approximately 50 feet from County Road 920 S (Old Clifty Road), and 145-190 feet from Alternatives 1, 2, 3, and 4. Land use category B: 1 residence
M-55	An un-built lot in the Rolling Glen subdivision located approximately 860 feet from Victor Pike, 530-655 feet from Alternatives 2, 3, and 4 and 1330-1360 feet from Alternative 1. Land use category B: 22 residences.
M-56	Adjacent to the playground at the Fern Hills Club Campground and is located approximately 1,110 feet from Rockport Road, and is located 575-730 feet from the Alternatives. Land use category B: 5 residences

Table 5.10-14: Existing Noise Level Measurement Locations (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No.	Site Description and Land Use Category Classification
	Land use category C: 2 receptors Land use category E: 1 business
M-57	The front yard of a residence located approximately 250 feet from Evans Rd, and is located 885-965 feet from Alternatives 1, 2, 3, and 4. Land use category B: 6 residences
M-58	The front yard of a residence located approximately 640 feet from Tramway Rd, and is within the right-of-way limits for Alternative 1, 340-350 feet from Alternatives 2 and 4, and 1095 feet from Alternative 3. Land use category B: 1 residence
M-60	The front yard of a residence located approximately 475 feet from Victor Pike, and is located 620-680 feet from Alternative 1, and 135 feet from Alternatives 2, 3, and 4. Land use category B: 4 residences
M-61	The front yard of a residence located approximately 800 feet from That Rd. and 1030 feet from SR 37, and is located 270 feet from Alternatives 1, 2, 3, and 4. Land use category B: 12 residences
M-62	The front yard of a residence located approximately 2,400 feet from State Route 45 (north of State Route 445), and is located 155-175 feet from Alternatives 1, 2, 3, and 4. Land use category B: 12 residences
M-63	The front yard of a residence located approximately 980 feet from Carmichael Road, and is located 380 feet from Alternatives 1, 2, 3, and 4. Land use category B: 2 residences Land use category C: Adams Cemetery
M-64	The front yard of a residence located approximately 1,290 feet from Evans Lane, and is located 310-340 feet from Alternatives 1, 2, 3, and 4. Land use category B: 8 residences
C-1	The front yard of a residence located approximately 60 feet from State Route 45 (south of State Route 445), and is located inside the right-of-way of Alternatives 1, 2, 3, and 4. Land use category B: 1 residence
C-2	The front yard of a residence located in Shea Estates. This site is approximately 1430 feet from State Route 45, 70 feet from the south connector road of Alternatives 1, 2, 3, and 4. Land use category B: 10 residences
C-3	The front yard of a residence located in Shady Meadows. This site is approximately 610 feet from State Route 45, 1970 feet from the south connector road of Alternatives 1, 2, 3, and 4. Land use category B: 6 residences
C-4	The front yard of a residence located approximately 125 feet from State Route 45 (north of State Route 445), and 2990 feet from the south connector road of Alternatives 1, 2, 3, and 4. Land use category B: 18 residences Land use category E: 4 businesses

Note: Only the existing condition noise measurement locations that were within the limits of the noise analysis with regards to the final horizontal alignment of the Refined Preferred Alternative 2 are included in this table. The total number of residences and cemeteries identified in this table differs from the total number identified in Table 5.10.2 since only the residences and cemeteries located within 800 feet of the edge of the outer travel lane were included and no undeveloped platted lots were included per the INDOT *Traffic Noise Analysis Procedure, dated 2011*.

5.10.6.3.2. Prediction of Future Noise Levels

The prediction of the future noise levels for the Section 4 Refined Preferred Alternative 2 used the same version of the FHWA TNM and the same traffic volume projections that were used for Alternatives 1-4, as discussed in Section 5.10.3.2.

In accordance with the requirements of the *INDOT Traffic Noise Analysis Procedure (2011)* each individual travel lane was modeled as a separate roadway feature in TNM and all receptors located within 500 feet of the edge of the nearest travel lane of the Refined Preferred Alternative 2 were assessed for traffic noise impacts. Based on an evaluation of the existing topography and the proposed horizontal and vertical alignments of the Refine Preferred Alternative 2, additional receptors located at distances out to a maximum of 800 feet from the edge of the nearest travel lane were also included in the model. The *INDOT Traffic Noise Analysis Procedure (2011)* limits the noise study area to a maximum of 800 feet from the nearest travel lane based on FHWA's most current validation study for acoustically soft sites.

5.10.6.3.3 TNM 2.5 Program Model Validation

There were no substantive changes made. Refer to Section 5.10.3.3.

5.10.6.3.4 Abatement Assessment

Noise abatement for the Section 4 Refined Preferred Alternative 2 was evaluated for all receptors that are predicted to experience noise impacts (as defined in Section 5.10.6.2) in design year 2030. The *INDOT Traffic Noise Analysis Procedure (2011)* is consistent with the FHWA guidelines to determine the "feasibility" and "reasonableness" of noise abatement measures for all major highway projects. The term feasible means that it is structurally and acoustically possible to achieve a substantial noise reduction of at least 5 dBA at a majority (greater than 50%) of the impacted receptors. The term reasonableness is the combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure and consists of the consideration and obtaining views of residents and property owners, INDOT design goal for noise abatement, and the cost-effectiveness of the noise abatement measure.

5.10.6.4 Analysis

5.10.6.4.1 Existing Condition Noise Levels and TNM Validation

There were no substantive changes made. Refer to Section 5.10.4.1

5.10.6.4.2 Design Year Noise Results

Following the distribution of the DEIS, Build Alternative 2 was further refined into the Refined Preferred Alternative 2 in the FEIS. Revisions incorporated into the Refined Preferred Alternative 2 are described in Section 5.6 of the FEIS. This section provides a comparison of the design year noise results for the Future No-Build Condition with the Refined Preferred Alternative 2 using both the initial design criteria and the low-cost design criteria evaluated using

the *INDOT Traffic Noise Analysis Procedure, (2011)*. **Table 5.10-15** summarizes the data associated with these results.

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Table 5.10-15: Design Year 2030 Predicted Noise Levels (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No	Number of Receptors Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)	
							Refined Preferred Alternative 2	
							Initial Design Criteria[4]	Low Cost Design Criteria[4]
M-2	1	B	59.2	67	74.2	60.9	47.4 dBA Impacts: 0	47.2 dBA Impacts: 0
M-3	2	B	42.2	67	57.2	40.6	55.6-59.4 dBA Impacts: 1	55.2-56.9 dBA Impacts: 0
M-4	5	B	41.3	67	56.3	36.5	59.2-65.9 dBA Impacts: 5	56.8-65.0 dBA Impacts: 5
	2	C	41.3	67	56.3	36.5	59.2-60.5 dBA Impacts: 2	57.9-59.8 dBA Impacts: 2
M-8	13	B	38.9	67	53.9	31.2	52.4-65.1 dBA Impacts: 6 Displacements: 6	54.9-63.0 dBA Impacts: 7 Displacements: 6
	1	C	38.9	67	53.9	31.2	54.7 dBA Impacts: 1	61.3 dBA Impacts: 1
M-12	1	B	42.9	67	57.9	41.6	56.6 dBA Impacts: 0	57.4 dBA Impacts: 0
M-15	14	B	61.8	67	76.8	59.4	52.1–60.7 dBA Impacts: 0 Displacements: 2	52.2-60.7 dBA Impacts: 0 Displacements: 2
M-18	7	B	49.5	67	64.5	42.5	53.8-65.0 dBA Impacts: 1 Displacements: 2	54.1-65.0 dBA Impacts: 1 Displacements: 2
M-19	10	B	57.3	67	72.3	57.8	55.1-59.2 dBA Impacts: 0 Displacements:3	55.1-59.4 dBA Impacts: 0 Displacements: 3
M-21	12	B	39.7	67	54.7	15.3	57.4-68.1 dBA Impacts: 10 Displacements: 2	57.2-68.0 dBA Impacts: 10 Displacements: 2

Table 5.10-15: Design Year 2030 Predicted Noise Levels (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No	Number of Receptors Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)	
							Refined Preferred Alternative 2	
							Initial Design Criteria[4]	Low Cost Design Criteria[4]
	1	E	39.7	72	54.7	15.3	Impacts: 0 Displacements: 1	Impacts: 0 Displacements: 1
M-22	3	B	46.5	67	61.5	51.3	57.7-51.3 dBA Impacts: 0	57.1-61.2 dBA Impacts: 0
M-23	7	B	40.9	67	55.9	41.2	53.2-59.9 dBA Impacts: 3 Displacements:1	52.7-59.8 dBA Impacts: 4 Displacements: 1
M-25	19	B	39.3	67	54.3	30.9	48.9-65.2 dBA Impacts: 8 Displacements: 9	48.5-65.2 dBA Impacts: 8 Displacements: 8
M-27	4	B	50.1	67	65.1	50.3	59.9-61.6 dBA Impacts: 0 Displacements: 1	59.4-61.5 dBA Impacts: 0 Displacements: 1
M-28	6	B	37.5	67	52.5	39.6	51.3-59.8 dBA Impacts: 3 Displacements: 2	51.2-60.6 dBA Impacts: 3 Displacements: 2
M-31	6	B	44.3	67	59.3	51.8	55.0-61.8 dBA Impacts: 2 Displacements: 1	55.1-61.8 dBA Impacts: 2 Displacements: 1
M-32	12	B	49.6	67	64.6	41.1	51.1-62.7 dBA Impacts: 0 Displacements: 5	50.6-63.0 dBA Impacts: 0 Displacements: 4
M-36	11	B	49.7	67	64.7	49.6	60.3-67.0 dBA Impacts: 3 Displacements: 3	59.7-67.7 dBA Impacts: 3 Displacements: 3
M-38	6	B	40.7	67	55.7	46.1	58.3-65.1 dBA Impacts: 5 Displacements: 1	57.5-65.3 dBA Impacts: 5 Displacements: 1

Table 5.10-15: Design Year 2030 Predicted Noise Levels (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No	Number of Receptors Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)	
							Refined Preferred Alternative 2	
							Initial Design Criteria[4]	Low Cost Design Criteria[4]
M-40	1	B	43.2	67	58.2	32.2	63.6 dBA Impacts: 1	62.8 dBA Impacts: 1
M-42	2	B	52.0	67	67.0	40.6	65.0 dBA Impacts: 0 Displacements: 1	63.6 dBA Impacts: 0 Displacements: 1
M-43	3	B	43.0	67	58.0	41.1	56.8-63.0 dBA Impacts: 2	57.2-62.5 dBA Impacts: 2
M-44	9	B	53.7	67	68.7	50.9	56.9-64.3 dBA Impacts: 0	57.1-62.7 dBA Impacts: 0
M-45	7	B	61.2	67	76.2	62.8	59.2-65.3 dBA Impacts: 0 Displacements: 3	59.2-65.1 dBA Impacts: 0 Displacements: 3
M-46	9	B	57.4	67	72.4	60.0	53.6-58.5 dBA Impacts: 0 Displacements: 5	52.9-59.4 dBA Impacts: 0 Displacements: 5
M-47	5	B	40.5	67	55.5	38.0	58.4-59.1 dBA Impacts: 2 Displacements: 3	57.7-58.5 dBA Impacts: 2 Displacements: 3
M-49	11	B	54.4	67	69.4	55.0	53.1-64.9 dBA Impacts: 0	53.0-64.6 dBA Impacts: 0
M-50	1	B	60.8	67	75.8	52.8	54.0 dBA Impacts: 0	54.2 dBA Impacts: 0
M-53	5	B	39.0	67	54.0	51.1	55.8-62.4 dBA Impacts: 5	55.7-62.3 dBA Impacts: 5
	1	C	39.0	67	54.0	51.1	66.7 Impacts: 1	67.5 Impacts: 1
M-54	1	B	43.9	67	58.9	37.6	57.6 dBA Impacts: 0	58.1 dBA Impacts: 0

Table 5.10-15: Design Year 2030 Predicted Noise Levels (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No	Number of Receptors Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)	
							Refined Preferred Alternative 2	
							Initial Design Criteria[4]	Low Cost Design Criteria[4]
M-55	22	B	40.0	67	55.0	35.2	58.8-67.4 dBA Impacts: 16 Displacements: 6	53.0-69.2 dBA Impacts: 17 Displacements: 5
M-56	5	B	43.6	67	58.6	26.4	56.2-61.7 dBA Impacts:2 Displacements: 2	55.8-61.7 dBA Impacts: 2 Displacements: 2
	2	C	43.6	67	58.6	26.4	61.2-61.9 Impacts 2	61.2-61.9 dBA Impacts:2
	1	E	43.6	72	58.6	26.4	60.4 Impacts: 1	60.4 Impacts: 1
M-57	6	B	42.3	67	57.3	38.6	56.9-57.7 dBA Impacts: 1 Displacements: 2	57.0-59.7 dBA Impacts: 2 Displacements: 1
M-58	1	B	57.9	67	72.9	23.5	63.0dBA Impacts: 0	63.0 dBA Impacts: 0
M-60	4	B	43.2	67	58.2	44.3	62.9-66.6 dBA Impacts: 4	61.0-64.5 dBA Impacts: 4
M-61	12	B	47.3	67	62.3	50.2	46.5-52.9 dBA Impacts: 0	46.4-52.9 dBA Impacts: 0
M-62	12	B	52.1	67	67.1	40.7	46.9-55.1 dBA Impacts: 0	46.9-55.6 dBA Impacts: 0
M-63	2	B	45.0	67	60.0	33.8	57.0-60.0 dBA Impacts:1	57.2-59.7 dBA Impacts: 0
	1	C	45.0	67	60.0	33.8	58.7 Impacts: 0	58.5 Impacts: 0
M-64	8	B	33.2	67	48.2	33.6	Displacements: 8	Displacements: 8
C-1	1	B	**66.1**	67	81.1	62.1	Displacements: 1	Displacements: 1

Table 5.10-15: Design Year 2030 Predicted Noise Levels (INDOT *Traffic Noise Analysis Procedure, 2011*)

Site No	Number of Receptors Represented	Activity Category	Existing Measured[1] (dBA Leq)	Noise Abatement Criterion (dBA)	Substantial Increase Criterion[2] (dBA)	Modeled Future No-Build Condition[3] (dBA Leq)	2030 Noise Levels (dBA Leq)	
							Refined Preferred Alternative 2	
							Initial Design Criteria[4]	Low Cost Design Criteria[4]
C-2	10	B	50.4	67	65.4	42.6	48.3-55.5 dBA Impacts: 0	48.2-56.2 dBA Impacts: 0
C-3	6	B	50.7	67	65.7	47.1	45.9 -58.6 dBA Impacts: 0 Displacements: 1	45.9-59.4 dBA Impacts: 0 Displacements: 1
C-4	18	B	61.3	67	76.3	66.5[5]	50.6-62.3 dBA Impacts: 0 Displacements: 6	50.6-61.3 dBA Impacts: 0 Displacements: 6
	4	E	61.3	72	76.3		59.5 dBA Impacts: 0 Displacements: 3	59.3 dBA Impacts: 0 Displacements: 3

[1] *These noise levels represent a combination of highway traffic noise and non-highway noise (i.e. birds, insects, residential noise, etc.) as measured in the field.*
[2] *Substantial means the predicted traffic noise levels exceed existing noise levels by 15 dBA or more.*
[3] *These noise levels represent design-year model results predicting noise levels attributed solely to highway traffic and does not account for ambient conditions.*
[4] *In cases where two or less receivers were modeled, a full range of sound levels (Leq) were not able to be represented. If all the non-displaced represented receivers were too distant to model, the range is represented as a "-".*
[5] *While this ambient noise site represents 22 receivers, the future no-build sound level that is reported only represents the Leq at the location the ambient measurement was taken. In the future no-build discussion, only 3 of the 22 receivers of this group are identified as impacted. One is the ambient location C-4 and the other two are modeled receivers at non-ambient locations...*

Yellow highlights indicate noise levels that approach or exceed the applicable Noise Abatement Criterion, or result in a substantial noise level increase or both

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Within the Refined Preferred Alternative 2 the total number of receptors modeled using the initial design criteria may not equal the total number of receptors modeled using the low-cost design criteria since the vertical alignments and the right-of-way limits for the two design criteria are different.

A summary of the range of predicted year 2030 noise levels for the Refined Preferred Alternative and a summary of the range compared to the existing condition noise levels evaluated based on the *INDOT Traffic Noise Analysis Procedure, dated 2011* is contained in **Table 5.10-16**.

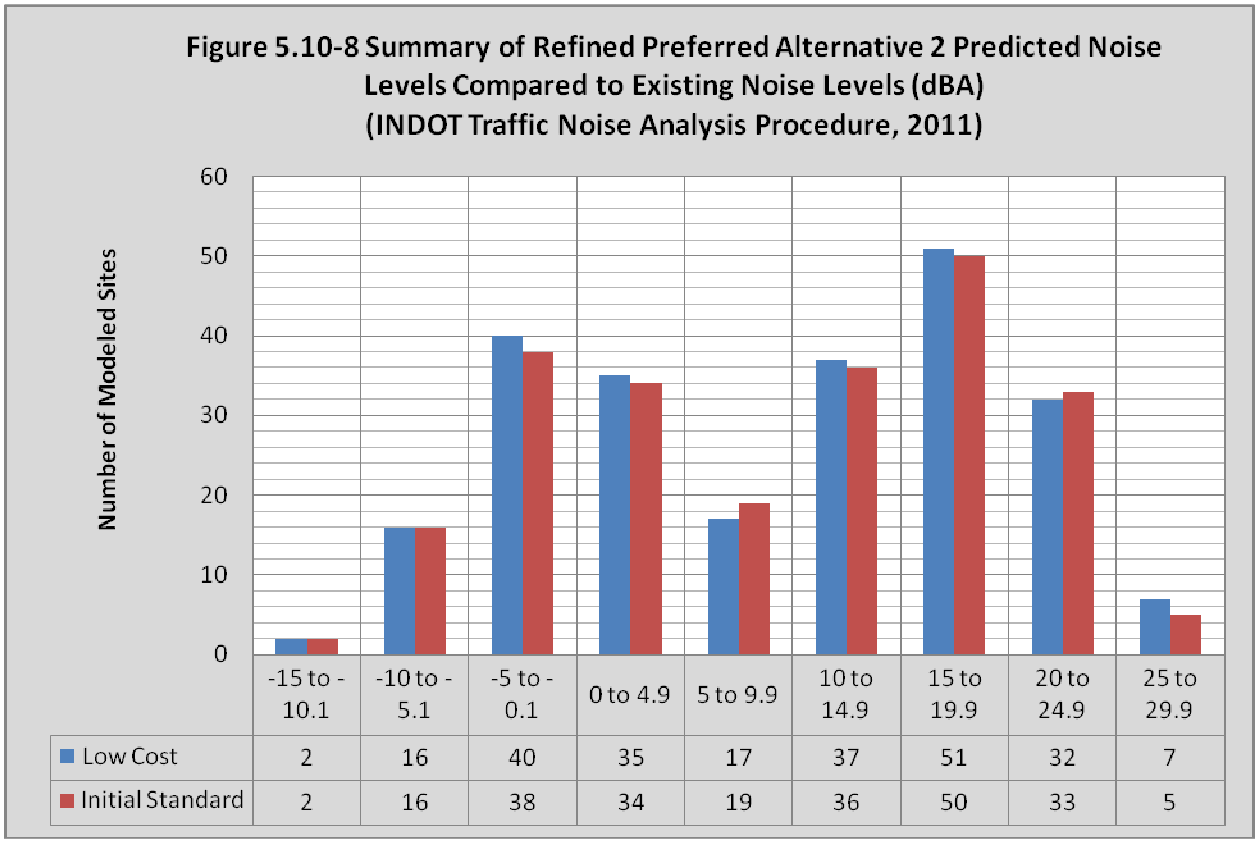
Table 5.10-16: Refined Preferred Alternative 2
Summary of Future Noise Level Ranges (INDOT *Traffic Noise Analysis Procedure , 2011)*

Alternative	Design Criteria	Range of Predicted Noise Levels	Range Between Predicted Noise Levels to Existing Noise Levels
Refined Preferred Alternative 2	Low-Cost Design Criteria	45.9 dBA to 68.0 dBA	-12.0 dBA to 28.5 dBA
	Initial Design Criteria	45.9 dBA to 68.1 dBA	-11.8 dBA to 28.4 dBA

Refined Preferred Alternative 2

The results of the noise analysis indicate that the year 2030 proposed noise levels would range from 45.9 dBA L_{eq} to 68.1 dBA L_{eq} (45.9 dBA L_{eq} to 68.0 dBA L_{eq})[30]. These predicted noise levels represent a difference from existing noise levels ranging from -11.8 dBA L_{eq} to +28.4 dBA L_{eq} (-12.0 dBA L_{eq} to +28.5 dBA L_{eq}). **Figure 5.10-8** (p.336) summarizes the number of receptors that are expected to experience increases and decreases from existing noise levels in 5 dBA increments. The decrease in predicted noise levels when compared to existing noise levels is attributed to a decrease of traffic volumes on the local roads and the fact that background noise components are not included in the model results for each modeled site.

[30] There was not a significant change in the predicted noise levels for the Refined Preferred Alternative 2 using the INDOT Traffic Noise Policy, 2011 when compared to the predicted noise levels for the Refine Preferred Alternative 2 using the INDOT Traffic Noise Policy, 2007. This indicates that the methodology change (which requires each individual travel lane to be modeled as a roadway feature and the traffic to be distributed between the traffic lanes) does not significantly change the predicted noise level results



5.10.6.4.3 Identification of Predicted Traffic Noise Impacts

The noise level impacts identified for the Refined Preferred Alternative evaluated based on the *INDOT Traffic Noise Analysis Procedure (2011)* are described below and summarized in **Table 5.10-17**.

Table 5.10-17: Noise Level Impacts by Land Use
Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011)*

Receptor Type	2030 Predicted Noise Levels Impacts	
	Refined Preferred Alternative 2	
	Low Cost Design Criteria	Initial Design Criteria
Residences	85	83
Churches	0	0
Cemeteries	4	4
Schools	0	0
Parks	0	0
Historic Sites	0	0
Nat'l. Historic Landmarks	0	0
Commercial	1	1
Industrial	0	0

Table 5.10-17: Noise Level Impacts by Land Use
Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011)*

Receptor Type	2030 Predicted Noise Levels Impacts	
	Refined Preferred Alternative 2	
	Low Cost Design Criteria	Initial Design Criteria
Total	**90**	**88**

Within this alternative, the total number of traffic noise impacts may vary between the two design criteria since the vertical alignments and the right-of-way limits for the two design criteria are different. Since the criteria have different right-of-way-limits, the number of displacements may also be different.

A summary of the type of impacts for the predicted year 2030 Refined Preferred Alternative 2 is contained in **Table 5.10-18**. Refer to **Appendix X** for more detailed information regarding the predicted impacts.

Table 5.10-18: Noise Level Impact Summary
Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011)*

Receptor Type	2030 Predicted Year Results	
	Refined Preferred Alt 2	
	Low Cost Design Criteria	Initial Design Criteria
NAC Impact	0	0
NAC & Substantial Increase Impact	6	6
Substantial Increase Impact (15-20 dBA)	51	50
Substantial Increase Impact (20-25 dBA)	32	33
Substantial Increase Impact (>25 dBA)	7	5
Total	**90(1)**	**88(1)**

1): The NAC and Substantial Increase Impact number is not included in the total number of impacts because this number has been included in the breakdown of the substantial increase impact numbers.

The Refined Preferred Alternative 2 will result in 88 (90)[31] traffic noise impacts. Of these, 82 (84) are substantial increase impacts only and 6 (6) are both NAC and substantial increase

[31] Significantly less traffic noise impacts were identified for the Refined Preferred Alternative 2 when using the INDOT *Traffic Noise Analysis Procedure, 2011* when compared to the traffic noise impacts identified with the Refined Preferred Alternative 2 when using the INDOT *Traffic Noise Policy, 2007*. The significant decrease is a result of a change in the INDOT *Traffic Noise Analysis Procedure, 2011*, which eliminated the undeveloped lots and residences located greater than 800 feet from the outer edge of the closest travel lane from the noise study.

impacts. An evaluation of the substantial increase impacts indicate that 50 (51) of the impacts will experience a substantial increases between 15 and 20 dBA, 33 (32) of the impacts have substantial increases between 20 and 25 dBA, and 5 (7) of the impacts have substantial increases of 25 dBA or greater.

5.10.6.5 Mitigation

In accordance with the *INDOT Traffic Noise Analysis Procedure (2011)*, possible mitigation measures were considered for sites where noise impacts were predicted to occur. Mitigation was assessed in terms of its feasibility and reasonableness. For the purposes of assessing noise mitigation strategies, "feasibility" means that it is structurally and acoustically possible to reduce noise occurring at a majority (greater than 50%) of the impacted receptors by 5 dBA. In order to determine "reasonableness", INDOT has established three criteria to be evaluated for each feasible form of noise abatement. If any of the criteria is not met, noise abatement measures will not be constructed. The three "reasonableness" criteria are described as follows:

- Consideration and Obtaining Views of Residents and Property Owners: A survey of the benefited receptors will be performed so that they have the opportunity to express their opinion and may elect to decline such mitigation if they believe the positive benefits outweigh the potential negative impacts of noise barriers (i.e., unsightliness, shortened daylight, poor air circulation, degradation by weather, reduced safety, vandalism, and restriction of access for emergency vehicles. In addition to the survey, a fact sheet describing Highway Traffic Noise and Noise Barriers and a map identifying the location of the proposed noise barrier will be provided to the benefited receptors. If the total respondents to the survey do not total a majority (more than 50%) of the benefited receptors and affected property owners, then a second survey of those that did not respond will be performed. A third survey will not be performed regardless of the percentage of the responses.

- INDOT Design Goal for Noise Abatement: INDOT has established a noise reduction design goal of 7 dBA for a majority (greater than 50%) of the benefited first row receptors. If the proposed noise abatement measure is unable to produce this required level of noise reduction, then the noise abatement measure will not be considered "reasonable".

- Cost-Effectiveness: To determine cost effectiveness, the estimated cost of constructing a noise barrier will be divided by the number of benefited receptors. A benefited receptor includes those sites which are predicted to experience at least a 5 dBA $L_{eq}(h)$ reduction at the noisiest hour conditions, and may include receptors that are not impacted. Barrier cost should be arrived at by applying a square footage cost (determined by INDOT to be $30 per square foot) to the square footage of the noise barrier. Noise abatement will be considered cost effective if the estimated cost of constructing abatement divided by the number of benefited receptors is $25,000 or less. In situations where the majority (greater than 50%) of the receptors were in place prior to construction of the highway, the cost effective criteria will be 20% greater (currently $30,000 per benefitted receptor). Since the project involves the construction of a roadway on new alignment and the receptors were on in place prior to this study, a cost effectiveness criteria of $30,000 per benefited receptor will be used.

5.10.6.5.1 Noise Abatement Considerations

The following strategies were considered for permanent noise impacts.

Traffic Management Measures: Traffic management measures were not considered reasonable and feasible for abating noise impacts for any receptor. Measures such as installation of additional traffic control devices, prohibition of vehicle types, time-use restrictions, speed limit reductions, and exclusive lane designations would be detrimental to the proposed project's ability to function as a freeway and major north-south route.

Alteration of Horizontal and Vertical Alignments: The final design of the preferred alternative may include shifting the alternative both vertically and horizontally, wherever feasible, to minimize impacts to adjacent land uses. Both vertical and horizontal alignments may be altered to minimize noise impacts where other factors are not prohibitive.

Acquisition of Property Rights or Acquisition of Property: The purchase of property and/or buildings for noise barrier construction or the creation of a "buffer zone" to reduce noise impacts was considered. The amount of property required for this option to be effective would create significant additional impacts (*e.g.*, in terms of residential displacements), which were determined to outweigh the benefits of land acquisition.

Noise Insulation of Public Use or Nonprofit Institutional Structures: This noise abatement measure option applies only to public and institutional use buildings. Since no public use or institutional structures are anticipated to have interior noise levels exceeding FHWA's interior NAC, this noise abatement option will not be applied.

Coordination Among Local Planning Authorities. Since a portion of the proposed project would be located on a new roadway, the potential does exist for local officials and developers to help minimize adverse noise impacts in the future through the use of careful land use planning. With regard to currently undeveloped land, the creation of a "buffer zone" or locating noise sensitive developments a reasonable distance away from the project would help minimize future noise impacts. Local planning authorities will be provided with the 66 dBA noise contour mapping and can utilize it to develop noise compatible land uses outside the 66 dBA buffer zone. This mapping can be found in **Appendix II**. Copies of this EIS will be provided to Greene and Monroe county officials for use in noise-sensitive land use planning.

Construction of Noise Barriers: The construction of noise barriers between the shoulder and the right-of-way limits is generally one of the most feasible and/or reasonable abatement measures available. For those receptors experiencing a noise impact, the feasibility and reasonableness of noise abatement were evaluated using *INDOT's Traffic Noise Analysis Procedure (2011).*

5.10.6.5.2 Noise Mitigation Assessment

Using INDOT's *Highway Traffic Noise Analysis Procedure (2011)*, receptors that were categorized as having design year (2030) traffic noise impacts for the Refined Preferred Alternative 2 were assessed to determine if the construction of noise barriers would be a

"feasible" and "reasonable" form of noise abatement. As part of the barrier analysis, the location of the impacted receptors along with the topographic conditions and surrounding land uses were taken into consideration to determine the number of proposed noise barriers that would require analysis. Based on this evaluation, it was determined that a total of 36 proposed noise barriers would require evaluation in order to assess noise mitigation for all the impacted receptor locations. The areas where barrier analyses were performed are depicted in **Figure 5.10-9** (p. 5-367).

Feasibility Determination

A barrier analysis was performed at 36 (36) separate proposed noise barrier locations located along the Refined Preferred Alternative 2 to determine the acoustic feasibility of each of the proposed noise barriers to achieve a 5 dBA reduction for a majority of the impacted receptors at that location. The barrier analysis was performed for both design criteria using TNM. Proposed noise barriers were evaluated at the edge of the shoulder and/or at the right-of-way limits depending on the roadway profile, the surrounding topography, and the elevation of the impacted receptors. Based on the barrier analysis 31 (32) noise barriers were determined to be acoustically feasible. A summary of the feasibility of the proposed noise barriers is contained in **Table 5.10-19**.

Table 5.10-19:Noise Barrier Feasibility Summary–
Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011)*

Barrier ID	Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria
	Noise Barrier Feasibility Met?	Noise Barrier Feasibility Met?
A-1	Yes	Yes
A-2	Yes	Yes
B-1	Yes	Yes
C-1	No	Yes
C-2	Yes	Yes
C-3	Yes	Yes
C-4	Yes	No
D-1	Yes	Yes
E-2	Yes	Yes
E-3	Yes	Yes
E-4	Yes	Yes
E-5	Yes	Yes
E-6	Yes	Yes
F-1	Yes	Yes
F-3	Yes	Yes
F-4	Yes	Yes
F-5	Yes	Yes
F-6	Yes	Yes
F-7	Yes	Yes
F-8	Yes	No
F-9	No	No
F-10	Yes	Yes
F-11	Yes	Yes

**Table 5.10-19:Noise Barrier Feasibility Summary–
Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011)***

Barrier ID	Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria
	Noise Barrier Feasibility Met?	Noise Barrier Feasibility Met?
G-1	Yes	Yes
G-3	Yes	Yes
G-4	Yes	Yes
G-5	Yes	Yes
G-6	No	No
G-7	No	No
G-8	Yes	Yes
G-9	Yes	Yes
H-2	Yes	Yes
H-3	Yes	Yes
H-4	Yes	Yes
H-5	Yes	Yes
H-6	Yes	Yes

Reasonableness of Noise Abatement Measures

In order to determine "reasonableness", the three reasonableness criteria were evaluated for all proposed noise barriers that are determined to be feasible. Based on the feasibility determination, 31 (32) noise barriers that were determined to be feasible and will require analysis using the reasonableness criteria stated in the INDOT *Traffic Noise Analysis Procedure, dated 2011.* INDOT requires that all three of the criteria be met and if they are not then the noise barrier will not be constructed

Consideration and Obtaining Views of Residents and Property Owners

In order to solicit the views of the residents and property owners, a total of 105 surveys were distributed to each impacted and benefited residence associated with a potential noise barrier location.

At the time of the initial mailing of surveys, all impacted residences associated with potential barriers received a survey mailing. This included a single residence along SR37 associated with barrier H-7, which through subsequent modeling was determined to not be impacted and did not warrant a barrier evaluation. The survey mailing was conducted prior to barrier analysis to determine acoustic feasibility, and as a result surveys were sent to residences associated with barrier F-9 (one residence), barrier G-6 (one residence) and barrier G-7 (one residence) where it was subsequently determined that a barrier for either of the design criteria was not feasible. As such, survey responses received from these locations are not included in the following benefited receptors opinion survey summary. Additionally, surveys were sent out to residents at nine receptor locations where it was subsequently determined through the barrier analysis that they could not be counted as benefited receivers for the respective barriers since a 5 dBA reduction in the predicted noise levels could not be achieved. Again, survey responses received from these locations are not included in the following benefited receptors opinion survey summary.

A total of 83 (90) surveys were distributed to the benefited residents associated the 31 (32) noise barriers that were determined to be feasible for the Refined Preferred Alternative 2. The benefited residents were allowed 14 calendar days to respond to the survey. A second survey was sent to the benefited residents that did not respond during the first round time frame allotted. Benefited residents were allowed 14 calendar days to respond during the second round of the survey. A total of 65 (68) completed surveys were returned from the benefited residents of 26 (26) of the proposed noise barriers that were determined to be feasible. Based on the results of the survey, 23 (23) of the proposed noise barriers contained greater than 50% of the benefited residents (per noise barrier) responding that they were in favor of constructing a noise barrier if it was found to be reasonable. One (0) of the proposed noise barriers contained greater than 50% of the benefited residents (per noise barrier) responding that they were not in favor of constructing a noise barrier if it was found to be reasonable. Two (3) of the proposed noise barriers had 50 % or less response from the benefited residents (per barrier). The results of the survey of the benefited residents associated with the proposed noise barriers that meet the feasibility requirement for the Refined Preferred Alternative 2 is contained in **Table 5.10-20**.

Table 5.10-20:Benefited Residents Survey Summary– Refined Preferred Alternative 2[1] (INDOT *Traffic Noise Analysis Procedure, 2011*)

Barrier ID	Refined Preferred Alternative 2 – Low Cost Design Criteria				Refined Preferred Alternative No. 2 Initial Design Criteria			
	No. Benefitted Receptors	No. of Surveys Received	Total % of Surveys Received	Benefited Receptors Opinion[2]	No. Benefitted Receptors	No. of Surveys Received	Total % of Surveys Received	Benefited Receptors Opinion[2]
A-1	1	1	100%	Yes	1	1	100%	Yes
A-2	4	3	75%	Yes	4	3	75%	Yes
B-1	1	0	0%	No	1	0	0%	No
C-1	*	*	*	*	1	1	100%	Yes
C-2	1	1	100%	Yes	1	1	100%	Yes
C-3	1	1	100%	Yes	1	1	100%	Yes
C-4	1	0	0%	No	*	*	*	*
D-1	1	1	100%	Yes	1	1	100%	Yes
E-2	1	1	100%	Yes	1	1	100%	Yes
E-3	1	0	0%	No	1	0	0%	Yes
E-4	2	2	100%	Yes	1	1	100%	Yes
E-5	4	2	50%	Yes	1	1	100%	Yes
E-6	2	2	100%	Yes	1	1	100%	Yes
F-1	6	5	83%	Yes	6	5	83%	Yes
F-3	4	4	100%	Yes	4	4	100%	Yes
F-4	1	1	100%	Yes	1	1	100%	Yes
F-5	1	1	100%	Yes	1	1	100%	Yes
F-6	3	1	33%	Yes	3	1	33%	Yes
F-7	1	1	100%	Yes	1	1	100%	Yes
F-8	1	1	100%	No	*	*	*	*
F-10	1	1	100%	Yes	1	1	100%	Yes
F-11	3	3	100%	Yes	3	3	100%	Yes
G-1	8	8	100%	Yes	8	8	100%	Yes
G-3	1	1	100%	Yes	1	1	100%	Yes

Table 5.10-20:Benefited Residents Survey Summary– Refined Preferred Alternative 2[(1)] (INDOT *Traffic Noise Analysis Procedure, 2011*)

Barrier ID	Refined Preferred Alternative 2 – Low Cost Design Criteria				Refined Preferred Alternative No. 2 Initial Design Criteria			
	No. Benefitted Receptors	No. of Surveys Received	Total % of Surveys Received	Benefited Receptors Opinion[(2)]	No. Benefitted Receptors	No. of Surveys Received	Total % of Surveys Received	Benefited Receptors Opinion[(2)]
G-4	2	1	50%	Yes	2	1	50%	Yes
G-5	5	3	60%	Yes	5	3	60%	Yes
G-8	1	0	0%	No	1	0	0%	No
G-9	7	6	86%	Yes	7	6	86%	Yes
H-2	21	15	71%	Yes	21	15	71%	Yes
H-3	1	1	100%	Yes	1	1	100%	Yes
H-4	1	1	100%	Yes	1	1	100%	Yes
H-5	1	0	0%	No	1	0	0%	No
H-6	1	0	0%	No	1	0	0%	No

(1) The data presented in **Table 5.10-20** is based on the results of the two[t] rounds of the Survey.
(2) Yes indicates that greater than 50% of the respondents are in favor of a noise barrier. No indicates that greater than 50% of the respondents are not in favor of a noise barrier.
* Represents Barriers that did not meet INDOT's feasibility requirement

INDOT Design Goal for Noise Abatement

A barrier analysis using TNM was performed for the 31 (32) proposed noise barriers that were determined to be feasible in order to evaluate if the required INDOT design goal noise reduction could be achieved. Based on the barrier analysis it was determined that a 7 dBA noise reduction could be achieved at a majority of the first row receptors at 25 (25) of the proposed noise barriers. A summary of the design goal noise reduction determination for the proposed noise barriers that met the feasibility requirement for the Refined Preferred Alternative 2 is contained in **Table 5.10-21.**

Table 5.10-21: INDOT Design Goal Noise Reduction Summary
Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011*)

Barrier ID	Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria
	7 dBA ReductionAchieved?	7 dBA Reduction Achieved?
A-1	Yes	Yes
A-2	Yes	Yes
B-1	Yes	Yes
C-1	*	No
C-2	Yes	Yes
C-3	Yes	Yes
C-4	No	*
D-1	Yes	Yes
E-2	Yes	Yes
E-3	Yes	Yes
E-4	No	No
E-5	Yes	Yes
E-6	Yes	Yes
F-1	Yes	Yes
F-3	Yes	Yes
F-4	No	No
F-5	Yes	Yes
F-6	Yes	Yes
F-7	Yes	Yes
F-8	No	*
F-10	Yes	Yes
F-11	Yes	Yes
G-1	Yes	Yes
G-3	Yes	Yes
G-4	Yes	Yes
G-5	Yes	Yes
G-8	No	No
G-9	Yes	Yes
H-2	Yes	Yes
H-3	No	No
H-4	Yes	Yes
H-5	No	No
H-6	Yes	Yes

* Represent proposed barrier locations that do not meet feasibility requirement

Cost Effectiveness Determination

In order to determine the cost-effectiveness of the proposed noise barriers associated with the Refined Preferred Alternative 2, a barrier analysis was performed for the 31 (32) proposed noise barriers that were determined to be feasible. The barrier analysis was performed using TNM. Based on the results of the barrier analysis the cost per benefitted receptor ranged from $99,194 to $3,320,208 ($103,588 to $2,210,718)[32]. None of the 31 (32) barriers analyzed meet the cost per benefited receptor cost of $30,000.00 established by INDOT. A summary of the cost per benefitted receptor for each of the proposed noise barriers is contained in **Table 5.10-22**.

Statement of Likelihood

Based on the studies thus far accomplished, the State of Indiana has not identified any locations where noise abatement is likely. Noise abatement at these locations is based upon preliminary design costs and design criteria. Noise abatement has not been found to be feasible at 5 (4) of the proposed noise barrier locations based on the inability of these barriers to achieve the minimum acoustic feasibility requirement. Noise abatement has not been found to be reasonable at 31 (32) of the proposed noise barrier locations based on the inability of these proposed noise barriers to satisfy all three of the reasonableness criteria. A summary of feasibility and reasonableness evaluation for the 36 (36) proposed noise barriers is contained in **Table 5.10-23**. A reevaluation of the noise analysis will occur during final design. If during final design it has been determined that conditions have changed such that noise abatement is feasible and reasonable, the abatement measures might be provided. The final decision on the installation of any abatement measure(s) will be made upon the completion of the project's final design and the public involvement process.

[32] The significant increase in the cost per benefited receptor compared to the costs identified using the INDOT *Traffic Noise Policy, 2007* is a result of a change to the INDOT *Traffic Noise Analysis Procedure, 2011,* which eliminates the use of undeveloped lots and residences located beyond 800 feet from the outer edge of the nearest travel lane from the noise study. This change resulted in fewer benefits that were able to be used in the cost effectiveness determination, which results in a higher cost per benefited receptor cost.

Table 5.10-22: Noise Barrier Analysis Cost Effectiveness Determination – Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011*)

Proposed Barrier Location	Total Barrier Length (feet)		Average Height (feet)		No. of Impacted Receptors		Impacts Benefitted		Additional Benefits		No. of Benefited Receptors		Cost of Barrier ($30/sq ft)		Cost per Benefited Receptor	
	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
A-1	2,400	1,895	17.4	18	1	1	1	1	0	0	1	1	$1,254,124	$1,027,579	$1,254,124	$1,027,579
A-2	5,475	5,473	19.2	17.6	4	5	4	4	0	0	4	4	$3,159,575	$2,897,059	$789,894	$724,265
B-1	2,304	1,755	15.6	19.5	1	1	1	1	0	0	1	1	$1,081,472	$1,026,610	$1,081,472	$1,026,610
C-1	*	5,124	*	20	*	1	*	1	*	0	*	1	*	$3,017,031	*	$3,017,031
C-2	3,595	2,215	11.9	13.5	1	1	1	1	0	0	1	1	$1,282,379	$887,607	$1,282,379	$887,607
C-3	3,692	3,426	12	13.5	1	1	1	1	0	0	1	1	$1,328,993	$1,388,790	$1,328,993	$1,388,790
C-4	3,013	*	19.2	*	1	*	1	*	0	*	1	*	$1,734,840	*	$1,734,840	*
D-1	2,144	1,700	11.9	13.75	1	1	1	1	0	0	1	1	$767,514	$702,007	$767,514	$702,007
E-2	1,800	2,000	16.8	13	1	1	1	1	0	0	1	1	$906,873	$779,991	$906,873	$779,991
E-3	1,900	2,300	13.5	11	1	1	1	1	0	0	1	1	$768,055	$761,997	$768,055	$761,997
E-4	1,890	5,628	17.9	19.6	1	1	1	1	1	0	2	1	$1,014,436	$3,320,208	$507,218	$3,320,208
E-5	2,091	1,582	20	18.7	1	1	1	1	3	0	4	1	$1,254,591	$908,259	$313,647	$908,259
E-6	1,628	333	15.8	14	2	1	1	1	0	0	1	1	$762,727	$135,410	$762,727	$135,410
F-1	5,800	3,350	17.7	18.5	4	5	4	5	2	1	6	6	$3,249,562	$1,819,786	$541,593	$303,298
F-3	1,327	1,124	17.7	15.6	4	4	4	4	0	0	4	4	$704,579	$527,040	$176,145	$131,760
F-4	1,900	1,553	19.2	19.2	2	2	1	1	0	0	1	1	$1,127,800	$880,731	$1,127,800	$880,731
F-5	2,100	1,600	16.3	18.8	1	1	1	1	0	0	1	1	$1,025,772	$905,991	$1,025,772	$905,991
F-6	1,708	891	14.4	12.2	1	2	1	2	2	0	3	2	$736,601	$326,835	$245,534	$163,418
F-7	1,889	1,231	19.6	18.4	1	1	1	1	0	0	1	1	$1,109,427	$687,435	$1,109,427	$687,435
F-8	3,776	*	19.5	*	2	*	1	*	0	*	1	*	$2,210,718	*	$2,210,718	*
F-10	1,506	1,504	11.4	12.6	1	1	1	1	0	0	1	1	$517,792	$568,200	$517,792	$568,200
F-11	3,767	2,987	14.8	16.8	1	1	1	1	2	2	3	3	$1,672,132	$1,511,204	$557,377	$503,735
G-1	2,002	2,001	13.8	13.9	8	8	4	4	4	4	8	8	$828,711	$834,432	$103,588	$104,304
G-3	700	700	11.8	12.1	1	1	1	1	0	0	1	1	$248,966	$254,964	$248,966	$254,964
G-4	700	3,066	17.8	17.5	2	2	2	2	0	0	2	2	$375,137	$1,779,999	$187,569	$890,000
G-5	4,918	4,211	19.8	17.7	4	4	3	3	2	2	5	5	$2,917,607	$2,234,787	$583,521	$446,957
G-8	2,112	2,514	19.7	20	1	1	1	1	0	0	1	1	$1,251,834	$1,505,161	$1,251,834	$1,505,161
G-9	3,200	3,100	13.9	15.3	6	6	6	6	1	1	7	7	$1,335,083	$1,424,965	$190,726	$203,566
H-2	4,210	4,311	19.5	16.1	19	18	15	16	4	5	19	21	$2,459,210	$2,083,074	$129,432	$99,194
H-3	2,590	3,180	18.8	19	1	1	1	1	0	0	1	1	$1,460,413	$1,818,799	$1,460,413	$1,818,799
H-4	2,800	2,400	14.7	12.8	1	1	1	1	0	0	1	1	$1,232,967	$920,886	$1,232,967	$920,886
H-5	2,123	1,722	18.4	16.8	1	1	1	1	0	0	1	1	$1,171,394	$866,104	$1,171,394	$866,104
H-6	3,595	3,794	18.1	12	1	1	1	1	0	0	1	1	$1,945,701	$1,360,407	$1,945,701	$1,360,407

* Represents a proposed noise barrier that that does not meet the feasibility requirement

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Table 5.10-23:Noise Abatement Assessment Summary– Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011*)

Barrier I.D.	Refined Preferred Alternative 2 – Low-Cost Design Criteria					Refined Preferred Alternative 2 – Initial Design Criteria				
	Feasibility Determination	Reasonableness Criteria				Feasibility Determination	Reasonableness Criteria			
		Public Involvement Favorable	Cost Effectiveness	INDOT Design Goal	Reasonableness Determination		Public Involvement Favorable	Cost Effectiveness	INDOT Design Goal	Reasonableness Determination
A-1	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
A-2	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
B-1	Yes	No	No	Yes	No	Yes	No	No	Yes	No
C-1	No	*	*	*	*	Yes	Yes	No	No	No
C-2	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
C-3	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
C-4	Yes	No	No	No	No	No	*	*	*	*
D-1	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
E-2	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
E-3	Yes	No	No	Yes	No	Yes	No	No	Yes	No
E-4	Yes	Yes	No	No	No	Yes	Yes	No	No	No
E-5	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
E-6	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
F-1	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
F-3	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
F-4	Yes	Yes	No	No	No	Yes	Yes	No	No	No
F-5	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
F-6	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No

Table 5.10-23:Noise Abatement Assessment Summary– Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011*)

Barrier I.D.	Refined Preferred Alternative 2 – Low-Cost Design Criteria					Refined Preferred Alternative 2 – Initial Design Criteria				
	Feasibility Determination	Reasonableness Criteria				Feasibility Determination	Reasonableness Criteria			
		Public Involvement Favorable	Cost Effectiveness	INDOT Design Goal	Reasonableness Determination		Public Involvement Favorable	Cost Effectiveness	INDOT Design Goal	Reasonableness Determination
F-7	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
F-8	Yes	No	No	No	No	No	*	*	*	*
F-9	No	*	*	*	*	No	*	*	*	*
F-10	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
F-11	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
G-1	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
G-3	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
G-4	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
G-5	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
G-6	No	*	*	*	*	No	*	*	*	*
G-7	No	*	*	*	*	No	*	*	*	*
G-8	Yes	No	No	No	No	Yes	No	No	No	No
G-9	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
H-2	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
H-3	Yes	Yes	No	No	No	Yes	Yes	No	No	No
H-4	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
H-5	Yes	No	No	No	No	Yes	No	No	No	No
H-6	Yes	No	No	Yes	No	Yes	No	No	Yes	No

* Reasonableness criteria were not evaluated for proposed noise barriers that did not meet the feasibility requirement.

5.10.7 Construction Noise Impacts

In addition to permanent impacts, there will be temporary impacts during highway construction. Project construction would result in short term noise impacts from construction vehicles, driving of piles and/or blasting (if necessary), etc. Refer to Section 5.12, *Construction Impacts*, for more information relative to probable impacts and suggested abatement measures.

5.10.8 Summary

A Noise Analysis was performed for the Section 4 Alternatives to determine the traffic noise impacts using the initial design criteria and the low-cost design criteria. For the purpose of the following discussions, traffic noise impacts associated with the initial design criteria are discussed first and then followed by the traffic noise impacts for the low-cost design criteria in parentheses.

Forty-four existing ambient measurements were recorded. Only one of the ambient levels approached the NAC of 67 dBA. It is the only existing conditions traffic noise impact that was identified. An evaluation of the Future No-Build scenario resulted in the identification of two NAC impacts.

The predicted noise levels for the year 2030 Alternatives ranged from 41.8 dBA L_{eq} to 68.4 dBA L_{eq}. (41.5 dBA L_{eq} to 69.2 dBA L_{eq}). These predicted noise levels represent a difference from existing noise levels ranging from -11.9 dBA L_{eq} to +28.7 dBA L_{eq} (-12.6 dBA L_{eq} to +29.9 dBA L_{eq}). The decrease in predicted noise levels when compared to existing noise levels is attributed to a decrease of traffic volumes on the local roads and the ambient component not being calculated by the TNM.

Alternative 1

This alternative was evaluated based on the requirements of the INDOT *Traffic Noise Policy, dated 2007* and is predicted to result in 170 (150) noise impacts. Of these, 158 (142) are substantial increase impacts, 1 (0) is a NAC impact, and 11 (8) are both NAC and substantial increase impacts. An abatement analysis utilizing both the initial design criteria and the low-cost design criteria resulted in five barriers meeting INDOT's criterion for "feasibility" for both sets of design criteria. However, none of the five barriers meet INDOT's "reasonable" criteria for cost effectiveness.

Alternative 2

This alternative was evaluated based on the requirements of the INDOT *Traffic Noise Policy, dated 2007* and is predicted to result in 165 (163) traffic noise impacts. Of these, 152 (154) are substantial increase impacts only and 13 (9) are both NAC and substantial increase impacts. An abatement analysis utilizing both the initial design criteria and the low-cost design criteria resulted in six barriers meeting INDOT's criterion for "feasibility" for both sets of design criteria. However, none of the six barriers meet INDOT's "reasonable" criteria for cost effectiveness.

Alternative 3

This alternative was evaluated based on the requirements of the INDOT *Traffic Noise Policy, dated 2007* and is predicted to result in 165 (156) traffic noise impacts. Of these, 154 (147) are substantial increase impacts only and 11 (9) are both NAC and substantial increase impacts. An abatement analysis resulted in six barriers using the initial design criteria and seven barriers using the low-cost design criteria meeting INDOT's criterion for "feasibility". However, none of the barriers met INDOT's "reasonable" criteria for cost effectiveness.

Alternative 4

This alternative was evaluated based on the requirements of the INDOT *Traffic Noise Policy, dated 2007* and is predicted to result in 151 (147) traffic noise impacts. Of these, 139 (139) are substantial increase impacts only and 12 (8) are considered both NAC and substantial increase impacts. An abatement analysis utilizing both the initial design criteria and the low-cost design criteria resulted in five barriers meeting INDOT's criterion for "feasibility" for both sets of design criteria. However, none of the five barriers meet INDOT's "reasonable" criteria for cost effectiveness.

Refined Preferred Alternative 2 (INDOT *Traffic Noise Policy 2007)*

The Refined Preferred Alternative 2, evaluated using the INDOT *Traffic Noise Policy, dated 2007* is predicted to result in 165 (152) traffic noise impacts. Of these, 152 (142) are substantial increase impacts, 1 (0) is a NAC impact, and 12 (10) are both NAC and substantial increase impacts. An abatement analysis utilizing both the initial design criteria and the low-cost design criteria resulted in six barriers meeting INDOT's criterion for "feasibility" for both sets of design criteria. However, none of the five barriers meet INDOT's "reasonable" criteria for cost-effectiveness.

Refined Preferred Alternative 2 (INDOT *Traffic Noise Analysis Procedure, 2011)*

This Refined Preferred Alternative 2 was evaluated based on the requirements of the INDOT *Traffic Noise Analysis Procedure, dated 2011* and the year 2030 proposed noise levels would range from 45.9 dBA L_{eq} to 68.1 dBA L_{eq} (45.9 dBA L_{eq} to 68.0 dBA L_{eq}). There were 88 (90) traffic noise impacts. Of these, 82 (84) are substantial increase impacts only and 6 (6) are both NAC and substantial increase impacts. Significantly less traffic noise impacts were identified when compared to the traffic noise impacts identified for the Refined Preferred Alternative 2 when using the INDOT *Traffic Noise Policy (2007)*. The significant decrease is a result of a change in the INDOT *Traffic Noise Analysis Procedure (2011)*, which eliminated the undeveloped lots and residences located greater than 800 feet from the outer edge of the closest travel lane from the noise study

An abatement analysis of these impacts was performed and resulted in the identification of 36 (36) proposed noise barriers. The abatement analysis was performed to determine feasibility and reasonableness of noise abatement at these locations. Based on the evaluation it was determined

that 31 (32) of the proposed noise barriers meet the feasibility requirement. As a result, these proposed noise barriers were then analyzed to determine if they meet the three reasonableness criteria. Based on the abatement analysis, it was determined that none of the proposed noise barriers determined to be feasible meet all three of the reasonableness criteria (none of the barriers meet the cost effectiveness criteria).

A final determination on noise abatement for the Refined Preferred Alternative 2 will be made during the design phase. At such time, additional noise analysis will be performed to more accurately determine barrier performance, barrier characteristics (length and height), and the optimal barrier location for any potential noise barriers that may be recommended for noise abatement.

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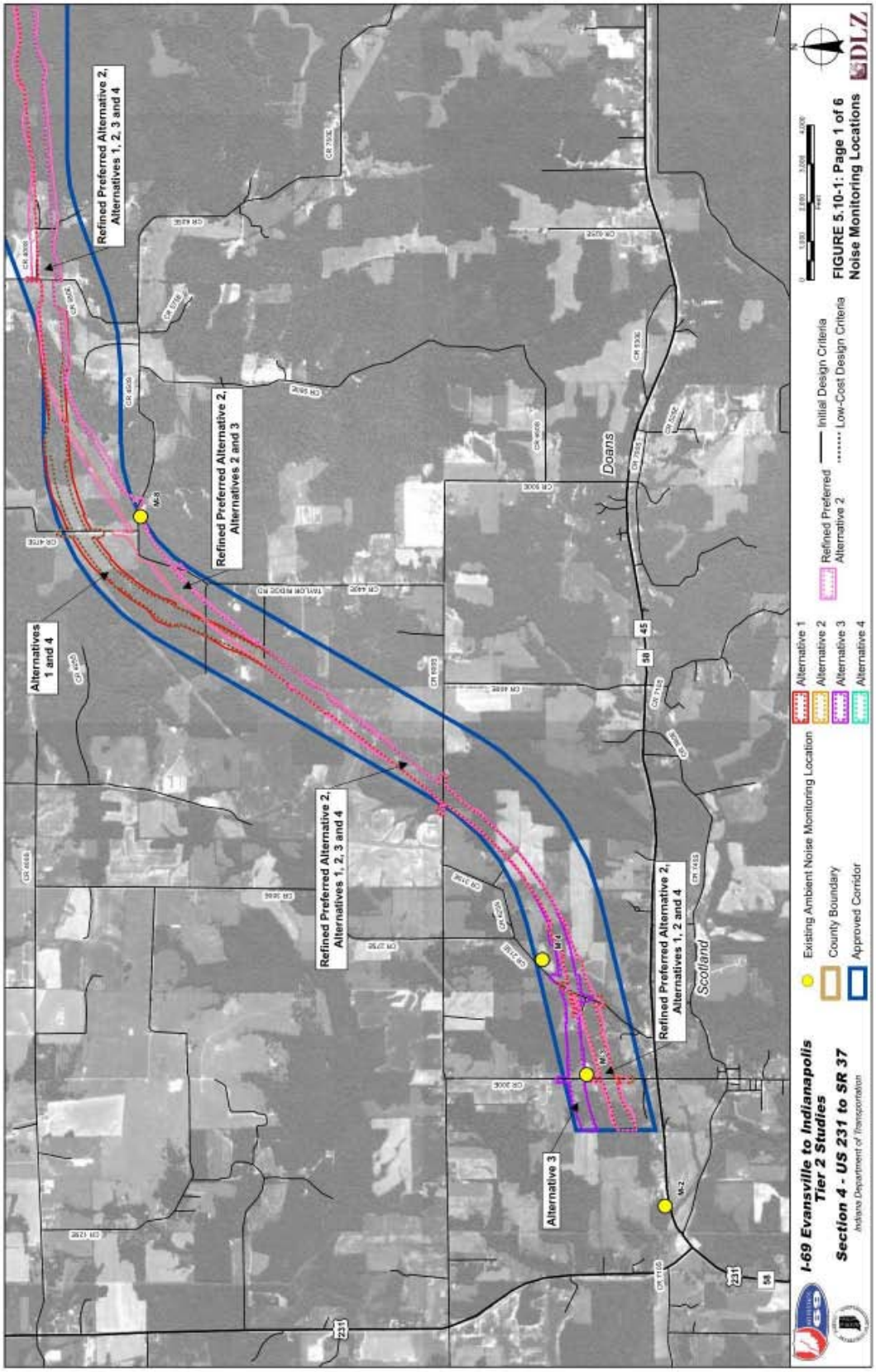
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Alternative 3
Doans
Scotland
M-8
M-4
M-2
231
58
45
I-69 Evansville to Indianapolis Tier 2 Studies
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Indiana Department of Transportation
Existing Ambient Noise Monitoring Location
County Boundary
Approved Corridor
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
FIGURE 5.10-1: Page 1 of 6
Noise Monitoring Locations
DLZ

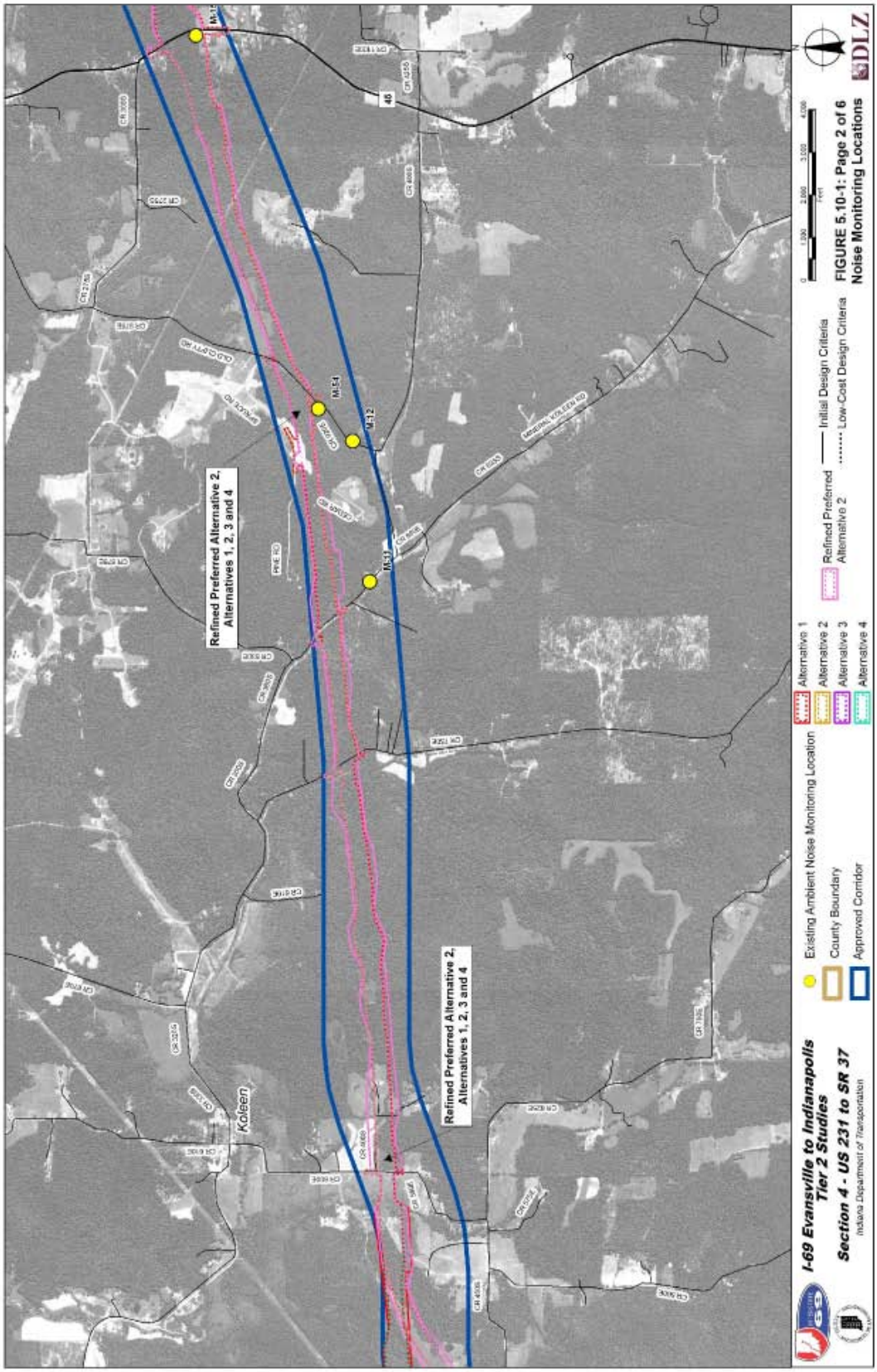


FIGURE 5.10-1: Page 2 of 6
Noise Monitoring Locations

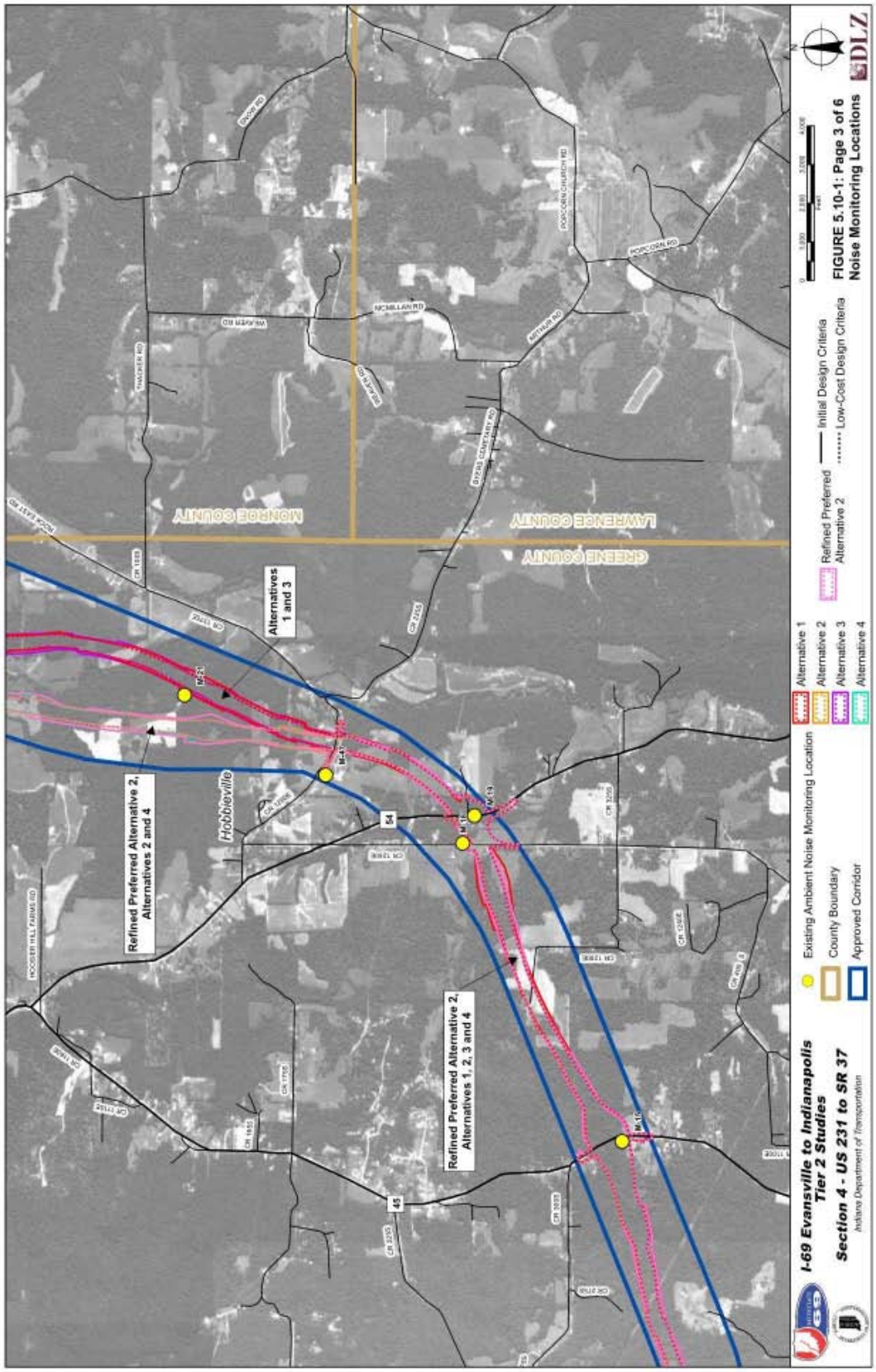


FIGURE 5.10-1: Page 3 of 6 Noise Monitoring Locations

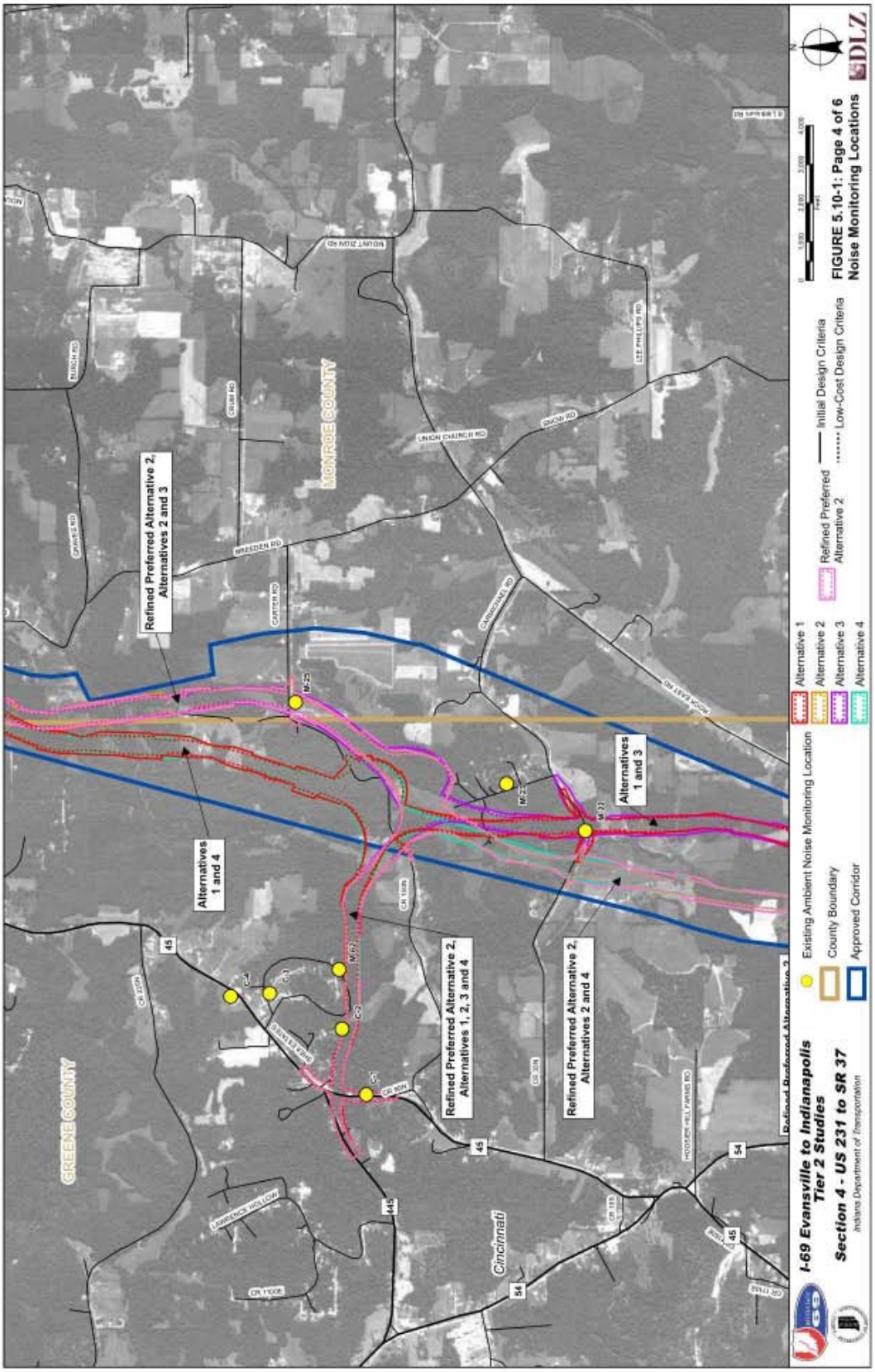
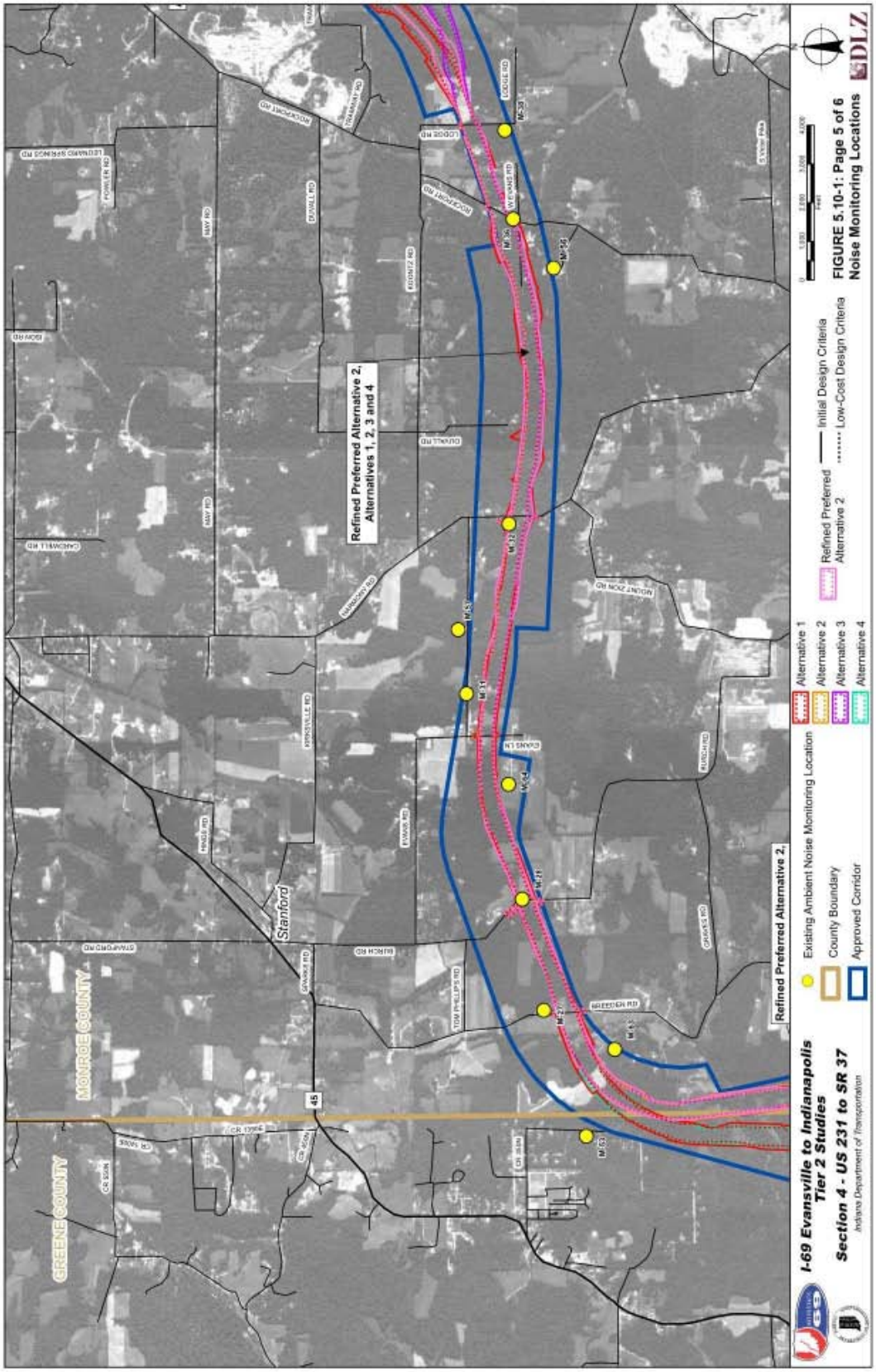


FIGURE 5.10-1: Page 4 of 6 Noise Monitoring Locations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GREENE COUNTY
Existing Ambient Noise Monitoring Location
County Boundary
Approved Corridor
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
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Low-Cost Design Criteria
I-69 Evansville to Indianapolis Tier 2 Studies
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FIGURE 5.10-1: Page 5 of 6
Noise Monitoring Locations
DLZ

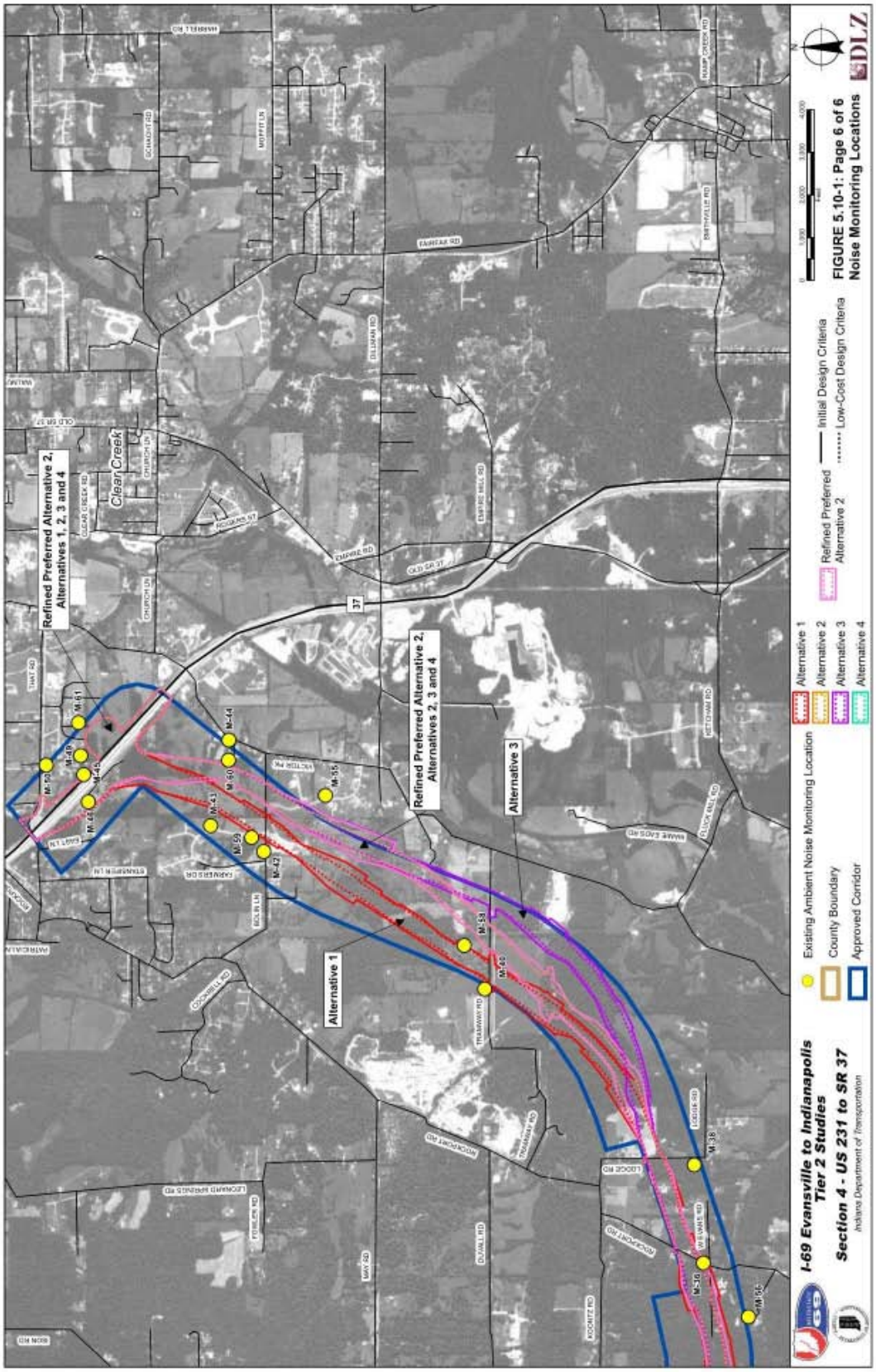
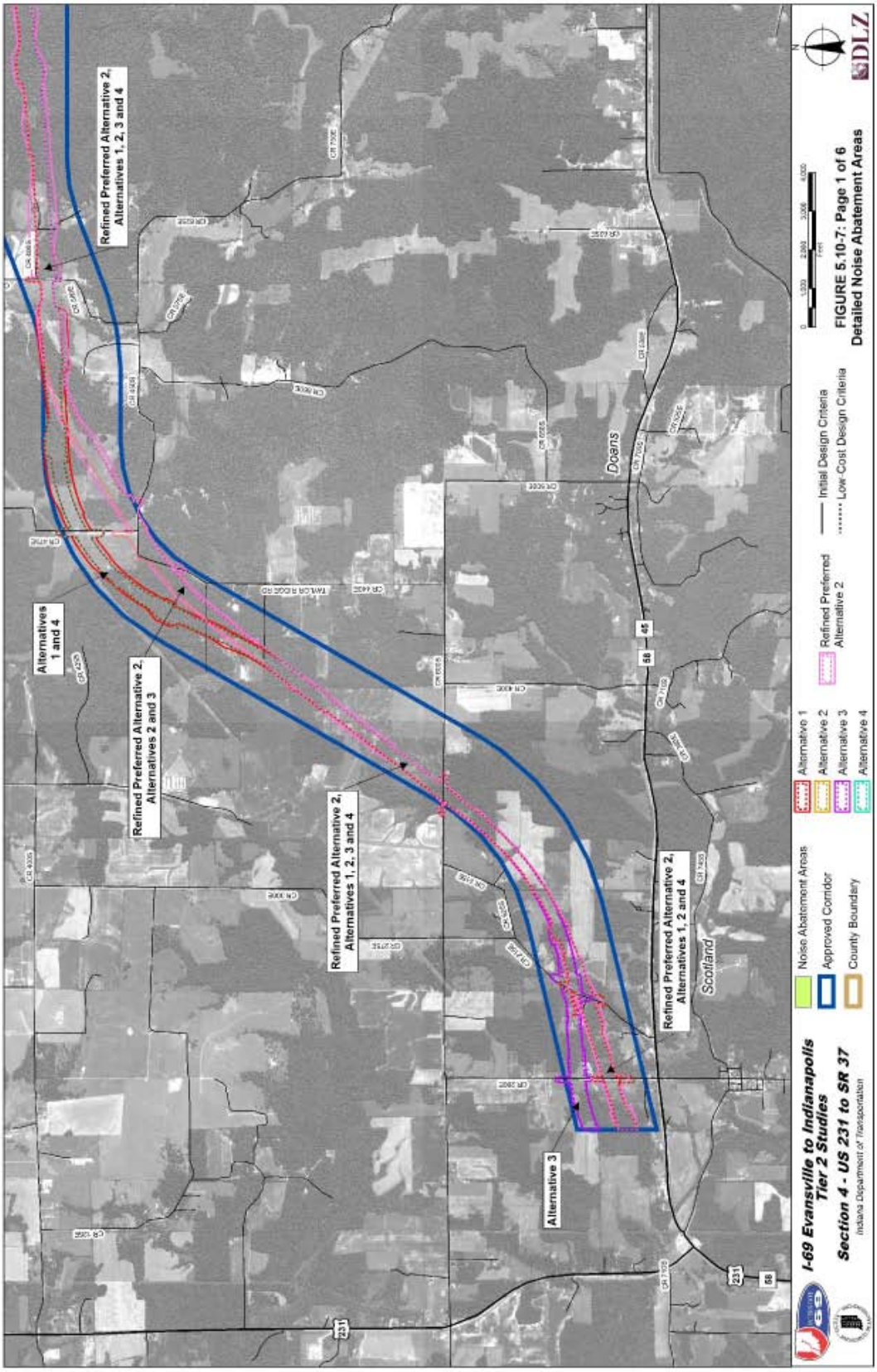


FIGURE 5.10-1: Page 6 of 6
Noise Monitoring Locations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Alternative 3
Doans
Scotland
Noise Abatement Areas
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Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
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Low-Cost Design Criteria
I-69 Evansville to Indianapolis Tier 2 Studies
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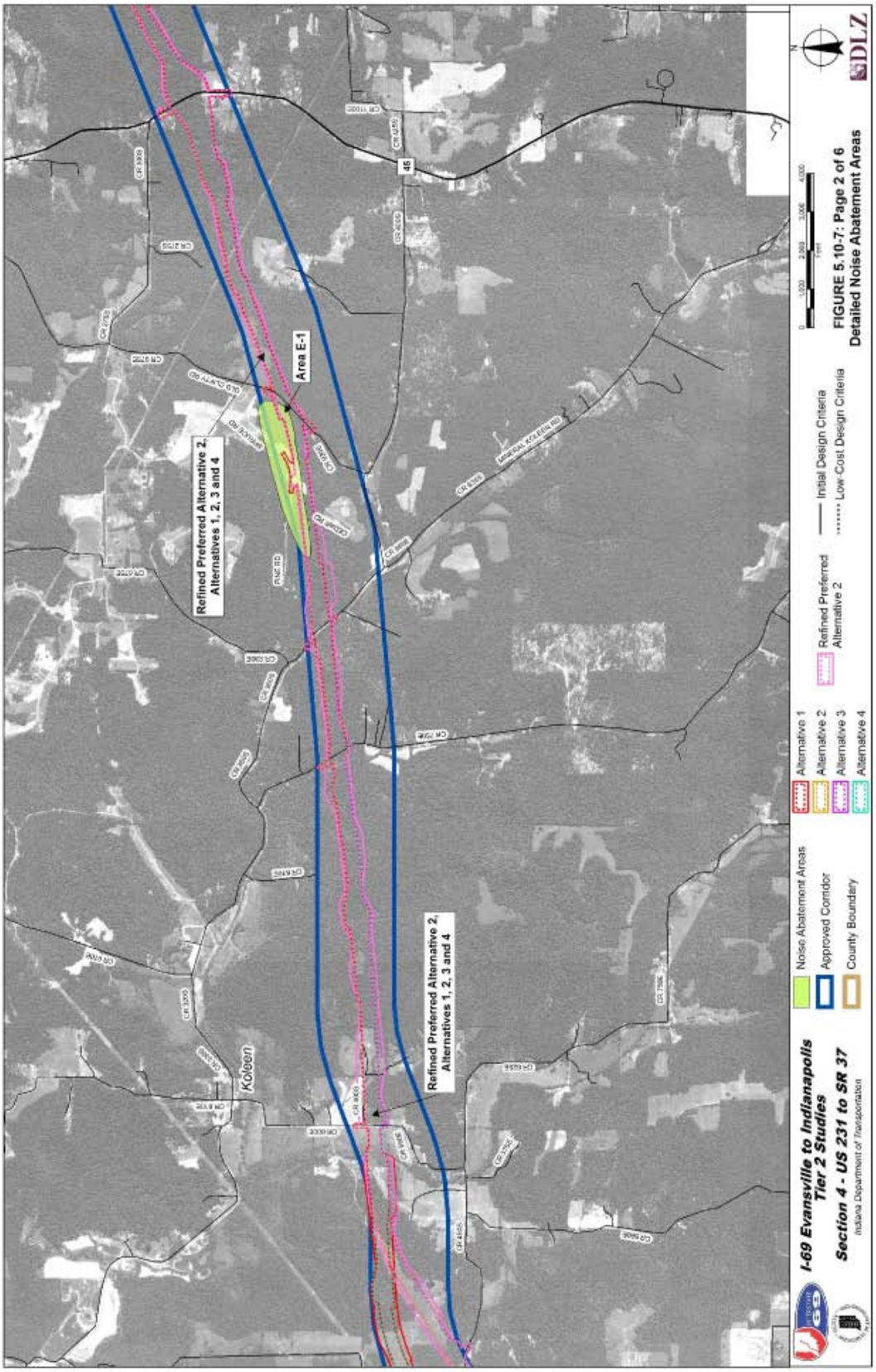
Indiana Department of Transportation
FIGURE 5.10-7: Page 1 of 6
Detailed Noise Abatement Areas
DLZ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Kolsen
45
Noise Abatement Areas
Approved Corridor
County Boundary
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis Tier 2 Studies
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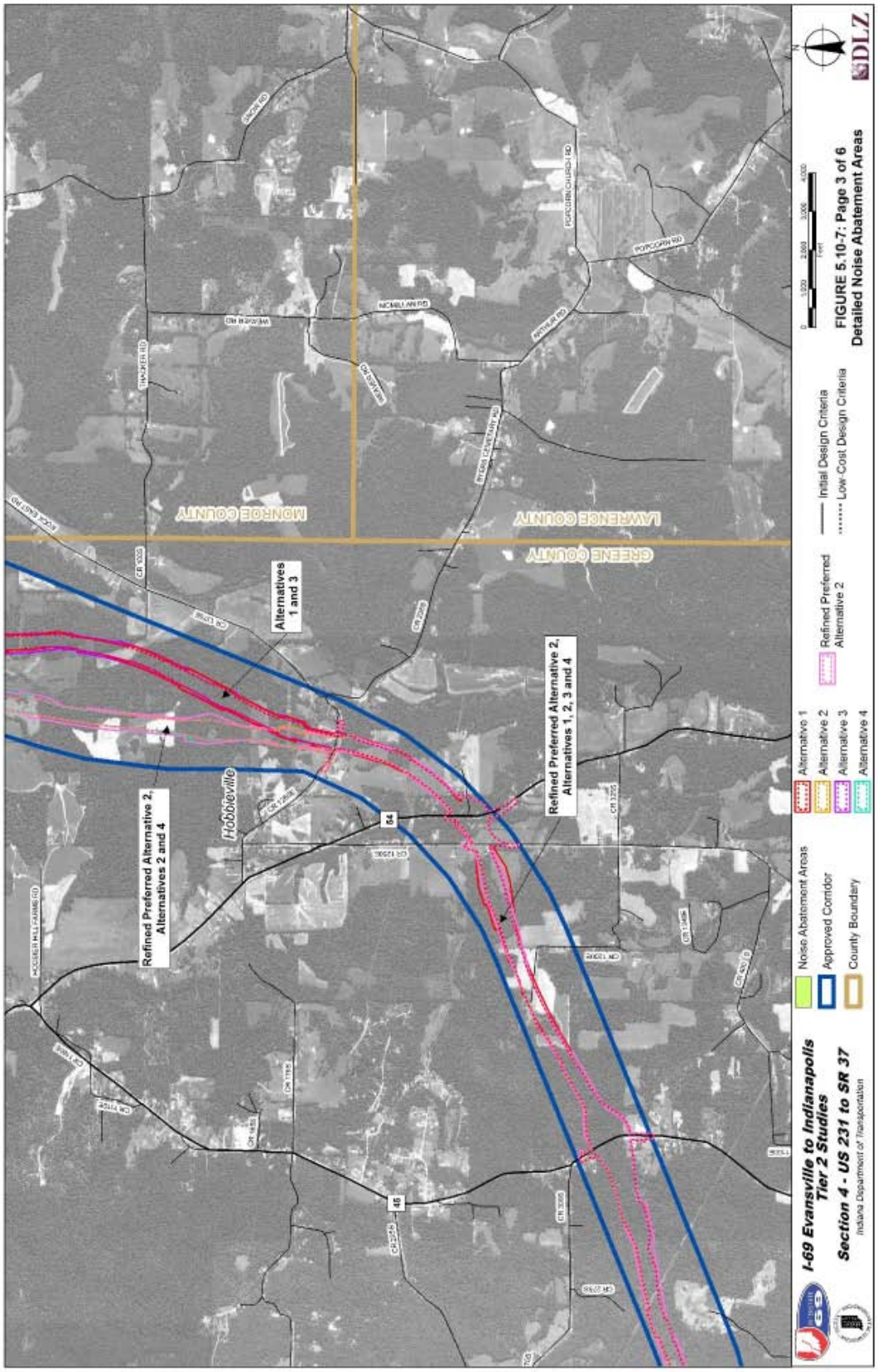
FIGURE 5.10-7: Page 2 of 6
Detailed Noise Abatement Areas
DLZ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GREENE COUNTY
LAWRENCE COUNTY
I-69 Evansville to Indianapolis Tier 2 Studies
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Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
FIGURE 5.10-7: Page 3 of 6
Detailed Noise Abatement Areas
DLZ

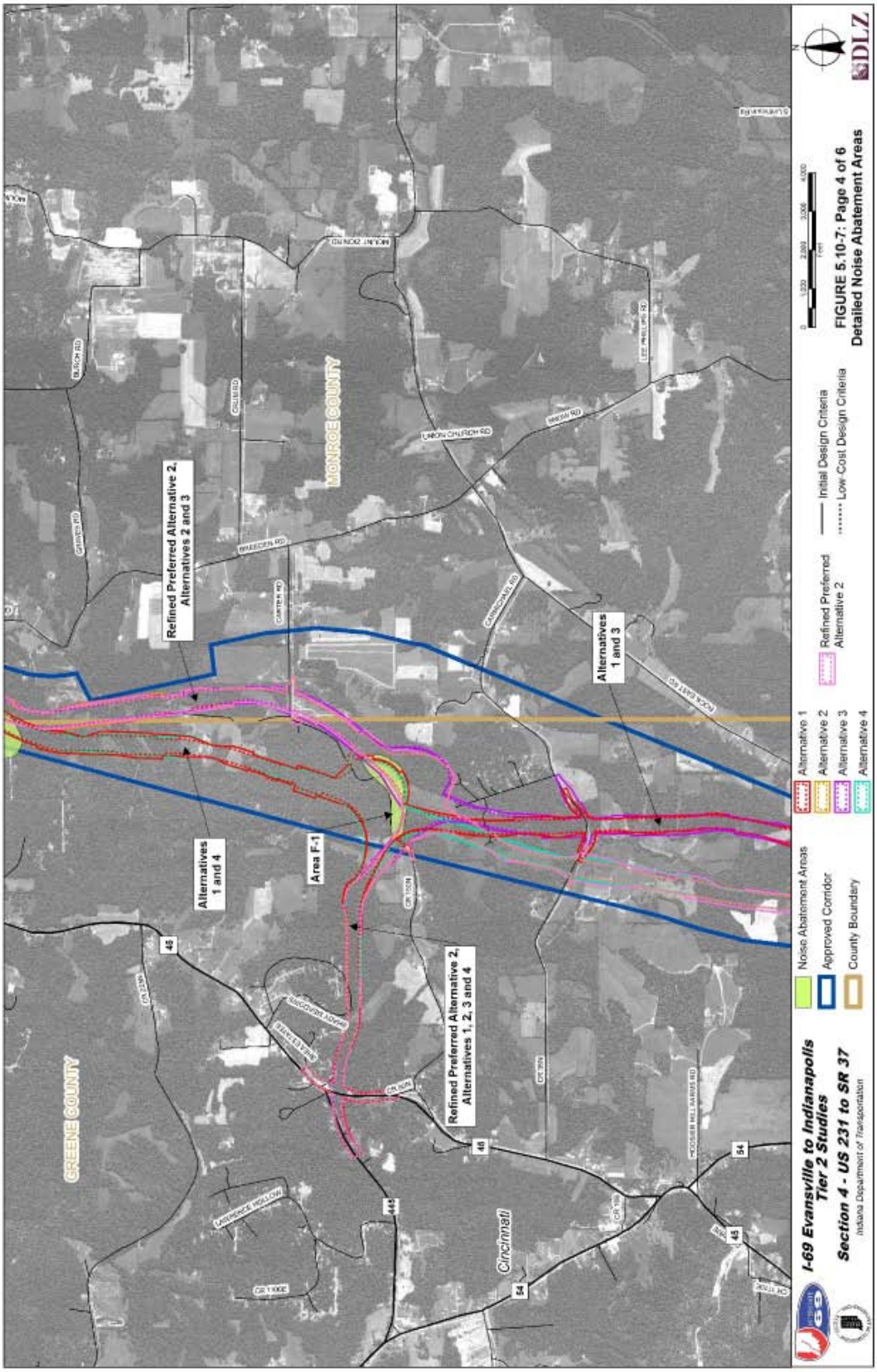
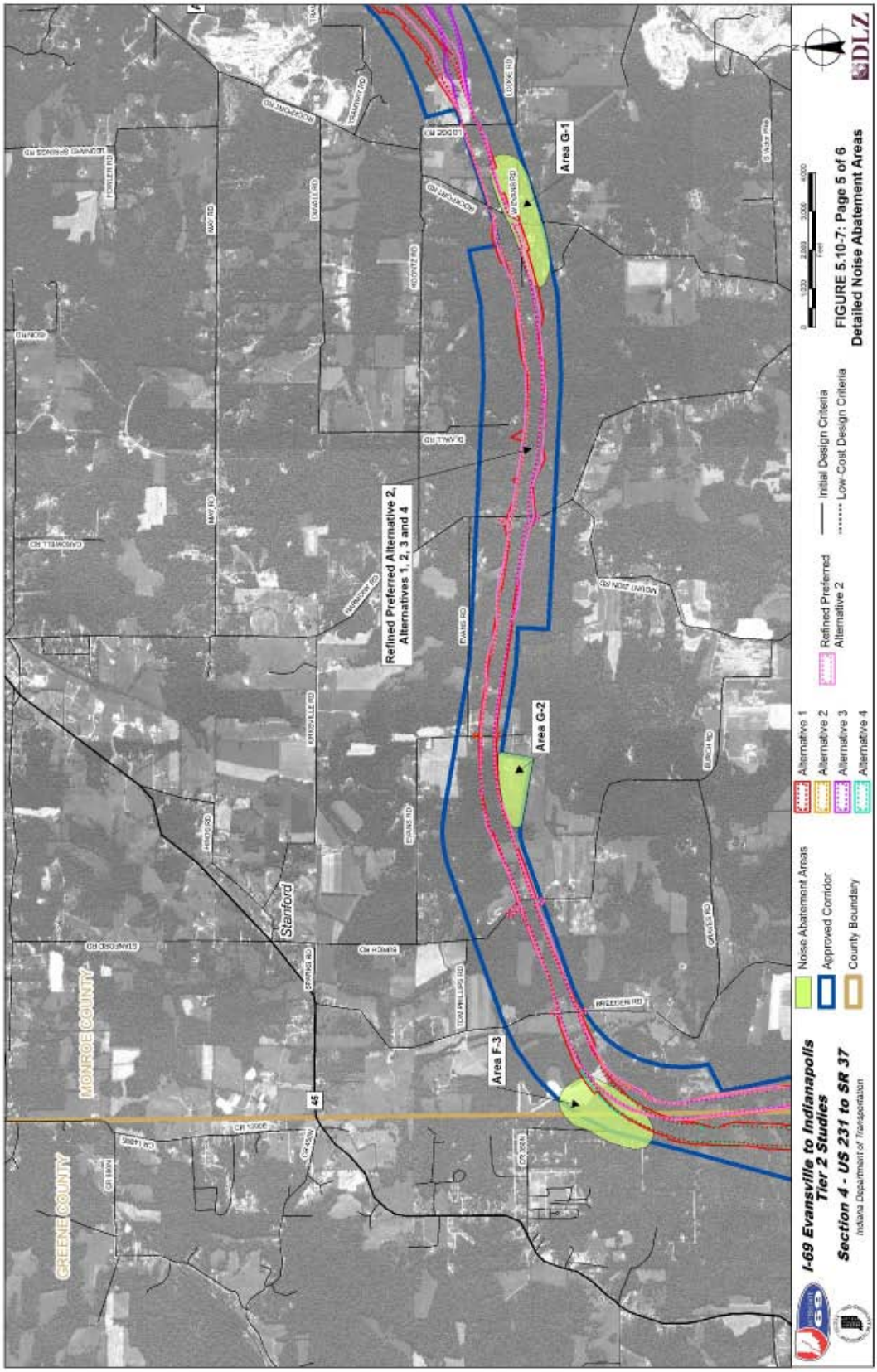


FIGURE 5.10-7: Page 4 of 6
Detailed Noise Abatement Areas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Area G-2
Area F-3
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Stanford
MONROE COUNTY
GREENE COUNTY
45
Noise Abatement Areas
Approved Corridor
County Boundary
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
FIGURE 5.10-7: Page 5 of 6
Detailed Noise Abatement Areas
I-69 Evansville to Indianapolis Tier 2 Studies
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Indiana Department of Transportation
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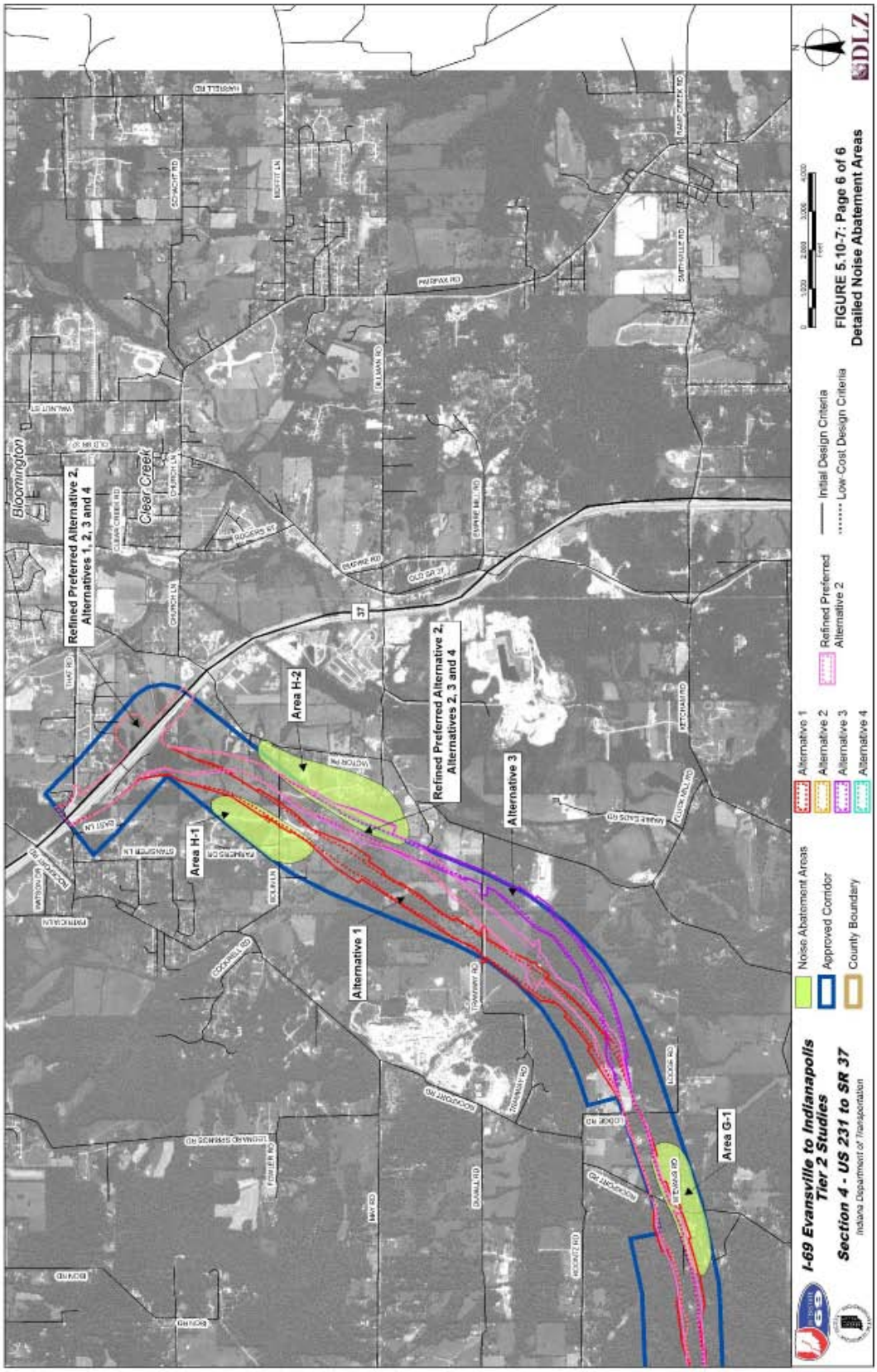
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Clear Creek
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Area H-2
Area H-1
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Alternative 3
Alternative 1
Area G-1
Noise Abatement Areas
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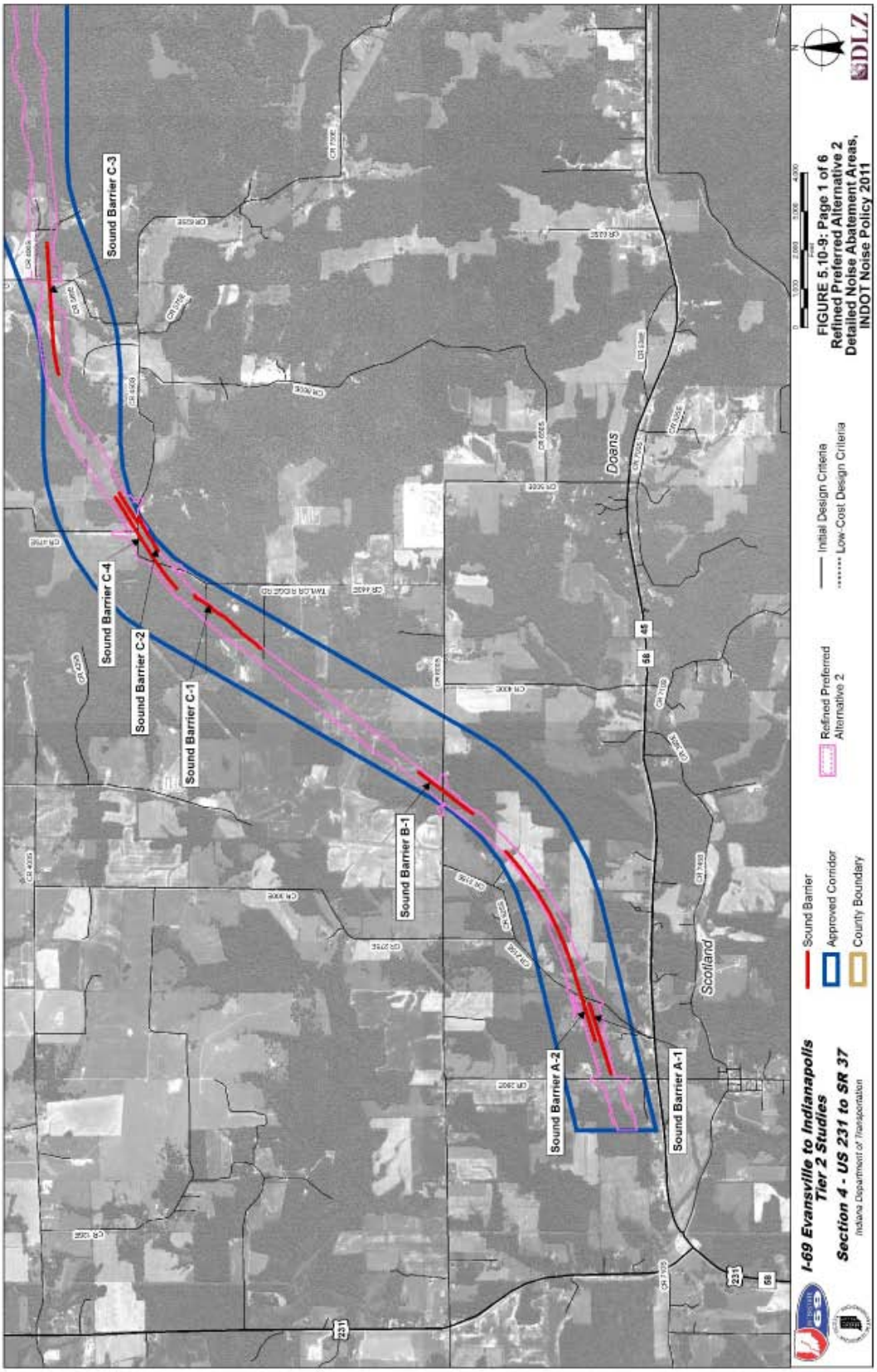
FIGURE 5.10-7: Page 6 of 6
Detailed Noise Abatement Areas
DLZ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Sound Barrier C-4
Sound Barrier C-2
Sound Barrier C-1
Sound Barrier B-1
Sound Barrier A-2
Sound Barrier A-1
Doans
Scotland
231
48
Sound Barrier
Approved Corridor
County Boundary
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
FIGURE 5.10-9: Page 1 of 6
Refined Preferred Alternative 2
Detailed Noise Abatement Areas,
INDOT Noise Policy 2011
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
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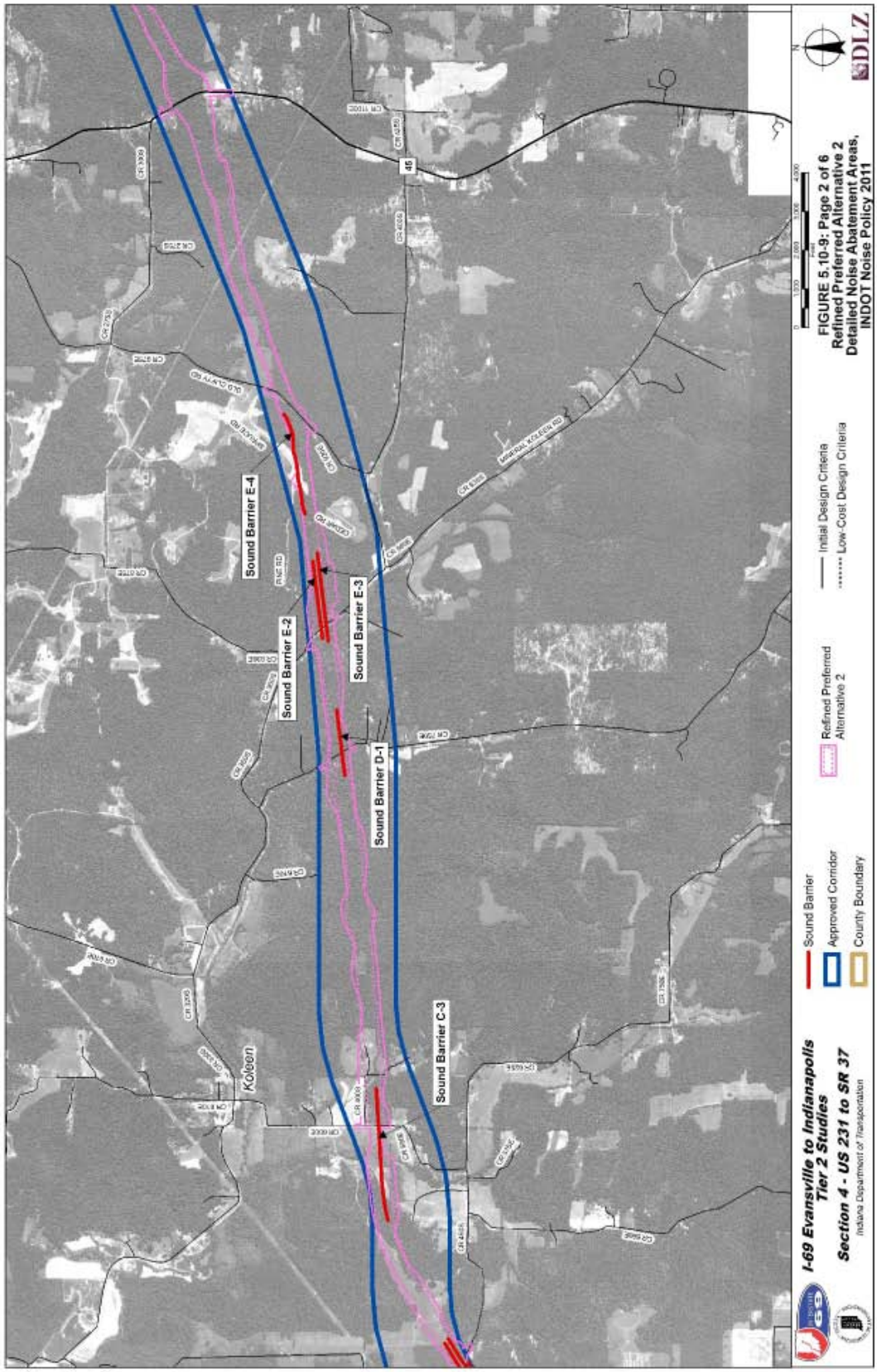
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Sound Barrier D-1
Sound Barrier C-3
Kolsen
45
Sound Barrier
Approved Corridor
County Boundary
Refined Preferred Alternative 2
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FIGURE 5.10-9: Page 2 of 6
Refined Preferred Alternative 2
Detailed Noise Abatement Areas,
INDOT Noise Policy 2011
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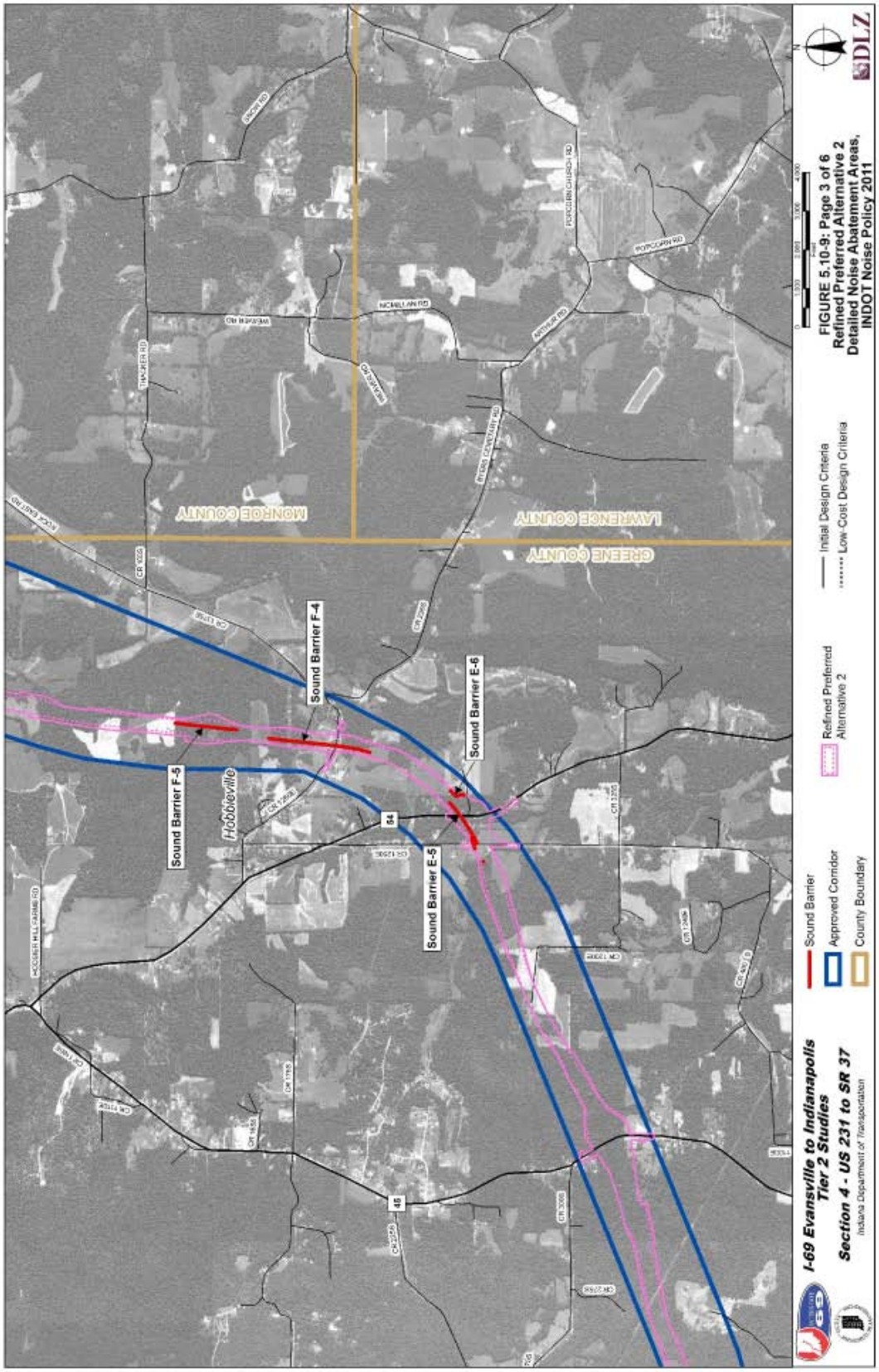
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Sound Barrier F-4
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FIGURE 5.10-9: Page 3 of 6
Refined Preferred Alternative 2
Detailed Noise Abatement Areas,
INDOT Noise Policy 2011
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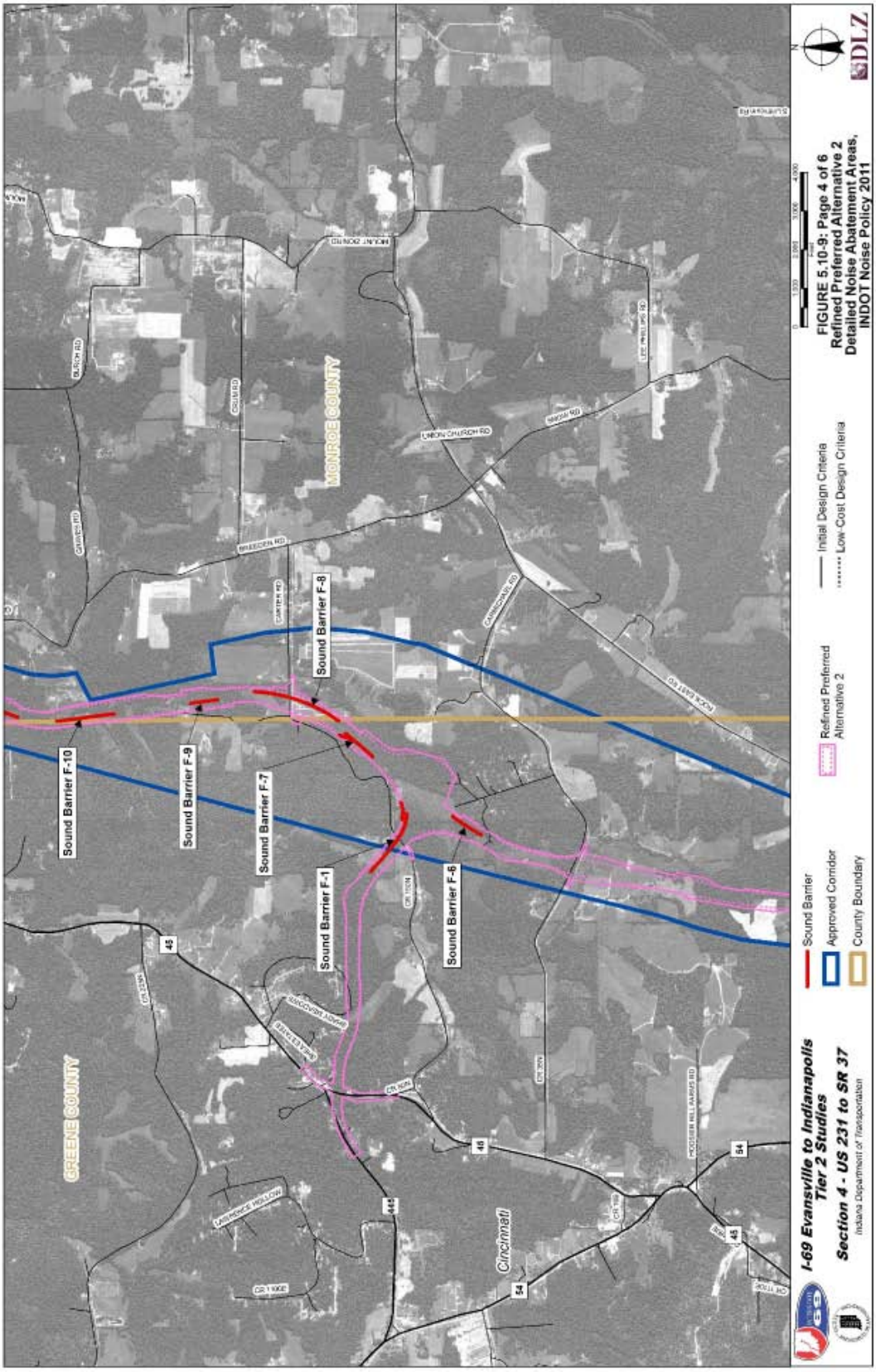
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Sound Barrier F-8
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Sound Barrier F-6
GREENE COUNTY
MONROE COUNTY
Cincinnati
Sound Barrier
Approved Corridor
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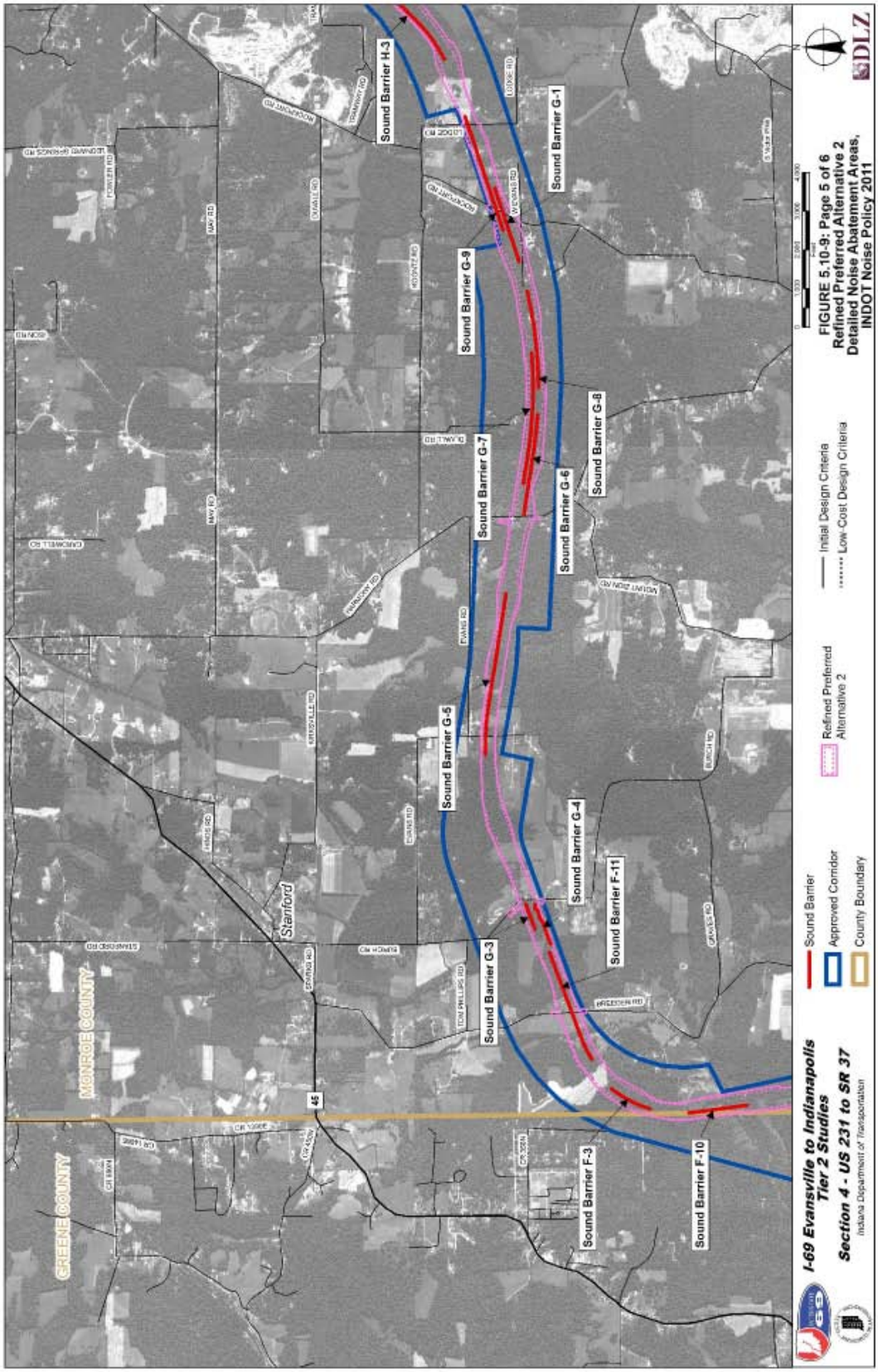
FIGURE 5.10-9: Page 4 of 6
Refined Preferred Alternative 2
Detailed Noise Abatement Areas,
INDOT Noise Policy 2011
DLZ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Sound Barrier F-11
Sound Barrier G-3
Sound Barrier F-3
Sound Barrier F-10
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MONROE COUNTY
GREENE COUNTY
Sound Barrier
Approved Corridor
County Boundary
Refined Preferred Alternative 2
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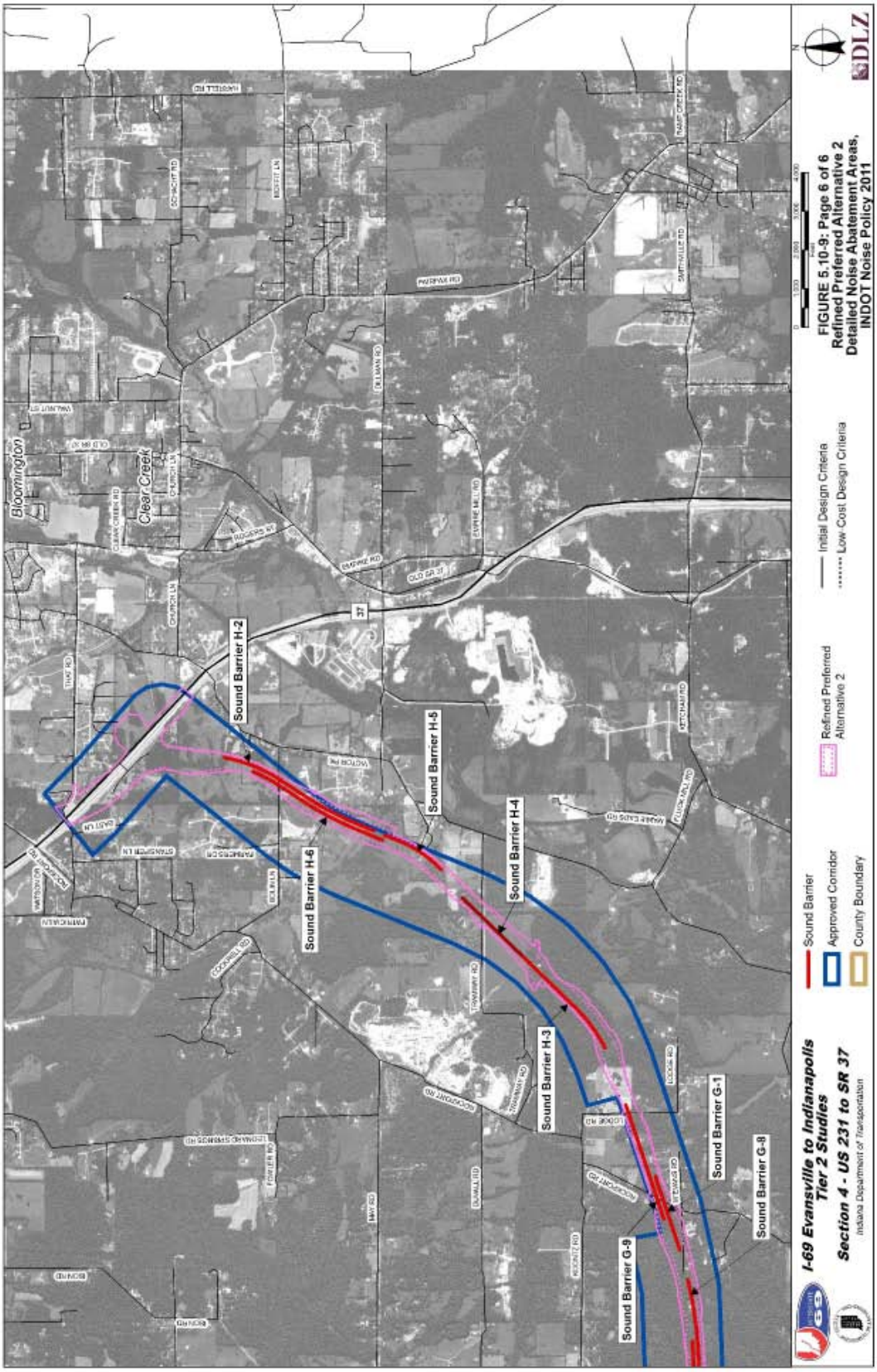
FIGURE 5.10-9: Page 5 of 6
Refined Preferred Alternative 2
Detailed Noise Abatement Areas,
INDOT Noise Policy 2011
DLZ


Bloomington
Clear Creek
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Sound Barrier G-1
Sound Barrier G-8
Sound Barrier G-9
Sound Barrier
Approved Corridor
County Boundary
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
FIGURE 5.10-9: Page 6 of 6
Refined Preferred Alternative 2
Detailed Noise Abatement Areas,
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Indiana Department of Transportation
DLZ

5.11 Wild and Scenic Rivers

No substantive changes have been made to this section since publication of the Draft Environmental Impact Statement (DEIS).

5.11.1 Introduction

The rivers of the United States are valuable resources that provide a variety of scenic, recreational, geological, wildlife, historic, and cultural values. Many of these rivers are protected under federal and state laws. The National Wild and Scenic Rivers System (which includes the nation's premier rivers) and the Nationwide Rivers Inventory (NRI) both protect rivers at the national level. The Indiana Department of Environmental Management (IDEM) and the Indiana Department of Natural Resources (IDNR) protect Indiana's rivers at the state level.

The National Wild and Scenic Rivers System was created in 1968 by the Wild and Scenic Rivers Act. The Wild and Scenic Rivers Act states that it "be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geological, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." (16 USC 1271-1287) The National Wild and Scenic Rivers System list is maintained by the National Park Service (NPS).

In addition to the National Wild and Scenic Rivers System, the NPS has compiled and maintains the Nationwide Rivers Inventory (NRI). The NRI is a register of rivers that may be eligible for inclusion in the National Wild and Scenic Rivers System. The intent of the NRI is to provide information to assist in making balanced decisions regarding use of the nation's river resources.

Rivers and streams considered to have special importance and merit special protection by the State of Indiana must also be taken into consideration. These rivers are listed in either the IDEM Waters Designated for Special Protection, or the IDNR Natural and Scenic River Segments.

5.11.2 Methodology

The National Park Service National Wild and Scenic Rivers System internet Website was reviewed to determine if National Wild and Scenic Rivers were present within the Section 4 Study Area.

The Geographic Information Systems (GIS) data layer, "Designated Rivers in Southwestern Indiana," was used to determine if proposed alternatives crossed rivers listed on: the Nationwide Rivers Inventory, the IDEM Waters Designated for Special Protection, and/or the IDNR Natural and Scenic River Segments.

5.11.3 Analysis

There are no rivers listed in the National Wild and Scenic Rivers System in the Section 4 Study Area. Therefore this project will not adversely affect these resources. In addition, there are no

rivers listed on the NRI, the IDEM Waters Designated for Special Protection, or the IDNR Natural and Scenic River Segments within this Study Area.

The alignment for the Section 4 Preferred Alternative will be developed using the initial design criteria and consideration will be given during the subsequent design phase for use of certain low-cost design criteria as a measure to possibly reduce direct impacts and/or construction costs (see Section 5.1*, Introduction and Methodology*). Potential impacts upon rivers listed in the National Wild and Scenic Rivers System were determined per the right-of-way and development of the Preferred Alternative based upon the initial design criteria. Implementation of some or all of the low-cost design criteria will not change the impacts identified within this chapter.

5.11.4 Mitigation

No Wild and Scenic Rivers are present in the proposed Study Area; therefore, no mitigation for impacts to such resources will be required.

5.11.5 Summary

There are no National Wild and Scenic Rivers present within the Section 4 Study Area. Therefore, the proposed project will have no adverse impacts to those resources. No rivers listed on the NRI, IDEM Waters Designated for Special Protection, or IDNR Natural and Scenic River Segments are crossed by this project; therefore, the project will have no adverse impacts to those resources.

5.12 Construction Impacts

Since publication of the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Section 5.12.2.5 has been revised to state that blasting within areas where dimensional limestone (or limestone in block form) is being quarried will be completed following specifications developed in consultation with limestone industry representatives.
- Section 5.12.2.9 has been updated to clarify tree clearing restrictions dates for the Winter Action Area of the Indiana bat.
- Section 5.12.2.10 has been updated with new wetland impacts for Refined Preferred Alternative 2.
- Section 5.12.3, *Mitigation*, has been modified to discuss soil bioengineering techniques for bank stabilization.
- Section 5.12.3 has been updated with tree clearing restrictions dates for the Winter Action Area of the Indiana bat.

5.12.1 Introduction

Construction of any of the alternatives will impact the existing environment in several ways. The construction impacts for this project may include noise generated by construction equipment, air pollution as a result of construction activities, water pollution due to soil erosion and construction activities, impacts due to heavy blasting, traffic impacts from detours with resulting motorist inconveniences, and damage to local roads by construction equipment. Alternative 2 is the Section 4 Preferred Alternative.

Section 5.12.2 describes the types of impacts that could occur during construction. Section 5.12.3 identifies mitigation measures that could be implemented to avoid and/or minimize these potential impacts. Section 5.12.4 summarizes the impacts associated with the proposed alternatives.

5.12.2 Analysis

5.12.2.1 Noise

Construction equipment used to build a highway may generate noise affecting sensitive receivers. The presence of a potentially affected noise receiver within close proximity of project construction limits could result in construction noise impacts. Generally speaking, the potential for construction-related noise impacts is much higher where an alternative would pass through an urban or suburban area and where an alternative would pass near existing development. The high number of noise receptors in close proximity to the construction activity in these areas increases the potential for noise impacts.

In contrast, the Section 4 corridor consists mainly of undeveloped upland habitat and agricultural land. In addition to many rural residences on farmsteads or along public roads, the corridor contains three businesses (naturist resort, sawmill, and catering service business). The area along SR 45 in the vicinity of the South Connector Road of the Greene/Monroe County Line interchange contains four additional businesses (electronics repair shop, women's fitness center, bank, and gas station/convenience store/restaurant). Construction noise abatement measures may be required in areas where residences or other sensitive noise receivers are subjected to excessive noise from highway construction for example at subdivisions such as Rolling Glenn Estates, Farmers Field Acres, Timber Trace, Clifty Hills, Shady Meadows, and for other scattered residences. Consideration will be given to providing reasonable and feasible noise abatement early in the construction phase to mitigate construction noise. Noise impacts could be controlled through the regulation of construction time and hours worked, using noise-controlled construction equipment, limitations of construction vehicles during evening and weekend hours and by locating equipment storage areas away from noise sensitive areas.

5.12.2.2 Air Pollution

The main component of air pollution derived from construction activities is fugitive dust. Fugitive dust is the generation of sufficient particulate matter that some portion of the material escapes beyond the right-of-way or construction boundary. Fugitive dust emissions can be created by many construction related activities. Reasonable precautions are typically sufficient to control fugitive dust emissions during construction. Best management practices as outlined in INDOT's *Standard Specifications* for roadway construction will be followed to minimize air quality impacts from fugitive dust.

Fine particulate matter ($PM_{2.5}$) is a product of combustion. During construction activities, equipment engines, increased vehicle emissions due to traffic delays, and burning cleared vegetation are the major sources of $PM_{2.5}$. Air quality impacts may be reduced by scheduling construction activities to minimize traffic delays. Impacts will also be reduced by adhering to state and local air pollution control laws and regulations regarding open burning.

5.12.2.3 Groundwater and Karst

Construction activities could involve and/or be adjacent to several of the 25 groundwater wells located in the project corridor. All recorded wells within the corridor are at least 50 feet deep and it is not anticipated that temporary surface disturbance from construction activities would impact any wells outside of the right-of-way. Any wells encountered within the right-of-way will be properly capped to prevent contamination of the groundwater.

Figure 5.12-1: Typical Sediment Basin

Numerous karst features are present either in the Section 4 corridor or outside the corridor, but interconnected with the corridor. Some of these karst features will be impacted by the end-to-end alternatives. These features are identified and potential impacts described in Section 5.21. Procedures to reduce the impacts to karst during construction will be implemented in accordance with INDOT's *Standard Specifications* and the *1993 Karst Memorandum of Understanding* (MOU) between the Indiana Department of Transportation (INDOT), Indiana Department of Natural Resources (IDNR), Indiana Department of Environmental Management (IDEM) and the U.S. Fish and Wildlife Service (USFWS). This MOU was developed for construction of transportation projects in karst regions of the state. This includes provisions for erosion control and handling of potential fuel spills from construction equipment in karst areas. Further discussion of the Karst MOU is provided in Section 5.21.2.

5.12.2.4 Erosion Control

There are more than 250 streams in the corridor that are crossed by one or more of the build alternatives and, thus, could be adversely affected by construction activity. These streams are identified and potential impacts described in Section 5.19.2. Procedures to reduce the impact of erosion and runoff into streams—stormwater best management practices (BMPs), including temporary sediment basins and silt fencing—will be implemented. **Figure 5.12-1** (p. 5-376) illustrates a typical sediment basin, which is used to detain sediment-laden runoff from areas disturbed during construction.

5.12.2.5 Heavy Blasting

It is anticipated that heavy blasting will be used for construction of the highway in Section 4. Blasting within areas where dimensional limestone (or limestone in block form) is being quarried will be completed following specifications developed in consultation with limestone industry representatives as well as the Indiana Geological Survey and other geology experts. In addition, blasting within the Indiana bat Winter Action Area will be completed follow guidelines developed in coordination with USFWS. No blasting will be conducted during the period from September 15 through April 15 within 0.5 mile of any identified Indiana bat hibernaculum. Blasting in all other areas will be performed in accordance with the INDOT *Standard Specifications* for roadway construction.

5.12.2.6 Damage to Local Roads

Local public roads could be damaged by the movement of heavy construction equipment to and from the construction site. INDOT's *Standard Specifications* will be followed, including that which states: "legal load restrictions shall be complied with on public roads beyond the limits of the project. A special permit will not relieve the Contractor of liability for damage which may result from the moving of equipment. The operation of equipment of such weight or so loaded as to cause damage to structures or the roadway or to any other type of construction will not be permitted…The Contractor shall be responsible for all damage done by the Contractor, its employees, agents, or subcontractors." (Section 105.12)

5.12.2.7 Borrow Sites/Waste Disposal

The locations of borrow and waste disposal sites generally are not known until the project is let for construction. In general practice, the contractor selects the sites based on free market economics (i.e., negotiations with property owners). Contractors must comply with all permitting requirements for borrow locations, and follow other applicable INDOT *Standard Specifications*. Prior to their use, these sites would be assessed for impacts to resources such as archaeological resources, wetlands, etc., and appropriate measures would be employed to avoid or minimize impacts, if any. Where impacts would warrant, the contractor, with INDOT oversight, would obtain required permits. Due to the cost of mitigation that is often required when these sites are identified and would be impacted by its use for borrow or waste disposal, contractors often elect to identify and choose other sites in a different location that would avoid the impacts. Solid waste generation resulting from construction should be short-term and confined to the vicinity of the project area. In most cases the construction contractors use existing agricultural fields near the construction sites for borrow/waste sites as they are much easier to use and have low potential to impact protected environmental resources.

5.12.2.8 Traffic Flow and Travel Patterns

Existing travel patterns will be impacted during construction of the project along existing roadways. Motorist inconveniences and safety concerns will be greatest where construction occurs along the existing State Routes (SR 45, SR 54, and SR 37). There will be some detours and traffic restrictions during construction at these locations. Every opportunity will be taken, where feasible, to utilize part-width construction to keep each of these roads open during construction. Though maintenance of traffic plans (See Section 5.12.3) will be prepared for the entire length of the corridor, and efforts will be made to notify the public of road closures and temporary activities that would impede traffic flow (such as reducing travel to one lane of traffic), unannounced traffic delays could occur. Such delays would impede travel time unexpectedly and could require some motorists to seek alternate routes without prior notification.

5.12.2.9 Threatened and Endangered Species/Tree Clearing

Twenty-six state- or federally-listed species were determined to be present in Section 4: the federally endangered Indiana bat; the state endangered Northern harrier, Jeannel's groundwater ostracod, Ray's cave beetle, Krekeler's cave ant beetle, barn owl, loggerhead shrike, and evening bat; the state-endangered candidate Ashcraft cave springtail; the state watch list Indiana cave springtail, Packard's groundwater amphipod, Bollman's cave millipede, Weingartner's cave flatworm, and Indiana cave amphipod; the state threatened Fountain cave springtail; the state rare hilly springtail; the state-special-concern eastern spadefoot, mudpuppy, eastern box turtle, red-shouldered hawk, sharp-shinned hawk, little brown bat, eastern pipistrelle, eastern red bat, northern myotis and bobcat. No state- or federally-listed mollusks, crustaceans or fishes were detected during Section 4 field studies.

Field studies for Section 4 showed one federally-listed species; eleven (11) Indiana bats were captured in the vicinity of Section 4. None of these were captured within the project corridor. Five roost trees were found from radio tagging of the bats. None of these roost trees were

located within the entire project corridor. Studies conducted in accordance with the Tier 1 USFWS Biological Opinion (revised August 24, 2006) have determined that the project in Section 4 has the potential to affect the summer and winter habitat of the Indiana bat.

Tree clearing has the highest potential to directly affect the Indiana bat during construction. This species' nocturnal habits and its preference for large trees with loose bark as summer roosts presents the potential for disturbance during day time roosting. The presence of these bats may go undetected during clearing activities, resulting in the potential for direct takes of this species. For this reason, no trees with a diameter of three or more inches will be removed between April 1 and November 15 within the Winter Action Area (WAA) and April 1 and September 30 within the Summer Action Area (SAA) to avoid any direct take of Indiana bats. Tree clearing will be allowed in the WAA from November 16 to March 31, and tree clearing will be allowed from October 1 through March 31 in the SAA.

Construction activities will be minimized and mitigated in accordance with standard INDOT specifications for construction contracts and in accordance with the USFWS Biological Opinion as identified in Section 5.12.3. These specifications address issues such as tree clearing restrictions to avoid the potential for direct impacts to Indiana bats, as well as the minimization of construction-related air quality and noise impacts, erosion and sediment control, and spill prevention and control.

Tree clearing will account for the possible presence of the emerald ash borer. INDOT will consult with IDNR to determine appropriate measures during tree clearing to address these concerns.

5.12.2.10 Wetlands

Section 4 has approximately 11.45 acres of forested wetland, 3.06 acres of shrub-scrub wetland, and 27.01 acres of emergent wetland for a total of 41.52 acres within the project corridor. Depending on the alternatives considered, the total impacts to wetlands using the low-cost design criteria and initial design criteria range from approximately 5.26 acres to 13.09 acres. Wetland impacts from Refined Preferred Alternative 2 using the low-cost design criteria and initial design criteria range from approximately 5.32 acres to 9.55 acres. Wetland areas within the right-of-way but outside the construction limits will be identified and protected from use as borrow or waste disposal sites, construction staging areas, etc. Wetlands adjacent to the construction limits will be protected with silt fences and other erosion control measures.

5.12.3 Mitigation

Construction Noise—Construction noise abatement measures may be required in areas where residences or other sensitive noise receivers are subjected to excessive noise from highway operations. Noise and vibration control measures will include those contained in INDOT *Standard Specifications*. In addition, consideration will be given to providing reasonable and feasible noise abatement early in the construction phase to mitigate construction noise. Noise and vibrations impacts originate from heavy equipment movement and construction activities such as pile driving and vibratory compaction of embankments. Noise impacts could be controlled

through the regulation of construction time and hours worked, using noise-controlled construction equipment, limitations of construction vehicles during evening and weekend hours and by locating equipment storage areas away from noise-sensitive areas.

Air Quality—Construction equipment will be maintained in proper mechanical condition. Fugitive dust generated during land clearing and demolition procedures will be controlled by proper techniques. INDOT's *Standard Specifications* include the use of water spraying for the control of fugitive dust, as well as the tarping of vehicles. These specifications will be followed.

All bituminous and Portland cement concrete proportioning plants and crushers would meet the requirements of the IDEM. For any portable bituminous or concrete plant or crusher, the contractor must apply for and obtain a permit-to-install from the Permit Section, Air Quality Division of IDEM. Dust collectors must also be provided on all bituminous plants. Dry, fine aggregate material removed from the dryer exhaust by the dust collector must be returned to the dryer discharge unless otherwise directed by the project engineer.

Groundwater and Karst—BMPs will be implemented during construction to protect ground water. Where groundwater from private, individual wells is the principal source of potable water, grassy swales or equivalent methods to divert stormwater from the road to ditches and streams, and construction methods to reduce turbidity that construction temporarily causes will be among the measures employed to protect sources of potable water. Stormwater runoff protection measures will be installed at all karst features in the right-of-way at the initiation of construction and maintained until all stormwater drainage has been diverted away from the feature, or final permanent stormwater treatment measures are in place.

Procedures to reduce the impacts to karst will be implemented in accordance with INDOT's *Standard Specifications* and the 1993 Karst MOU between the INDOT, IDNR, IDEM and the USFWS.

Erosion Control—BMPs will be used in the construction of this project to minimize impacts of erosion. Erosion control measures will be put in place as a first step in construction and maintained throughout construction. Temporary erosion control devices such as silt fencing, check dams, sediment basins, inlet protection, sodding and other appropriate BMPs will be used to minimize sediment and debris in tributaries within the project area. Timely revegetation after soil disturbance will be implemented and monitored. Any riprap used will be of a large diameter in order to allow space for habitat for aquatic species after placement. Prior to construction, heavy equipment parking and turning areas will be located outside the construction limits but within the right-of-way to minimize soil erosion. Soil bioengineering techniques for bank stabilization will be considered where appropriate.

Heavy Blasting—Heavy blasting is anticipated, and strict blasting specifications will be followed.

Blasting will be avoided between September 15 and April 15 in areas within 0.5 miles of known Indiana bat hibernacula. All blasting in the Winter Action Area will follow the specifications developed in consultation with the USFWS and will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of nearby caves serving as

Indiana bat hibernacula. Blasting within areas where dimension limestone is being quarried will be completed following special provisions developed in consultation with limestone industry representatives as well as the Indiana Geological Survey and other geology experts.

Borrow Sites/Waste Disposal—BMPs will be used in the construction of this project to minimize impacts related to borrow and waste disposal activities. Solid waste generated by clearing and grubbing, demolition or other construction practices will be removed from the location and properly disposed. Contractors are required to follow safeguards established in INDOT's *Standard Specifications* (Section 203.08 Borrow or Disposal) that include obtaining required permits. Prior to their use, borrow sites would be assessed for impacts to resources such as archaeological resources, wetlands, etc., and appropriate measures taken to avoid or mitigate impacts to these resources. Special Provisions will include prohibiting tree clearing from April 1 to November 15 within the Winter Action Area and for April 1 through September 30 for areas outside of the Winter Action Area of the Indiana bats, as identified in the revised Tier 1 and Tier 2 BOs; and prohibiting the filling or other damaging of wetlands within the right-of-way outside the construction limits. Note that this does not include isolated ponds such as farm ponds or those developed from old borrow sites since these are exempt from regulation because they are man-made bodies of water constructed from uplands.

Burning of construction-related debris would be conducted in accordance with all local, state, and federal regulations and INDOT's *Standard Specifications*. All burning will be conducted at a reasonable distance from all homes and care will be taken to alleviate any potential atmospheric conditions that may be a hazard to the public. All burning will be monitored.

Traffic—Coordination with local agencies and schools will be conducted to ensure that all access is maintained during construction with as little disturbance to emergency routes as possible. Traffic flow maintenance and construction sequences will be planned and scheduled to minimize traffic delays on existing public crossroads, where necessary. Signs will be used to notify the traveling public of road closures and other pertinent information. Local law enforcement officials, fire departments, and other emergency responders will be notified in advance of road closings and other construction-related activities that could affect their response times and routes so they can plan alternative routes in advance. Likewise, the local news media will be notified in advance of road closings and other construction-related activities that could excessively inconvenience the community so motorists can be advised and plan travel routes in advance. Access to all properties will be maintained to the extent practical through controlled construction scheduling. Traffic delays will be controlled to the extent possible where many construction operations are in progress at the same time.

Threatened and Endangered Species/Tree Clearing—The potential construction impacts to the Indiana bat's summer and winter habitat will be addressed in accordance with the requirements of the USFWS's revised Tier 1 Biological Opinion for the I-69 Evansville to Indianapolis project, which was issued on August 24, 2006, (See **Appendix DD**, *Revised Tier 1 BO*) and any subsequent formal consultation conditions specific to Section 4. These measures include the following (with revisions based on USFWS's updated dates)**:** Tree and snag removal will be avoided or minimized. No trees with a diameter of three or more inches will be removed between April 1 and November 15 within the Winter Action Area (WAA) and April 1 and

September 30 within the Summer Action Area (SAA) to avoid any direct take of Indiana bats. Tree clearing will be allowed in the WAA from November 16 to March 31, and tree clearing will be allowed from October 1 through March 31 in the SAA. Tree clearing and snag removal will be kept to a minimum and limited to within the construction limits. Tree clearing will be kept to a minimum outside of the clear zone with woods kept in as much of a natural state as reasonable in bifurcated sections with widened medians. Forested medians will be managed following the IDNR State Forest timber management plan.

Although protection afforded state-listed species differs from that accorded federally-listed species, efforts made during the Tier 2 study to avoid or minimize impacts to wildlife habitat (See Section 5.18, *Wildlife Considerations*) would be expected to benefit state-listed as well as federally-threatened or endangered species.

INDOT will consult IDNR to determine appropriate measures during tree clearing to address concerns about the emerald ash borer.

Spill Prevention/Containment— Contractors will be required to provide an acceptable spill response plan. This response plan will include telephone numbers for emergency response personnel and copies of agreements with any agencies which are part of the spill-response effort. An emergency contact telephone number also is required.

Wetlands—Wetlands and wetland complexes will be avoided as much as possible. If unable to be avoided completely, wetland impacts will be minimized by shifts in the alignment. Where direct impacts are unavoidable, wetlands will be replaced in accordance with the MOU between INDOT, USFWS, and IDNR as dated January 28, 1991, or any successor agreement entered into by these agencies. The following measures will be taken to avoid/minimize impacts during construction:

- BMPs will be followed for erosion control in the project.
- Disturbed in-stream habitats will be returned to their original condition, when possible, upon completion of construction in the area.
- Parking and turning areas for heavy equipment will be confined to sites that will minimize soil erosion and tree clearing and will avoid environmentally-sensitive areas. Special Provisions will include prohibiting and filling and other damaging of non-isolated wetlands in the right-of-way outside the construction limits. (Note: this prohibition would not extend to isolated ponds such as farm ponds and those developed from old borrow sites since these are exempt from regulation because they are man-made bodies of water constructed from uplands.

5.12.4 Summary

Construction activities for the proposed project would have air, noise, water quality, karst, traffic flow, and other impacts. In addition, all the alternatives have the same typical section (i.e., lane number and width, shoulders, median, etc.), and the same interchange configurations (SR 37 interchange, SR 45 interchange and Greene/Monroe County Line interchange).

As a result of their proximity and design similarities, all end-to-end alternatives would have similar construction impacts. During construction, measures to minimize such impacts would be controlled in accordance with proposed mitigation measures and commitments, and INDOT *Standard Specifications*.

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5.13 Historic Resource Impacts

Since the DEIS, the following substantive changes have been made to this section:

- Section 5.13.2.1 – Updated consultation activities timeline and narrative to include consultation between SHPO and Section 3 regarding resources located in the overlap between Section 3 and Section 4, to include consultation relating to those mitigation sites where additional investigations were recommended for an archaeological site which is partially located within Section 4's Preferred Alternative, and to include all consultation activities since publication of the DEIS, especially the invitation to the Advisory Council on Historic Preservation (ACHP) to participate in consultation and the ACHP's response

- Section 5.13.2.1 – Added information regarding Virginia Iron Works Archaeological District to second consulting party meeting; information added regarding third and fourth consulting party meeting

- Section 5.13.2.5 – Added information regarding the consideration of Maryland Ridge as a cultural district

- Section 5.13.2.7 – Added information regarding Victor Limestone Archaeological District

- Section 5.13.4 – Added information regarding effects to Virginia Iron Works and Victor Limestone Archaeological Districts. Updated date for submittal of Modified Eligibility and Effect finding

- **Table 5.13-1** – Revised to clarify NRHP status and to reflect effects only on historic aboveground properties

- Section 5.13.5 – Updated to include date of signature of the Memorandum of Agreement (MOA)

- Section 5.13.6 – Updated to include the MOA and updated date for submittal of Modified Eligibility and Effect finding.

5.13.1 Introduction

All evaluations of historic properties were conducted in accordance with Section 106, National Historic Preservation Act (NHPA) of 1966, as amended, 36 CFR Part 800 (2010).

According to the NHPA, "the historical and cultural foundations of the Nation should be preserved as part of our community life and development in order to give a sense of orientation to the American people." [16 U.S.C. 470(b)(2)] Further, the federal government has the responsibility "to foster conditions under which our modern society and our prehistoric and historic resources can exist in productive harmony." [16 U.S.C. 470-1(1)] Section 106 of the NHPA requires federal agencies "to take into account the effect of the undertaking" (the project) upon historic properties. [16 U.S.C. 470f] This requires the agency to make a "reasonable and

good faith effort" to identify and evaluate historic properties and then to document the project's effects upon these historic properties. [36 CFR 800.4(b)(1)]

The following information documents the process by which FHWA and INDOT initiated Section 106 consultation, identified and evaluated historic properties, assessed the effects of the undertaking upon historic properties, and mitigated any adverse effects of the undertaking upon historic properties.

This section focuses only on historic (aboveground) resources. Section 5.14 discusses archaeological resources, which also are protected by the NHPA. Consultation regarding both historic (aboveground) and archaeological resources is documented in this section.

5.13.2 Methodology

All work described in this chapter was conducted by professional historians who meet the standards set forth by the U.S. Department of the Interior in 36 CFR Parts 61 and 68 and the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (48 F.R. 44716).

The section on methodology is divided into the following sections: 1) consultation process, 2) Area of Potential Effects (APE), 3) research, and 4) fieldwork.

5.13.2.1 Consultation Process

According to 36 CFR 800.16(f) consultation is "the process of seeking, discussing, and considering the view of other participants, and, where feasible, seeking agreement with them regarding matters arising in the section 106 process." Consulting parties can include: the State Historic Preservation Officer (SHPO); Native American tribes; representatives of local governments; applicants for federal assistance, permits, licenses, and other approvals; and other interested parties. For the State of Indiana, the Director of the Department of Natural Resources (IDNR) has been designated as the SHPO. Members of his or her staff in the Division of Historic Preservation and Archaeology (DHPA) typically are involved in the consultation. Pursuant to 36 CFR 800.2(c)(5) additional consulting parties are defined as those "with a demonstrated interest in the undertaking … due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties."

Timeline of Consultation

Significant activities in the consultation process for Section 4 are detailed below.

May 18, 2004 — FHWA sent a letter and response card to potential consulting parties, including thirteen Native American Tribes, inviting them to participate as consulting parties for Tier 2. The letter directed invitees to the Advisory Council on Historic Preservation (ACHP) website to obtain more information about the Section 106 process.

June 23, 2004 — Map of the Section 4 APE was sent to the SHPO for review.

June 25, 2004 — Invitations were sent to responding consulting parties having an identified interest in the Section 4 project area notifying them of the first scheduled Section 4 consulting party meeting. A map of the APE and a list of potentially eligible properties identified in the Tier 1 study were included with each invitation.

July 1, 2004 — The Section 4 Project Office held an Open House, at which visitors were advised of the Section 106 process and encouraged to take a copy of the booklet, "Protecting Historic Properties – A Citizen's Guide to Section 106 Review."

July 7, 2004 — The SHPO indicated that the Section 4 APE "appears to be appropriate."

July 12, 2004 — The first consulting party meeting was held. The booklet, "Protecting Historic Properties – A Citizen's Guide to Section 106 Review," was available at the meeting.

August 12, 2004 — Tier 2 coordination continued with the SHPO: The first Tier 2 environmental resource agency coordination meeting was held to which representatives of all Tier 2 project sections and participating government agencies, including the SHPO, were invited. The SHPO's office was represented at this meeting.

February 7, 2005 — A meeting was held with the State Archaeologist at SHPO to define what constitutes aboveground versus archaeological resources as related to limestone quarries.

February 15, 2005 — A meeting was held with the SHPO staff. Discussion items included integrity as it relates to limestone-related resources and the formatting of the Draft Historic Property Report (HPR).

February 23-24, 2005 — Coordination with the SHPO continued via the second environmental resource agency coordination meeting attended by all Tier 2 project sections.

May 20, 2005 — Coordination continued with the SHPO. A webcast meeting was held to review Section 4's Statement of Purpose and Need and preliminary alternatives.

May 27, 2005 — A site visit was made with the SHPO staff to selected limestone quarries to review kinds of resources associated with them.

June 13, 2005 — Additional site investigation of the Dowden Farm was made by the project historians.

July 20, 2005 — FHWA invited consulting parties to attend the second consulting party meeting to discuss the Findings of Eligibility. Materials provided to consulting parties along with the invitation included an executive summary of the Draft HPR, descriptions of eligible properties, a table listing all surveyed properties and a map showing the location of the Section 4 project office. Consulting parties were informed that the Draft HPR was available for review at the Section 3, Section 4, and Section 5 project offices.

July 20, 2005 — The Draft HPR documenting the methodology and Findings of Eligibility as part of the Section 106 process for the Section 4 Tier 2 Study was sent to the SHPO.

July 21, 2005 — A separate mailing of maps depicting the locations of recommended historic properties within the APE was sent to consulting parties.

August 1, 2005 — A report entitled "Change in Eligibility Determination Scotland Historic District Tier 2, I-69 Evansville to Indianapolis Study: Section 3" was sent to the SHPO.

August 4, 2005 — The second consulting party meeting was held.

August 17, 2005 — Minutes of the second consulting party meeting were mailed to consulting parties.

August 18, 2005 – SHPO sent a letter to Section 3 project agreeing that the proposed Scotland Downtown Historic District which is located in the overlap between Section 3 and Section 4 is not eligible for listing in the NRHP and that the Blackmore Store be considered individually eligible.

October 14, 2005 — The SHPO sent a letter stating general agreement with the recommendations of eligibility in the Draft HPR.

November 4, 2005 — Additional information was sent to SHPO regarding Greene County and Monroe County bridges.

November 17, 2005 — The SHPO was provided an information package which included Section 4's Draft Statement of Purpose Need/Preliminary Alternatives.

November 23, 2005 — A document titled Report on the Determination of Ineligibility of the Dowden Farm for Listing in the NRHP was sent to the SHPO for review.

December 15, 2005 — In response to additional information provided on November 4, 2005, the SHPO sent a letter indicating that three bridges (Greene County Bridges No. 35 and No. 311, and Monroe County Bridge No. 83) within the APE are not eligible for listing in the NRHP.

December 16, 2005 — SHPO sent a letter in response to the "Purpose and Need/Preliminary Alternatives Package for Section 4" that was provided to resource agencies on November 17, 2005. The SHPO expressed no objections to the information provided.

December 28, 2005 — An APE revision for additional area at a possible interchange at County Line Road was sent to SHPO.

January 6, 2006 — SHPO sent a letter concurring with the overall conclusion of the Report on the Determination of Ineligibility of the Dowden Farm for Listing in the NRHP.

January 25, 2006 — FHWA transmitted the Report on the Determination of Ineligibility of the Dowden Farm for Listing in the NRHP, along with SHPO concurrence, to the National Park Service.

February 24, 2006 — A second APE revision for area at a possible interchange at County Line Road was transmitted to SHPO.

March 20, 2006 — The Keeper of the NRHP concurred with the conclusion of the Report on the Determination of Ineligibility of the Dowden Farm for Listing in the NRHP.

March 24, 2006 — Draft Phase Ia Archaeological Investigations Archaeological Records Review was sent to SHPO.

March 31, 2006 — SHPO sent a letter regarding the APE Second Revision, saying that it "appears to reasonably encompass the area."

May 8, 2006 — SHPO sent a letter regarding the archaeological records review in which the office asked for "clarifications and questions … to be addressed."

May 12, 2006 — The SHPO was provided with information about properties located in the expanded APE of the Greene/Monroe County Line and associated connector road options linking to SR 45; no properties were recommended eligible.

July 31, 2006 — The SHPO sent a letter in response to the information provided on May 12, 2006, concurring with a preliminary determination that there are no properties within the expanded APE that are eligible for inclusion in the NRHP.

August 4, 2006 — SHPO and the Project Management Consultant (PMC) conducted a site visit to assess the relationship of the undertaking to historic properties.

September 13, 2006 — FHWA issued its Findings and Determinations of APE and Eligibility for aboveground historic resources.

September 18, 2006 — FHWA invited consulting parties to attend the third consulting party meeting to discuss its September 13, 2006 Findings and Determinations of APE and Eligibility, and to discuss the effects of the undertaking on historic properties. A Final HPR and a Draft Identification of Effects Report were transmitted to all consulting parties.

October 4, 2006 — The third consulting party meeting was held to discuss FHWA's September 13, 2006 Findings and Determinations of APE and Eligibility and to discuss the effects of the undertaking on historic properties.

October 16, 2006 — Minutes of the third consulting party meeting were mailed to consulting parties.

October 17, 2006 — SHPO sent a letter concurring with FHWA's September 13, 2006 Findings and Determinations of APE and Eligibility. The SHPO did not object to the determinations presented in the Final HPR. The SHPO requested that the Draft Identification of Effects Report's recommended findings of effect be revised in light of consulting party comments prior to issuance of formal determinations of effect.

October 30, 2006 — SHPO sent a letter clarifying its opinion (stated in its October 17, 2006 letter referenced above) that the undertaking will not demonstrably diminish the integrity of the NRHP-listed Scotland Hotel or the NRHP-eligible Blackmore Store, located in Greene County.

November 15, 2006 — SHPO was sent additional correspondence regarding the eligibility of the Dowden Farm, recommending that information noted by a consulting party to be in error or missing from the Report on the Determination of Ineligibility of the Dowden Farm for Listing in the National Register of Historic Places does not change the property's eligibility status.

November 29, 2006 — SHPO sent a letter to a consulting party (J. Boyd), indicating receipt of materials provided, and that issues raised pertaining to the Dowden Farm's eligibility are under consideration.

March 5, 2007 — SHPO sent a letter reiterating that "we still do not believe that the property [Dowden Farm] is eligible for inclusion in the National Register of Historic Places."

November 1, 2007 — The Final Identification of Effects Report was sent to the SHPO and other consulting parties.

November 28, 2007 — SHPO concurred with the recommendations of the Final Identification of Effects Report.

March 25, 2009 — Meeting held with staff of the SHPO, INDOT, PMC, and FHWA to discuss the methodology for updating the survey to include more recent properties.

July 7, 2009 — The SHPO received a cover letter and materials from the PMC regarding Dowden Farm in Greene County, Indiana. The materials transmitted comments from William Boyd and contained responses to Boyd's comments.

August 7, 2009 — SHPO issued a letter agreeing with the PMC responses from June 2009 to the consulting party comments on Dowden Farm. The SHPO stated, "[W]e continue to hold the opinion that the Dowden Farm is not eligible for inclusion in the National Register of Historic Places."

October 22, 2009 — Meeting held with staff of the SHPO, INDOT, and PMC to discuss the field survey results and integrity considerations for properties investigated during the Additional Information (AI) Report.

November 23, 2009 — FHWA invited consulting parties to attend the fourth consulting party meeting to discuss an AI Report. Consulting parties were provided an Effects Letter and a copy of the AI Report with the meeting invitation.

December 17, 2009 — The fourth consulting party meeting was held to discuss the AI Report, the effects of the undertaking on extant historic properties and ways to mitigate the effects of the undertaking on extant historic properties.

December 17, 2009 — FHWA extended the comment period for the AI Report to January 17, 2010, at the request of consulting parties.

January 6, 2010 — Minutes of the fourth consulting party meeting were mailed to consulting parties.

January 7, 2010 — FHWA sent INDOT a letter recommending "corrective actions" for work in the I-69 corridors and future federal aid projects.

January 14, 2010 — SHPO sent a letter to W. Boyd regarding a possible artifact discovery on his property.

January 15, 2010 — SHPO sent a letter concurring with the recommendations of eligibility contained in the AI Report, as well as the analysis of effects upon historic properties presented at the fourth consulting party meeting.

March 31, 2010 — PMC sent a letter to consulting parties advising them that the comment period for the AI Report and the analysis of effects upon historic properties had ended on January 17, 2010, and that responses to comments would be included in the forthcoming 800.11(e) documentation.

April 20, 2010—A Phase Ia archaeological reconnaissance report regarding a Section 4 Mitigation Site is sent to SHPO. Please note that an archaeological site discovered during this reconnaissance was located within the Preferred Alternative for the highway project. Therefore information on this mitigation site is included in the consultation record for the highway project.

May 20, 2010—SHPO concurred with the Phase Ia archaeological reconnaissance report regarding a Section 4 Mitigation Site. Please note that an archaeological site discovered during this reconnaissance was located within the Preferred Alternative for the highway project. Therefore information on this mitigation site is included in the consultation record for the highway project.

May 25, 2010 —Phase Ia archaeological reconnaissance report regarding a Section 4 Mitigation Site sent to the SHPO.

June 2, 2010 —Phase Ia archaeological reconnaissance report for a Section 4 Mitigation Site was sent to SHPO.

June 10, 2010 — PMC sent a letter to SHPO staff detailing efforts to respond to consulting party comments received following publication of the AI Report.

July 13, 2010 — SHPO responded to the letter regarding consulting party comments received following publication of the AI Report. In the letter, the SHPO stated that they were generally satisfied that surveys in 2004-2005 and 2009 were conducted in accordance with established methodology for I-69 surveys.

July 15, 2010 — FHWA issued its Findings and Determinations of Modified Eligibility and Effects.

July 23, 2010 — Draft Phase Ia Archaeological Investigations report for portions of the archaeology APE submitted to SHPO.

July 23, 2010 — FHWA transmitted 800.11(e) documentation to SHPO and consulting parties.

July 23, 2010 — The Draft Environmental Impact Statement (DEIS) was signed by INDOT and FHWA and subsequently distributed to consulting parties. The DEIS contained the 800.11(e) documentation.

August 2, 2010—A legal notice of the Section 106 finding was published for the first of two times in the Bloomington, Indiana, *Herald-Times.*

August 3, 2010—A legal notice of the Section 106 finding was published for the first of two times in the *Greene County Daily World.*

August 9, 2010—A legal notice of the Section 106 finding was published for the second of two times in the Bloomington, Indiana, *Herald-Times.*

August 10, 2010—A legal notice of the Section 106 finding was published for the second of two times in the *Greene County Daily World.*

August 30, 2010 — SHPO commented on the Adverse Effect finding, the 800.11(e) documentation, and the Draft Phase Ia Archaeological Investigations Report. SHPO concurred with the Adverse Effect finding for the project and the No Adverse Effect finding on Scotland Hotel, Blackmore Store, Clifty Church, Koontz House, Stipp-Bender Farmstead, Harris Ford Bridge, Green County Bridge No. 311, and Monroe County Bridge No. 83. SHPO requested more information on archaeological investigations.

September 9, 2010 — Revised Phase Ia archaeological reconnaissance report for a Section 4 Mitigation Site was sent to SHPO. Please note that an archaeological site discovered during this reconnaissance was located within the Preferred Alternative for the highway project. Therefore information on this mitigation site is included in the consultation record for the highway project.

September 10, 2010 — Draft Addendum 1: Phase Ia Archaeological Investigations Report was transmitted to the SHPO.

September 22, 2010 — Meeting between SHPO, INDOT, and Gray and Pape to discuss VIW and limestone quarries.

September 27, 2010 — The PMC sent a letter requesting consulting parties to provide updated information on the Virginia Iron Works complex and limestone quarries and associated railways.

October 8, 2010 — Addendum to Phase Ia Archaeological Reconnaissance Survey for a Section 4 Mitigation Site is transmitted to SHPO.

October 13, 2010 — SHPO concurred with the revised Phase Ia archaeological reconnaissance report for a Section 4 Mitigation Site. Please note that an archaeological site discovered during this reconnaissance was discovered within the Preferred Alternative for the highway project. Therefore information on this mitigation site is included in the consultation record for the highway project.

October 26, 2010 — SHPO issued a response to the DEIS. In it, the SHPO agreed with the findings relating to aboveground historic resources. Regarding archeology, the SHPO issued some questions and comments on Sections 4.4.3.1 and 4.4.3.2. SHPO questioned if a summary of all investigations to date should be included in the EIS and if the possibility of a Virginia Iron Works (VIW) multiple property listing, cultural landscape, or discontinuous landscape should be mentioned.

November 5, 2010 — SHPO commented on the Draft Addendum 1 Report, concurring in part and recommending additional investigations or research in some areas.

November 17, 2010 — Meeting held with SHPO, INDOT, and PMC to discuss VIW and the limestone quarries.

November 19, 2010 — The PMC transmitted Draft Addendum 2: Phase Ia Archaeological Investigations Section 4 (US 231 to SR 37) North Connector Road, Greene County, Indiana report to the SHPO.

November 22, 2010 — The PMC transmitted the Draft VIW and Limestone Quarry Context Study and a memorandum on aboveground survey and investigation of VIW to the SHPO.

December 2, 2010 — The SHPO issued a response to the Draft Addendum 2: Phase Ia Archaeological Investigations Section 4 (US 231 to SR 37) North Connector Road, Greene County, Indiana, agreeing that there were no currently known archaeological resources in the research area.

December 16, 2010 — The SHPO issued a response to the memorandum regarding aboveground survey and investigation of the Virginia Iron Works sites; the revised Phase Ia Archaeological Investigations Report; Revised Addendum 1 to the Phase Ia Archaeological Investigations Report; and the Draft VIW and Limestone Quarry Context Study. The SHPO agreed with the conclusions regarding aboveground resources and the discontiguous districts recommended in the draft context study. The SHPO stated there was insufficient information regarding Maryland

Ridge as a potential archaeological district and regarding certain sites in the VIW or Limestone area.

December 29, 2010 — In response to SHPO's December 16, 2010 correspondence, the PMC delivered a letter to the SHPO responding to questions posed about the Maryland Ridge area and Site 12Mo1343.

December 29, 2010 — The IDNR issued a response to the PMC's December 29, 2010 letter concurring with the conclusion that a Maryland Ridge archaeological district does not appear to be supported and that Site 12Mo1343 is Non-Contributing to the Victor Limestone District.

January 17, 2011—Phase Ia archaeological reconnaissance report and INDOT's Finding of No Historic Properties Affected regarding a Section 4 Mitigation Site sent to the SHPO. Please note that archaeological sites discovered during this reconnaissance were discovered within the Preferred Alternative for the highway project. Therefore information on this mitigation site is included in the consultation record for the highway project.

January 18, 2011 — FHWA signed Modified Eligibility Determinations and Effect Finding.

January 19, 2011 — FHWA transmitted the revised 800.11(e) documentation and Modified Eligibility Determinations and Effect Finding to SHPO and consulting parties.

January 21, 2011 — PMC transmitted a CD containing the revised 800.11(e) documentation and Modified Eligibility Determinations and Effect Finding, replacing the material sent January 19, 2011, which was found to contain an error.

January 22, 2011 — A legal notice of the modified Section 106 finding was published in the *Greene County Daily World.*

January 24, 2011 — A legal notice of the modified Section 106 finding was published in the Bloomington, Indiana, *Herald-Times.*

February 3, 2011 — FHWA transmitted the revised 800.11(e) documentation to the ACHP inviting them to "review the documentation to determine whether your agency wishes to participate in the consultation to resolve adverse effects."

February 10, 2011—SHPO concurred with the Phase Ia archaeological reconnaissance report recommendations and INDOT's findings for a Section 4 Mitigation Site. Please note that archaeological sites discovered during this reconnaissance were discovered within the Preferred Alternative for the highway project. Therefore information on this mitigation site is included in the consultation record for the highway project.

February 15, 2011—SHPO concurred with the Adverse Effect finding for the undertaking and agreed with the previously-identified historic properties and with the archaeological districts identified in the report. The SHPO further offered comments on the MOA.

February 25, 2011—*Addendum 3: Phase Ia Archaeological Investigation Section 4, US 231 to SR 37, Coal Mine Investigation* was transmitted to the SHPO. Revised Section 4 Mitigation Site Phase Ia report transmitted to the SHPO. (Information relating to this mitigation site is included in this documentation because during the reconnaissance, archaeological sites were discovered within the Preferred Alternative.)

March 2, 2011—SHPO concurred with the recommendations of the revised Section 4 Mitigation Site Phase Ia report. (Information relating to this mitigation site is included in this documentation because during the reconnaissance, archaeological sites were discovered within the Preferred Alternative.)

March 3, 2011—SHPO responded to the Addendum 3 report and stated that archaeological site 12Gr1868 is outside the project are and must be avoided by all project activities or subjected to further investigations.

March 11, 2011—In response to a request from the ACHP, FHWA transmitted additional figures relating to VIW that had been redacted from the 800.11(e) documentation due to their sensitive information regarding archaeological sites.

March 14, 2011 – FHWA emailed two additional comment letters to ACHP pursuant to 36 CFR 800.5(c)(2)(i).

March 17, 2011 – FHWA notified the consulting parties that pursuant to 36 CFR 800.5(c)(2)(i), the agency has sent two comment letters regarding the finding to the ACHP for its review.

March 18, 2011—PMC sent letter to consulting parties advising them that the comment period for the revised 800.11(e) ended February 22, 2011, and that responses to comments would be included in the forthcoming final 800.11(e) documentation.

March 25, 2011 — ACHP notified FHWA that it concurred with its findings and that it "has concluded that our participation in consultation for this undertaking is not warranted."

April 8, 2011—INDOT delivered revised copy of the MOA to SHPO for review.

April 18, 2011—Phase Ia Archaeological Reconnaissance Survey for a Section 4 Mitigation Site submitted to the SHPO.

May 5, 2011—SHPO concurred with the Phase Ia archaeological reconnaissance report recommendations and INDOT's findings for a Section 4 Mitigation Site. Please note that archaeological sites discovered during this reconnaissance were discovered within the Preferred Alternative for the highway project. Therefore information on this mitigation site is included in the consultation record for the highway project.

May 9, 2011 — FHWA emailed the ACHP a consulting party comment dated February 22, 2011 (and sent to an inactive email address).

May 12, 2011 — Required signatories have signed the Memorandum of Agreement (MOA).

May 24, 2011 — Two revised Phase Ia Archaeological Reconnaissance Surveys for two Section 4 Mitigation Sites transmitted to SHPO.

June 15, 2011 — SHPO concurred with the revised Phase Ia archaeological reports, 800.11(d) documentation for the site, and the INDOT finding of "No Historic Properties Affected" for a Section 4 Mitigation Site. (Information relating to this mitigation site is included in this documentation for the Preferred Alternative because during the reconnaissance, archaeological sites were discovered within the Preferred Alternative. Note that the Memorandum of Agreement (May 12, 2011) recognized that "the identification and evaluation of archaeological properties remains to be completed, as required by 36 C.F.R. section 800.4 (2010).")

June 21, 2011 — The ACHP wrote that in regards to the additional consulting party comment submitted May 9, 2011, that the additional comment does not change FHWA's substantive findings for the project.

June 27, 2011 — ACHP wrote correcting a typo in its June 21, 2011, and confirming that the additional consulting party comment does not affect FHWA's substantive findings for the project.

July 8, 2011 — Signed MOA distributed to required signatories; final 800.11(e) distributed to consulting parties.

Identification of Consulting Parties

In May 2004 the Section 4 project team, composed of the section consultant and the PMC, began the task of identifying potential participants in the Section 106 consulting party process for Section 4. On May 18, 2004, invitations to join consultation, which included response postcards, were mailed to consulting parties who participated in the Tier 1 Studies and to Native American tribes. The list included individuals, representatives of government jurisdictions, Native American tribes, and members of various historic groups and other organizations that had an interest in historic resources in the 26-county Tier 1 Study Area.

There were 65 responses declining the invitation and 24 responses accepting the invitation to serve as a consulting party for Section 4. At the time of this writing, there are 20 individuals or organizational representatives serving as consulting parties. In addition to SHPO, affirmative initial responses were received from the Prairie Band Potawatomi Nation, the Peoria Tribe of Indians of Oklahoma, the Delaware Nation, the Shawnee Tribe of Oklahoma, and the Miami Tribe of Oklahoma. Representatives of the following organizations also agreed to be consulting parties: Bloomington Restorations, Inc.; Monroe County Historic Preservation Board of Review; Owen County Preservations, Inc.; City of Mitchell, Indiana; Morgan County Historian; Historic Landmarks Foundation of Indiana (now Indiana Landmarks); Hoosier Environmental Council; Citizens for Appropriate Rural Roads (CARR); Owen County CARR; and Traditional Arts Indiana.

The Section 106 process requires coordination with recognized Native American tribes with an interest in the project area. From the list of consulting parties who participated in the Tier 1 Study, 13 tribes were identified and included in the invitations to become consulting parties in Section 4. The tribes mentioned in the above paragraph responded affirmatively to the invitation.

Subsequent additions to the Section 4 consulting party list were made as a result of requests from Pauline Spiegel, Patrick Munson, and Cheryl Ann Munson as interested members of the public and from Jan Boyd as an owner of property within Section 4. The Wabash and Ohio Chapter of the Society of Industrial Archaeology (via Robert Bernacki) and the City of Bloomington Historic Preservation Commission were also included in consultation. C. Munson later served as the representative from the Monroe County Historic Preservation Board of Review as its chairperson. Joanne Stuttgen (Traditional Arts Indiana) requested that she be removed as a consulting party in May 2010. (See **Appendix N**, *Section 106 Documentation* for consulting party information.)

Consulting Party Meetings

First Consulting Party Meeting

On June 25, 2004, invitations to the meeting were mailed to those requesting consulting party status for Section 4. The first consulting party meeting was held on July 12, 2004, at the Section 4 Project Office to discuss the Section 106 process, review and obtain comments on the APE, and share information about the potential for historic properties within the APE. Representatives of FHWA, INDOT and its consultants, SHPO, and eight other consulting parties attended the meeting. Discussion centered on the rationale used to identify the boundary of the APE for aboveground historic resources. The Tier 1 Memorandum of Agreement (MOA) was reviewed. Archaeological survey tasks were discussed, including the field reconnaissance (Phase Ia survey) and the fact that it would be conducted for the preferred alternative only. (See **Appendix N**, *Section 106 Documentation* for documents associated with this meeting including invitation, agenda, minutes, consulting party comments.)

Second Consulting Party Meeting

On July 19, 2005, consulting parties were invited to a second meeting, to be held on August 4, 2005, at the Section 4 Project Office. The purpose of this second meeting was to review the Draft HPR prepared for Section 4, and to provide an update on the status of the archaeological survey work. In preparation for that meeting, consulting parties were sent a packet of information that included a summary of the Draft HPR's findings (for aboveground resources). The report was available for review in the Section 4 Project Office, as well as the project offices for Sections 3 and 5.

In attendance were representatives of FHWA, INDOT and its consultants, SHPO, three consulting parties, and two members of the public. The team presented the results of Section 4 identification and evaluation efforts, which included the evaluation of properties within the APE and preparation of the Draft HPR. The consultants identified one NRHP-listed and seven additional NRHP-eligible properties within the APE.

Regarding archaeology, it was explained that documentary research and an archaeological (Phase Ia) field survey are to be conducted as part of the Section 106 process. At the time of the meeting, the literature review had been completed. The Phase Ia survey had been completed in the vicinity of VIW. Phase Ia survey for the remainder of the project would be limited to the preferred alternative per standard Section 106 procedures.

The Phase Ia pedestrian survey of an approximate 2.5 mi (4 km) portion of the Section 4 Corridor west of the Virginia Iron Works (VIW) archaeological site (12Mo158) and other associated sites was conducted between April 11 and April 23, 2005. The purpose of the survey was to identify the presence of any archaeological remains that may be associated with the VIW and that are potentially eligible for listing on the NRHP. Because of the importance and sensitivity of the VIW and its associated sites, the survey was conducted to provide information that could be used in the development of alternatives within this portion of the study corridor. The corridor was identified in Tier 1 and is generally 2,000 feet wide, but its width is narrower in some places and broader in others. Ten new archaeological sites were identified through the pedestrian survey of the Section 4 survey corridor. These sites include an access road, a possible quarry, a fieldstone wall remnant, two excavations, and five prehistoric sites. The prehistoric sites consist of ephemeral lithic scatters and an isolated find. Four of the historic sites appear to be the product of nineteenth- and twentieth-century agricultural settlement. None of the sites were determined eligible for the NRHP. Note, that since this consulting party meeting a context study was prepared for the Virginia Ironworks and resulted in recognition of a discontiguous archaeological VIW District. One site (12Mo1293), an excavation or prospecting pit, is located within the Section 4 archaeology APE and is recommended as a contributing resource to the district.

The presentation concluded with a request for consulting party comments on the Draft HPR. Several comments pertaining to the NRHP-eligibility of properties were received. (See **Appendix N**, *Section 106 Documentation* for documents associated with this meeting including invitation, agenda, minutes, consulting party comments.)

Third Consulting Party Meeting

On September 18, 2006, consulting parties were invited to attend the third consulting party meeting to be held on October 4, 2006, at the Section 4 Project Office. The purpose of the third meeting was to discuss the FHWA's September 13, 2006, Findings and Determinations of APE and Eligibility, and the effects of the undertaking on historic properties. In attendance were representatives of FHWA, INDOT and its consultants, SHPO, five invited consulting parties, one member of the public, and owners of two properties determined to be NRHP-eligible.

The team explained that a formal determination request regarding the NRHP eligibility of the Dowden Farm had been prepared and sent to the SHPO on November 23, 2005. The report recommended the property not eligible because it lacked integrity and failed to meet any of the criteria for listing in the NRHP. The SHPO concurred with this recommendation on January 6, 2006. The report underwent a copy edit before it was then sent to the Keeper of the NRHP on January 25, 2006. In a letter dated March 20, 2006, the Keeper determined that the Dowden Farm is not eligible for listing in the NRHP.

It was explained that the Final HPR was revised in consideration of SHPO and consulting party comments, and also to account for an expansion of the APE necessary to reasonably encompass an additional potential interchange location near the Greene and Monroe County Line. It was also explained that corridor-wide Phase Ia archaeological investigations including background checks, research, and literature reviews, had been initiated.

The findings of effect recommended in the Draft Identification of Effects Report were discussed. At the meeting, consultants stated the undertaking will not directly impact any historic property and therefore, the anticipated effects are limited to the introduction of auditory and/or visual elements into the properties' settings. With the exception of the Stipp-Bender Farmstead, effects upon properties ranged from "no effect" to "no adverse effect." In the case of the Stipp-Bender Farmstead, one interchange design option would result in an adverse effect.

The presentation concluded with a request for consulting party comments on the documents discussed at the meeting. Several comments pertaining to NRHP-eligibility and the undertaking's effects upon historic properties were received. (See **Appendix N**, *Section 106 Documentation*. For documents associated with this meeting including invitation, agenda, minutes, consulting party comments.)

Subsequent to the third consulting party meeting, the SHPO concurred with the FHWA's September 13, 2006, Findings and Determination of APE and Eligibility in a letter dated October 17, 2006. In consideration of SHPO and consulting party comments, the Draft Identification of Effects Report was revised and provided to the SHPO and consulting parties on November 1, 2007. The SHPO concurred with the findings of the Final Identification of Effects Report in a letter dated November 28, 2007. (See **Appendix N**, *Section 106 Documentation* for SHPO correspondence.)

Fourth Consulting Party Meeting

On November 23, 2009, consulting parties were invited to attend the fourth consulting party meeting to be held on December 9, 2009, at the Section 4 Project Office. (Note that due to inclement weather, this meeting was subsequently re-scheduled to December 17, 2009.) The purpose of the fourth meeting was to discuss to discuss the AI Report prepared for evaluation of properties within the APE constructed between 1954 and 1967 that merit a rating of Contributing or higher, the effects of the undertaking on extant historic properties, and ways to mitigate any effects of the undertaking on extant historic properties. An electronic copy of the AI Report and a letter summarizing the AI Report, including an assessment of the undertaking's potential effects upon historic properties, were sent to all consulting parties with the meeting invitation.

In attendance at the meeting were representatives of FHWA, INDOT and its consultants, the SHPO, and five consulting parties. The team summarized the findings of the AI Report and related that the NRHP-eligible John May-Ada Wilson House had been destroyed by fire, and that the NRHP-eligible Philip Murphy-Jonas May House had been demolished. Additionally, consulting parties were informed that two truss bridges previously determined not to be NRHP eligible (Greene County Bridge No. 311 and Monroe County Bridge No. 83) are now considered NRHP eligible in light of INDOT's recent *Indiana Statewide Historic Bridge Inventory*.

Consulting parties were also informed that the Maurice Head House, located on South East Lane in Monroe County is recommended eligible for listing in the NRHP, as a result of the evaluations completed for the AI Report.

It was explained that two sets of design criteria were being evaluated for implementation with the Section 4 Alternatives: Initial Design Criteria and Low-Cost Design Criteria. The undertaking will not directly impact any historic property and therefore, the anticipated effects are limited to the introduction of auditory and/or visual elements onto the properties' settings. Effects upon properties ranged from "no effect" to "no adverse effect." Consultants said that a design option previously under consideration at the I-69/SR 37 interchange, which would have resulted in an adverse effect upon the Stipp-Bender Farmstead due to noise, is no longer under consideration. Project engineers informed that deferment of construction of some ramps at the I-69/SR 37 interchange is under consideration, but the full interchange was considered in the effects analysis.

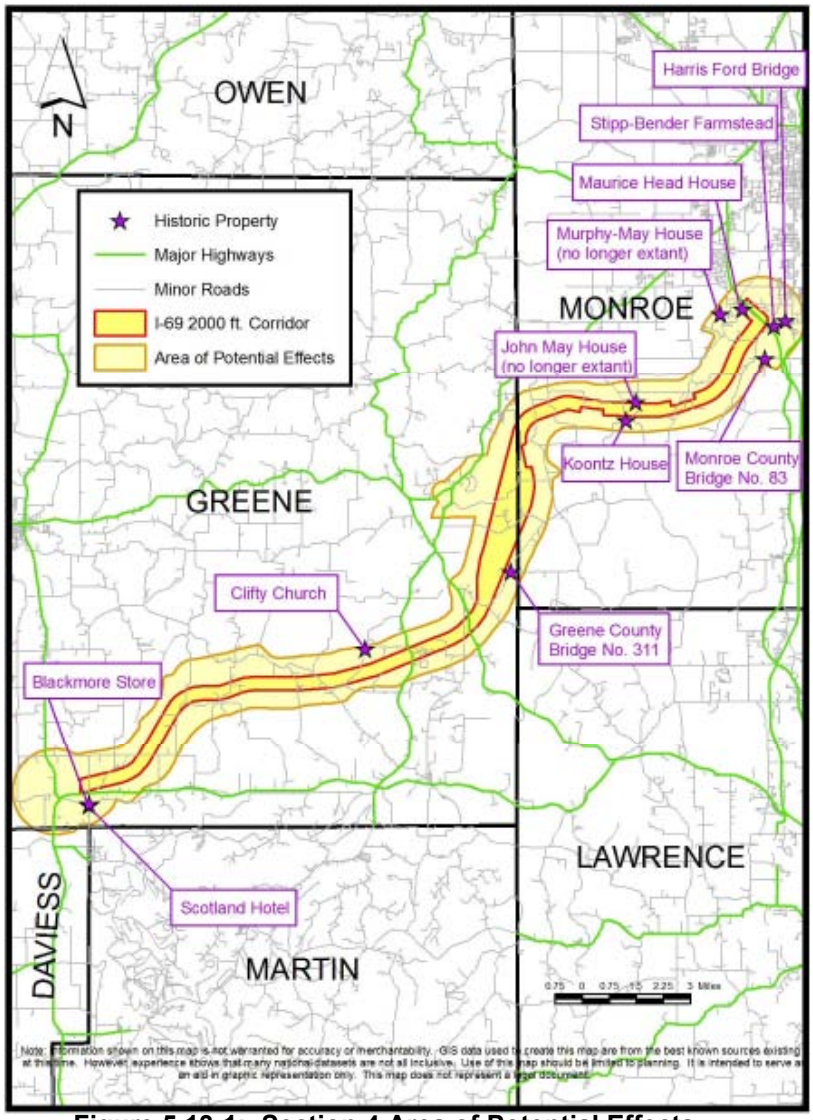

Figure 5.13-1: Section 4 Area of Potential Effects

The presentation concluded with a request for consulting party comments on the documents discussed at the meeting. Several comments pertaining to NRHP-eligibility and the undertaking's effects upon historic properties were received. (See **Appendix N**, *Section 106 Documentation*, for documents associated with this meeting including invitation, agenda, minutes, and consulting party comments.)

Consultation with ACHP following signed Modified Finding and Determinations

On January 18, 2011, FHWA issued a modified Findings and Determinations for the Section 4 Project undertaking of "Adverse Effect." FHWA determined the appropriate finding for individual, aboveground resources within the APE was "No Adverse Effect"; however,

archaeological resources within the APE were considered to be adversely impacted by the undertaking. Therefore, FHWA issued a finding of "Adverse Effect" for the entire Section 4 Project undertaking. The updated 800.11(e) documentation containing the modified determination and finding was sent to consulting parties on January 21, 2011. The documentation included copies and summaries of consulting party views received following the July 2010 publication of 800.11(e) documentation. FHWA and its consultants considered and provided written response to all consulting party comments received following the July 2010 documentation distribution.

In a letter dated February 3, 2011, FHWA sent the ACHP a copy of the updated 800.11(e) and asked the ACHP to review the documentation to decide if it wished to participate in consultation. On February 25, 2011, the Council received a request from the Monroe County Preservation Board of Review to participate in consultation. FHWA also transmitted to the ACHP two additional comment letters that it received following the issuance of the modified Findings and Determinations on January 18, 2011. Pursuant to 36 CFR 800.5(c)(2)(i), FHWA provided consulting parties concurrent notification of its submission to the Council on March 18, 2011. Copies of the letters submitted to Council were made available to consulting parties upon request. On March 25, 2011, the ACHP sent a letter to FHWA concurring with its Findings and Determinations and stated that they found "that the FHWA has been inclusive and transparent in coordinating the Section 106 process and negotiating an outcome to balance historic preservation values and project goals." Further, "[t]he ACHP has concluded that our participation in consultation for this undertaking is not warranted." On May 4, 2011, consulting party Jan Boyd forwarded FHWA comments dated February 22, 2011, that had been sent to an inactive email address for the Section 4 project office. At the request of the consulting party, FHWA forwarded the comments dated February 22, 2011, to the ACHP on May 9, 2011. (See **Appendix N**, *Section 106 Documentation* for documentation associated with this consultation.)

On June 20, 2011, the ACHP wrote regarding the comment submitted May 9, 2011. The ACHP stated that the opinion that the additional comment does not affect FHWA's substantive findings for the project. (ACHP wrote on June 27, 2011, correcting a typo in the June 20, 2011, email and confirming its opinion that the comment does not change FHWA's findings for the project.) (See **Appendix N**, *Section 106 Documentation* for documentation associated with this consultation.)

5.13.2.2 Area of Potential Effects

The Area of Potential Effects (APE) is the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of the undertaking…" [36 CFR 800.16(d)].

The APE for the aboveground resources survey in Section 4 is centered on the 2,000-foot-wide corridor that was selected at the end of the Tier 1 study as the preferred alternative to advance to the Tier 2 study (See **Figure 5.13-1**, p. 5-400**)**.

The project is located in Greene and Monroe Counties. The APE is primarily located within Greene and Monroe counties in Southwestern Indiana. A very small portion of the APE is in

Daviess County, although no historic aboveground resources are located in that portion of the APE.

In Tier 1 it was established that the width of the APE would be subject to revisions, if necessary, in consultation with the SHPO, as the Section 106 process moved forward.

Beginning with a preliminary APE boundary 1.0 mile beyond the study corridor, the historians narrowed the APE if a topographic feature blocked the view of the study corridor and no other portion of the study corridor viewed from other angles was within 1.0 mile. There is extensive vegetation throughout Section 4; in many locations, even during times of the year when no leaves are present, woods obscure the view to or from the study corridor. In these locations, the APE was narrowed to 0.5 mile beyond the study corridor. Where the view of the undertaking was not obvious or where a line of sight existed, the APE was widened accordingly. At locations of proposed and potential interchanges identified in the Tier 1 Study, an APE 1.0 mile beyond the study corridor was maintained regardless of topography, unless compelling reasons suggested that land use would not change. In order to study all potential effects to historic properties by the proposed project, the length of the APE of Section 4 extends 1.0 mile beyond the termini of the approximately 27-mile long corridor. This results in areas of overlap with the APE in both Section 3 and Section 5. This overlap allows the historians of each section to effectively evaluate the aboveground resources that may be affected by that section of the undertaking.

A description and map of the APE was sent to the SHPO on June 23, 2004, and the SHPO stated the APE was "appropriate" on July 7, 2004.

In consultation with SHPO, FHWA expanded the APE to encompass an appropriate area around a potential interchange being studied in Tier 2, in the vicinity of the Greene/Monroe County Line. The SHPO sent a letter regarding the expanded APE on March 31, 2006, stating that "appears to reasonably encompass the area." (See **Appendix N**, *Section 106 Documentation*.)

5.13.2.3 Research

To initiate research on Section 4 aboveground historic properties, the project historians were provided data on all potentially-eligible historic properties identified during the Tier 1 study. In May 2004, the project historians conducted a literature review to identify previously inventoried aboveground resources located in the APE of Section 4. Because the Tier 1 study largely concentrated on Outstanding- and Notable-rated aboveground resources from the Indiana Historic Sites and Structures (IHSS) Inventory,[1] the literature review also included collecting

[1] Each year DHPA funds matching grants that allow counties within the state to be surveyed for the identification of architectural and historical resources. To be included in the survey, a property must be at least 40 years old and retain sufficient historic integrity to contribute to the historic fabric of the area. The survey rates a structure as "Notable" or "Outstanding" if it is an excellent, relatively unaltered example of a particular architectural style, and/or has a strong association with history, settlement patterns, or important figures. Buildings that are rated notable or outstanding may be eligible for listing in the NRHP. The inventory field work concludes with the publication of an *Interim Report*, so named because the changing nature of the built environment precludes a "final" inventory, e.g., some structures are demolished while others are added. (Sources: http://www.in.gov/dnr/historic/2824.htm and http://www.indianalandmarks.org/Resources/ArchitecturalSurveys/Pages/QuestionsAboutSurveys.aspx)

information on aboveground resources rated as Contributing[2] in the IHSS Inventory. Documentary research included reviewing the Greene County and Monroe County Interim Reports, the City of Bloomington Interim Report, published county histories of Greene and Monroe counties, published histories of Scotland and Bloomington, plat maps of Greene and Monroe counties between 1876 and the present, and various publications and articles having a bearing on Greene and/or Monroe counties. Historians reviewed the NRHP nomination form for the Scotland Hotel. Other types of research included consultation of various National Park Service publications and guidance review of aerial photographs (dating to 1937 and 1958) from the Indiana State Archives and USGS maps. Finally, historians consulted with more than fifteen knowledgeable persons as part of the research for this section.

5.13.2.4 Fieldwork

The project historians initially surveyed (2004) and inventoried 201 resources associated with a locally important theme and with at least a moderate level of integrity. One hundred fifty-three (153) of the resources had been identified previously for the IHSS Inventory in Greene and Monroe counties. The survey initiated in 2004 found that 11 previously identified IHSS Inventory resources had been demolished. Forty-eight (48) aboveground resources were newly inventoried during the initial survey. (See HPR in **Appendix N,** *Section 106 Documentation*.)

An additional information historic property survey was conducted in 2009 for evaluation of aboveground resources from the "recent past" (in this case, properties constructed between 1954 and 1967) within the APE meriting a Contributing or higher rating as defined through the IHSS Manual and refined through consultation with the DHPA. For those properties constructed between 1954 and 1967, historians conducted a field reconnaissance of more than 200 properties and inventoried 21 properties that they rated Contributing or higher. (See AI Report in **Appendix N,** *Section 106 Documentation*.)

5.13.2.5 Consideration of a Maryland Ridge Historic District or Cultural Landscape

During the Tier 1 consultation process (2002), a member of the public expressed the opinion that an area locally referred to as "Maryland Ridge" may be NRHP eligible as an historic district or cultural landscape. Later in 2002, the members of the Maryland Ridge community submitted additional information to the SHPO. SHPO considered the information and determined that while there might be some individually eligible properties, Maryland Ridge would not meet any criteria for NRHP listing as a district or landscape. No NRHP nomination for the district has been submitted.

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[2] The word "Contributing" carries multiple meanings. Consistent with the terminology of the IHSS Inventory, individual properties that meet the age requirement and that possess some integrity and some significance but which are not individually eligible for listing in the NRHP are labeled as "Contributing" resources as a way of classification. The word "Contributing" also carries another meaning in regards to NRHP districts. In that context, resources that may lack individual distinction but are part of an eligible district may be considered "Contributing" to the district. Therefore, properties may be considered as contributing to the history of the county and not eligible for listing in the NRHP and/or they may be considered as a contributing element within a NRHP-eligible district but not individually eligible for listing in the NRHP.

In Tier 2, the project historians further evaluated the area known as Maryland Ridge as a potential district and as a cultural landscape. Maryland Ridge was fully analyzed as part of this Tier 2 study. Reportedly, it is comprised of approximately 25,000 acres of land in a three- to seven-mile wide band along the Monroe and Greene county lines. Advocates of Maryland Ridge, writing in 2002, suggested two major themes: 1.) 1816-1839: exploration and settlement and 2) 1840-1954: community development. Project historians further expanded the basic areas of significance to include agriculture, commerce, education, ethnic heritage, industry, religion, and social history.

The historians carried out extensive field reviews of the portion of the Maryland Ridge community within the corridor and APE. As a result of that survey, the historians recommended no eligible aboveground historic district, since there are insufficient resources with integrity to convey significance. The historians observed there were insufficient features with integrity to convey the historical character of an historic district within the APE. The project historians also observed there were insufficient landscape features with integrity to convey the historical character of a cultural landscape within the APE.

Project historians also evaluated Maryland Ridge as a potential cultural landscape. With the scale of the area, particular attention was given to aspects of the landscape that demonstrated a connection between aboveground resources, including the transportation routes, shared agricultural lands, fences, and fencerow vegetation. Project historians also identified and evaluated the number of modern intrusions into the possible cultural landscape, such as residences and other buildings erected after the period of significance, modern utility lines, modern fencing materials, and changes in agricultural land use. Project historians recommended that there were not enough landscape features with integrity to convey an aboveground cultural landscape. (See **Appendix N**, *Section 106 Documentation* for information pertaining to consideration of a Maryland Ridge Historic District or Cultural Landscape.)

5.13.2.6 Consideration of the Dowden Farm

In the draft HPR, project historians did not recommend the Dowden Farm, located in the overlap area between Section 3 and Section 4 along Greene County Road 215 East north of SR 58, as eligible for inclusion in the NRHP. This property was discussed in detail at the second and third consulting party meetings. Some consulting parties expressed a high level of concern regarding the Dowden Farm (initially referenced in discussion and written comments as the Boyd Farmstead); therefore, an additional site visit was held on June 13, 2005, additional research was conducted, and the project team prepared an NRHP eligibility report. The FHWA submitted the Dowden Farm eligibility report to the Keeper of the NRHP on January 19, 2006. The Keeper determined that the property was not eligible on March 20, 2006. (See **Appendix N**, *Section 106 Documentation* for documentation of consultation associated with the NRHP-eligibility of the Dowden Farm.)

5.13.2.7 Consideration of a Limestone Quarry/Mill Historic District or Cultural Landscape

Historians undertook a methodical consideration of a possible district made up of limestone quarries and/or mills and associated features. Historians documented quarries, mills, and other associated resources (i.e., worker housing, transportation networks, or slag piles), and then undertook extensive research on the limestone industry as a whole in Monroe County. The historians toured operating mills and quarries and interviewed individuals knowledgeable in the industry. Both published and non-published works regarding the industry and its evolution, particularly in the Monroe County area, were studied. The project team developed a timeline of the industry along with a list of expected elements of quarry and mill sites. This information was then placed in a matrix to provide a means to compare and contrast each property. The matrix included topics such as historic ownership of the property, the date the quarry or mill was established, large or well-recognized projects for which the quarry/mill was known, changes to the landscape due to the technological evolution of the industry, and the presence or absence of specific building forms associated with the different aspects of the industry. Historians then identified Contributing and Non-Contributing resources based on their age and integrity of their built environment. As a result of this work, historians found no historic district representing the limestone industry within the APE.

The historians also evaluated the area for a potential cultural landscape made up of limestone quarries and/or mills and associated features. They focused on historic characteristics and their integrity or lack thereof. Due to the 50-year requirement imposed by the NRHP, the historians recognized that technological changes could alter the historic appearance of an active quarry. Thus, the historians sought to identify quarries that still conveyed the industry of the mid-1950s or earlier. Historians recognized that the area may not possess integrity but may have scenic qualities. As a result of extensive deliberation, the historians recommended that no NRHP-eligible aboveground limestone quarry and/or mill cultural landscape exists within the APE due to loss of integrity.

In November 2010, archaeologists examined the Victor Limestone area as a potential discontiguous district; this study resulted in a recommendation of NRHP eligibility for a Victor Limestone Archaeological District but did not alter the previous recommendation for aboveground resources. (See **Appendix N**, *Section 106 Documentation* for documentation associated with the Limestone Quarry/Mill Historic District or Cultural Landscape determination, specifically HPR Appendix G, Technical Memorandum: Historic Resources Associated with the Limestone Industry in Monroe County and DRAFT Virginia Iron Works and Limestone Quarry Context Study Section 4, US 231 to SR 37.)

5.13.3 Identification and Evaluation of Aboveground Historic Resources

Project historians identified and evaluated aboveground resources in consultation with the Indiana SHPO and the consulting parties for this project. The HPR and the AI Report prepared for Section 4 document the methodology and recommended findings of eligibility as part of the Section 106 process.

The Tier 1 FEIS provides a detailed description of the historical context of Southwest Indiana. Chapter 4 of this Tier 2 FEIS provides description of the cultural overview (Section 4.4.1) and historic setting (Section 4.4.2) applicable to Section 4 of the I-69 Evansville to Indianapolis project.

Aboveground resources within the APE were evaluated to determine their eligibility for listing in the NRHP based on their integrity and their ability to meet one or more NRHP selection criteria.

The NRHP evaluation criteria[3] stipulates that eligible aboveground properties may be "districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

> A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> B. That are associated with the lives of persons significant in our past; or
>
> C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> D. That have yielded, or may be likely to yield, information important in prehistory or history."

According to the NRHP, "integrity is the ability of a property to convey its significance." There are seven attributes of integrity: location, design, setting, materials, workmanship, feeling, and association. As part of the evaluation process, historians took into account the exemptions specified in 36 CFR 60.4. "Ordinarily cemeteries, birthplaces or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past fifty years…" are not eligible for listing in the NRHP. Although these exemptions are applicable, the presence of documented cemeteries was verified whenever practical, and churches were included if they illustrated an architectural or historical theme.

The significance of an aboveground resource can only be determined when it is evaluated within its historic context. NRHP guidance defines historic contexts as "those patterns or trends in history by which a specific occurrence, property, or site is understood and its meaning (and ultimately its significance) within history or prehistory is made clear." Historic contexts identify the trends, patterns, and themes that shaped the history of particular geographic areas during certain time periods, and the types of aboveground resources associated with them.

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[3] NRHP definitions appear in: "How to Apply the National Register Criteria for Evaluation," *National Register Bulletin* 15 (Washington, D.C.: U.S. Department of the Interior, National Park Service, 1990), 2.

A field survey of the APE and documentary research were conducted to collect all the data needed to develop a historic context and complete the eligibility determinations according to NRHP guidelines. The survey was completed in accordance with the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* and the professional standards common to this type of aboveground resource identification and evaluation.

Of the aboveground properties initially surveyed in the Section 4 APE (HPR), the project historians concluded that one is listed on the NRHP and recommended seven others eligible for listing in the NRHP. The Scotland Hotel is listed in the NRHP. The Blackmore Store, the Clifty Church, the Koontz House, the Stipp-Bender Farmstead, the Harris Ford Bridge, the Philip Murphy-Jonas May House, and the John May-Ada Wilson House were recommended eligible for listing in the NRHP. (Consulting parties were notified on November 23, 2009, that the John May-Ada Wilson House had been destroyed by fire and that the Philip Murphy-Jonas May house had been demolished.)

Additional aboveground survey (AI Report) concluded that two bridges previously determined not to be NRHP eligible (Greene County Bridge No. 311 and Monroe County Bridge No. 83) are now considered eligible in light of INDOT's recent *Indiana Statewide Historic Bridge Inventory.*[4] Further, the historians recommended the Maurice Head House, located within the APE on South East Lane in Monroe County, as NRHP eligible.

5.13.4 Effects Evaluation

An effect is the "alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." [36 C.F.R. Part 800 Sec. 800.16(i)] In determining the effects of the undertaking upon historic properties, the finding will be either: No Historic Properties Affected or Historic Properties Affected. [36 C.F.R. 800. 4(d)(1) and (2)] The results of an Historic Properties Affected assessment will be either: No Adverse Effect or Adverse Effect. [36 C.F.R. 800.5 (d)(1) and (2)]. According to 36 C.F.R. 800.5(a)(2), "adverse effects include but are not limited to:

i. Physical destruction or damage to all or part of the property;

[4] US 231 Bridge over Doans Creek (157-28-03525/NBI No. 27860) and US 231 Bridge over Branch of Doans Creek (157-28-03526/NBI No. 27870), which are located in the overlap area between Section 3 and Section 4, were not recommended eligible for inclusion in the NRHP in the Section 4 HPR. Both bridges were subsequently determined eligible as part of the *Indiana Statewide Historic Bridge Inventory*. After the inventory was published, historians re-evaluated the bridges and conducted additional, more detailed research. Historians identified a factual error in the *Indiana Statewide Historic Bridge Inventory* which, when corrected, eliminated the rationale for eligibility provided in the inventory. On June 29, 2010, FHWA, SHPO and INDOT signed a memorandum determining that US 231 Bridge over Doans Creek (157-28-03525/NBI No. 27860) and US 231 Bridge over Branch of Doans Creek (157-28-03526/NBI No. 27870) are not considered NRHP-eligible resources in the *Indiana Statewide Historic Bridge Inventory* in accordance with the procedures established in the Programmatic Agreement Regarding Management and Preservation of Indiana's Historic Bridges. Documentation of consultation associated with the NRHP-eligibility of the US 231 Bridges is contained in **Appendix N**, *Section 106 Documentation.*

ii. Alteration of the property including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 800) and applicable guidelines;

iii. Removal of a property from its historic location;

iv. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic features;

v. Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

vi. Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

vii. Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance."

The Section 4 project team evaluated the undertaking's effects on historic properties, including consideration of the initial design criteria as well as the low-cost design criteria. This evaluation was based on field observation of site lines and noise modeling. The three effects evaluated for each historic property were direct (destruction or damage), visual intrusion, and noise intrusion. For visual effects, the project team used aerial and topographic mapping, as well as field observation, to determine sight lines between the historic resources and the alternatives under consideration, based on each alternative's proposed horizontal and vertical alignment. Photographs were taken when foliage was at a minimum to portray a scenario with the highest potential effect.

For evaluation of noise effects, the project team used the most current *INDOT Highway Traffic Noise Policy* (October 15, 1997), updated to *INDOT Traffic Noise Policy* (February 26, 2007). The *INDOT Traffic Noise Policy* states that highway noise impacts occur if either of two conditions is met: 1) the predicted $L_{eq(h)}$ levels "approach" or "exceed" the appropriate noise abatement criteria for the land use identified, or 2) the predicted highway $L_{eq(h)}$ noise levels substantially exceed the existing noise level. "Approach or exceed" is defined as levels higher than 1 dBA $L_{eq(h)}$ below the appropriate noise abatement criteria. "Substantially exceed" means predicted traffic noise levels exceed existing noise levels by 15 dBA or more.

Noise effects upon historic properties attributable to the undertaking were assessed in the following manner. A TNM-predicted noise impact was considered an adverse effect. Noise effects were considered not adverse if a noise impact was not predicted, but the undertaking would result in some change in noise, i.e., a predicted audible noise level increase, or, if traffic noise would be introduced or existing traffic noise would be added to. Noise effects were considered absent if it was thought that the undertaking would cause no change in noise levels, and would not introduce or add to existing traffic noise.

On July 15, 2010, FHWA signed a Finding of Effects for Section 4 of the I-69 Evansville to Indianapolis Study: **Historic Properties Affected – Adverse Effect**, since a potential existed for an adverse effect with not all archaeological surveys completed**.**

Since the publication of the DEIS, archaeological investigations have revealed the presence of two discontiguous archaeological districts considered eligible for listing in the NRHP: Virginia Iron Works Archaeological District and Victor Limestone Archaeological District. The criteria of adverse effects apply to the Virginia Iron Works Archaeological District and the Victor Limestone Archaeological District because a Contributing site in each district will be impacted by the project. A modified finding of **Historic Properties Affected – Adverse Effect**, which included an adverse effect to the Virginia Iron Works Archaeological District and the Victor Limestone Archaeological District (as well as the potential for adverse effects on archaeological sites still requiring additional investigation) was issued by FHWA on January 18, 2011. **(**See **Appendix N**, *Section 106 Documentation* for more detailed information, and Section 5.14 of this document. See **Table 5.13-1** for a summary of aboveground resources on or eligible for the National Register. **Table 5.13-1** also lists some select properties that were evaluated, but found to not be eligible for the NRHP.)

Table 5.13-1: Eligibility and Effects on Selected Aboveground Properties

Survey No.	Property Name	Address	Property Type	County	NRHP Status	Effects
105-115-45062	John May-Ada Wilson House	6530 Duvall	Single pen/Hall and parlor	Monroe	NRHP Eligible	No Longer Extant
105-607-45005	Koontz House	7401 Mt. Zion Road	Greek Revival	Monroe	NRHP Eligible	No Adverse Effect: Auditory effects will not be adverse
105-115-35104	Harris Ford Bridge	N side Church, Clear Creek Trail	Pratt Through Truss	Monroe	NRHP Eligible	No Adverse Effect: No effect on the property
105-115-35055	Stipp-Bender Farmstead	5075 S. Victor Pike	I-house/ Greek Revival	Monroe	NRHP Eligible	No Adverse Effect: Visual and Auditory effects will not be adverse
105-115-40051	Philip Murphy-Jonas May House	Ida Lane, Rockport Road	Hall and Parlor/ I-House	Monroe	NRHP Eligible	No Longer Extant
105-115-35064	Monroe County Bridge No. 83	Dillman Road and Clear Creek	Warren Pony Truss Bridge	Monroe	NRHP Eligible	No Adverse Effect: No effect on the property
AD 10	Maurice Head House	4625 South East Lane	Ranch	Monroe	NRHP Eligible	No Adverse Effect: Auditory effects will not be adverse
055-576-56002	Scotland Hotel	NW corner of Main Street and Jackson Street	Commercial Italianate	Greene	NRHP Listed	No Adverse Effect: Visual and Auditory effects will not be adverse
055-324-50008	Clifty Church	W side of CR 920E/Old Clifty Road, N of CR 415E	Gable Front/ Log Structure	Greene	NRHP Eligible	No Adverse Effect: Auditory effects will not be adverse
055-576-56001	Blackmore Store	E. side of Main Street, N. end of town	Italianate Commercial	Greene	NRHP Eligible	No Adverse Effect: Visual and Auditory effects will not be adverse

Table 5.13-1: Eligibility and Effects on Selected Aboveground Properties

Survey No.	Property Name	Address	Property Type	County	NRHP Status	Effects
055-607-45041	Greene County Bridge No. 311	CR 100S/Thacker Road - Crossing Indian Creek	Warren Pony Truss Bridge	Greene	NRHP Eligible	No Adverse Effect: Auditory effects will not be adverse
12Mo158	Virginia Iron Works	North-central Indian Creek Township	Cultural Landscape	Monroe	NRHP Eligible archaeological district	See Section 5.14
105-115-40073	South Union Christian Church	6510 Rockport Road	Classical Revival	Monroe	Not NRHP Eligible	NA
105-115-35061	Indian Hill Stone Company	Victor Pike	Functional	Monroe	Potentially part of NRHP archaeological district	See Section 5.14
105-115-40076	Shawnee Tramway	S side of Tramway Road, W of Victor Pike	Bridge Piers for former Quarry tramway	Monroe	Not NRHP Eligible	NA
055-324-50044	Koleen Union Church	SE corner of CR 330S and CR 610E	19th Century Functional Ecclesiastical	Greene	Not NRHP Eligible	NA
NA	Maryland Ridge Historic District	Monroe and Greene county border	Cultural Landscape	Monroe and Greene	Not NRHP Eligible	NA
NA	Limestone Quarry/ Mill Historic District	Tramway & Victor Pike	Mining district	Monroe	NRHP Eligible archaeological district	See Section 5.14
055-576-55042	Dowden Farm	W side of CR 215E, N of Hwy 58	Gable Front & Farmstead	Greene	Not NRHP Eligible	NA
055-607-45042	Greene County Bridge No. 35	CR 1375E - Crossing Indian Creek	Pratt Pony Truss Bridge	Greene	Not NRHP Eligible	NA

There will be visual and auditory effects upon the Scotland Hotel property but the effects will not be adverse. There will be visual and auditory effects upon the Blackmore Store property but the effects will not be adverse. There will be auditory effects upon the Clifty Church property but the effects will not be adverse. There will be auditory effects upon the Koontz House property but the effects will not be adverse. There will be auditory and visual effects upon the Stipp-Bender Farmstead property but the effects will not be adverse.[5] There will be no effects upon the Harris Ford Bridge property. There will be some increased noise for Greene County Bridge No. 311 but the effects are not considered adverse since this is a transportation property and road noise is part of its setting. There will be no effect upon Monroe County Bridge No. 83. There will be auditory effects upon the Maurice Head House property but the effects will not be adverse.

[5] Per the discussion at the third and fourth Consulting Party Meeting (see Section 5.13.2.1), use of a loop interchange at I-69/SR 37 avoids an adverse noise impact to the Stipp-Bender farmstead. Based in part upon this determination, all alternatives carried forward for detailed study provide for a loop ramp at this location.

5.13.5 Resolution of Adverse Effects - Mitigation

Since there are no adverse effects to aboveground historic properties in the Section 4 APE, there is no resolution of adverse effects required for aboveground resources. A Memorandum of Agreement (MOA) was signed on May 12, 2011 for archaeological resources. The MOA also included general mitigation as part of a larger mitigation stipulation for the I-69 corridor that was provided for in the I-69 Tier 1 MOA. This mitigation involves the preparation of an audio tour focusing on the cultural and natural environment along the I-69 corridor. Specific to the Section 4 portion of the tour, there is a proposed community history component whereby local members of the community can record memories/stories that relate to selected cultural themes; these memories/stories will incorporated into the audio tour if feasible. (See Section 5.14, Archaeology Impacts, for additional information and **Appendix N**, *Section 106 Documentation,* for a copy of the MOA.)

5.13.6 Summary

Regarding aboveground historic resources:

NRHP Properties — One individual property, the Scotland Hotel, is located within the APE of Section 4 and listed in the NRHP.

NRHP Districts — No aboveground historic districts listed in the NRHP are located within the APE of Section 4.

Eligible Properties — Eight individual properties, the Blackmore Store, the Clifty Church, Greene County Bridge No. 311, the Koontz House, Monroe County Bridge No. 83, the Stipp-Bender Farmstead, the Harris Ford Bridge, and the Maurice Head House are eligible for listing in the NRHP and are located within the APE of Section 4.

Eligible Districts — No aboveground historic districts that are eligible for inclusion in the NRHP are located in the APE of Section 4. No significant concentration, linkage or continuity of sites, buildings, structures, or objects in the APE are historically or aesthetically linked by plan or by physical development. (See Section 5.14 for a discussion of NRHP-eligible archaeological districts.)

FHWA issued the Findings and Determinations of APE and Eligibility on September 13, 2006.

FHWA issued the Modified Eligibility Determinations and Effects Finding on July 15, 2010. FHWA again issued the Modified Eligibility Determinations and Effects Finding, this time incorporating effects on two NRHP-eligible archaeological districts, on January 18, 2011. The finding of effects for Section 4 of the I-69 Evansville to Indianapolis Study is: **Historic Properties Affected – Adverse Effect**. A Memorandum of Agreement (MOA) was signed on May 12, 2011 for archaeological resources. The MOA also included general mitigation as part of a larger mitigation stipulation for the I-69 corridor that was provided for in the I-69 Tier 1 MOA.

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5.14 Archaeology Impacts

Since the DEIS, the following substantive changes have been made to this section:

- Section 5.14.2 has been updated with descriptions of the phases of archaeological work conducted for the Section 4 APE
- **Table 5.14-1** has been revised to update the anticipated schedule for completion of Section 106 archaeological activities in relation to the NEPA process
- Section 5.14.2 was updated with sites recommended for additional study as well as the Virginia Ironworks and Victor Limestone Archaeological Districts
- Section 5.14.2.3 was revised to include descriptions of methods employed for the Section 4 Phase Ia survey
- Section 5.14.3 has been revised to summarize the results of the Phase Ia investigations conducted within the APE of the Section 4 Preferred Alternative as well as the historic context study for the Virginia Ironworks and Victor Limestone Archaeological Districts
- **Table 5.14-2** has been revised to show those sites identified through the Phase Ia investigations in the Section 4 APE
- Section 5.14.4 has been revised to discuss the Memorandum of Agreement, procedures that will be followed should Phase Ic and Phase II investigations determine that Phase II Evaluation or Phase III Archaeological Mitigation is warranted, and Archaeological Mitigation for the Contributing sites to be impacted within the Virginia Ironworks and Victor Limestone Archaeological Districts
- Section 5.14.5 has been revised to summarize results of archaeological investigations completed, to discuss the Memorandum of Agreement and coordination with ACHP.

5.14.1 Introduction

Section 106 of the National Historic Preservation Act of 1966, as amended, mandates that federal agencies, or their designees, consider the effects of their actions on historic properties. The definition of historic properties includes, but is not limited to, prehistoric or historic sites or districts that may be eligible for listing in the National Register of Historic Places (NRHP). Tier 2 studies for the I-69 Evansville to Indianapolis project include the identification of archaeological resources (36 CFR 800.4), the assessment of effects on archaeological resources (36 CFR 800.5), and consultation to develop methods to avoid, minimize, or mitigate any adverse effects (36 CFR 800.6).

Per 36 CFR 800.4(b)(2), a phased approach has been developed to accomplish Tier 2 archaeological research and evaluation tasks. For the DEIS, archaeological research included literature review, background research, and site files research at the Indiana Department of Natural Resources (IDNR)-Division of Historic Preservation and Archaeology (DHPA) and

other pertinent repositories. Information pertaining to previously recorded sites within a 2,000-foot-wide study corridor, identified in the Tier 1 FEIS, was gathered. For this FEIS, Phase Ia investigations were conducted for the Preferred Alternative Area of Potential Effects (APE). Section 5.14.2 describes the methods employed to accomplish the work in Section 4, and Section 5.14.3 describes the results of that work.

The current study is in compliance with the Indiana Historic Preservation Act (IC-14-21-1). The archaeological research and investigations were conducted by, or directly supervised by professional archaeologists meeting the standards set forth by the U.S. Department of the Interior detailed in 36 CFR Part 61 and the Secretary of Interior's *Guidelines for Historic Preservation and Archaeology* (48 FR 44716).

5.14.2 Methodology

In the I-69 Tier 1 study, potentially eligible historic and archaeological resources were evaluated using eligibility criteria established under the NHPA (See Section 5.13.3 for NRHP Criteria). The purpose of the Tier 1 research was to determine the "likely presence" of historic and archaeological resources within the APE, in accordance with 36 CRF 800.4(b)(2). The description and results of the Tier 1 evaluation are included in the Tier 1 FEIS Chapter 5 and Appendix P. That appendix includes a Memorandum of Agreement (MOA) between FHWA and the Indiana State Historic Preservation Officer (SHPO)[1] identifying the corridor known as Alternative 3C as the Preferred Alternative, and agreeing to the steps that would be taken to continue the Section 106 process in Tier 2. Tier 1 Appendix P also includes FHWA documentation of Section 106 finding of potential adverse effects (800.11(e) documentation), and the Section 106 Compliance Plan, which provides a framework for completing the consultation process.

The Tier 2 Section 106 archaeological research has been phased to appropriately correspond with the project NEPA process. The *Draft Guidebook for Indiana Historic Sites and Structures Inventory—Archaeological Sites,* whose stipulations have been followed for these studies, define the phases of archaeological research, summarized below:

- Phase Ia is a surface survey and visual inspection of the soil when ground surface visibility and survey conditions are adequate, or (when ground surface and survey conditions are not adequate) using shovel probes, cores, and/or augering techniques to discover site evidence at or near the surface of the site.
- Phase Ib is an intensive survey with the use of controlled surface collections, piece plotting, or subsurface sampling.

[1] For the State of Indiana, the Director of the Department of Natural Resources (IDNR) has been designated as the SHPO. Members of his or her staff in the Division of Historic Preservation and Archaeology (DHPA) typically are involved in the consultation.

- Phase Ic is subsurface reconnaissance to locate archaeological sites buried in alluvial, colluvial, or eolian landforms.
- Phase II testing is conducted for sites identified through Phase I investigations that are potentially eligible for the National Register of Historic Places. Sites are tested to determine the vertical extent of the site, the presence of subsurface cultural features (i.e. hearths, trash/storage pits, living surfaces), the nature and context of deposits, and extent of disturbance, if any. Field research is conducted through the controlled excavation of test units (usually measuring between 1x1m to 2x2m). Testing may also involve the stripping of top soil in areas to identify cultural features. Sites determined eligible for NRHP listing are recommended for avoidance and/or mitigation.
- Phase III projects are designed to mitigate or recover data from significant archaeological sites that cannot be avoided. These projects involve large-scale excavations and recovery efforts to mitigate adverse effects on a site. Mitigation plans are developed to determine the methodology and research design for the project.

The Tier 2 research for the Section 4 DEIS focused on background research to identify previously recorded archaeological sites and corresponding studies within a 2,000-foot-wide study corridor. The results, which were reviewed by IDNR-DHPA, were considered in the selection of the Preferred Alternative (Area of Potential Effects) (see Section 5.14.2.2).

For Section 4, Phase Ia archaeological field surveys were completed for the initial design criteria and low cost design criteria right-of-ways for the Preferred Alternative (Alternative 2). Four technical reports[2] documenting the results of these surveys were submitted to the SHPO; management summaries from these reports are included in **Appendix N**, *Section 106 Documentation*.

Commitments for the completion of Phase Ic and Phase II investigations and any subsequent phases of archaeological investigation have been incorporated into a Memorandum of

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[2] James A. Robertson, Ph.D., and Michael J. Hambacher, Ph.D., *I-69 Corridor Tier 2 Studies Evansville to Indianapolis Phase Ia Archaeological Investigations Section 4, US 231 to SR 37*. Report prepared by Commonwealth Cultural Resources Group, Inc., Jackson, Michigan for Federal Highway Administration and Indiana Department of Transportation (November 15, 2010)

Matthew P. Purtill, M.A., and Marcia Vehling, *I-69 Corridor Tier 2 Studies Evansville to Indianapolis Addendum 1: Phase Ia Archaeological Investigations Section 4, US 231 to SR 37*. Report prepared by Gray and Pape, Cincinnati, Ohio for Federal Highway Administration and Indiana Department of Transportation (November 16, 2010)

Baltz, Christopher J., *I-69 Corridor Tier 2 Studies Evansville to Indianapolis Addendum 2: Phase Ia Archaeological Investigations Section 4 (US 231 to SR 37), North Connector Road, Greene County, Indiana.* Report prepared by Gray and Pape, Cincinnati, Ohio for Federal Highway Administration and Indiana Department of Transportation (November 18, 2010). This investigation lies outside the current Section 4 Preferred Alternative.

McCord, Beth K., *I-69 Corridor Tier 2 Studies Evansville to Indianapolis Addendum 3: Phase Ia Archaeological Investigations Section 4, US 231 to SR 37, Coal Mine Investigation.* Report prepared by Gray and Pape, Cincinnati, Ohio for Federal Highway Administration and Indiana Department of Transportation (February 17, 2011). This investigation lies outside the current Section 4 Preferred Alternative.

Agreement (MOA) between FHWA and IN-SHPO (included in **Appendix N**, *Section 106 Documentation*). If the results of this additional testing show that a Phase III is warranted, that work will be completed before construction on the project could begin at that site.

Table 5.14-1 summarizes the phases and schedule for accomplishing the work in Section 4.

Table 5.14-1: Phases of Archaeological Research in Section 4

Phase	Work Completed	Section 106 Step	Schedule	Deliverable
Ia literature review	Archival research and site files check for study corridor (2000')	Research design and identification	Before DEIS (inform selection of Preferred Alternative)	Technical report
Ia field research	Survey of APE, Preferred Alternative ROW	Identification	Before FEIS	Technical report/ results summarized in FEIS
Ib	Intensive survey of site	Eligibility clarification for questionable sites	Before FEIS when possible	Addendum to Phase Ia technical report/ results summarized in FEIS
Ic	Subsurface Reconnaissance	Identification of buried sites	Following FEIS but before construction	Technical report/ results summarized in FEIS
II	Site evaluation research	Determination of NRHP Eligibility	Following FEIS but before construction	Technical report/ results summarized in FEIS where possible
MOA	Develop plan outlining FHWA responsibilities and schedule for Section 106 completion	Mitigation of Adverse Effects	In FEIS	MOA
III	Data recovery of site	Mitigation of NRHP eligible sites	Following ROD but before construction	Technical report issued for each site subject to data recovery

5.14.2.1 Consultation Process

Section 106 consultation pertaining to archaeological resources was conducted in conjunction with consultation for historic (aboveground) resources. The timeline and results of the consultation process for Section 4 were detailed in 5.13.2.1. Topics specific to archaeological resources discussed at the Section 4 consulting parties meetings focused on the phased research approach. The Tier 1 MOA was reviewed, and it was noted that the archival research and site file reviews focused on the study corridor. Consulting parties were informed that after the Preferred Alternative is selected, the Phase Ia surveys of the alternative's right-of-way will be completed in accordance with INDOT's standard practice for NEPA studies (described in the *Procedural Manual for Preparing Environmental Studies* (INDOT, December 2004), and promulgated by INDOT). Documentation associated with consulting party meetings (invitations, agenda, minutes, etc.) is contained in **Appendix N**, *Section 106 Documentation*.

5.14.2.2 Area of Potential Effects

One of the first steps in the Section 106 process is to define the Area of Potential Effects (APE). The APE is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. The area of potential effects is influenced by the scale and nature of an undertaking…" [36 CFR 800.9(a)].

The APE for archaeological resources, per 36 CFR 800.16(d), has been defined, through consultation with IN-SHPO, as the right-of-way for the Preferred Alternative. In Section 4, the right-of-way for the preferred alternative (Alternative 2) averages approximately 500 feet for the initial design criteria; however, the right-of-way widths would vary from about 300 feet to over 850 feet depending upon the alignment, terrain features, and local access treatments. The average right-of-way width for the low-cost design criteria is approximately 380 feet; however, the right-of-way widths would vary from about 270 feet to 700 feet depending upon the alignment, terrain features, and local access treatments. As described in Section 5.14.2, Phase Ia field studies have been conducted for the right-of-way for both the initial and low cost design criteria for the preferred alternative.

5.14.2.3 Research Methods

As part of the phased approach to Tier 2 archaeological studies, research for alternatives in the project study corridor consisted of a literature search, IN-SHPO site files check, and archival research. Site recordation forms for all sites were copied and site locations marked on project maps and entered into the Section 4 project Geographic Information System (GIS). The sites were considered in the alternative selection process described in this document.

Research for the FEIS included Phase Ia field surveys for the Preferred Alternative APE only. The Phase Ia field investigations employed a combination of field methods:

Shovel testing

This method was utilized in areas where ground surface visibility was less than 30%. This method consists of excavating 30-centimeter-diameter shovel tests at 10-meter or 15- meter intervals (the intervals were decreased to 5 meters when delineating the perimeter of an archaeological site). Shovel tests were excavated to a depth that penetrated subsoil by a depth of 10 centimeters or the maximum possible depth. The fill from these shovel tests was sieved through 0.25-inch, hardware cloth and all artifacts encountered were collected and provenienced to the shovel test and in relation to the soil horizons. A record was kept for all shovel tests excavated. This record includes soil profile, soil texture, soil color (Munsell), and presence/absence of cultural materials. Either landform boundaries or negative shovel probes determined site boundaries. In areas of subsurface disturbance, the interval between shovel tests was increased or soil coring was substituted at the discretion of the field supervisor.

Surface survey/collection

In areas where the ground surface permitted at least 30% visibility, surface collection/survey was utilized. This method consists of visually examining the ground surface at a maximum of 10-meter intervals. Once cultural materials were discovered, intervals no greater than 5 meters were utilized in the site area and its vicinity.

Visual Inspection

Areas of obvious physical disturbance and steep slopes were visually inspected. In undeveloped areas, this consisted of a walkover at 10-meter intervals. In areas recorded as low and wet, visual inspection included soil coring to document the presence of hydric soils.

Soil probes

In some areas that appeared to be disturbed, a one-inch diameter soil probe was used to extract a soil sample to determine if the stratigraphic profile was intact. If the profile was intact, a shovel test was excavated. If the profile was not intact, the location was recorded as disturbed.

Field notes and map notations were employed to record area designations, field conditions, located sites, and methods of investigation. Similar notes were taken for each site and include observations, methods of investigation, site size, and slope gradient and direction. Notes were retained for all shovel probes, and include information on Munsell soil color, soil texture, presence/absence of cultural materials, and stratigraphy. All artifacts located in the field were bagged, with the date and provenience marked on the bag. At least one shovel test was excavated at each site surveyed, even if it was discovered by surface survey, in an effort to gain information on site stratigraphy. All site boundaries were recorded by GPS to sub-meter accuracy. The results of the Phase Ia investigations for the Section 4 Preferred Alternative APE are presented in Section 5.14.3.

5.14.3 Summary of Archaeological Resources in Preferred Alternative

The Phase Ia archaeological investigations within the Section 4 APE for the initial design criteria and low cost design criteria right-of-ways for the preferred alternative facilitated the delineation of two previously recorded archaeological sites and identified 63 unrecorded archaeological sites. The sites included: 15 prehistoric isolated finds, 35 prehistoric lithic scatters, 4 historic scatters/farmsteads, 7 multicomponent prehistoric/historic scatters, a historic logging feature, a historic excavation pit, a historic quarry, and a railroad spur. The 65 sites identified during the archaeological investigations are summarized in **Table 5.14-2**.

Phase Ia archaeological surveys for mitigation areas also recorded archaeological sites within the preferred alternative.[3] Sites 12Gr1057, 12Mo1325, 12Mo1332, 12Mo1340, 12Mo1350,

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[3] Cochran, Donald R. and Carl Kirk, *Phase Ia Archaeological Reconnaissance Survey for the Glasgow Mitigation Site for Section 4, I-69, Evansville to Indianapolis Monroe/Greene County, Indiana. Des.No. 1005448.* Report prepared by Gray and Pape, Cincinnati, Ohio for Federal Highway Administration and Indiana Department of Transportation (September 3, 2010).
Kelley, Christina E. and Donald Burden, *Phase Ia Archaeological Reconnaissance Survey for the Bray Mitigation Site for Section 4, I-69, Evansville to Indianapolis Greene County, Indiana. Des.No. 1005454,* Report prepared by Gray and Pape, Cincinnati, Ohio for Federal Highway Administration and Indiana Department of Transportation (April 7, 2010).
Norr, Jeremy A., *Phase Ia Archaeological Reconnaissance Survey for the Elkins Mitigation Site for Section 4, I-69, Evansville to Indianapolis Monroe County, Indiana. Des.No. 1005604.* Report prepared by Gray and Pape, Cincinnati, Ohio for Federal Highway Administration and Indiana Department of Transportation (May 18, 2010).
Trader, Patrick D., *Phase Ia Archaeological Reconnaissance Survey for the Cornwell Mitigation Site for Section 4, I-69, Evansville to Indianapolis Monroe County, Indiana.* Report prepared by Gray and Pape, Cincinnati, Ohio for Federal Highway Administration and Indiana Department of Transportation (February 22, 2011).

12Mo1352, and 12Mo1353 were recorded during the mitigation surveys and are included in **Table 5.14-2**. The sites included 5 prehistoric lithic scatters and 2 multicomponent prehistoric/historic scatters.

Please note that 71 sites are listed in **Table 5.14-2**; however, six sites are outside of the preferred alternative APE.

Sites 12Gr1775, 12Gr1783, 12Mo1345, and 12Mo1350 were recommended for Phase II investigations. Seven sites, 12Gr1779, 12Gr1784, 12Mo1268, 12Mo1272, 12Mo1273, 12Mo1325, and 12Mo776, were recommended for avoidance or additional study. Seven creek crossing locations (two crossings in Black Ankle Creek, one crossing in Mitchell Branch, and four crossings in Indian Creek) were also identified for Phase Ic archaeological investigations.

In addition, a context study[4] prepared by project archaeologists recommended a discontiguous Virginia Iron Works Archaeological District and a discontiguous Victor Limestone Archaeological District eligible for the National Register of Historic Places (NRHP). One Contributing site, 12Mo1293, within the discontiguous Virginia Iron Works Archaeological District, and one Contributing site, 12Mo1280, within the Victor Limestone District were recommended for avoidance or additional work.

Table 5.14-2: Summary of Archaeological Sites Identified

State Site Number	Cultural Period(s)	Site Type	Size m2	Topography	Soils	Recommendations
12Gr1055	Early-Middle Archaic	Lithic Scatter	1.6 ha	Upland Ridge Spur	Zanesville Silt Loam	Not Eligible – No Further Work
12Gr1057	Archaic	Litthc Scatter	4.5 ha	Floodplain	Stendal, Steff and Cuba silt loam	Not Eligible– No Further Work
12Gr1763	Historic	Logging Feature	37 x 27	Hill Slope	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1764	Unidentified Prehistoric	Lithic Scatter	31 x 88	Ridge Top	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1765	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	Ridge Spur	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1766	Unidentified Prehistoric	Lithic Scatter	20 (diameter)	Ridge Spur	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1767	Unidentified Prehistoric	Lithic Scatter	25 x 25	Ridge Spur	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1768	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	Bench	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1769	Unidentified Prehistoric	Lithic Scatter	85 x 24	Ridge Spur	Zanesville Silt Loam	Not Eligible– No Further Work

[4] Patrick O'Bannon, Ph.D., Donald Burden, Patrick Trader and Beth McCord, *I-69 Corridor Tier 2 Studies Evansville to Indianapolis, Draft Virginia Iron Works and Limestone Quarry Context Study, Section 4, US 231 to SR 37*. Report prepared by Gray and Pape, Cincinnati, Ohio, for Federal Highway Administration and Indiana Department of Transportation (November 18, 2010).

Table 5.14-2: Summary of Archaeological Sites Identified

State Site Number	Cultural Period(s)	Site Type	Size m2	Topography	Soils	Recommendations
12Gr1770	Unidentified Prehistoric	Lithic Scatter	1132 m²	Hill Top	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1771*	Unidentified Prehistoric	Lithic Scatter	25 x 20	Ridge Top	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1772	Unidentified Prehistoric	Lithic Scatter	56 x 132	Ridge Spur	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1773	Unidentified Prehistoric	Lithic Scatter	44 x 38	Bench	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1774*	Historic	Artifact Scatter	20 x 45	Knoll	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1775	Early Archaic	Lithic Scatter	32 x 196	Ridge Spur	Zanesville Silt Loam	Potentially Eligible- Phase II Investigation
12Gr1776*	Historic	Artifact Scatter	65 x 32	Terrace	Gilpin-Wellston Silt Loams	Not Eligible– No Further Work
12Gr1777	Unidentified Prehistoric	Lithic Isolate	20 diameter	Hill Slope	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1778*	Unidentified Prehistoric	Lithic Scatter	20 x 80	Hill Slope	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1779	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	Flood Plain	Haymond Silt Loam	Insufficient – Phase Ic
12Gr1780	Historic	Well	20 (diameter)	Knoll	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1781	Unidentified Prehistoric	Lithic Scatter	2981 m²	Hill Slope	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1782	Unidentified Prehistoric	Lithic Scatter	12,556 m²	Bench/Terrace	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1783	Unidentified Prehistoric	Lithic Scatter	55 x 61	Bench	Zanesville Silt Loam	Potentially Eligible – Phase II Investigation
12Gr1784	Early Woodland	Lithic Isolate	20 (diameter)	T-1 Terrace	Haymond Silt Loam	Insufficient – Phase Ic
12Gr1785	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	Bench	Pike Silt Loam	Not Eligible– No Further Work
12Gr1855	Unidentified Prehistoric	Lithic Scatter	3876 m²	Ridge	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1856	Historic/ Unidentified Prehistoric	Artifact Scatter/ Isolated Find	42.5 m²	Ridgetop	Crider Silt Loam	Not Eligible– No Further Work
12Gr1857	Unidentified Prehistoric	Lithic Isolate	1 m²	Ridge Spur	Crider Silt Loam	Not Eligible– No Further Work
12Gr1858	Unidentified Prehistoric	Lithic Isolate	1 m²	Ridge	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1859*	Unidentified Prehistoric	Lithic Scatter	926 m²	Ridge	Ebal-Wellston Silt Loam, 10-18% slopes	Not Eligible– No Further Work
12Gr1860	Historic	Dump	35 m²	Ridge	Ebal-Wellston Silt Loam, 10-18% slopes	Not Eligible– No Further Work
12Gr1861	Unidentified Prehistoric	Lithic Scatter	70 m²	Ridge	Zanesville Silt Loam	Not Eligible– No Further Work
12Gr1862	Unidentified Prehistoric	Isolated Find	1 m²	Terrace	Zanesville Silt Loam	Not Eligible– No Further Work

Table 5.14-2: Summary of Archaeological Sites Identified

State Site Number	Cultural Period(s)	Site Type	Size m2	Topography	Soils	Recommendations
12Gr1863	Unidentified Prehistoric	Isolated Find	1 m²	Terrace	Haymond Silt Loam	Not Eligible– No Further Work
12Gr1868*	Historic	Coal Mines	4200 m²	Hill Slope	Gilpin-Wellston silt loam	Insufficient – Avoidance or further work
12Mo776	Unidentified Prehistoric	Lithic Scatter	70 x 20	Hill Slope	Hagerstown Silt Loam	Not Eligible in APE – Mark Site Boundaries
12Mo1267	Historic	House and Artifact Scatter	2928 m²	Bench	Crider Silt Loam	Not Eligible– No Further Work
12Mo1268	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	T-1 Terrace	Haymond Silt Loam	Insufficient – Phase Ic
12Mo1269	Unidentified Prehistoric	Lithic Scatter	58 x 42	Bench	Zanesville Silt Loam	Not Eligible– No Further Work
12Mo1270	Unidentified Prehistoric / Historic	Lithic Scatter/ Farmstead	69 x 61	Knoll	Wellston Silt Loam	Not Eligible– No Further Work
12Mo1271	Unidentified Prehistoric	Lithic Scatter	24 x 54	Bench	Zanesville and/or Tilsit Silt Loam	Not Eligible– No Further Work
12Mo1272	Woodland	Lithic Scatter	20 x 28	Bench/Base of Slope	Parke Silt Loam	Insufficient – Phase Ic
12Mo1273	Unidentified Prehistoric	Lithic Scatter	20 x 34	T-1 Terrace	Cuba Silt Loam	Insufficient – Phase Ic
12Mo1274	Unidentified Prehistoric	Lithic Scatter	20 x 25	Ridge Top	Tilsit Silt Loam	Not Eligible– No Further Work
12Mo1275	Unidentified Prehistoric	Lithic Scatter	50 x 20	Hill Slope	Crider Silt Loam	Not Eligible– No Further Work
12Mo1276	Unidentified Prehistoric	Lithic Scatter	20 x 74	Hill Slope	Crider Silt Loam	Not Eligible– No Further Work
12Mo1277	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	T-1 Terrace	Hagerstown Silt Loam	Not Eligible– No Further Work
12Mo1278	Unidentified Prehistoric	Lithic Scatter	20 (diameter)	T-1 Terrace	Hagerstown Silt Loam	Not Eligible– No Further Work
12Mo1279	Historic	Quarry	107 x 134	Hill Top	Hagerstown Silt Loam	Not Eligible– No Further Work
12Mo1280	Historic	Abandoned Railroad Spurs	Linear Transportation Features	Flood Plain/ Terrace	Haymond Silt Loam	Not Individually Eligible, Contributing Resources at VL – Further Investigation
12Mo1281	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	Bench	Hagerstown Silt Loam	Not Eligible– No Further Work
12Mo1282	Unidentified Prehistoric	Lithic Scatter	32 x 36	Bench	Hagerstown Silt Loam	Not Eligible– No Further Work
12Mo1283	Unidentified Prehistoric	Lithic Scatter	35 x 75	Flood Plain/ T-1 Terrace	Haymond Silt Loam	Not Eligible– No Further Work
12Mo1284	Unidentified Prehistoric	Lithic Scatter	2284 m²	Hill Slope	Crider Silt Loam	Not Eligible– No Further Work
12Mo1285	Unidentified Prehistoric	Lithic Scatter	30 x 20	Hill Slope	Hagerstown Silt Loam	Not Eligible– No Further Work
12Mo1286	Unidentified Prehistoric	Lithic Scatter	30 x 66	Bench	Hagerstown Silt Loam	Not Eligible– No Further Work
12Mo1287	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	Hill Slope	Crider Silt Loam	Not Eligible– No Further Work
12Mo1292	Unidentified Prehistoric	Lithic Isolate	20 (diameter)	Terrace	Cuba Silt Loam	Not Eligible– No Further Work

Table 5.14-2: Summary of Archaeological Sites Identified

State Site Number	Cultural Period(s)	Site Type	Size m2	Topography	Soils	Recommendations
12Mo1293	Historic	Excavation Pit	10 x 4	Hill Slope	Ebal-Gilpin-Hagerstown Silt Loams	Not Individually Eligible, Contributing Resources at VIW – Further Investigation
12Mo1325	Woodland/Historic	Artifact scatter	267 m²	Slope	Gilpin Gullied Land Complex	Insufficient – Further investigation
12Mo1332	Unidentified Prehistoric	Lithic scatter	122 m²	Ridge spur	Caneyville Silt Lloam	Not Eligible– No Further Work
12Mo1340	Unidentified Prehistoric	Lithic scatter	30 m²	Terrace	Pekin Silt Loam	Not Eligible– No Further Work
12Mo1343	Historic/Unidentified Prehistoric	Artifact Scatter	1844 m²	Ridge Top	Crider Silt Loam	Not Eligible– No Further Work
12Mo1344	Unidentified Prehistoric	Lithic Scatter	655 m²	Ridge	Crider Silt Loam	Not Eligible– No Further Work
12Mo1345	Historic/Unidentified Prehistoric	Farmstead/Artifact Scatter	1258 m²	Ridge	Haymond Silt Loam	Potentially Eligible – Phase II Investigation
12Mo1346	Historic/Unidentified Prehistoric	Artifact Scatter	1258 m²	Terrace	Crider Silt Loam	Not Eligible– No Further Work
12Mo1347	Historic/Unidentified Prehistoric	Historic Structure/ Artifact Scatter	2326 m²	Terrace	Burnside Silt Loam	Not Eligible– No Further Work
12Mo1348	Historic	Artifact Scatter	595 m²	Ridge	Parke Silt Loam	Not Eligible– No Further Work
12Mo1350	Unidentified Prehistoric/Historic	Artifact scatter	14,442 m²	Terrace	Pekin Silt Loam, Haymond Silt Loam	Potentially Eligible – Phase Ic/II Investigation
12Mo1352	Unidentified Prehistoric	Lithic scatter	100 m²	Terrace	Pekin Silt Loam	Not Eligible– No Further Work
12Mo1353	Unidentified Prehistoric	Lithic scatter	1625 m²	Terrace	Pekin Silt Loam, Haymond Silt Loam	Not Eligible– No Further Work

Note: Since the DEIS, this table has been substantially revised to provide more detailed information about sites in Section 4 Preferred Alternative APE.
**Designates sites identified during archaeological investigations, but not within the Section 4 Preferred Alternative*

5.14.4 Mitigation

Per 36 CFR 800.5(a)(1), an adverse effect is defined as a direct or indirect alteration to NRHP-eligible resources through a federal undertaking. Adverse effects of an undertaking, as related to archaeological resources, generally involve partial or complete destruction of a site. The finding for this project is Adverse Effect due to impacts to Contributing sites included in the Virginia Iron Works Archaeological District and the Victor Limestone Archaeological District. In addition, eleven individual sites were recommended for avoidance or additional study (Sites 12Gr1775, 12Gr1779, 12Gr1783, 12Gr1784, 12Mo1268, 12Mo1272, 12Mo1273, 12Mo776, 12Mo1325, 12Mo1345, and 12Mo1350). Seven creek crossing locations (two crossings in Black Ankle Creek, one crossing in Mitchell Branch, and four crossings in Indian Creek) were identified for Phase Ic archaeological investigations. Once additional studies are conducted on these sites, a determination can be made as to the NRHP eligibility of each. All of these archeological sites are considered to be chiefly important for what information can be gained

through data recovery and have little value for preservation in place. In a letter dated February 15, 2011, the IN-SHPO noted that the impacted Contributing sites within the archaeological districts do not warrant preservation in place.

Commitments for the completion of additional archaeological investigations at these sites are included in an MOA (see **Appendix N**, *Section 106 Documentation*). The MOA was signed on May 12, 2011. The MOA stipulates that Site 12Mo1293 in the Virginia Iron Works Archaeological District and site 12Mo1280 in the Victor Limestone Archaeological District will be documented per the Secretary of the Interior's Guidelines for Archaeological Documentation. Such documentation may include but not be limited to: plan view, photographs, profiles, cross-section, and the collection of material samples. The Section 4 MOA also included general mitigation as part of a larger mitigation stipulation for the I-69 corridor that was provided for in the I-69 Tier 1 MOA. This mitigation involves the preparation of an audio tour focusing on the cultural and natural environment along the I-69 corridor. Specific to the Section 4 portion of the tour, there is a proposed community history component whereby local members of the community can record memories/stories that relate to selected cultural themes; these memories/stories will incorporated into the audio tour if feasible.

If the results of further archaeological testing show that additional archaeological investigations or mitigation would be warranted, that work would be completed, in consultation with the Indiana SHPO and any appropriate consulting parties (for example, Native American tribes for prehistoric sites), before construction of the project could begin in those areas. Should any archeological discoveries be made that are subject to Section 4(f), these sites will be considered pursuant to 23 CFR 774.9(e). Any areas or sites requiring further investigation will be included in the ROD.

5.14.5 Summary

Section 106 of the National Historic Preservation Act of 1966, as amended, mandates that federal agencies consider the effects of their actions on historic properties, including archaeological resources. For Tier 2 of the I-69 project, a phased approach has been developed to accomplish this task. The literature review and research phase has been completed and was reported in the Section 4 DEIS document.

Phase Ia archaeological survey has been conducted for the Section 4 Preferred Alternative APE to identify whether NRHP-eligible archaeological resources are located within the APE and to determine what effect the proposed I-69 undertaking could have on those resources. The APE was investigated through shovel testing, surface collection/survey, and visual inspection. Phase Ia archaeological research identified 65 sites within the Preferred Alternative APE. (see **Table 5.14-2**). Eleven individual sites within the Section 4 Refined Preferred Alternative 2 right-of-way were recommended for avoidance or additional study and seven creek crossing locations were identified for Phase Ic archaeological investigations.

In addition to the Phase Ia archaeological survey, a historic context was prepared for the Virginia Ironworks and Victor Limestone areas. The context recommended a discontiguous Virginia Iron Works Archaeological District and a discontiguous Victor Limestone Archaeological District as

eligible for the NRHP. Three individual sites within these two recommended-eligible districts are also in the right-of-way for Section 4; two of the sites were recommended as Contributing to the districts. All of these archeological sites are considered to be chiefly important for what information can be gained through data recovery and have little value for preservation in place. SHPO concurred with the recommendation of discontiguous districts and recommended avoidance or additional work for one Contributing site within the Virginia Iron Works District and one Contributing site within the Victor Limestone District. The finding for the project is Adverse Effect, due to impacts to the Contributing sites within these two districts. Commitments for completion of additional archaeological investigations at these sites are included in an MOA.

On February 3, 2011, FHWA notified the Advisory Council on Historic Preservation (ACHP) of its findings and determinations, submitted documentation regarding the status of the archaeological surveys and MOA and invited ACHP's participation in consultation. On March 25, 2011, the ACHP stated, "we find no basis to object to the findings and determinations made by INDOT and FHWA for Section 4 of the I-69 Project" and declined to participate in consultation on the project. The findings and determinations, together with the draft MOA, were appended to the FHWA's Documentation of Section 106 Finding of Adverse Effect and sent for review and comment to the Indiana SHPO and all Section 4 consulting parties. After revisions to the MOA, the final version was circulated to the SHPO. FHWA and the SHPO signed the MOA with INDOT, the project applicant, as an invited signatory. The consulting parties were provided the opportunity to sign as concurring parties. All documentation referenced herein is provided in **Appendix N**, *Section 106 Documentation*.

5.15 Mineral Resource Impacts

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Sections 5.15.2 – Updated **Table 5.15-1** for Refined Preferred Alternative 2.
- Section 5.15.3 – Revised text referring to abandoned coal mines.
- Section 5.15.3 and Section 5.15.5 – Updated for Refined Preferred Alternative 2

5.15.1 Introduction

Mineral resources continue to play an integral role in society, as they have throughout human history. Mineral resources in Southwest Indiana include oil, gas, coal, shale, sand, gravel, limestone, and gypsum. These minerals have many uses, such as providing electricity for homes and offices; energy for transportation, and heating/cooling for residents and businesses; and building products. Building products include cement products from shale, asphalt paving bitumens from crude oil, and limestone premium aggregate products.

5.15.2 Methodology

Mineral resources were reviewed in this study using the project's Geographic Information System (GIS). Each alternative within the corridor was analyzed using GIS layers for mineral resources. The resources crossed by the alternatives were calculated and summarized for the following mineral resources: oil, natural gas and limestone. **Table 5.15-1** identifies the potential impacts of the Alternatives on mineral resources in the project corridor. **Figure 5.15-1** (p. 5-429) provides a general overview of potentially marketable limestone[35] in and near the project corridor. **Figure 5.15-2** (p. 5-427) shows an abandoned limestone quarry operation typical of the project area.

Table 5.15-1: Mineral Resources Potentially in Right-of-Way of Alternatives

Criteria	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial
Potentially Marketable Limestone* (Acres)	286	359	278	357	279	354	278	357	279	349
Abandoned Limestone Quarries	0	0	1	1	0	0	1	1	1	1

[35] Limestone is considered potentially marketable from the Blue River Group and the Sanders Group of limestone within the corridor to the east of Harmony Road based on 2009 personal communication with Hydrogeology, Inc. This is based on the quality of the limestone in the area and the shallow depth and potential surface accessibility to the limestone resource. For this analysis, potential marketability does not take into consideration current market conditions or the current status of proven marketable reserves.

Active Limestone Quarries	0	0	0	0	0	0	0	0	0	0
Active Oil/Gas Wells (number of wells)	0	0	0	0	0	0	0	0	0	0
Abandoned/Dry Oil/Gas Wells (number of wells)	1	1	1	1	1	1	1	1	1	1

Source: GIS layer titled Natural Regions SW, Coal Availability DA SW, Coal Availability SP SW; the Indiana Geological Survey (IGS) layers titled Petroleum Fields and Bedrock Geology; and Well Locations exported from the IGS Petroleum Database Management System (PDMS)

**Potentially Marketable Limestone consists of Blue River Group Limestone and Sanders Group Limestone located in the corridor east of Harmony Road.*

5.15.3 Analysis

Coal

There are no known areas of significant coal mining in Section 4. Eight small volume abandoned coal mines are reported to be present within the Section 4 corridor. The Indiana Geological Survey (IGS) has identified these abandoned coal mining operations as very old, small, and abandoned shallow surface and slope excavations. No active coal mines are present within the Section 4 corridor. Future coal mining is not anticipated in the Section 4 corridor.

Shale and Gypsum

There are no known significant shale or gypsum deposits in Section 4.

Limestone

Limestone resources are known to underlie portions of the project corridor. Limestone is potentially marketable in the corridor in the area east of Harmony Road in Monroe County. This is based on the quality of the limestone in the area and the shallow depth and potential surface accessibility to the limestone resource. For this analysis, potential marketability does not take into consideration current market conditions or the current status of other proven marketable reserves. This potentially marketable limestone is from the Blue River Group and the Sanders Group. Presently, there is no active quarrying occurring within the corridor. There are three active limestone quarries located near the north end of the Section 4 corridor. Two are located southeast and one is located west of the corridor. Alternative impacts to potentially marketable limestone resources range from 349 to 359 acres under the initial criteria, and from 278 to 286 acres under the low-cost criteria. Since no active quarries are being impacted by the alternatives and impacts to limestone resources are very similar for each alternative, project impacts to limestone are considered essentially equal. There are two abandoned quarries in the corridor. Alternatives 2, 4, and Refined Preferred Alternative 2 will impact one of these abandoned features. **Figure 5.15-1** (p. 5-429) shows the location of potentially marketable limestone resources and abandoned quarries.

Figure 5.15-2: Abandoned Limestone Quarry

Gas, Oil, and Gas Storage Fields

Much of Southwest Indiana contains known petroleum reserves. Oil and gas drilling has occurred in scattered locations in Greene and Monroe counties, including the project corridor. Presently, there are no active oil or gas wells within the project corridor. However, three abandoned gas wells, one abandoned salt water disposal (brine) well, and three dry wells are located in the corridor. Each alternative may impact one of the dry wells. This dry well is located in a roadway cut area so there is greater potential for impacting the well cap below the surface of the ground. The locations of the dry and abandoned wells are shown on **Figure 5.15-3** (p. 5-432).

The alternatives within Section 4 cross petroleum fields that may contain deposits of natural gas and oil. However, the construction of any Alternative should not impact the future extraction of said resources due to improvements in technology and extraction processes.

Sand and Gravel

Sand and gravel resources are known, but they have low potential for development. These areas exist north of Scotland and south of Koleen within the Section 4 corridor. Sand and gravel resources are mapped as having high potential for development within the southern portion of the Section 4 corridor east of Greene County CR 200E. Alternatives 1, 2, and 4 using the low-cost design criteria would result in very minor impacts to this mapped area (less than 0.01 acres).

5.15.4 Mitigation

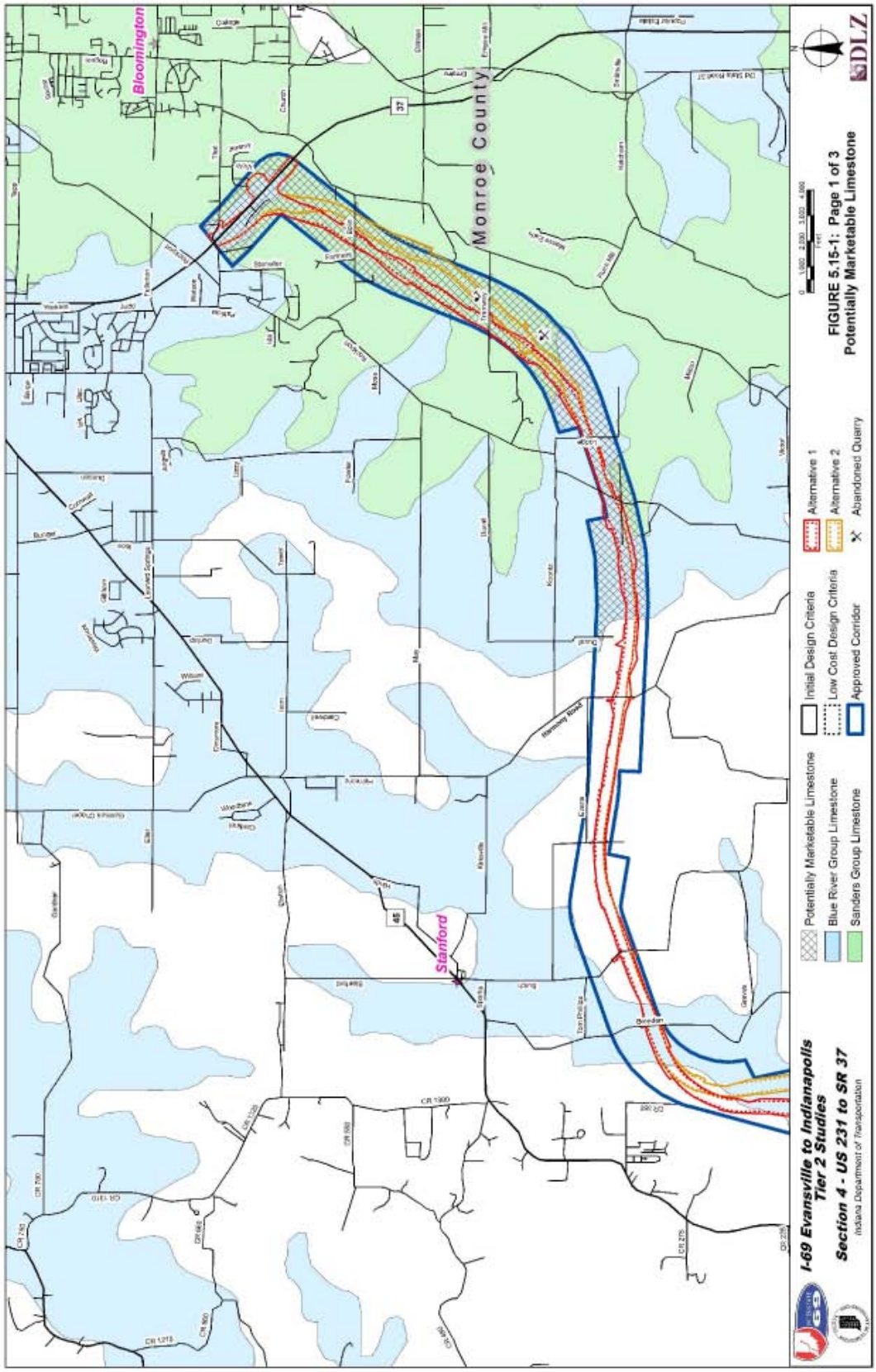
If the dry well is encountered during construction, proper closure methods shall be implemented through coordination with the Indiana Department of Natural Resources (IDNR) Division of Oil and Gas and the Indiana Department of Environmental Management (IDEM). No mitigation will be performed for impacts to known limestone deposits which are not commercially owned.

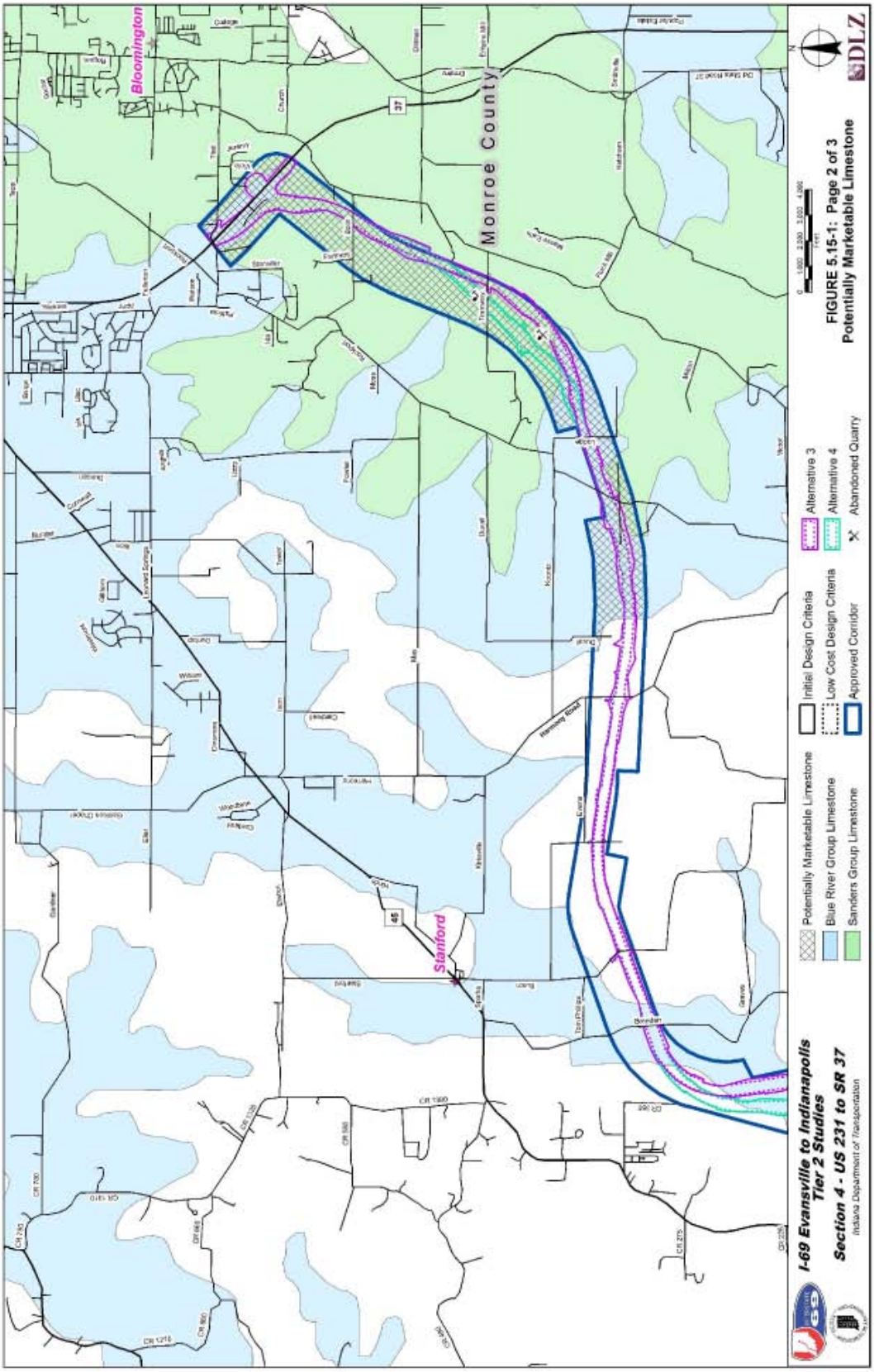
Blasting specifications will be implemented during roadway construction to prevent damage to adjacent potentially marketable limestone resources. Any limestone material that will be removed from roadway cut sections will be incorporated into the roadway either as fill or will be crushed and used as roadway base.

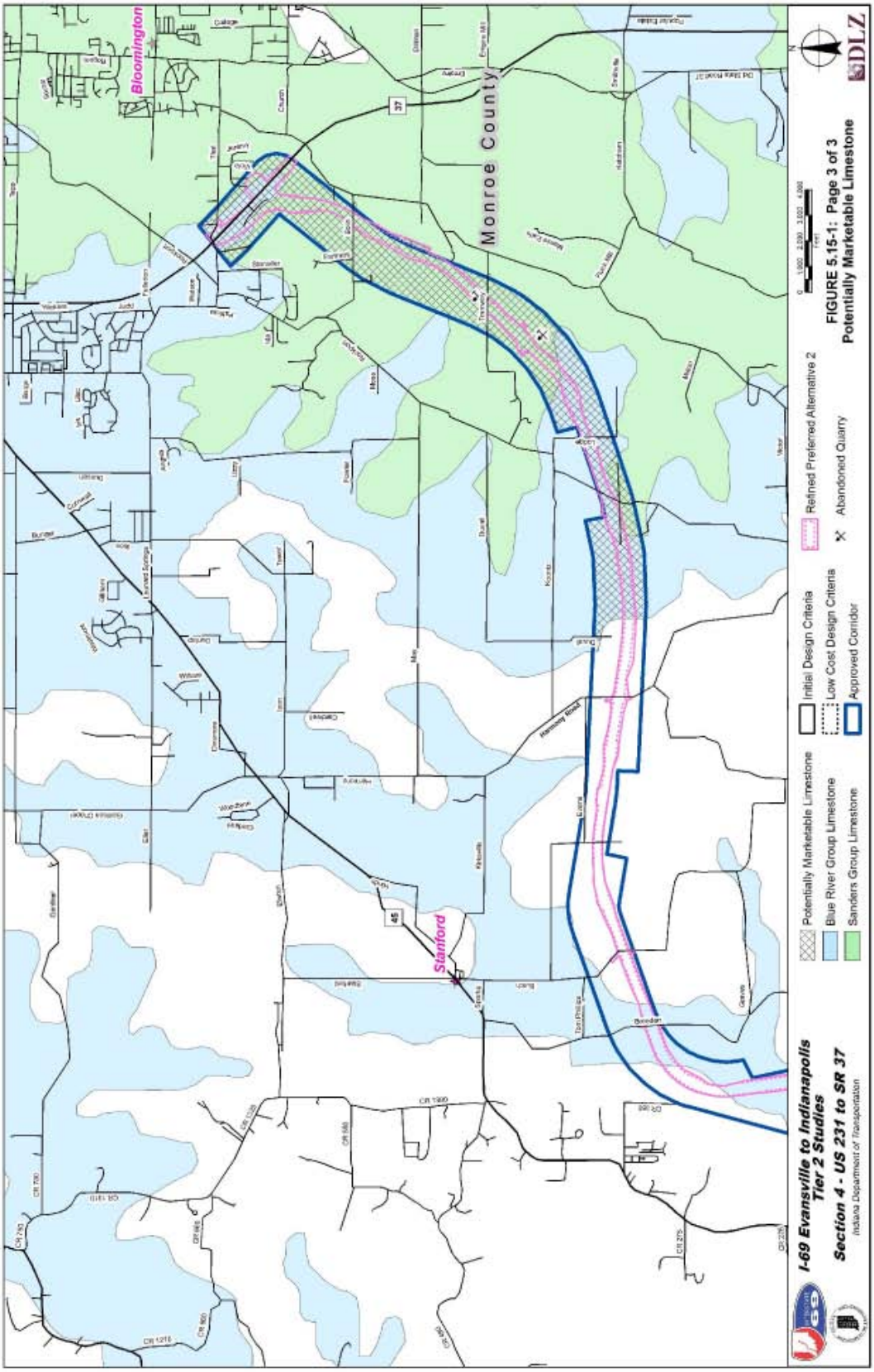
There may be impacts on the evaluation that exploration and financial investment groups make regarding in-place mineral reserves in the area. Decisions to explore, drill, and develop mineral resources are influenced significantly by service company infrastructure, product profitability, and land/lease associated costs. Land/lease costs would be affected by new transportation or utility development, residential development, and urban expansion. However, interruption of an existing operation and its extra associated cost would potentially affect the desirability of the natural resource development when compared to similar resources elsewhere. All property owners/interest owners will be compensated based on what is acquired at its fair market value at the time of the acquisition, as determined by its current developed use (e.g., mining, farming, residential, commercial, or other development).

5.15.5 Summary

The major mineral resource within Section 4 is limestone. Potentially marketable limestone in the corridor is primarily located east of Harmony Road. Alternative impacts to potentially marketable limestone resources range from 278 to 359 acres. All the proposed alternatives impact mineral resources to a similar degree. Alternatives 2, 4, and Refined Preferred Alternative 2 will impact one abandoned quarry.


Bloomington
Monroe County
Stanford
Potentially Marketable Limestone
Blue River Group Limestone
Sanders Group Limestone
Initial Design Criteria
Low Cost Design Criteria
Approved Corridor
Alternative 1
Alternative 2
Abandoned Quarry
FIGURE 5.15-1: Page 1 of 3
Potentially Marketable Limestone
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


Bloomington
Monroe County
Stanford
Potentially Marketable Limestone
Blue River Group Limestone
Sanders Group Limestone
Initial Design Criteria
Low Cost Design Criteria
Approved Corridor
Alternative 3
Alternative 4
Abandoned Quarry
FIGURE 5.15-1: Page 2 of 3
Potentially Marketable Limestone
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


Bloomington
Monroe County
Stanford
37
45
Potentially Marketable Limestone
Blue River Group Limestone
Sanders Group Limestone
Initial Design Criteria
Low Cost Design Criteria
Approved Corridor
Refined Preferred Alternative 2
Abandoned Quarry
FIGURE 5.15-1: Page 3 of 3
Potentially Marketable Limestone
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ

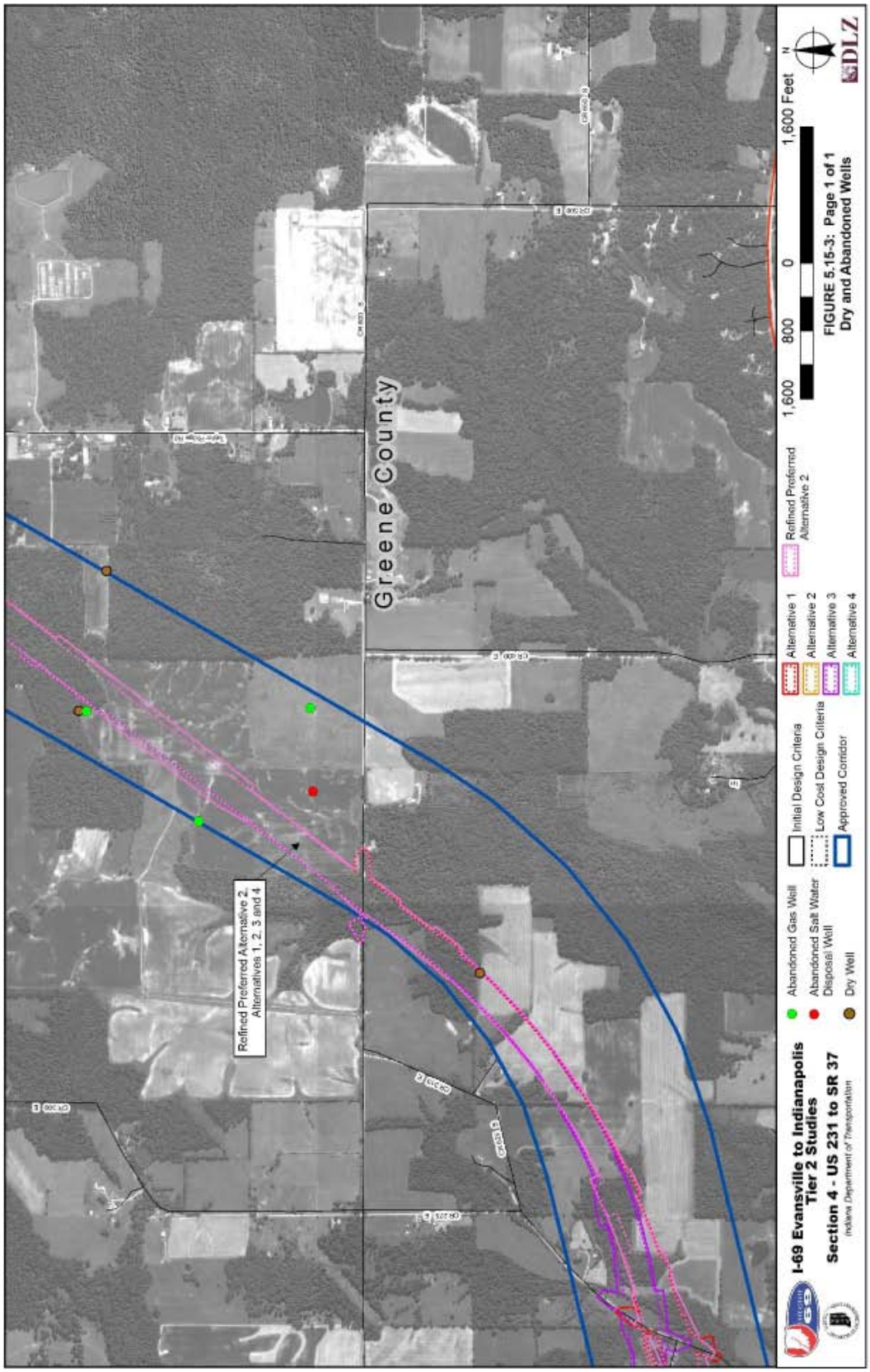


FIGURE 5.15-3: Page 1 of 1
Dry and Abandoned Wells

5.16 Hazardous Waste Sites

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section.

- Section 5.16.3 and Section 5.16.4 – Updated to include Refined Preferred Alternative 2
- **Table 5.16.1** – Updated to include Refined Preferred Alternative No. 2

5.16.1 Introduction

Hazardous waste sites are regulated by various laws including the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). During the Tier 2 process, the locations of permitted and non-regulated hazardous waste sites are being identified. The INDOT Potential Hazardous Waste Site Assessment Form is being used during the Tier 2 EIS process. Known or potential waste sites are identified and located on a map showing their relationship to the alternatives under consideration. If a known or potential hazardous waste site is impacted by an alternative, information about the site, the potential involvement, impacts, and public health concerns of the affected alternative(s) and the proposed mitigation measures to eliminate or minimize impacts or public health concerns will be discussed.

5.16.2 Methodology

The data used to identify the hazardous waste and Underground Storage Tank/Leaking Underground Storage Tank (UST/LUST) sites within the rights-of-way of the alternatives came from the Geographical Information System (GIS) layers and state and federal government databases. These databases are described in Section 4.5.1.

In addition to these databases, information from the Indiana Department of Environmental Management (IDEM) concerning brownfield sites and voluntary remediation program sites was reviewed.

A windshield survey of the project corridor was conducted to verify the locations of listed sites and to augment the database listings with additional hazardous waste sites not included in the various databases. Locations were compared to aerial photographs of the corridor to determine which sites would likely be impacted by the proposed alternatives. Identified sites were then field inspected and a *Potential Hazardous Waste Site Assessment Form* was completed for each location. Where possible, on-site inspections were conducted, which included photographs. **Figure 5.16-1** (p. 5-439) shows the locations of potential hazardous waste sites in the project corridor. See **Appendix H**, *Hazardous Materials Report*, for more information on potential hazardous waste sites.

5.16.3 Analysis

The alignment for the Section 4 Refined Preferred Alternative has been developed using the initial design criteria and certain low-cost design criteria as a measure to possibly reduce direct impacts and/or construction costs (See Section 5.1, *Introduction and Methodology*). Potential impacts upon hazardous waste sites were determined per the right of way and development of the Alternatives based upon the initial design criteria. Implementation of some or all of the low-cost design criteria will not change the impacts identified within this chapter. Refined Preferred Alternative 2 is the Section 4 Preferred Alternative.

5.16.3.1 RCRA, Brownfield, UST, and LUST Sites

No RCRA, brownfield, UST, or LUST sites were identified in the Section 4 corridor. There were three UST database sites and one LUST site located adjacent to the Section 4 corridor.

The three UST database sites and the LUST database site that were located adjacent to the corridor in Section 4 are described as follows:

Petro-Plus & Crossroads Café (HM-3): This facility consists of a gas station and restaurant and is located along the north side of SR 45 near the intersection of SR 45 and SR 445. This facility may be impacted by all five alternatives (including the Refined Preferred Alternative 2) for the development of the Greene/Monroe County Line interchange South Connector Road. This facility would not be impacted by the development of the Greene/Monroe County Line interchange North Connector Road. The facility (Facility ID 15998) contains two registered petroleum USTs in operation. This facility is not listed in the LUST database. **Figure 5.16-2** (p. 5-444) shows the facility along the north side of SR 45 near the intersection of SR 45 and SR 445.

Sunmart Food Store (HM-1): This facility consists of a gas station and convenience store located in the northeast quadrant of the intersection of SR 37 and Victor Pike in Monroe County. This facility (Facility ID 22232) contains four registered petroleum USTs in operation. The facility is not listed in the LUST database. The facility will not be impacted by the proposed alternatives.

Hasler Junction (HM-2): This facility consists of a gas station and convenience store located at the intersection of US 231 and SR 45/58. This facility (Facility ID 23015) contains four registered petroleum USTs that are currently in operation. The facility was not listed on the LUST database. This facility is located just to the south of the Section 4 corridor and was evaluated by the EIS in Section 3. A design for the US 231 interchange in Section 3 was chosen which avoids impacts to this location. See Section 3 FEIS, p. 5-241.

Pinewood Village (HM-4): This facility consists of a gas station and carwash that are located along the north side of SR 45, just east of the intersection of SR 45 and SR 445. The facility has two registered petroleum USTs that are currently in operation. A review of the IDEM Site files for this facility (FID 19717) indicated that a release from the underground storage tank at this facility was reported to IDEM on September 16, 2009. The release was identified as part of a Phase II Investigation being performed by the owner of the facility. The results of the Phase II

Investigation identified the presence of soil contamination at concentrations less than the IDEM Risk Integrated System of Closure (RISC) Residential and Industrial criteria. Groundwater samples were not collected as part of the Phase II Investigation. IDEM has directed the Owner of this facility to perform an Initial Site Characterization in accordance with 329 IAC 9-5-5.1 within 60 days of the reported release. As part of the Initial Site Characterization, the Owner must install a minimum of three soil borings, collect soil and groundwater samples and determine the groundwater flow direction. This facility will not be impacted by the proposed alternatives.

5.16.3.2 CERCLA Sites

No sites listed on the EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLA) were identified in or near the Section 4 corridor.

5.16.3.3 Active/Abandoned Landfill Sites

No active or abandoned landfill sites were identified in or near the proposed alternatives.

5.16.3.4 Other Hazardous Waste Sites

There are three locations that lie within the Section 4 corridor that represent a potential environmental concern. These sites consist of an open dump/auto graveyard (HM-6), a lumber yard/mill (HM-5), and a stone fabricating/cutting facility (HM-7). The open dump/auto graveyard is located at 7699 Evans Road and contains large piles of tires, automotive parts, vehicles, and other debris items scattered throughout the property. The southern portion of this site is located within the right-of-way of all five alternatives (including the Refined Preferred Alternative 2). **Figure 5.16-3** (p. 5-444) shows the open dump/auto graveyard with automotive parts and tire piles.

The small lumber yard/mill is located along Rockport Road near the intersection with West Evans Lane. The northern portion of the site is located within the right-of-way of all five alternatives (including the Refined Preferred Alternative 2). **Figure 5.16-4** (p. 5-445) shows the lumber yard/mill.

The stone fabricating/cutting facility (3-D Stone) is located at 6700 Victor Pike. A portion of the site is located within the right-of-way of the Alternative 3. **Figure 5.16-5** (p. 5-445) shows the 3-D Stone facility.

Three abandoned gas wells, one abandoned brine well, and three dry wells are located in the Section 4 corridor. One of the dry wells will be impacted by all five alternatives (including the Refined Preferred Alternative 2). The remaining wells will be avoided by all four alternatives.

Numerous rural residences and farms were identified within the Section 4 corridor that may have the potential for aboveground storage tanks (ASTs) and USTs to be present. These tanks are typically used for the on-site storage of chemicals associated with pesticides and herbicides and fuel for equipment. No specific sites were identified.

During the field inspection, utility owned pole-mounted electrical transformers located along public rights-of-way were observed. No visible indicators of oil leakage were observed. Due to the number and placement of these transformers, all five alternatives (including the Refined Preferred Alternative 2) may impact some of these transformers.

5.16.4 Mitigation

A Phase II Environmental Site Assessment consisting of soil and/or groundwater testing would be conducted for all properties located within the Refined Preferred Alternative 2 that contain USTs. The Phase II Environmental Site Assessment will be performed prior to or as part of right-of-way acquisition. The USTs located within the Refined Preferred Alternative 2 will be removed in accordance with applicable state and federal laws and regulations. As part of the removal of the USTs, an impact assessment consisting of soil and/or groundwater testing will be performed.

The IDEM site files for FID 19717 shall be reviewed to assess the results of the Initial Site Characterization report and any other investigations that may be performed at this facility. Based on the results of the review of the IDEM site files, if warranted a Phase II Environmental Site Assessment consisting of soil and/or groundwater testing will be conducted to determine if the properties located within the right-of-way limits of the Refined Preferred Alternative 2 have been impacted.

A Phase II Environmental Site Assessment will be conducted for the property where the open dump/auto graveyard is located to determine if the soil and/or groundwater have been impacted. The Phase II Environmental Assessment will be performed prior to or as part of right-of-way acquisition. The debris will be removed and properly disposed of in accordance with applicable state and federal laws and regulations.

A Phase I Environmental Site Assessment will be performed for the lumberyard/mill property prior to, or as part of, right-of-way acquisition. A Phase II Environmental Site Assessment will be performed, if warranted based on the results of the Phase I Environmental Site Assessment.

The dry well that is located within the right-of-way of all five alternatives (including the Refined Preferred Alternative 2) will need to be cut and capped in accordance with the requirements of the Indiana Department of Environmental Management and the Indiana Department of Natural Resources. The abandoned oil gas wells, abandoned brine well, and the other two dry wells will not require mitigation because they are not located within the right-of-way for Build Alternatives 1, 2, 3, or 4.

The 3-D Stone facility will not require mitigation since it is not located within the right-of-way of the Preferred Alternative.

Coordination will occur with the owners of electrical transformers before and during construction for proper handling and removal of any transformers or pipes affected by the Refined Preferred Alternative 2.

5.16.5 Summary

Table 5.16-1 summarizes the identified hazardous waste sites within Section 4 and suggested mitigation measures for each impacted site by the alternatives.

Table 5.16-1: Summary of Hazardous Waste Sites

Site ID	Site Name	Site Description	Affected Alternatives	Suggested Mitigation Measures
HM-3	Petro-Plus & Crossroads Café	Gas Station with UST's located along the north side of SR 45 at SR 45 and SR 445 intersection. Subsection F of the corridor.	1, 2, 3, 4, & Refined Preferred 2 County Line Interchange South Connector Road*	Conduct Phase II Environmental Site Assessment. Remove tanks in accordance with applicable state and federal laws and regulations and perform impact analysis consisting of soil and/or groundwater testing.
HM-1	Sunmart Food Store	Gas station with UST's located at the intersection of SR 37 and Victor Pike.	None	None required.
HM-2	Hasler Junction	Gas station with UST's located at the US 231 and SR 45/58.	None	Site is being evaluated as part of Section 3.
HM-4	Pinewood Village	Gas station with UST's located along SR 45 east of the intersection of SR 45 and SR 445.	None	Review IDEM site files for FID 19717. Phase II Environmental Site Assessment, if warranted.
HM-6	Open Dump/Auto Graveyard	Dump and auto graveyard located at 7699 Evans Road. Subsection G of the corridor.	1, 2, 3, 4 & Refined Preferred 2	Phase II Environmental Site Assessment and removal and disposal of all debris.
HM-5	Lumber Yard/Mill	Lumber yard/mill located along Rockport Road near the intersection with West Evans Lane. Subsection G of the corridor.	1, 2, 3, 4, & Refined Preferred 2	Phase I Environmental Site Assessment; Phase II Environmental Site Assessment, if warranted.
HM-7	3-D Stone	Stone Fabricating/Cutting Facilty	3	None required
	Abandoned Gas Wells & Brine Well	Located along the north side of CR 600S, just west of CR 400E. Subsection B of the corridor.	None	None required.
	Dry Well	Located near CR 600S , Subsection A of the Corridor.	1,2,3, 4, Refined Preferred 2	Cap in accordance with IDEM and IDNR Requirements
	---	Electrical Transformers (Multiple Locations)	1, 2, 3, 4, & Refined Preferred 2	Coordinate with owner for proper handling/removal if affected.
	---	Residence and farm UST's. No specific sites identified.	1, 2, 3, 4, & Refined Preferred 2	Soil and groundwater impact assessment and remove tanks in accordance with applicable state and federal laws and regulations.
	* Petro-Plus and Crossroads Café will not be impacted by the development of a Greene/Monroe County Line interchange North Connector Road.			

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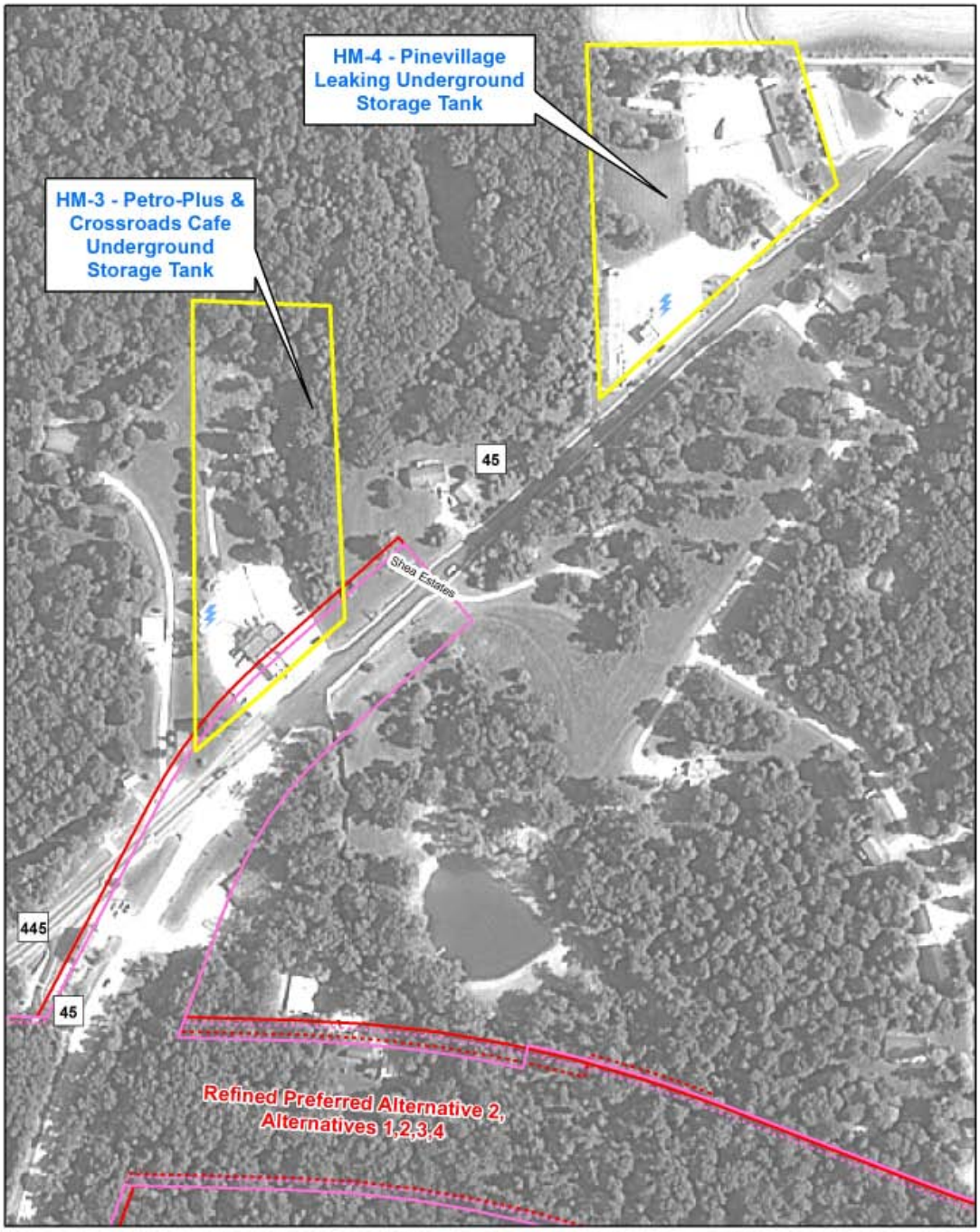


Underground Storage Tanks (Alternatives 1-4)

Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Potential Hazardous Materials Site
Approved Corridor
Parcel Boundary

FIGURE 5.16-1: Page 1 of 5
Potential Hazardous Waste Sites

0 55 110 220 330 440 Feet

N

DLZ

Open Dump / Auto Graveyard (Alternatives 1-4)

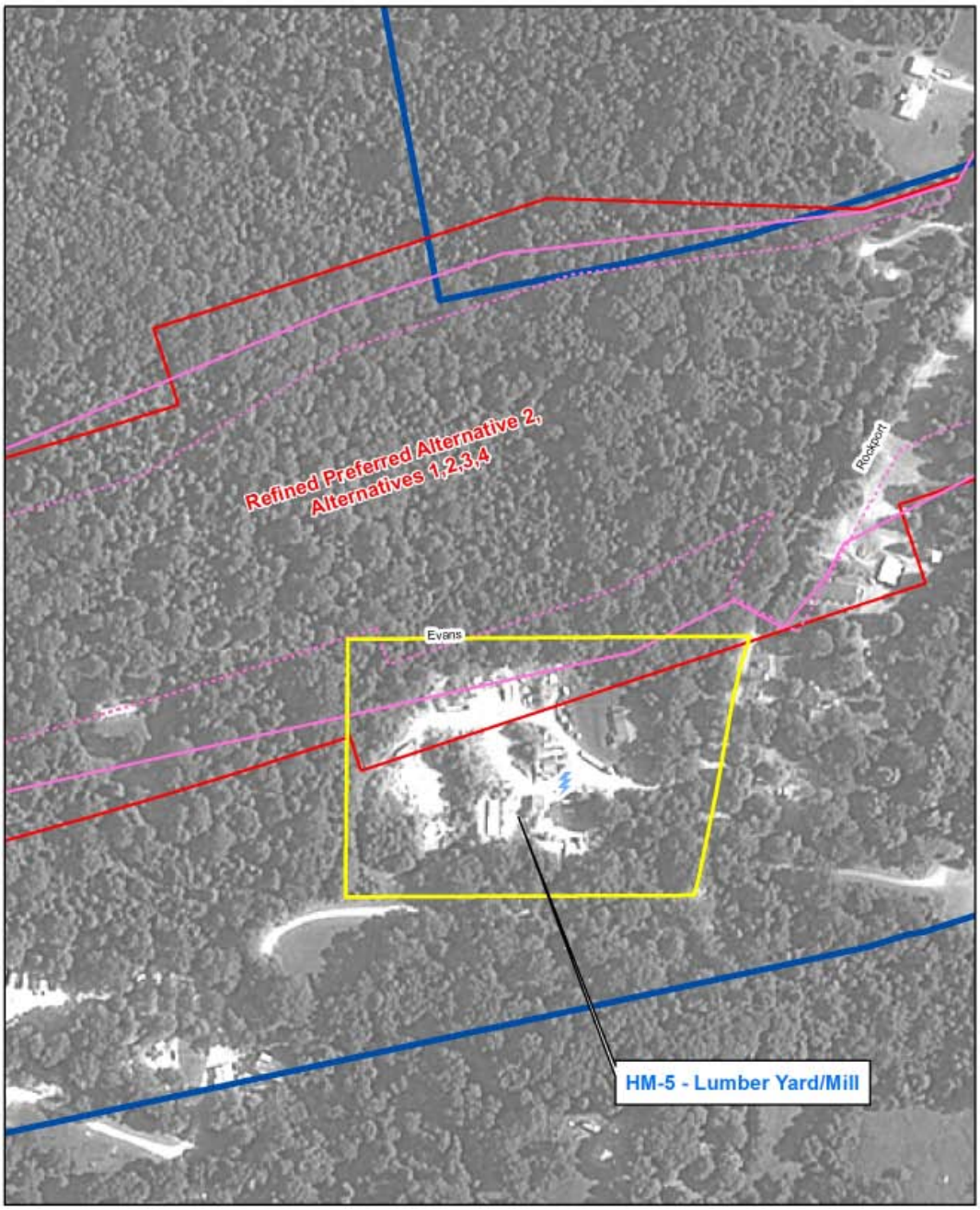
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Potential Hazardous Materials Site
Approved Corridor
Parcel Boundary

FIGURE 5.16-1: Page 2 of 5
Potential Hazardous Waste Sites

0 55 110 220 330 440 Feet

N

DLZ



Lumber Yard / Mill (Alternatives 1-4)

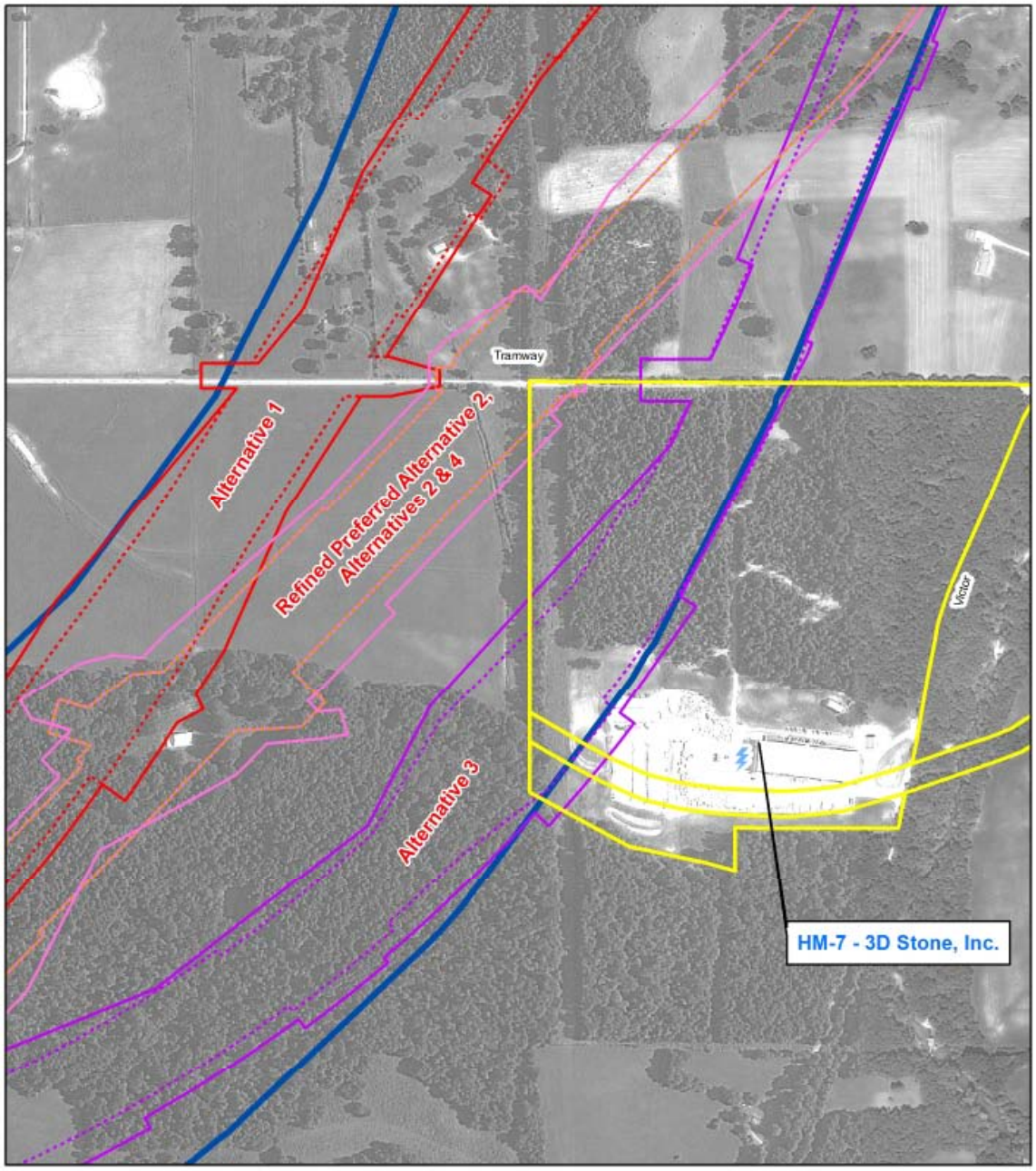
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Potential Hazardous Materials Site
Approved Corridor
Parcel Boundary

FIGURE 5.16-1: Page 3 of 5
Potential Hazardous Waste Sites

0 55 110 220 330 440 Feet

N

DLZ



3D Stone, Inc. (Alternatives 1-4)

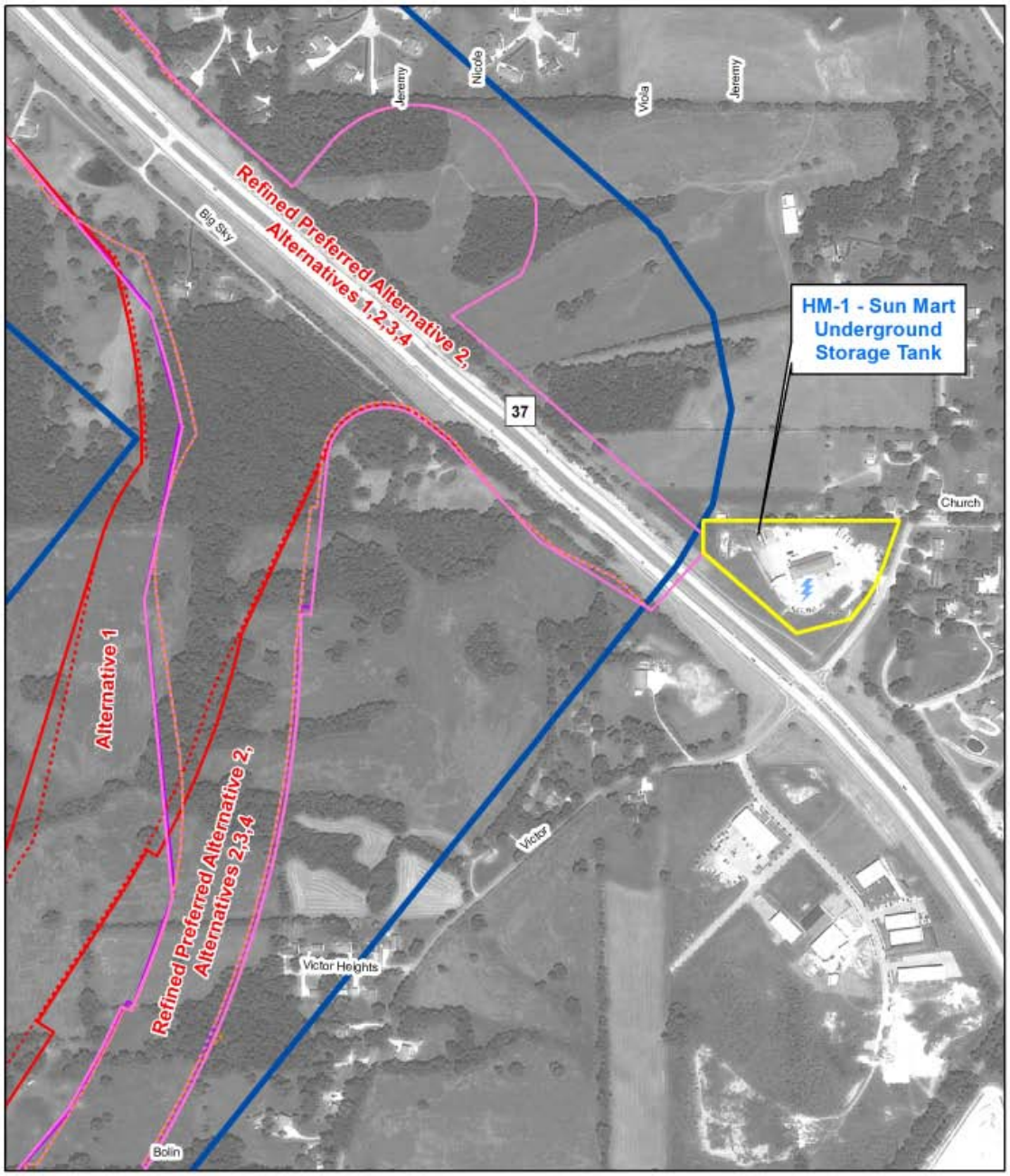
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Potential Hazardous Materials Site
Approved Corridor
Parcel Boundary

FIGURE 5.16-1: Page 4 of 5
Potential Hazardous Waste Sites

0 150 300 600 900 1,200 Feet

N

DLZ



Sun Mart Underground Storage Tank (Alternatives 1-4)

Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Potential Hazardous Materials Site
Approved Corridor
Parcel Boundary

FIGURE 5.16-1: Page 5 of 5
Potential Hazardous Waste Sites

0 150 300 600 900 1,200 Feet

N

DLZ

Figure 5.16-2: Gas Station along north side of SR 45at intersection of SR 45 and SR 445

Figure 5.16.3: Open Dump/Auto Graveyard located at 7699 Evans Road

Figure 5.16-4: Lumber Yard/Mill located along Rockport Road

Figure 5.16-5: 3-D Stone Facility located at 6700 Victor Pike

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5.17 Bald Eagles, Federal and State Threatened and Endangered Species

Since the DEIS, the following substantive changes have been made to this section:

- Section 5.17.1 – Updated **Table 5.17-1** with information on recent NEPA and Section 7 consultation with FWS.
- Section 5.17.1 – Added a footnote regarding pre-construction mist netting and the discovery of a 14th Indiana bat maternity colony.
- Section 5.17.1 – Updated with information regarding reinitiation of Tier 1 consultation and issuance of the Amendment to the Tier 1 revised BO, and the Section 4 Tier 2 Biological Assessment (BA) and Biological Opinion (BO).
- Section 5.17.2 – Added information on pre-construction mist netting for the Indiana bat.
- Section 5.17.2 – Added information on why selected caves were chosen for cave fauna surveys and information on recently discovered cave.
- Section 5.17.3.1 – Added results of 2010 pre-construction mist netting.
- Section 5.17.3.2 – Added information on USFWS conclusions regarding maternity colonies and winter, spring, and fall habitat from the Amendment to the Tier 1 revised BO.
- Section 5.17.3.2 – Provided information on the Section 4 Tier 2 BA and BO, and updated forest impacts associated with Refined Preferred Alternative 2.
- Section 5.17.3.2 – Added discussion on Section 4 Indiana bat maternity colonies.
- Section 5.17.3.2 – Moved bald eagle discussion to a new subheading, Bald and Golden Eagle Protection Act.
- Section 5.17.3.3 – Added a statement regarding forest and wetland mitigation benefitting state and federally listed species.
- Section 5.17.3.3 – Revised the common mudpuppy description of potential for occurrence and potential impact discussion.
- Section 5.17.3.3 – Revised the Henslow's sparrow potential for occurrence and potential impact discussions.
- Section 5.17.3.3 – Added cerulean warbler and hooded warbler to the discussions of State listed bird species.

- Section 5.17.3.3 – Revised discussions of loggerhead shrike, northern harrier, and red-shouldered hawk regarding 1993 bird surveys.
- Section 5.17.3.3 – Revised the bobcat potential for occurrence discussion.
- Section 5.17.3.3 – Revised the evening bat description of potential for occurrence and potential impact discussion.
- Section 5.17.4 – Information has been added regarding the Section 4 Tier 2 BA and BO. Section.
- Section 5.17.4 – The tree-cutting date restriction has been modified to now extend from April 1 through September 30 in the Indiana bat Summer Action Area and from April 1 to November 15 in the Indiana bat Winter Action Area.
- Section 5.17.4 - Revised the discussion of bat-friendly bridges to indicate that none are being proposed on I-69 due to concerns relative to attracting bats to the high-speed interstate facility.
- Section 5.17.4 – Revised the discussion minimizing impacts to floodplains.
- Section 5.17.4 – Updated discussion of roadside drainage to include treatment of karst features.
- Section 5.17.4 – Updated discussion of spill prevention/containment to include the locations where special measures will be put in place in the Indiana bat maternity colonies and Winter Action Area.
- Section 5.17.4 – Updated discussion of herbicide use plan to include the locations of environmentally sensitive areas.
- Section 5.17.4 - Updated the discussion of revegetation with native species.
- Section 5.17.4 – Updated the discussion of low salt zones and karst feature drainage areas.
- Section 5.17.4 – Updated the discussion of the use of BMPs for erosion control.
- Section 5.17.4 – Updated summer habitat creation/enhancement, wetland MOU, and forest mitigation discussions to include current mitigation acreages.
- Section 5.17.4 – Updated hibernacula purchase and autumn/spring habitat purchase discussions to include willing sellers for six Indiana bat hibernacula as a part of the mitigation sites.
- Section 5.17.4 – Updated mist netting discussion with results of 2010 survey.

- Section 5.17.4 – Revised language regarding the eastern box turtle to state that INDOT will continue to coordinate with IDNR regarding the species.
- Section 5.17.4 – Added updated information of the current status of proposed mitigation sites for Section 4.
- Section 5.17.5 – Updated to include discussion of the Tier 2 Section 4 BA and BO.
- Section 5.17.5 – Updated to include results of 2010 pre-construction mist netting surveys.
- Section 5.17.5 - Added Henslow's sparrow, cerulean warbler and hooded warbler to the species for which the potential for impacts have been identified. Removed common mudpuppy and evening bat.
- Section 5.17.3.3 – Added a statement regarding forest and wetland mitigation benefitting state and federally listed species.

5.17.1 Introduction

Federally Listed Threatened and Endangered Species

Threatened and endangered species are recognized by federal and state agencies as being in danger of extinction (endangered) or being sufficiently compromised that they are at risk of becoming endangered (threatened) either nationally or in a state. The assessment of endangered and threatened species is concerned with preservation and conservation of such species and their sustainability. This chapter will discuss both federally-listed and state-listed species.

Federally-listed species are protected under Section 7 of the Endangered Species Act (ESA). Section 7 directs all federal agencies, in consultation with the USFWS, to ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. Section 2 of the ESA also directs federal agencies to use their existing authorities to conserve threatened and endangered species.

Consultation with the USFWS is divided into two separate types for this project, informal consultation and formal consultation.

During Tier 1 studies for the I-69 Evansville to Indianapolis project, both formal and informal consultation with USFWS was conducted. The consultation provided for INDOT and FHWA to submit a Tier 1 Biological Assessment (BA) of potential impacts of the Evansville-to-Indianapolis project on threatened and endangered species. The conclusion of this process included the issuance of a Tier 1 Biological Opinion (BO) by USFWS. There were three federally listed species potentially affected by the project. This formal consultation determined there would be no adverse affect upon one species, the eastern fanshell mussel, and any effects were not likely to jeopardize the continued existence of two other species, Indiana bat and bald

eagle.[1] This formal consultation also provided for FHWA and INDOT to submit a Tier 2 Biological Assessment (BA) for each Tier 2 Section.

Coordination with USFWS during Tier 2 resulted in the re-initiation of Tier 1 formal consultation for the Indiana bat. Additional information provided by Tier 2 bat surveys prompted USFWS to re-examine the effects of the project as a whole on this species. Current information shows no bald eagle nests or eastern fanshell mussels within the corridor. Thus, there has been no re-initiation of formal consultation on the bald eagle or eastern fanshell mussel.

The re-initiation of formal consultation resulted in the preparation of an Addendum to the Tier 1 BA which was provided to the USFWS. Also, a finding was made that the project would not adversely modify any critical habitat of the Indiana bat. USFWS concurred with the determinations and issued a revised Tier 1 Biological Opinion (included herein as **Appendix DD**), which updated its finding on the Indiana bat and provided direction to be carried out in Tier 2 consultation.

Tier 1 Informal Consultation

FHWA and INDOT began consulting with USFWS prior to initiation of Tier 1 of this project. Informal consultation began May 18, 1999, prior to the issuing of the Notice of Intent for the Tier 1 project on January 5, 2000, when the resource agency meeting on the tiered approach was held. Beginning at this time, resource agencies were consulted to guide the analysis of resource impacts within the context of a tiered study. Since that time, FHWA and INDOT have consulted extensively with USFWS concerning this project.

On July 1, 2002, USFWS provided FHWA and INDOT a list of species for consideration for the 26-county Study Area of Southwest Indiana. (See Appendix Y of the Tier 1 FEIS.) The federally-endangered and threatened species that may be present within the proposed project counties and were considered in the environmental evaluation for the I-69 Tier 1 DEIS included:

1. Indiana bat (*Myotis sodalis*) — Endangered
2. Bald eagle (*Haliaeetus leucocephalus*) — Threatened
3. American burying beetle (*Nicrophorus americanus*) — Endangered
4. Eastern fanshell mussel (*Cyprogenia stegaria*) — Endangered
5. Fat pocketbook mussel (*Potamilus capax*) — Endangered

[1] In a final rule issued on July 9, 2007, the USFWS removed the Bald Eagle from the list of threatened and endangered species established under the Endangered Species Act. The bald eagle continues to be protected under the Bald and Golden Eagle protection Act (16 U.S.C. §§ 668-668d) and the Migratory Bird Treaty Act (16 U.S.C. §§ 703-712). In particular, the Bald and Golden Eagle Protection Act prohibits the incidental taking of a bald eagle except as allowed by a permit granted by the USFWS. On June 25, 2009, the USFWS issued INDOT and FHWA a permit under the Bald and Golden Eagle Protection Act for the I-69 Evansville to Indianapolis project based upon the incidental take permit under the ESA, 50 C.F.R. Part 22. FHWA and INDOT will comply with the Bald and Golden Eagle Protection Act permit requirements established by USFWS, which include Terms and Conditions associated with the Incidental Take Statement.

6. Rough pigtoe mussel (*Pleurobema plenum*) Endangered

On July 22, 2002, the Tier 1 DEIS was signed. On November 14, 2002, the USFWS responded with comments to the Tier 1 DEIS. These comments addressed, among other things, impacts to threatened and endangered species. USFWS indicated the following:

> *"Because all of the Build Alternatives are likely to have some adverse effects on federally listed species or their habitats, the USFWS anticipates that formal consultation under section 7(a)2 of the ESA will be required for this project if a build alternative is selected. If INDOT and FHWA select a build alternative as their preferred alternative, they will need to prepare a biological assessment (BA) to analyze the effects the preferred alternative will have on federally listed species and make an "effects determination." Once this determination has been made, FHWA should submit the BA and determination to the FWS's Bloomington Field Office and request concurrence with the determination or that formal consultation be initiated. If adverse effects are unavoidable, formal consultation is required and would conclude within a maximum of 135 days (unless a time extension was mutually agreed to)."*

After identification of the Preferred Alternative 3C on January 9, 2003, by then-Governor Frank O'Bannon, USFWS narrowed the number of federal species for consideration from six to three based upon geographic distribution. The three federal species that may be present in the Preferred Alternative 3C project area include:

1. Indiana bat (*Myotis sodalis*) Endangered
2. Bald eagle (*Haliaeetus leucocephalus*) Threatened[2]
3. Eastern fanshell mussel (*Cyprogenia stegaria*) Endangered

An agency coordination meeting was held March 11, 2003, at the Bloomington Field Office (BFO) of the USFWS to discuss, among other things, Section 7 consultation.

A Draft Biological Assessment (BA) was submitted to USFWS March 26, 2003, for its review. The BA described the Indiana bat, bald eagle, and eastern fanshell mussel. USFWS reviewed the Draft BA and provided comments to FHWA and INDOT on May 30, 2003. The document was revised, and a Final BA was submitted to the USFWS on July 18, 2003.

Tier 1 Formal Consultation

Formal Section 7 consultation for Tier 1 was initiated with USFWS by FHWA and INDOT July 21, 2003. On August 22, 2003, USFWS acknowledged receipt and completeness of the formal consultation and initiation package. In that letter, USFWS stated that, "we concur that the construction, operation, and maintenance of Alternative 3C of I-69 is not likely to adversely

[2] See footnote on page 5-450.

affect fanshell mussels. Therefore, this precludes the need for further consultation regarding the fanshell mussel and this project as required under Section 7 of the Endangered Species Act."

A Biological Opinion (BO), which included an Incidental Take Statement,[3] was received by INDOT and FHWA on December 3, 2003. The BO provided conclusions that "Alternative 3C of I-69 from Evansville to Indianapolis, as proposed, is not likely to jeopardize the continued existence of either the Indiana bat or the bald eagle," and "no destruction or adverse modification of [Indiana bat] critical habitat is anticipated. No critical habitat has been designated for the bald eagle."

Table 5.17-1 provides a summary of NEPA/Section 7 consultation for Tier 1 and Tier 2 as of July 2011 of this project.

[3] Section 9 of the Endangered Species Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited provided that such taking is in compliance with the terms and conditions developed prior to the action and set forth in an Incidental Take Statement.

Table 5.17-1: Summary of NEPA and Section 7 Consultation History for I-69 Tier 1 & Tier 2

Date	Event / Action
May 18, 1999	Agency review meeting held to discuss tiered approach for this project.
January 5, 2000	Notice of Intent to undertake Tier 1 NEPA study for I-69 between Evansville and Indianapolis is published in Federal Register.
February 3, 2000	INDOT and FHWA hosted a "Scoping Meeting" with environmental review agencies.
June 5, 2001	INDOT and FHWA convened an agency review meeting to discuss the "Purpose and Need Statement." A substantial portion of this meeting was devoted to discussing the type of agency coordination required in Tier 1 and Tier 2 of this study. The specific requirements of each agency were discussed in terms of its legal and regulatory responsibilities.
November 27, 2001	INDOT and FHWA convened an agency review meeting to discuss their "Screening of Alternatives" for I-69 (included environmental information).
December 21, 2001	BFO sent comments on the Draft Level 2 Alternatives Analysis Report for the Evansville to Indianapolis I-69 study including endangered species and critical habitat technical information.
March 14, 2002	Federally-listed species were reviewed and appropriate tables constructed with species, their number and status and presented to the USFWS at the BFO.
June 4 and 5, 2002	A BFO biologist took a two-day bus tour of I-69 alternatives focused on environmentally-sensitive areas with INDOT, FHWA, United States Environmental Protection Agency (USEPA), and Indiana Department of Natural Resources (IDNR).
June 2002	Through informal consultation with the USFWS, INDOT agreed to shift the common alignment of Alternative 3A, B, and C to be beyond the range of bats that forage around and hibernate in a cave that is Designated Critical Habitat for the Indiana bat in Greene County.
June 27, 2002	FHWA sent a letter to BFO requesting a list of federally-listed species and Designated Critical Habitat that may be present in the I-69 Study Area of five alternatives being carried forward for detailed analysis in the DEIS.
July 1, 2002	BFO sent FHWA a species list for all five alternatives that included six species and one cave Designated Critical Habitat for the Indiana bat that may be present within the proposed project counties.
July 31, 2002	INDOT and FHWA released their Tier 1 DEIS for public comment. The DEIS had been approved on July 22.
November 14, 2002	BFO comments on the Tier 1 DEIS are combined with those of the National Park Service and sent in a single letter from the Department of the Interior's Washington Office to FHWA.
January 9, 2003	Gov. Frank O'Bannon announced Alternative 3C as INDOT's recommendation as the "preferred alternative" for I-69.
February 21, 2003	FHWA requests a species list for their preferred alternative, 3C.
February 28, 2003	FHWA sends BFO a letter requesting comments on regarding the four variations of Alt. 3C around the City of Washington.
March 11, 2003	An Agency Coordination Meeting was held at BFO to discuss a Conceptual Tier 1 Forest and Wetland Mitigation Plan, Sections of Independent Utility, the proposed Patoka River crossing, and how the Sec. 7 consultation would be undertaken.
March 13, 2003	BFO sent FHWA a letter listing three species that may be present in the Alternative 3C Study Area, Indiana bat, bald eagle, and fanshell mussel.
March 14, 2003	BFO sent FHWA a letter recommending that it choose one of the two eastern routes around Washington (variation "WE1" was specifically recommended) as they were less likely to have adverse affects to Indiana bats or bald eagles because impacts to forest and wetlands would be smaller.
March 26, 2003	BFO was sent a Draft BA addressing effects to Alt. 3C on Indiana bats, bald eagles, and fanshell mussels and requested review and comments.
May 30, 2003	BFO returned comments on Draft BA.
June 15 – July 2003	BFO assisted INDOT and FHWA in developing Conservation Measures to be included in the BA that would avoid and minimize incidental take of Indiana bats and bald eagles.

Table 5.17-1: Summary of NEPA and Section 7 Consultation History for I-69 Tier 1 & Tier 2 (Continued)

Date	Event / Action
July 21, 2003	BFO received a revised BA and letter from FHWA requesting formal Section 7 consultation for the effects of Alt. 3C of I-69 on Indiana bats and bald eagles. The letter also requested concurrence that fanshell mussels were not likely to be adversely affected by Alt. 3C. The 135-day period for formal consultation began.
August 22, 2003	BFO sent FHWA a letter acknowledging receipt and completeness of formal consultation initiation package. Informed FHWA that the USFWS expected to provide them with a final Biological Opinion no later than December 3, 2003. Based on information contained in the BA, the USFWS also provided the FHWA written concurrence with their determination that the fanshell mussel was "not likely to be adversely affected" by the proposed construction, operation, and maintenance of Alternative 3C of I-69.
August – November 2003	BFO consulted with FHWA/INDOT to gain clarification on various issues resulting in several revisions to the Tier 1 BA.
November 28, 2003	BFO sent FHWA/INDOT a draft Biological Opinion for review.
December 2, 2003	FHWA/INDOT returned comments on draft BO to BFO.
December 3, 2003	BFO sent FHWA/INDOT the Final Biological Opinion for Alternative 3C of I-69.
December 2003	INDOT released Final EIS with Alternative 3C named as its preferred alternative.
March 2004	FHWA issued a Record of Decision approving the 3C corridor.
Summer 2004	Tier 2 mist net surveys revealed the presence of 13 maternity colonies and scattered occurrences of male Indiana bats throughout the 3C corridor.
Fall-Winter-Spring 2004 and 2005	Tier 2 surveys at caves within five miles of the 3C corridor revealed limited seasonal use by Indiana bats at a small number of caves without previous documented use by Indiana bats.
Summer 2005	Additional mist netting and radio tracking located additional Indiana bat roost trees within the 13 maternity colony areas.
July 1, 2005	FHWA and INDOT met with USFWS and agreed to reinitiate formal consultation on Tier 1 of I-69 in light of all the new information on Indiana bat maternity activity and hibernacula in the project area.
Fall 2005	BFO and project consultant staff held weekly meetings to guide development of the Tier 1 BA Addendum.
February 2006	FHWA, INDOT, and USFWS signed a Pre-consultation Agreement.
March 7, 2006	FHWA submitted a Tier 1 BA Addendum to the USFWS with a letter requesting to reinitiate formal consultation for the Indiana bat.
June & July 2006	BFO consulted with FHWA/INDOT/project consultants to gain clarification on various issues discussed within the BA Addendum.
July 10, 2006	BFO reviewed and submitted comments on the Tier 1 Re-evaluation Report for I-69, which outlined anticipated impacts resulting from the interstate being a toll road.
July 17, 2006	BFO met with FHWA/INDOT/project consultants to discuss findings of the Tier 1 Re-evaluation report and other issues. It was agreed to expand the Winter Action Area to include an additional cave, which would necessitate FHWA/INDOT/project consultants to provide additional data to BFO and an effects determination on the cave as Critical Habitat. It was mutually agreed to extend the formal consultation period to accommodate these changes.
July 20, 2006	BFO received a letter from FHWA stating that it determined that I-69 "may effect, but is not likely to adversely affect" the cave as Critical Habitat for the Indiana bat. Additional information was provided regarding impacts around this cave and revised data for the revised Winter Action Area.
July 26, 2006	USFWS provided FHWA a Draft of the revised Tier 1 BO and Incidental Take Statement for review.
August 10, 2006	FHWA/INDOT return comments on the draft revised Tier 1 BO to BFO.
August 24, 2006	BFO sent FHWA/INDOT the final Revised Tier 1 BO for Alternative 3C of I-69.
May 18, 2007	BFO sent FHWA a letter noting intention to prepare an individual Tier 2 BO for each Tier 2 section BFO concludes will be likely to adversely affect the Indiana bat and/or bald eagle. Each will be a stand-alone document rather than being appended to the 2006 revised Tier 1 BO.
June 22-24, 2010	Section 4 Three Day Agency Tour of proposed mitigation sites took place. Attendees included USCOE, USFWS, USEPA, INDOT, IDEM, & IDNR.
July 28-August 9,	Pre-construction mist netting was completed for a portion of Section 4.

Table 5.17-1: Summary of NEPA and Section 7 Consultation History for I-69 Tier 1 & Tier 2 (Continued)

Date	Event / Action
2010	
October 6, 2010	BFO Submitted general comments on the Section 4 Draft BA.
September 15, 2010	Department of Interior submitted formal comments on the Section 4 DEIS.
November 1, 2010	FHWA submitted a Tier 2 BA to the USFWS for Section 4.
November 23, 2010	BFO sent FHWA a letter acknowledging November 2, 2010, receipt of the letter and BA.
April 11, 2011	FHWA sent BFO a letter requesting reinitiation of formal Tier 1 consultation for the Indiana bat.
April 12, 2011	BFO sent FHWA a letter acknowledging receipt of April 11, 2011 letter and stating it plans to amend the Tier 1 Revised Programmatic Biological Opinion dated August 24, 2006.
May 18, 2011	Draft Amendment to the Tier 1 Revised Programmatic Biological Opinion dated August 24, 2006 sent to FHWA/INDOT for review.
May 23, 2011	FHWA/INDOT returned comments on the Draft Amendment to the Tier 1 Revised Programmatic Biological Opinion dated August 24, 2006 to BFO.
May 25, 2011	BFO sent FHWA/INDOT the final Amendment to the Tier 1 Revised Programmatic Biological Opinion dated August 24, 2006.
June 29, 2011	Draft Biological Opinion sent to FHWA/INDOT for review.
July 5, 2011	FHWA/INDOT returned comments on the draft Tier 2 BO to BFO.
July 6, 2011	BFO sent FHWA/INDOT the final Tier 2 BO for Section 4 of I-69.
Note: BFO = Bloomington Field Office, USFWS	

Re-initiation of Formal Tier 1 Consultation – Tier 1 Revised Programmatic Biological Opinion (August 24, 2006)

A meeting with FHWA, INDOT, and USFWS discussing the I-69 Tier 2 studies and Section 7 Consultation was held on July 1, 2005. During this meeting, USFWS recommended re-initiating formal consultation for only the Indiana bat. This would involve reexamining the I-69 corridor from Evansville to Indianapolis and possible impacts to the Indiana bat. The request for re-initiation was based on new field information collected in 2004 and 2005 concerning the Indiana bat. Re-initiation of formal consultation for Tier 1 resulted in the preparation of a BA Addendum for Tier 1 and issuance of a revised Tier 1 BO on August 24, 2006.

The BA Addendum was provided to USFWS on March 7, 2006. The BA Addendum detailed information gathered on the Indiana bat during Tier 2 studies and after the original BO was issued. Such studies included mist netting, radiotelemetry studies, emergence counts of roost trees, autumn and spring habitat surveys, and cave surveys.

Upon completion of its review of the Addendum, USFWS submitted a revised Tier 1 BO, including an Incidental Take Statement, to FHWA and INDOT on August 24, 2006. The revised BO replaces the original December 3, 2003, BO.

In Tier 1, a Summer Action Area (SAA)[4] for the Indiana bat was identified. This SAA is 2.5 miles to either side of the centerline of the corridor approved in Tier 1. This distance corresponds to the average range around maternity colonies in which female adult bats will forage during the summer breeding season. During consultation with USFWS, 13[5] Indiana bat maternity colonies with roosting/foraging areas were identified within the I-69 SAA. These colonies had not been identified and were not included in the original Tier 1 BA. According to the revised Tier 1 BO, three of these colonies are present near the Section 4 corridor. According to the revised Tier 1 BO, the USFWS believes that "despite the direct and indirect impacts from I-69 and other cumulative impacts, the USFWS believes that all 13 of the maternity colonies should still be able to persist in their current maternity areas, especially if proposed mitigation efforts are successful. USFWS recognized only a high level of concern for 4 out of the 13 colonies in regards to their long-term (50+ years) conservation/sustainability." (p. 87) The Indiana bat maternity colonies associated with Section 4 are not among the four colonies regarding which the USFWS had a high level of concern regarding long-term sustainability. These maternity colonies are discussed in Section 5.17.3.2.

In summary, as stated in the revised Tier 1 BO, the following effects are anticipated for the Winter Action Area (WAA):

- The Proposed Action will only directly or indirectly take or otherwise reduce the fitness of a relatively small number of bats (estimated total = 857 bats over a 17-year long period or about 50 bats/year) within the WAA and will only have minimal, short-term effects on these bats' respective maternity colonies and hibernating populations. The estimated amount of take only represents 1.2% of the *annual* winter population within the WAA. Similarly, loss of these individuals will have no adverse effect on the viability of other maternity colonies in the region or the species' range or to hibernating populations to which these individuals belong. So again, the Proposed Action in combination with relatively small amounts of cumulative impacts/take is not reasonably expected, directly or indirectly, to cause an appreciable reduction in the reproduction, numbers or distribution of the Indiana bat as a species. (p. 99)

In the revised Tier 1 BO, USFWS confirmed its original opinion that the I-69 project is "not likely to adversely affect the eastern fanshell mussel" and "is still likely to adversely affect but not jeopardize the bald eagle." Regarding the Indiana bat, USFWS concluded "the proposed extension of I-69 from Evansville to Indianapolis will have greater impacts to Indiana bats than were originally considered," but the project "is not likely to jeopardize the continued existence of the Indiana bat and is not likely to adversely modify the bat's designated Critical Habitat."

4 An "action area" is defined by regulation as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. (50 CFR 402.02) The action area is not limited to the footprint of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. FHWA and INDOT, and the USFWS-Bloomington Field Office jointly developed two seasonally based action areas for the Indiana bat—a Summer Action Area (SAA) and a Winter Action Area (WAA)—and one for the bald eagle (Bald Eagle Action Area). A SAA and a WAA for the Indiana bat, as well as a Bald Eagle Action Area were identified for Section 4.

5 During pre-construction mist netting for a portion of Section 4 in 2010, an additional Indiana bat maternity colony was identified. This brings the total number of maternity colonies to 14.

Re-initiation of Formal Tier 1 Consultation – Amendment to the Tier 1 Revised Programmatic Biological Opinion (August 24, 2006)

On April 11, 2011, the Federal Highway Administration again reinitiated Tier 1 consultation based on new maternity colony information, as well as documentation of the newly discovered disease White Nose Syndrome (WNS) within the action area. On May 25, 2011, the USFWS issued an Amendment to the August 24, 2006 Tier 1 revised BO, including a revised Incidental Take Statement.

During hibernacula surveys this past winter (2010-2011), the disease WNS was found within several Indiana caves, including some of those that serve as Indiana bat hibernacula. WNS was found on other species of hibernating bats (not Indiana bats). This is the first time the disease has been documented in Indiana. According to the USFWS, as of May 25, 2011 no Indiana bats in Indiana have been confirmed with WNS. In addition, during pre-construction mist netting in August 2010 (as required by a Conservation Measure in the Tier 1 revised BO) a fourth Indiana bat maternity colony was identified in Section 4. The new colony was named the Little Clifty Branch colony and brings the total number of maternity colonies to 14 project-wide. Finally, some minor impacts to the forest within five (5) miles of a cave, which has been designated as Critical Habitat for the Indiana bat under the Endangered Species Act, have recently been identified. The location of the habitat impacts had changed from the analysis completed for the Tier 1 revised BO. Specific impacts within five (5) miles of the cave designated as Critical Habitat were not identified because the County Line interchange north connector road was used in the original analysis. The north connector road is over five (5) miles from this cave. The south connector road for the interchange was chosen as the preferred connection and it resulted in minor forest impacts within five (5) miles of the cave. In light of the new information discussed above and in consultation with USFWS, FHWA and INDOT chose to reinitiate formal Section 7 consultation for the Indiana bat.

The Amendment to the Tier 1 revised BO addresses only those sections of the Tier 1 Revised BO that required new analysis for effects to the Indiana bat; otherwise the Tier 1 revised BO remains in effect.

The overall conclusions in the Amendment to the Tier 1 revised BO do not differ from those found in the Tier 1 revised BO. According to the Amendment to the Tier 1 revised BO (pg. 18):

> After reviewing the current status of the Indiana bat, updated information regarding WNS and the environmental baseline for the action area, and new information regarding the preferred alignment of the road connecting the County Line Interchange to SR 45/54/445 in Greene County, the USFWS has concluded that appreciable reductions in the likelihood of survival and recovery of Indiana bats due to the construction, operation, and maintenance of I-69 from Evansville to Indianapolis, Indiana are unlikely to occur, and hence, FHWA has ensured that their proposed action is not likely to jeopardize the continued existence of the Indiana bat or destroy or adversely modify its designated critical habitat.

Tier 2 Consultation

Because FHWA and INDOT are following a tiered approach for this project, USFWS has determined that a "tiered" consultation approach is appropriate. Under this approach, USFWS has completed a comprehensive and conservative "first tier" effects analysis in Tier 1. In conducting "second tier" section-specific consultations in Tier 2, USFWS ensures that actions "proposed under I-69's programmatic-level design standards (1) are consistent with the previously evaluated standards and conservation commitments, (2) that there is nothing unusual about the proposed Section-specific project that will result in unanticipated impacts, and (3) that the environmental baseline will be appropriately updated" (see **Appendix C**, letter dated May 18, 2007). USFWS used "reasonable worst case" assumptions when developing its Tier 1-level BO. This evaluation will be refined through Tier 2 section-level consultation.

This approach will ensure that FHWA can fulfill its responsibilities under Section 7(a)(2) of the Endangered Species Act to "insure" that actions implemented under the I-69 "program" are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat.

The programmatic approach for I-69 was originally followed in this study. However, further consultation with the USFWS has identified that the USFWS is no longer planning to follow an "appended" programmatic approach as presented on page 37 of the 24 August 2006 Revised Programmatic Biological Opinion (BO) for the second tier of the two-tiered consultation process for the I-69 project. Instead, the USFWS intends to prepare an individual Tier 2 BO for each of the six Tier 2 Sections for which the USFWS concludes will be likely to adversely affect the Indiana bat (*Myotis sodalis*) and/or bald eagle (*Haliaeetus leucocephalus*) (see letter dated May 18, 2007, in **Appendix C**). The Tier 2 BO for each of the six sections will be a stand-alone document that "tiers" back to the 2006 Revised Programmatic BO, rather than physically being appended to the Revised Programmatic BO.

Tier 2 Consultation – Section 4

Field studies in Section 4 included mist netting with radiotelemetry and Anabat, and bridge habitat surveys. Caves that provide winter habitat for the Indiana bat are referred to as hibernacula. The Winter Action Area (WAA) established for the Indiana bat includes land within a 5 mile radius circle around the known hibernacula within 5 miles of the 3C corridor. Caves within the WAA associated with Section 4 were harp trapped and surveyed to determine the presence of Indiana bats. Tier 2 studies related to the Indiana bat in Section 4 began in May 2004 and continued through August 2010.

As noted above, in Tier 1, a Summer Action Area (SAA) and a WAA for the Indiana bat were identified in Section 4. The Section 4 Tier 2 DEIS indicated that the project may induce additional development near the US 231 interchange and in eastern Greene County, outside the existing Tier 1 Indiana bat SAA. Therefore, the SAA for Section 4 has been expanded to include all areas identified as having the potential for induced growth. Most of the predicted growth falls within the Tier 1 Indiana bat WAA; however, it was expanded slightly to include areas identified with induced growth near the US 231 interchange. In addition, analysis of potential indirect

impacts to the Indiana bat in induced growth areas has been conducted as required by the revised Tier 1 BO.

Following USFWS's decision to prepare an individual Tier 2 BO for each section of I-69, on November 1, 2010, FHWA and INDOT sent USFWS-Bloomington Field Office (BFO) a letter requesting initiation of formal Section 7 consultation for possible effects of the Section 4 project on the Indiana bat. A Tier 2 BA for Section 4 was submitted to the USFWS with the letter for review by USFWS. This Tier 2 BA contains updated information on reasonably certain impacts of the Section 4 Refined Preferred Alternative 2 and proposed mitigation since the Tier 1 BA Addendum (March 7, 2006). The USFWS issued a Tier 2 BO for Section 4 on July 6, 2011. See Appendix JJ for the Tier 2 Section 4 BA and the BO.

In addition, FHWA and INDOT have agreed to commitments and mitigation in the revised Tier 1 BO, except where status changes were made in conservation measures reported in the revised Tier 1 BO. Such changes are documented in the Section 4 Tier 2 BO. Proposed mitigation for the Indiana bat includes providing additional forest and wetland habitat for the species.

The Tier 2 BA for Section 4 contains updated information on reasonably certain impacts of the Section 4 Refined Preferred Alternative 2, as identified in the Section 4 DEIS and subsequent modifications, and proposed mitigation since the Tier 1 BA Addendum (March 7, 2006). The Tier 2 BA identifies several mitigation sites in the vicinity of the Veale Creek, SR 57, Doans Creek, Plummer Creek, Little Clifty Branch, Indian Creek, Cave[6], and the Garrison Chapel Valley in Daviess, Martin, Greene, and Monroe Counties, on which Indiana bat summer and winter habitat will be created and enhanced through wetland and forest mitigation focused on riparian corridors and existing forest blocks to provide habitat connectivity. INDOT has purchased or is in the process of purchasing these sites. Proposed mitigation, including terms and conditions and conservation measures, is described in more detail in Section 5.17.4, *Mitigation.*

The Section 4 Tier 2 BA is intended to be reviewed in concert with the Tier 1 documents, field studies, and the Section 4 DEIS. Based on the Section 4 Tier 2 BA and associated documents, FHWA and INDOT determined that the overall impacts to the species as discussed in the Section 4 Tier 2 BA remain consistent with the findings in the revised Tier 1 BO and Amendment to the revised Tier 1 BO, and that the specific impacts within the Section 4 Tier 2 project are consistent with those analyzed in the consultation documented in the revised Tier 1 BO and amendment to the revised Tier 1 BO. FHWA and INDOT have determined that the project is "Likely to Adversely Affect" the Indiana bat. In its Section 4 Tier 2 BO issued on July 6, 2011 (See Appendix JJ2), USFWS concurred with FHWA and INDOT's determinations, and noted "the effects associated with the proposed construction, operation, and maintenance of Section 4 of I-69 are within the scope of effects contemplated in the recently amended Tier 1 Revised Programmatic Biological Opinion (2011). Upon evaluation of the proposed project, we believe incidental take of Indiana bats in the Section 4 Action Area is likely, but the impact of such taking is not likely to jeopardize the continued existence of the Indiana bat and is not likely to adversely modify the bat's designated Critical Habitat." (pg. 1) USFWS further stated: "with successful implementation and maturation of the proposed mitigation projects, permanent

[6] The cave is an important Indiana bat hibernaculum.

protection of two Priority 1A hibernacula, and other proposed mitigation and conservation measures, we anticipate that long-term habitat conditions for these colonies will be suitable and sustainable for the long-term survival and recovery of the species." (pg. 50) The issuance of the Section 4 Tier 2 BO concluded formal Section 7 consultation in I-69 Section 4.

5.17.2 Methodology

Endangered Species Surveys

Species specific surveys in Section 4 were conducted along with more generalized pedestrian surveys to determine the presence/absence of federal- and state-endangered and threatened species within the proposed I-69 project corridor. The survey methodologies are summarized below. The results of the surveys are described in Section 5.17.3, *Analysis*.

Indiana Bat Mist Netting

Through early coordination with USFWS, the federally-endangered Indiana bat (See **Figure 5.17-1**, p. 5-508 and **Figure 5.17-12**, p. 5-511) was identified as potentially present in the Section 4 Study Area . In the summers of 2004 and 2005, mist netting was conducted at selected sites within two miles on either side of the Section 4 corridor. This survey was conducted to document captures of all bat species, including the federally-endangered Indiana bat and the state-endangered evening bat. In addition, pre-construction mist netting was conducted for a portion of Section 4 in the summer of 2010. A detailed description of the survey methodologies and results for the Indiana bat can be found in *Summer Habitat for the Indiana Bat (Myotis sodalis) Within The Crawford Upland and Mitchell Plain From Scotland To Bloomington, Indiana* (ESI, 2004), *Additional Telemetry and Roost Studies of Summer Habitat For the Indiana Bat (Myotis sodalis) Within the Wabash Lowland, Crawford Upland, and Mitchell Plain Regions From Elberfeld to Bloomington, Indiana* (ESI, 2005), and *Pre-Construction Mist Netting for the Indiana Bat (Myotis sodalis) for Sites 2, 3, 8, 11, and 14 from US 231 to SR 45 Lower White River Watershed in Section 4 (Greene County, IN)* (BLA, 2010), provided in **Appendix O**, *Indiana Bat Surveys*. The methodology and results are summarized below.

According to the standard mist netting techniques as identified by the USFWS Mist Netting Guidelines (USFWS, 1999), two net sites netted for two nights are required for each square kilometer of Indiana bat habitat. Through consultation with USFWS, it was determined that 30 net sites would provide adequate coverage for Section 4. Parameters used for selecting exact net locations included access, canopy closure, travel corridors, size and quality of the adjacent habitat, and the presence of water. In addition to the mist netting activities, attempts were made to locate Indiana bat roost trees using radio-tracking technologies. A total of 72 bridges and culverts also were planned to be surveyed for the presence of bats. However, only 66 bridge locations were checked for bats and bat guano. The survey was conducted at 66 of these bridges/culverts, as one was not found at the specified location, one was under construction, and four were small culverts. Additional mist netting was conducted in the summer of 2005. The goal of the additional mist netting was to locate primary maternity roost tree(s) for the Indiana bat and to note the presence of the state-endangered evening bat. Pre-construction mist netting was conducted in 2010 for five of the 30 sites within Section 4. The pre-construction mist

netting is a commitment in the revised Tier 1 BO. Section 5.17.3 presents the results of the mist netting surveys.

Indiana Bat Harp Trapping and Cave Surveys

In addition to mist netting, harp trapping was conducted at 75 caves which were determined through coordination with USFWS to be potential Indiana bat habitat. These surveys were used to determine whether Indiana bats were present and to assess these caves as Indiana bat habitat. Traps were set to maximize coverage of flight paths used by bats at cave entrances. Typically, traps were placed at entrances, adjusted for height, and situated across (parallel to) the entrance. Areas of the entrance not covered by the trap were covered with netting to direct bats into the trap. Additional entrances were either trapped or excluded by netting. The caves were entered in winter 2005-2006 to search for hibernating Indiana bats. A detailed description of the survey methodologies and results for the Indiana bat can be found in *Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana* (BHE 2005), *Autumn, Winter, and Spring Habitat for the Indiana Bat (Myotis sodalis) Within the Crawford Upland and Mitchell Plain From Scotland to Bloomington, Indiana* (ESI, 2005), *Autumn 2005 and Winter 2006 Habitat for the Indiana Bat (Myotis sodalis) within the Crawford Upland and Mitchell Plain from Scotland to Bloomington* (ESI, 2006) and *Surveys for Indiana bats in Caves in Greene and Monroe Counties, Indiana* (BHE, 2006) provided in **Appendix O**.

Since the publication of the DEIS, ongoing public outreach lead to the identification of a cave with the proposed rights-of-way for all Section 4 Alternatives. This feature did not exist when surveys were completed in 2004 - 2006. It has been identified and added to the impacts for all alternatives. Karst geologic experts surveyed the cave on January 25, 2011 and March 8, 2011. No evidence of Indiana bats was observed during the field review. Due to the cave's length, size, configuration, temperature, and the lack of Indiana bat indicators, it is the opinion of the karst experts that this cave would not meet the criteria as an Indiana bat hibernaculum. See Section 5.21.3.10 for more information about this cave.

Cave Fauna Survey

Six sites within or in proximity to the Section 4 corridor were surveyed to determine the presence of cave fauna in 2006. Selection of the survey sites was based upon the results of karst studies within the Section 4 study area, which identified hydrologic connections between these sites and the Section 4 corridor or alternatives. The caves surveyed for cave fauna were selected based on the likelihood of impact from the proposed project. There were four additional caves that were found to have a hydrologic connection to the corridor, but were not surveyed because the alternatives either did not cross the connected feature's drainage area, or were down gradient of or in a cut section near the connected feature and would not direct any highway drainage to the feature. The cave fauna surveys were directed at invertebrate species (including state-listed species); however, observed vertebrate species were noted. A detailed description of the survey methodologies and results of this study can be found in *Interstate 69 Evansville to Indianapolis, Tier 2 Studies: Section 4 Cave Fauna* (Cave, Karst & Groundwater Consulting, in association with ESI, 2006), provided as part of **Appendix AA**.

Since the publication of the DEIS, ongoing public outreach lead to the identification of a cave with the proposed rights-of-way for all Section 4 Alternatives. This feature did not exist when surveys were completed in 2004 - 2006. It has been identified and added to the impacts for all alternatives. Karst geologic experts surveyed the cave on January 25, 2011 and March 8, 2011. No insects, invertebrates, or other fauna were observed inside the cave during the March 8, 2011 field review. See Section 5.21.3.10 for more information about this cave.

Generalized Pedestrian Surveys

Generalized pedestrian surveys were conducted to determine the presence/absence of listed species potentially located within the Section 4 corridor. A pedestrian survey consists of walking a study area and documenting floral and faunal species observed.

Many of the floral species in the Section 4 corridor were identified during wetland, stream, and forest analysis. However, many floral species are inconspicuous during certain times of the year and are only readily visible while in bloom or when fruit has matured. Additionally, certain species of wildlife are conspicuous and readily observed, but the majority of species are inconspicuous and elusive. The mobile nature of many mammal and bird species can limit the effectiveness of field surveys. Although surveys for these species can include actual sightings, more pertinent data is developed from identifying and characterizing habitat types that fall within the proposed project.

The potential of occurrence of listed species is based on the habitat needs of the species, its documented occurrence within the county of the project area, and the habitats encountered during the pedestrian surveys. The potential for occurrence is documented as “none” (habitat not present within project area), “low” (semi-suitable habitat present, but other factors such as disturbance, development pressures or other issues decrease the chances of locating and documenting this species), “moderate” (suitable habitat, but species has not been documented within project area), or “present” (species has been documented within the project area).

Bird species were observed during wetland, stream and forest field surveys to record the presence of any migratory bird species protected by the Migratory Bird Treaty Act (MBTA). The specific migratory bird species protected by the MBTA can be found in 50 CFR 10.13. Section 5.17.3 identifies the listed bird species observed in the Section 4 corridor.

Fish or Mussel Surveys

In 1996 a Draft Environmental Impact Statement was completed on the Southwest Indiana Highway Corridor from Evansville to Bloomington (Bernardin, Lochmueller & Associates, 1996). The Preferred Alternative corridor for the I-69 Evansville-to-Indianapolis project (Alternative 3C) is essentially on the same alignment as the alignment studied in the 1996 DEIS. Biological studies completed for the 1996 DEIS included those for fishes and mussels. The study conducted in the Section 4 Study Area did not produce notable results (i.e., no sites surveyed yielded any state or federally listed threatened or endangered fish or mussel species), and it was determined in consultation with IDNR and USFWS that no further surveys were necessary due to lack of suitable habitat for the species. In a meeting on May 23, 2006, the IDNR stated they felt

additional biota studies were not needed in the I-69 corridor because they are not likely to provide any new information.

5.17.3 Analysis

As previously noted, both species-specific and pedestrian surveys were conducted along the Section 4 corridor. A summary of the results for each survey type can be found below, followed by an evaluation of the likelihood of the occurrence of federal- and state-listed species in the Section 4 project area and potential impacts to the species as a result of the project.

5.17.3.1 Survey Results

Generalized Pedestrian Survey Results

No federally- or state-endangered flora or fauna was observed in the Section 4 corridor during generalized pedestrian surveys, which include the wetland, stream, and forest field surveys. One northern harrier, a state-endangered species, was observed in flight over a field along Tom Phillips Road, just north of the corridor and east of Breeden Road in Monroe County. The sharp-shinned hawk, a state species of special concern, was observed in various locations within the Section 4 corridor. The eastern box turtle, a state species of special concern was also observed within the corridor.

Bird species were observed during generalized pedestrian surveys to record the presence of any migratory bird species protected by the Migratory Bird Treaty Act (MBTA). The specific migratory bird species protected by the MBTA can be found in 50 CFR 10.13. Section 5.17.3 identifies the listed bird species observed in the Section 4 corridor.

Indiana Bat Mist Netting Results

In 2004, mist-netting surveys (see **Appendix** O) were conducted at 30 sites in Section 4. A total of 252 bats were captured, representing seven species, including Indiana bat (*Myotis sodalis*), big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), little brown bat (*Myotis lucifugus*), hoary bat (*Lasiurus cinereus*), northern bat (*Myotis septentrionalis*) and eastern tricolored or pipistrelle (*Perimyotis subflavus*), all of which are state-listed except the big brown bat. Section 5.17.3.3 discusses state-listed species. The Indiana bat is also federally-endangered. Section 5.17.3.2 discusses federally-listed species. A total of nine Indiana bats were captured. Three of the nine captured Indiana bats were fitted with radio-transmitters and tracked to roosts after release. Five roosts were located (four roost trees and one utility pole). None of these roosts were located within the project corridor. Sixty-six (66) bridges and culverts in the Section 4 corridor were inspected for bats. No Indiana bats were found at any of the bridge locations within the Section 4 corridor.

Additional mist netting (see **Appendix O**) was conducted at three Section 4 sites during the summer of 2005 for a total of 36 net nights. The goal of the additional mist netting was to locate primary maternity roost tree(s) for the Indiana bat. At the three netting sites, a total of 99 individuals representing six species were captured. Two adult male Indiana bats were captured,

but were not fitted with radio-transmitters. No additional maternity roost trees were identified. No evening bats were captured.

Pre-construction mist netting was conducted in July and August, 2010 for five of the 30 sites within Section 4. The pre-construction mist netting is a commitment in the revised Tier 1 BO. A total of 34 bats representing six species were captured, including Indiana bat (*Myotis sodalis)*, eastern red bat (*Lasiurus borealis*), little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), northern bat (*Myotis septentrionalis*), and eastern tricolored bat (*Perimyotis subflavus*) (formerly eastern pipistrelle). One male Indiana bat was captured and a radio-transmitter was placed on the bat. It was tracked to one primary roost tree and three secondary roost trees. The primary roost tree location is on land that is currently privately owned and not under INDOT control, but within the Section 4 Refined Preferred Alternative 2's right-of-way. This roost tree was found to no longer be standing in January, 2011. The USFWS has been made aware of these circumstances. A description of the survey results for the Indiana bat can be found in *Summer Habitat for the Indiana Bat (Myotis sodalis) Within The Crawford Upland and Mitchell Plain From Scotland To Bloomington, Indiana* (ESI, 2004), *Additional Telemetry and Roost Studies of Summer Habitat For the Indiana Bat (Myotis sodalis) Within the Wabash Lowland, Crawford Upland, and Mitchell Plain Regions From Elberfeld to Bloomington, Indiana* (ESI, 2005), and *Pre-Construction Mist Netting for the Indiana Bat (Myotis sodalis) for Sites 2, 3, 8, 11, and 14 from US 231 to SR 45 Lower White River Watershed in Section 4 (Greene County, IN)* (BLA, 2010), **Appendix O**.

Indiana Bat Harp Trapping and Cave Survey Results

Four rounds of harp trapping and cave surveys were conducted and documented in separate reports. Results of these four rounds of trapping/survey are described below.

Thirty caves were harp trapped during autumn 2004 for the federally-endangered Indiana bat (*Myotis sodalis*). A total of 1,081 bats representing 5 species were captured. These include 424 northern bats (*Myotis septentrionalis*), 417 little brown bats (*Myotis lucifugus*), 232 eastern pipistrelles (*Pipistrellus subflavus*), 6 Indiana bats (*Myotis sodalis*), and two big brown bats (*Eptesicus fuscus*). Indiana bats were captured at three caves. Surveyed caves were entered in winter 2005 to search for hibernating Indiana bats. A total of 627 bats representing five species were found. These include 382 little brown bats, 206 eastern pipistrelles, 29 Indiana bats, 6 big brown bats, and four northern bats. Indiana bats were found in two caves, one of which harbored 78% of the winter census. Two caves that were not entered in winter were again harp trapped during spring 2005 for the Indiana bat. A total of 296 bats representing three species were captured. These include 189 northern bats, 88 little brown bats, and 19 eastern pipistrelles. No Indiana bats were captured at these caves in the spring. A description of these survey results for the Indiana bat can be found in *Autumn, Winter, and Spring Habitat of the Indiana Bat (Myotis sodalis) Within the Crawford Upland and Mitchell Plain from Scotland to Bloomington, Indiana* (ESI 2005).

Thirty caves were harp trapped (autumn 2004) and surveyed (winter 2004 and 2005). A total of 719 bats representing four species were captured. These were 129 northern bats (*Myotis septentrionalis*), 296 little brown bats (*Myotis lucifugus*), 282 eastern pipistrelles (*Perimyotis*

subflavus), and 11 Indiana bats (*Myotis sodalis*). Thirty caves were surveyed during winter 2004 to search for hibernating bats. A total of 2,030 bats representing four species were found. These were 1,160 eastern pipistrelles, 844 little brown bats, 10 northern myotis, 9 big brown bat and 4 unknown *Myotis*. In spring 2005, 6 caves were trapped. A total of 27 bats representing four species were captured. These were 4 northern bats, 4 little brown bats, 17 eastern pipistrelles and 2 big brown bats (*Eptesicus fuscus*). Five caves were surveyed during spring 2005. The survey indicated that these caves were not used by hibernating bats for most of the previous winter. A description of these survey results for the Indiana bat can be found in *Surveys for Indiana Bats in Caves in Greene and Monroe Counties, Indiana* (BHE 2005).

In addition, seven caves were trapped (autumn 2005) and surveyed (winter 2006). A total of 384 bats representing four species were captured. These were 217 northern bats (*Myotis septentrionalis*), 118 little brown bats (*Myotis lucifugus*), 47 eastern pipistrelles (*Perimyotis subflavus*), and two Indiana bats (*Myotis sodalis*). The Indiana bats were captured at a cave in Greene County. The same caves were entered in winter 2006 to search for hibernating Indiana bats. A total of 216 bats representing three species were found. These were 136 eastern pipistrelles, 79 little brown bats, and one Indiana bat. Like the autumn survey, the Indiana bat was found in the same Greene County cave. This cave harbored 35 percent and 32 percent, respectively of the bats found during autumn and winter censuses. A description of these survey results for the Indiana bat can be found in *Autumn 2005 and Winter 2006 Habitat for the Indiana Bat (Myotis sodalis) within the Crawford Upland and Mitchell Plain from Scotland to Bloomington* (ESI, 2006), **Appendix O**.

Eight caves were trapped (autumn 2005) and surveyed (December 2005). A total of 84 bats representing four species was captured. These were 39 northern bats (*Myotis septentrionalis*), 33 little brown bats (*Myotis lucifugus*), 10 eastern pipistrelles (*Pipistrellus subflavus*), and two Indiana bats (*Myotis sodalis*). The Indiana bats were captured at a cave in Monroe County. The same caves were entered in winter 2005-2006 to search for hibernating Indiana bats. A total of 248 bats representing four species were found. These were 159 eastern pipistrelles, 80 little brown bats, one northern myotis and 8 big brown bats. A description of these survey results for the Indiana bat can be found in *Surveys for Indiana bats in Caves in Greene and Monroe Counties, Indiana* (BHE, 2006), **Appendix O**.

Bridge Inspections for the Presence of Roosting Bats

A total of three bats (two northern bats and one unidentified species) were observed roosting at two of the 66 inspected bridge locations. No guano was observed to be present at any of the inspected locations.

Cave Fauna Survey Results

Representatives of 76 taxa were identified; including the Indiana bat, little brown bat and eastern pipistrelle. All of the bats observed were found at a cave, which is located north of the Section 4 corridor in Greene County. Indiana bats were observed on two occasions; one individual was observed on August 12, 2006, and two individuals were observed on September 16, 2006. Fourteen (14) obligate subterranean species were found; including Weingartner's cave flatworm,

Jeannel's groundwater ostracod, Northern cave isopod, Packard's groundwater amphipod, Indiana cave amphipod, Bollman's cave millipede, Subterranean sheet-web spider, Cavernicolous sheet-web spider, Fountain cave springtail, Ashcraft cave springtail, Ray's cave beetle, Krekeler's cave ant beetle, Cave dung-fly and Indiana cave springtail. Hilly springtails (not an obligate subterranean animal) were also found. A detailed description of the survey methodologies and results of this study can be found in *Interstate 69 Evansville to Indianapolis, Tier 2 Studies: Section 4 Cave Fauna* (Cave, Karst & Groundwater Consulting, in association with ESI, 2006), provided as part of **Appendix AA**.

5.17.3.2 Federally-Listed Species

Federally-Listed Flora

Based on the Section 7 consultation initiated with USFWS as part of the Tier 1 FEIS, no federally listed plant species were identified as species of consideration for this project. According to IDNR Division of Nature Preserves (DNP) Natural Heritage Data Center database, there are no recorded occurrences of federally listed flora species known to occur within Greene and Monroe counties. Furthermore, no federally listed species of flora were observed during the Tier 2 field studies for Section 4. Therefore, no impacts to federally listed flora are anticipated in Section 4.

Federally-Listed Fauna

Based on the Section 7 consultation initiated with USFWS as part of the Tier 1 FEIS, described in Section 5.17.1, the following federally-listed endangered or threatened species were identified by USFWS as being potentially located within the Section 4 project corridor. The Tier 1 Section 7 consultation also included the bald eagle, which has since been delisted. The bald eagle is still federally protected under the Bald and Golden Eagle Protection Act and is discussed under a separate section below. The results of the Tier 1 Section 7 consultation are described following the description of each species below:

- **Indiana bat (*Myotis sodalis*,** see **Figure 5.17-1**, p. 5-508 and **Figure 5.17-12**, p. 5-511**) SE (State-Endangered), FE (Federal-Endangered):** During the summer months, Indiana bat habitat consists of wooded or semi-wooded areas, mainly along streams and riparian corridors. Solitary females or small maternity colonies bear their offspring in hollow trees or under loose bark of living or dead trees. Dead trees are preferred roost sites and trees standing in sunny openings are attractive since the air spaces and crevices under the bark provide warmth and cover. Typical roost tree species include red elm (*Ulmus rubra*), American elm (*Ulmus americana*), northern red oak (*Quercus rubra*), post oak (*Quercus stellata*), white oak (*Quercus alba*), shingle oak (*Quercus imbricaria*), shagbark hickory (*Carya ovata*), bitternut hickory (*Carya cordiformis*), red hickory (*Carya ovalis*), silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), Eastern cottonwood (*Populus deltoides)*, green ash (*Fraxinus pennsylvanica*), sassafras (*Sassafras albidum*), shell bark hickory (*Carya laciniosa*), white ash (*Fraxinus americana*) and black locust (*Robinia pseudoacacia*). Indiana bats have been known to use the same roost sites in successive summers, which suggest site fidelity. During the winter, the Indiana bat gathers in large numbers in a few caves in Indiana and elsewhere (Mumford & Whitaker, 1982). Indiana bats

were captured near the Section 4 corridor and the species is considered to be present within the project area.

- **Eastern fanshell mussel (*Cyprogenia stegaria*) SE, FE:** The eastern fanshell mussel (see **Figure 5.17-3**, p. 5-508) inhabits medium to large rivers in gravel riffles. It has a rounded, solid, and moderately inflated shell, numerous pustules (typically concentrated in the center of the shell), elevated growth lines, and broken green rays. The eastern fanshell mussel has a length of up to three inches. Based on previous studies, no eastern fanshell mussels have been found nor are they expected in the Section 4 corridor.

The formal and informal Section 7 consultation with USFWS during the Tier 1 EIS process narrowed the list of federal species for consideration during the Tier 2 process to the Indiana bat, the bald eagle and the eastern fanshell mussel. FHWA and INDOT prepared a Tier 1 BA for all three species identified by USFWS and an Addendum to the Tier 1 BA for the Indiana bat. Based on the original Tier 1 BA, USFWS issued a BO on December 3, 2003, in which it concluded that the construction, operation, and maintenance of I-69 is "not likely to adversely affect the eastern fanshell mussels"; and is "not likely to jeopardize the continued existence of either the Indiana bat or the bald eagle."

On August 24, 2006, USFWS issued a revised Tier 1 BO. The revised BO concurred with the conclusions of the December 2003 Tier 1 BO regarding the mussel, bald eagle, and Indiana bat, and additionally concluded the project would not be "likely to destroy or adversely modify [Indiana bat] designated Critical Habitat." Regarding Critical Habitat for the bald eagle, the revised BO noted, "[B]ecause no Critical Habitat has been designated for the bald eagle, none will be adversely modified by this project." The revised BO also included an incidental take statement for both species. The revised BO specifies the procedures to be followed for Section 7 consultation in Tier 2. On May 25, 2011, as a result of reinitiating Tier 1 consultation for the Indiana bat due to new information on White Nose Syndrome (WNS), a new Indiana bat maternity colony in Section 4, and minor forest impacts within five miles of a cave designated as Critical Habitat, the USFWS issued an Amendment to the August 24, 2006 Tier 1 revised BO, including a revised Incidental Take Statement. This Amendment to the Tier 1 revised BO stated, "the Service determined that the aggregate level of anticipated take is not likely to result in jeopardy to Indiana bats or destruction or adverse modification of designated Critical Habitat."

A Tier 2 Biological Assessment (BA) for Section 4 on Refined Preferred Alternative 2 has been prepared for USFWS in accordance with those procedures. It provides USFWS any new information available and documents compliance with the requirements of the revised Tier 1 BO. This Tier 2 BA was submitted to the USFWS on November 1, 2010, after the close of the comment period on the DEIS. USFWS issued a Tier 2 BO for Section 4 on July 6, 2011. The BA and BO are included in Appendix JJ. The Tier 2 BO confirmed the Indiana bat may be adversely affected and ensured the level of effect is commensurate with the Tier 1 revised BO and Amendment to the Tier 1 revised BO. This verifies the determination that I-69 Section 4 will not jeopardize the continued existence of the Indiana bat.

During the biological field surveys conducted for Section 4, no additional federally-listed species of flora or fauna were identified. The mist netting captured nine Indiana bats in 2004, two

Indiana bats in 2005, and one Indiana bat in 2010. Three Indiana bats were fitted with transmitters in 2004 and five roosts were located using radio-transmitters and telemetry in 2004. None of these roosts were located within the Section 4 corridor. No radio-transmitters were fitted to the two Indiana bats captured in 2005, as these were male bats and the objective of the study was to locate primary maternity roosts. One Indiana bat was fitted with a transmitter in 2010 and four roosts were located. A primary roost was identified within the right-of-way of Refined Preferred Alternative 2. The primary roost tree is located on land that is currently privately owned and not under INDOT control, but within the Section 4 Refined Preferred Alternative 2's right-of-way. In January, 2011 it was learned that this roost tree had likely been knocked down during timbering of the privately owned parcel. The USFWS has been made aware of these circumstances.

Four Indiana bat maternity colonies were identified in Section 4. A maternity colony consists of reproductively active female Indiana bats and their young. A maternity colony was determined to exist if there was evidence of reproduction in an area during the summer reproductive season (the capture of a reproductive female or juvenile, or high emergence counts at an identified roost tree). Each maternity colony foraging area is a circle with a 2.5-mile radius.

A total of 14[7] Indiana bat colonies were identified for all six sections of the I-69 project. The colonies identified in the Section 4 study area are in the vicinity of Doans Creek, Plummer Creek, Little Clifty Branch, and Indian Creek. These four (4) colonies are discussed below.

- **Doans Creek Maternity Colony** - This colony use area is in the vicinity of Doans Creek and includes portions of Crane Naval Surface Warfare Center. Two (2) secondary roost trees were identified within this colony. Approximately 75.7 acres of forest will be taken by I-69 in this colony use area. This constitutes approximately 0.93% of the 8,099 tree cover[8] acres of this colony use area. No known roost trees will be taken.

- **Plummer Creek Maternity Colony** - This colony use area is in the vicinity of Plummer Creek and overlaps slightly with the Doans Creek maternity colony. Two (2) secondary roost trees were identified within this colony. Approximately 195.8 acres of forest will be taken by I-69 in this colony use area. This constitutes approximately 2.3% of the 8,550 tree cover acres of this colony use area. No known roost trees will be taken.

- **Little Clifty Branch Maternity Colony** - This colony use area is in the vicinity of Little Clifty Branch. One (1) primary and three (3) secondary roost trees were identified within this colony. Approximately 247.0 acres of forest will be taken by I-69 in this colony use

[7] Thirteen (13) Indiana bat maternity colonies were originally identified in Tier 1. Pre-construction mist netting in 2010 for a portion of Section 4 identified an additional maternity colony, for a total of 14.

[8] Tree cover is defined as all trees, including individual, fragmented groups of trees. It is based on year 2003 aerial photography and is the most current available data for the maternity colony use areas. Previous forest numbers for the colony use areas in the DEIS were based on U.S. Geological Survey (USGS) Land Cover Information Systems GIS data. This data was a subset of the National Land Cover Data (NLCD) and is based on satellite imagery with 30-meter resolution. The USGS data is current through 1992. Tree cover also differs from the "forest" definition used to determine impacts for each alternative in Section 5.20. Forest impacts were determined using the U.S. Department of Agriculture (USDA) definition of forest, which states that the "minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land." Tree cover includes all trees regardless of acreage or crown width, and is more inclusive than the USDA definition of forest.

area. This constitutes approximately 2.8% of the 8,825 tree cover acres of this colony use area. The primary roost tree was identified within the right-of-way of Refined Preferred Alternative 2 during July and August, 2010. In January, 2011 it was learned that this tree is no longer standing. This colony was not analyzed in the Tier 1 BA Addendum or revised Tier 1 BO as it was recently identified during pre-construction mist netting.

- **Indian Creek Maternity Colony** - This colony use area is in the vicinity of Indian Creek and includes the county line interchange. One (1) secondary roost was identified within this colony. Approximately 290.8 acres of forest will be taken by I-69 in this colony use area. This constitutes approximately 3.9% of the 7,549 tree cover acres of this colony use area. No known roost trees will be taken.

According to the Amendment to the revised Tier 1 BO, the USFWS believes that "as indicated in the Tier 1 RPBO, none of the estimated take, direct or indirect, was expected to cause the loss or permanent displacement of any maternity colony. This assumption is still valid even if individual colonies decline to 64 bats (32 adult females) [as a result of WNS] per colony. Because most take is in the form of temporary reductions in reproductive fitness and not direct death of maternity colony members, we do not anticipate the effects of the action to reduce the long-term survival or reproductive potential of the maternity colonies exposed to the project." (p. 14)

The basis for this conclusion regarding the Indiana bat maternity colonies, as stated in the Amendment to the revised Tier 1 BO, is listed below (p. 19):

- *Because I-69 will have a long narrow/linear footprint, the amount of adverse impacts to any one habitat patch or maternity area along its path is minimal when compared to impacts of a similarly sized area that has a non-linear configuration.*

- *.In general, areas with less than 5% forest cover are not capable of sustaining an Indiana bat maternity colony. Currently, forest coverage (i.e. tree cover) in the maternity colonies ranges from 10.5% to 70% (estimates for tree cover loss at the colony with 10.5% cover is only 1 acre total); see Table B2* [of the Amendment to the revised Tier 1 BO] *for tree cover estimates per colony. The construction of I-69 will directly reduce the total amount of forest habitat/tree cover available around each of the 14 colonies and in some cases will cause small additional amounts to be indirectly lost by induced development. When combined, the percentages of existing tree cover that will be directly and/or indirectly impacted at each maternity colony is very small. Ten of the 14 colonies will lose less than 1% of their tree cover, and the other four will lose 1.4%, 1.7%, 2.1% and 2.6%; therefore the total amount of forest loss is insignificant for each colony. We do not anticipate any long-term reductions in maternity colony reproductive success or survival as a result of this loss.*

- *We do not believe that any of the 14 maternity colonies will be permanently displaced by the interstate; that is, sufficient quality and quantity of habitat will remain throughout the life of the project. In addition, the proposed 3:1 mitigation commitment for upland forest*

losses will largely be focused on improving forest habitats within these affected maternity colony areas, and thus, any adverse habitat impacts to these colonies will be temporary.

- *We estimated the maximum overall amount of I-69 related incidental take of Indiana bats* ***during the summer*** *will be no more than 304 bats (253 females/juveniles and 51 males) spread over a 17-year long period. On an annual basis, this equates to about 18 bats being taken per year throughout the entire project corridor. Table B4 in Appendix A* [of the Amendment to the revised Tier 1 BO] *breaks down the anticipated take by colony. This total take equates to less than 1% of the Indiana bat population that occupies these areas each summer. If the maternity colonies in the action areas were to see a 60% reduction in their number of members, we would expect most take to also be proportionally reduced.*
- *The combined estimated amount of I-69-related take during the summer maternity season and swarming, hibernation, and spring staging period, including estimated take from cumulative effects (non-federal actions apart from I69; see Tier 1 RPBO for details and Tables B4 and B5* [of the Amendment to the revised Tier 1 BO] *for cumulative take estimates) equals 2,159 bats over a 17-year period (127 bats/year). Again, we believe this level of yearly take is insignificant because it equates to 0.04% of the annual Midwest Recovery Unit* [RU] *population (based on 2009 data) and 0.03% of the annual range-wide population estimate of M. sodalis (again, based on 2009 population data). Much of the take (i.e. harm, harassment, wounding and killing) will be short-term/temporary in nature and the population should be able to absorb this amount of loss.*
- *If WNS reduces the Midwest RU population by 60% over the next several years, the estimated take (project-related and cumulative; n=2,159) would equal approximately 1.9% of the impacted Midwest RU population.*
- *Mitigation and conservation efforts associated with the project will include over 2,200 acres of reforestation (including permanent protection) and permanent protection of an additional 4,000-plus forested acres, managed for the Indiana bat and other wildlife species. Reforestation efforts will more than offset the anticipated direct forest loss and the additional acreage of forest preservation will ensure suitable bat habitat remains in the area in perpetuity.*

The potential direct impacts to all forests (upland and forested wetlands) associated with the Section 4 Alternatives were assessed for two sets of design criteria; low-cost design criteria and initial design criteria. The potential ranges of direct forest impacts vary from 873.93 to 1,091.13 acres for Refined Preferred Alternative 2, to 936.13 to 1,173.23 acres, for Alternative 1. All alternatives forest impacts range from approximately 20 to 27% of the forest within the corridor. The potential direct forest impacts associated with Alternative 1 - initial design criteria (1,173.23 acres) and Alternative 3 – initial design criteria (1,138.14 acres) are greater than the estimated forest take (1,132 acres) for Section 4 as identified in the revised Tier 1 BO. The potential direct forest impacts associated with Refined Preferred Alternative 2 – initial design criteria (1091.13), Alternative 2 - initial design criteria (1,098.35 acres), and Alternative 4 - initial design criteria (1,120.33 acres) are below the estimated forest take for Section 4 as identified in the revised Tier 1 BO. The potential direct forest impacts associated with Section 4 Alternatives 1 through 4 and

Refined Preferred Alternative 2 – low-cost design criteria (936.13 acres, 873.82 acres, 900.57 acres, 893.04 acres, and 873.93 acres, respectively) are less than the estimated forest take for Section 4 as identified in the revised Tier 1 BO. Forest impacts are anticipated to be within the range of the low-cost design criteria impacts and the initial design criteria impacts.

The Section 4 Tier 2 BA identifies potential direct impacts to the Indiana bat as a result of the project. The BA also identifies direct impacts to forests, noting: "The impact of the Preferred Alternative right-of-way on forests (1.4% of the available forest total within the Section 4 Expanded SAA) is considered insignificant and discountable in relation to the habitat needs for the Indiana bat." (pg. 43) Section 5.20, *Forest Impacts*, provides greater detail about impact to this resource. Section 4 is located in a karst area where caves provide winter habitat for the Indiana bat. A total of 15 Indiana bat hibernacula were identified for all six sections of the I-69 project. One cave in Greene County is a hibernaculum known to be hydrologically linked to the Section 4 corridor. Another Greene County cave is designated as critical habitat (a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection) and is located approximately 4.5 miles from the Section 4 Alternatives at the closest point.

As stated in the Amendment to the revised Tier 1 BO, the USFWS states, "after reviewing the current status of the Indiana bat, updated information regarding WNS and the environmental baseline for the action area, and new information regarding the preferred alignment of the road connecting the County Line Interchange to SR 45/54/445 in Greene County, the USFWS has concluded that appreciable reductions in the likelihood of survival and recovery of Indiana bats due to the construction, operation, and maintenance of I-69 from Evansville to Indianapolis, Indiana are unlikely to occur, and hence, FHWA has ensured that their proposed action is not likely to jeopardize the continued existence of the Indiana bat or destroy or adversely modify its designated critical habitat." (pg 18)

The basis for this conclusion regarding winter, fall and spring habitat, as stated in the Amendment to the revised Tier 1 BO, is listed below (p. 18):

- *An increase in the number of swarming habitat acres (16.2 acres of tree cover out of 32,607 acres) affected surrounding Ray's Cave will not reduce the value of the habitat and this area will continue to support the survival and fitness of Indiana bats as they prepare for hibernation in the fall and when they emerge from hibernation and prepare to migrate in the spring. Any impacts from this loss are considered immeasurable, and thus, will not reduce the likelihood of conserving the Indiana bat in the Midwest RU.*
- *The proposed action will only directly or indirectly take a relatively small number of bats* ***during fall, winter and spring*** *(estimated total = 883 bats over a 17-year long period or about 52 bats/year; see Table B5* [of the Amendment to the revised Tier 1 BO]*) and will only have minimal, short-term effects on these bats' respective maternity colonies and hibernating populations. The estimated amount of yearly take represents only 0.05% of the annual winter population within the Action Area. Loss of these individuals will have no measurable effects on the viability of other maternity colonies in the region or the species' range or to hibernating populations to which these individuals belong. Again, the proposed action in combination with relatively small amounts of cumulative impacts/take is not reasonably*

expected, directly or indirectly, to cause an appreciable reduction in the reproduction, numbers or distribution of the Indiana bat as a species.

- *In the event that a 60% population decline over a period of several years does occur within the Midwest RU due to WNS, the estimated take of 883 bats over a 17-year period* ***during the fall, winter, and spring*** *would reduce the WNS-impacted RU population by another 0.8%. We believe this small additional impact is not measurable and therefore will not result in any appreciable reduction in the survival or recovery potential for the species within the Midwest RU. Furthermore, this does not take into consideration that the amount of estimated take would also be proportionally reduced in a WNS-affected population (i.e. take would be closer to 353 individuals over a 17-year period) since the number of bats exposed to the various stressors would also decrease.*
- *The combined estimated amount of I-69-related take during the summer maternity season and swarming, hibernation, and spring staging period, including estimated take from cumulative effects (non-federal actions apart from I69; see Tier 1 RPBO for details and Tables B4 and B5* of the Amendment to the revised Tier 1 BO] *for cumulative take estimates) equals 2,159 bats over a 17-year period (127 bats/year). Again, we believe this level of yearly take is insignificant because it equates to 0.04% of the annual Midwest Recovery Unit population (based on 2009 data) and 0.03% of the annual range-wide population estimate of M. sodalis (again, based on 2009 population data). Much of the take (i.e. harm, harassment, wounding and killing) will be short-term/temporary in nature and the population should be able to absorb this amount of loss.*
- *If WNS reduces the Midwest RU population by 60% over the next several years, the estimated take (project-related and cumulative; n=2,159) would equal approximately 1.9% of the impacted Midwest RU population.*
- *Mitigation and conservation efforts associated with the project will include over 2,200 acres of reforestation (including permanent protection) and permanent protection of an additional 4,000-plus forested acres, managed for the Indiana bat and other wildlife species. Reforestation efforts will more than offset the anticipated direct forest loss and the additional acreage of forest preservation will ensure suitable bat habitat remains in the area in perpetuity.*
- *Documents confirming the intent to have a permanent conservation easement placed on the third and fourth largest hibernacula in the state have been signed; protection of these hibernacula will be very important for the long term protection and recovery of the species. Specifically, permanent protection will eliminate the estimated take due to vandalism and human disturbance. Furthermore, permanent protection of both caves and their surrounding forests will provide long-lasting protection for essential fall swarming habitat for the 37,000 Indiana bats that use these caves and eliminate future possibilities for this property to be developed.*

In its Section 4 Tier 2 BO summary of anticipated effects of the project, the USFWS stated the following (p. 48):

- *Direct habitat modification/loss will occur, but will be minimal with a loss of tree cover ranging from approximately 1% to 4% within the four maternity colony areas. Therefore, the total amount of forest loss is relatively insignificant. It is also unlikely that these maternity areas would experience a significant long-term decrease in quality of roosting or foraging habitat as a direct result of I-69, based on the amount and quality of remaining forest habitat.*
- *Seasonal tree-cutting restrictions[9] will ensure no direct impacts/take occurs from the construction of I-69 during the maternity colony season. INDOT has also extended this restriction to include all borrow areas used by construction contractors.*
- *Indirect loss of forest or wetland habitat from residential and commercial development is anticipated to be fairly small and minimal impacts are expected.*
- *One primary roost tree was recently discovered within the project right-of-way. Although this tree is no longer standing, to be conservative, the FWS assumes that upon return to the summer maternity area, the displaced bats will relocate to a new roost in the general vicinity, and potentially within the right-of-way. Loss of a primary roost tree during the winter could result in stress (and take) to pregnant females in the spring as they search for a new roost and try to meet thermoregulatory needs. A few individuals may have delayed parturition or abort their pups. Although no primary roosts were identified for the other colonies, alternate roost trees were located for all maternity colonies within Section 4. None of the known alternate roosts are anticipated to be lost. Loss of other unidentified alternate roost trees may occur.*
- *Due to the significant amount of forest and stream crossings in Section 4, numerous travel corridors may be disrupted by the proposed interstate alignment. Considering the amount of available foraging habitat, we anticipate that this potential adverse effect would impinge on a relatively small proportion of colony members and not be a significant source of take. Indian Creek is expected to be disrupted the most within Section 4 due to the configuration of the alignment through the colony area. (There will be ten separate bridge crossing locations in Section 4 that will have bridges with 25 feet or greater clearance. These bridge locations would include but are not limited to I-69 over CR 600 E and Black Ankle Creek, I-69 over CR 360 S and Plummer Creek, I-69 over Mitchell Branch, I-69 over SR 54 and Tributary of Mitchell Branch, I-69 over all three crossings of Indian Creek, the county line connector road over Indian Creek, and I-69 over Branch of Clear Creek in two separate locations. The bridge structures should provide areas for bats to connect to existing habitat and safely cross under the interstate.)*

[9] Tree cutting can only occur within the Winter Action Area between November 16 and March 31. No tree cutting within the Winter Action Area will occur between April 1 and November 15. Tree cutting can only occur within the Summer Action area between October 1 and March 31. No tree cutting within the Summer Action Area will occur between April 1 and September 30.

- *Death/kill from collision with vehicles once road is operational is anticipated on I-69 and other local roadways with increased traffic volume. One bat per colony is projected to be taken every two years through 2030. In addition up to 21 males during the summer and 244 bats in the fall swarming and spring staging periods may be taken through the year 2030. Some roadkill may be offset as traffic on local roads decreases and shifts to the new interstate.*
- *The maternity colonies and individual adult males have access to ample additional habitat nearby in the unlikely case that some individual bats should become displaced from their traditional foraging/roosting areas.*
- *I-69 may induce some amount of residential/commercial development in currently forested areas and may also speed up the rate of development that otherwise would have occurred within the action area at a slower rate, particularly in the immediate vicinity of and within easy commuting distance of Section 4 interchanges (e.g., SR 45). We anticipate approximately 10 Indiana bats will be taken due to indirect development.*
- *Some harassment of bats roosting near construction areas may occur as a result of exposure to novel noises/vibrations/disturbance causing roost-site abandonment and atypical exposure to day-time predators while fleeing and seeking new shelter during the day-time. This will most likely have only short term impacts, if any.*
- *Proposed forest, wetland, and stream mitigation within and near the maternity and hibernacula areas will ensure that at least 2,878 acres, and up to 3,583 acres of suitable roosting and foraging habitat persists in perpetuity. In addition, several Indiana bat hibernacula, including two Priority 1A caves, will be protected in perpetuity.*
- *A potential for increased disturbance/vandalism of bats in vulnerable hibernacula due to more accessibility to that part of the state.*
- *Long term reproduction and viability are not expected to be impacted by the project and all maternity colonies and hibernacula are likely to persist in the area.*

Although there may be some short-term impacts to individuals within the four colonies, these impacts are not likely to affect the colonies' long-term reproduction and viability. Thus, the maternity colonies are likely to persist within the Action Area into the reasonably foreseeable future following construction, operation, and maintenance of the I-69 project. Furthermore, with successful implementation and maturation of the proposed mitigation projects, permanent protection of two Priority 1A hibernacula, and other proposed mitigation and conservation measures, we anticipate that long-term habitat conditions for these colonies will be suitable and sustainable for the long-term survival and recovery of the species. (p. 50)

Eastern Fanshell Mussel

Although no mussel surveys were conducted in the Section 4 Tier 2 Studies, previous studies and coordination with IDNR have indicated or reported that there are no eastern fanshell mussels in the streams within the area.

The Bald and Golden Eagle Protection Act

- **Bald eagle (*Haliaeetus leucocephalus*) SSC, formerly FT (Federal-Threatened)[10]:** Bald eagles (see **Figure 5.17-2**, p. 5-508) live near large bodies of open water such as lakes, marshes, seacoasts, and rivers where there are plenty of fish to eat and tall trees for nesting and roosting. Bald eagles use a specific territory for nesting, winter feeding, or a year-round residence. The bald eagle's natural range is from Alaska to Baja, California, and from Maine to Florida. Those that reside in the Northern United States and Canada, migrate to the warmer southern climates of the United States during the winter to obtain easier access to food, especially fish. Some bald eagles that reside in the Southern United States migrate slightly north during the hot summer months. Bald eagles feed primarily on fish, but also eat small animals (ducks, coots, muskrats, turtles, rabbits, snakes, etc.) and occasional carrion (dead animals).

  They build large nests, called aeries, at the top of sturdy tall trees. The nests become larger as the eagles return to breed and add new nesting materials year after year. Bald eagles make their new nests an average of 2 feet deep and 5 feet across. Eventually, some nests reach sizes of more than 10 feet wide and can weigh several tons. When a nest is destroyed by natural causes, it is often rebuilt nearby. Nests are lined with twigs, soft mosses, grasses, and feathers. No nest sites are known within or near the Section 4 corridor. No impacts to the bald eagle are anticipated by the proposed action. Nest records do not show a nest within one mile of the Section 4 corridor.

The Bald and Golden Eagle Protection Act (Act) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act defines "take" as "pursue, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

No known bald eagle nesting sites are within the action area associated with the Section 4 corridor. No "take" of bald eagles is expected to result from the project.

5.17.3.3 State-Listed Species

The Indiana Natural Heritage Data Center database, managed by the IDNR Division of Nature Preserves, was checked to identify state-listed threatened, endangered, rare, or special concern species records within Greene and Monroe counties. Coordination with IDNR (Division of Nature Preserves and Division of Fish and Wildlife) along with past and present field reviews indicates that habitat for some state-listed species may be present within one mile of either side of the Section 4 corridor. Field surveys identified some species to be present in the Section 4 corridor and results are summarized below.

[10] Delisted under the Endangered Species Act effective August 8, 2007. The bald eagle is still federally protected under the Bald and Golden Eagle Protection Act. See footnote p. 5-347.

The potential for occurrence of listed species is based on the habitat needs of the species, its documented occurrence within the county of the project area, and the habitats encountered during the pedestrian transect surveys. The scale of potentiality is documented as follows: "none" (habitat not present within the project area), "low" (semi-suitable habitat present, but other factors such as disturbance, development pressures or other issues decrease the chances of locating and documenting this species), "moderate" (suitable habitat, but species has not been documented within the project area), and "present" (species has been documented by a qualified biologist within the project area).

The following briefly describes these species and preferred habitat, notes the potential for the species' occurrence in the project corridor, and assesses the potential for impacts to the species as a result of the project. As will be noted, the potential for occurrence for the majority of species is considered low. Some impacts are possible due to impacts on suitable habitat. Forest and wetland mitigation for Section 4 is anticipated to benefit both state and federally listed species.

State-Listed Flora

Black-fruit mountain-ricegrass (*Oryzopsis racemosa)* State Rare (SR): This species has been noted in Monroe County on the top of rocky, wooded, limestone cliffs along Clear Creek (Deam, 1929). Elsewhere in Indiana, it has been observed on dune slopes and wooded bluffs. This species has been noted to respond favorably to prescribed burns (Swink and Wilhelm, 1994).

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County, but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated.

Mercury (*Acalypha deamii*) SR: Mercury is an annual forb that blooms in early summer. This species is adapted to medium textured soils with pH between 5.9 and 7.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County, but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated.

Golden alexanders (*Zizia aptera*) SR: Golden alexanders is adapted to humus-rich soils and occurs in seasonally wet prairies and open woods.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County, but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated.

Butternut (*Juglans cinerea*) State Watch List (WL): The butternut tree ranges from Minnesota to South Carolina, Georgia, and Arkansas. In Indiana, it is a mesic forest tree that occurs in floodplain and stream terrace forests in rich, moist soil (Gleason and Cronquist, 1991). This species achieves its best growth in well-drained bottomland and floodplain soils (Homoya, 1992).

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County, but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated.

State-Listed Fauna

—Invertebrates—

Troglobitic crayfish (*Orconectes inermis testii)* SR: This cave obligate species inhabits subterranean pools and is known to be present in Monroe County and from over 70 localities in Southern Indiana and North-Central Kentucky (Lewis 2002h). This species occurs in the Wesley Chapel Gulf Special Area, Lick Creek, and the periphery of the Tincher Karst Special Area. It is typically found in cave streams either crawling around the substrate or hiding under rocks. Great depth is not required for this species; however, it is usually found in streams of depth adequate for the crayfish to remain submerged (Lewis 2002h).

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County and Greene County. This species was not observed in any of the six sites surveyed for cave fauna in 2006.

Potential impact: None anticipated.

Barr's commensal cave ostracod (*Sagittocythere barri*) SR: Ostracods are small crustaceans, typically around one mm in size, but varying between 0.2 mm to 30 mm, laterally compressed and protected by a bivalve-like, chitinous or calcareous valve or "shell."

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County and Greene County. This species was not observed in any of the six sites surveyed for cave fauna in 2006.

Potential impact: None anticipated.

Jordan cave isopod (*Caecidotea jordani*) SE: Isopods are one of the most diverse orders of crustaceans, with many species living in all environments. Cave isopods include obligate subterranean species. Cave isopods include obligate subterranean species. The Jordan cave isopod is an unusually large, blind, albinistic, troglobitic isopod within the family Asellidae. Maximum body length is 23 mm in males and 15 mm in females.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County, but is not listed for Greene County. This species was not observed in any of the six sites surveyed for cave fauna in 2006.

Potential impact: None anticipated.

Indiana cave springtail (*Sinella alata*) WL: This obligate subterranean species is endemic to Indiana, where it occurs in caves in Clark, Crawford, Harrison, Jennings, Lawrence, Monroe, Orange and Washington counties. The species has been recorded from six caves on the Hoosier National Forest. (Lewis, 1983, 1994, 1995, 1998, 2002; Lewis et al., 2004). This springtail is usually found in moist organic litter, stream detritus stranded on mudbanks, on raccoon or woodrat droppings, or similar nutrient rich microhabitats.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. However, this species was identified in a cave north of the Section 4 corridor, in Greene County.

Potential impact: This cave will not be directly impacted by highway construction. The Alternatives are about seven tenths of a mile south of the cave location. However, recharge to the cave is derived in part from three sinking streams in the vicinity of SR 45 (approximately four miles west of it) which receive runoff from the Section 4 corridor. As the alternatives are on a common alignment in this area, all alternatives will result in the same impact upon the drainage areas of these sinking streams. It should be noted that the affected distal drainage areas are linked to this cave via unusually long flowpaths which likely pass through non-karst groundwater and possibly surface channels to reach a karst conduit with connectivity to the cave. The majority of the recharge to the cave is derived from more proximal features. In the development of the highway drainage system design, care will be taken to perpetuate recharge to this cave. Additionally, the water quality of highway runoff directed toward recharge features will be remediated through appropriate measures implemented pursuant to the 1993 Karst Memorandum of Understanding (MOU) between the Indiana Department of Transportation (INDOT), Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources (IDNR) and the U.S. Fish and Wildlife Service (USFWS). Therefore, it is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave.

Mayfield cave beetle (*Pseudoanophthalmus shilohensis mayfieldensis*) SE: This cave dwelling ground beetle species is a member of the Other Beetles group in the Carabidae family. Its range is apparently limited to Indiana. It is known to inhabit cobble cave substrates with a very shallow stream flowing underneath.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County, but is not listed for Greene County. This species was not observed in any of the six sites surveyed for cave fauna in 2006.

Potential impact: None anticipated.

Hidden springsnail (*Fontigens cryptica*) SE: This species is a member of the freshwater snails group in the Hydrobiidae family.

Potential for occurrence: Low. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was not positively identified in any of the six sites surveyed for cave fauna in 2006. Snails (*Physa sp.)* were observed at a spring, and it was noted that they were not subterranean species.

Potential impact: None anticipated.

Packard's groundwater amphipod (*Crangonyx packardi*) WL (**Figure 5.17-4**, p. 5-509): Amphipods are peracarid crustaceans, typically ranging in size from 2 to 50 mm, although a few may be larger. Amphipods are common in aquatic ecosystems throughout many parts of the world, inhabiting marine, brackish, and freshwater environments. A few species also live in terrestrial ecosystems. This obligate subterranean amphipod occurs in a variety of groundwater habitats from southern Indiana south through Kentucky, west into Illinois, across Missouri and into the eastern third of Kansas. This species has been taken from a variety of aquatic habitats including ephemeral, as well as permanent, cave streams, stream pools, and drip pools. The species shows a preference for the interstices of cave stream gravels (Lewis 2002c).

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. However, this species was identified in a cave north of the Section 4 corridor in Greene County, and in a cave within the Section 4 corridor in Monroe County.

Potential impact: Neither cave would be directly impacted by highway construction.

With regard to the cave in Greene County, it is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave. Please see above discussion regarding this cave under Indiana cave springtail (*Sinella alata*).

With regard to the cave in Monroe County, the primary recharge area is most likely located to the northwest, near the intersection of Koontz Road and Rockport Road. All four alternatives share a common alignment and will introduce fill in the area north of the cave, between the spring and its recharge area. Because no features within the Section 4 corridor were identified that are believed to contribute significant recharge to the spring, it is not anticipated that the project will result in a degradation of the spring's water quality or quantity. Therefore, no impacts to the species identified in the cave are anticipated. If previously unidentified features are discovered during construction, they will be addressed via measures implemented pursuant to the 1993 Karst Memorandum of Understanding (MOU) between the INDOT, IDEM, IDNR and the USFWS.

Bollman's cave millipede (*Conotyla bollmani*) WL: This troglobitic species is primarily an inhabitant of caves, with only a few known surface collections. It is a member of the Millipedes and Centipedes group in the Conotylidae family endemic to Southern Indiana occurring in Orange, Martin, Lawrence, Monroe, and Owen counties. It seems to be ubiquitous in many

caves of the East Fork of the White River drainage (Lewis 1998) where it is typically found in riparian cave habitats or other moist areas.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. However, this species was identified in a cave north of the Section 4 corridor, in Greene County.

Potential impact: This cave would not be directly impacted by highway construction. It is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave. Please see above discussion regarding this cave under Indiana cave springtail (*Sinella alata*).

Jeannel's groundwater ostracod (*Pseudocandona jeanneli*) SE: This species is a microcrustacean known only from groundwater habitats including several caves in the south-central karst region of Indiana, one cave in Kentucky, and one cave in Tennessee. This species is known from five caves in Indiana in Crawford, Orange, Lawrence, and Monroe counties. Three of these locations are found on the Hoosier National Forest (Lewis 2004o). This species inhabits the interstices of stream gravel.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was identified in a cave east of the Section 4 corridor, in Monroe County.

Potential impact: The cave that this species was found in will not be directly impacted by highway construction. The alternatives are about seven-tenths of a mile west of the cave location. However, recharge to the cave is derived in part from four swallets (karst recharge features) in the vicinity of Harmony Road (approximately two miles to the northeast) which receive runoff from the Section 4 corridor. As the alternatives are on a common alignment in this area, all alternatives will result in the same impact upon the drainage areas of these sinking streams. In the development of the highway drainage system design, care will be taken to perpetuate recharge to this cave. Additionally, the water quality of highway runoff directed toward recharge features will be remediated through appropriate measures implemented pursuant to the 1993 Karst Memorandum of Understanding (MOU) between the Indiana Department of Transportation (INDOT), Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources (IDNR) and the USFWS. Therefore, it is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave.

Ray's cave beetle (*Pseudanopthalmus undescribed species*) SE: This species is an obligate subterranean carabid beetle known only from three caves. The primary food source of Pseudanophthalmus species is enchytraeid and tubificid worms found associated with cave mudbanks.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was identified in a cave north of the Section 4 corridor, in Greene County.

Potential impact: This cave would not be directly impacted by highway construction. It is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave. Please see above discussion regarding this cave under Indiana cave springtail (*Sinella alata*).

Krekeler's cave ant beetle (*Batrisodes krekeleri*) SE: In Indiana, *Batrisodes* beetles have only been collected from caves in three localities, including one privately-owned cave located in the Tincher Karst Special Area within the Hoosier National Forest Boundary. Nothing is known of the life history of *Batrisodes* in Indiana caves (Lewis 2004g).

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was identified in a cave north of the Section 4 corridor, in Greene County.

Potential impact: This cave would not be directly impacted by highway construction. It is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave. Please see above discussion regarding the cave, under Indiana cave springtail (*Sinella alata*).

Ashcraft Cave springtail (*Pygmarrhopalites ashcraftensis*) State Endangered Candidate (SEC): The known range of this Pygmarrhopalites springtail is limited to one Greene County cave, where it was collected from riparian mud banks. In general springtails feed on decaying plant material, fungi, bacteria or arthropod feces (Christiansen & Bellinger, 1998).

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was identified in a cave north of the Section 4 corridor, in Greene County.

Potential impact: This cave would not be directly impacted by highway construction. It is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave. Please see above discussion regarding the cave under Indiana cave springtail (*Sinella alata*).

Hilly springtail (*Pseudosinella collina*) SR: The reported range for this species is from Alabama north to Pennsylvania. This springtail has been reported from eight sites in Indiana, six of which are caves. These caves occur in Martin, Monroe, Orange, and Washington counties (Lewis 1998). The Hoosier National Forest contains five of the sites where this species is known to occur in Indiana. This species is known to inhabit leaf litter in the twilight zone of sinkhole caves, where leaf litter falls or is washed into the cave in quantities. The sinkhole floors and twilight zone of these caves represent a specialized buffer zone that likely remains moister throughout the year as well as buffered against changes in surface temperatures (Lewis 2004p). In general springtails feed on decaying plant material, fungi, bacteria or arthropod feces (Christiansen & Bellinger, 1998).

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was identified in a cave, within the Section 4 corridor in Monroe County.

Potential impact: No impacts to the species identified in the cave are anticipated. Please see above discussion regarding this cave above, under Packard's groundwater amphipod (*Crangonyx packardi*).

Fountain cave springtail (*Pseudosinella fonsa*) ST: Typical of other springtails, this species is a tiny insect, reaching a length of about 2.8mm, with 3-4 eyes per side and scattered blue pigment granules. Nothing is known specifically about the life history of this obligate subterranean species. In general springtails lay their eggs on the substrate in a concealed location. Several molts occur prior to the insect reaching its adult size, but in springtails no metamorphosis occurs and the juveniles and adults are similar except in size. It is usually found in moist organic litter, stream detritus stranded on mudbanks, on raccoon or woodrat droppings, or similar nutrient rich microhabitats. In general springtails feed on decaying plant material, fungi, bacteria or arthropod feces (Christiansen & Bellinger, 1998).

Potential for occurrence: Present. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County, but not for Greene County. This species was identified in a cave north of the Section 4 corridor, in Greene County.

Potential impact: This cave would not be directly impacted by highway construction. It is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave. Please see above discussion regarding the cave under Indiana cave springtail (*Sinella alata*).

Weingartner's cave flatworm (*Sphalloplana weingartneri*) WL: This species is endemic to southern Indiana and has been recorded from caves in Clark, Jefferson, Jennings, Ripley, Crawford, Harrison, Lawrence, Martin, Orange, and Washington counties (Lewis 2004v). This species has been found in seven caves on the Hoosier National Forest within the Tincher Karst Special Area, Gypsy Bill Allen Special Area, Wesley Chapel Gulf Special Area, Grease Gravy Special Area, and Springs Valley Recreation Area. Although there are seven known localities on the Hoosier National Forest, this species is not abundant within these caves. This flatworm is an obligate inhabitant of groundwater. Most records for this species have been from cave streams where the flatworms are typically found clinging to the undersides of stones (Lewis 2004v).

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was identified in a cave, within the Section 4 corridor in Monroe County.

Potential impact: No impacts to the species identified in the cave are anticipated. Please see above discussion regarding this cave under Packard's groundwater amphipod (*Crangonyx packardi*).

Indiana cave amphipod (*Crangonyx indianensis*) WL: This obligate subterranean amphipod occurs in many caves in southern Indiana.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was identified in a cave north of the Section 4 corridor, in Greene County.

Potential impact: This cave would not be directly impacted by highway construction. It is not anticipated that the project will cause a degradation of the cave spring's water quality or quantity that would impact the species identified in the cave. Please see above discussion regarding the cave under Indiana cave springtail (*Sinella alata*).

—Amphibians—

Crawfish frog (*Rana areolata circulosa*) SE (Figure 5.17-5, p 5-509): The range for the northern crawfish frog is the southwest and west central portions of Indiana. The frog normally lives in crayfish burrows and emerges at night to feed. Its habitat is in open, grassy, rather damp areas where there are burrows of the large, chimney-building crayfish.

Potential for occurrence: Moderate. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County and Greene County. Occurrence is possible in the Black Ankle, Plummer and Indian Creek bottoms, but not expected due to agricultural practices in these areas. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated.

Eastern spadefoot (*Scaphiopus holbrookii)* State Special Concern (SSC, Figure 5.17-6, p. 5-509**):** This species is found from Southern New England to Florida, west to Missouri, Northeast Arkansas and Eastern Louisiana. The range of the eastern spadefoot in Indiana is the southern third of the state. Indiana records are associated with floodplains of the lower Wabash and White rivers and barrens or relict prairies of the Ohio River Valley. It is a toad that prefers regions of loose or sandy soil at low elevations. It is usually found in open country and has been reported from urban and heavily cultivated situations (Minton, 1972). The toad is nocturnal, lives in shallow burrows, and breeds from March to September after rains fill temporary ponds.

Potential for occurrence: Moderate. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: Impacts are possible. All four of the Section 4 Alternatives will impact open agricultural areas with sandy soils, particularly in the portion of the Section 4 corridor west of the Black Ankle Creek.

Common Mudpuppy (*Necturus maculosus*) SSC: The mudpuppy is found throughout Indiana; however, it is not collected often. It is a bottom dweller in lakes, ponds, impoundments, rivers and streams. Its numbers appear to have decreased since the 1940s.

Potential for occurrence: Moderate. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species List for Monroe County or Greene County. This species was not netted in aquatic surveys within the Section 4 corridor in 1993or during pedestrian field surveys.

Potential impact: None anticipated. Good habitat would not be expected from the intermittent conditions of the majority of small streams and ditches crossed by the Build Alternatives in Section 4. Suitable habitat may be present within perennial streams such as Indian Creek and Plummer Creek; however, such streams will be bridged and there will not be a loss of habitat. All four of the Section 4 Alternatives would result in similar impacts.

—Birds—

Barn owl (*Tyto alba*) SE (Figure 5.17-7, p. 5-510**):** The barn owl inhabits open and partly open habitats, grasslands, and farmlands mainly in the southern half of Indiana. This nocturnal, predatory bird nests mainly in wooden barns, and thus occurs in agricultural areas with traditional farming practices.

Potential for occurrence: Moderate. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. This species was not observed or heard in the Section 4 corridor during pedestrian field surveys.

Potential impact: Impacts are possible. Open and partly open farmlands are present throughout the Section 4 corridor, particularly in the portion of the corridor west of Black Ankle Creek.

Henslow's sparrow (*Ammodramus henslowii*) SE (Figure 5.17-8, p. 5-510**):** The Henslow's sparrow inhabits moist or dry grasslands with scattered weeds and small shrubs. They migrate to marshes and open pine woods in the Southeastern United States during the winter months.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County, but is listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys. The species is considered present based upon a review of information contained in the *Breeding Bird Atlas Explorer (*online resource, 2011. U.S. Geological Survey Patuxent Wildlife Research Center & National Biological Information Infrastructure. http://www.pwrc.usgs.gov/bba. Data compiled from: Indiana Breeding Bird Atlas 2005-2010. Interim results used with permission.).

Potential impact: Impacts are possible. Habitat utilized by this species is present in the Section 4 corridor.

Hooded Warbler (*Wilsonia citrina*) SSC: The hooded warbler nests in understory of deciduous forest, especially along streams and ravine edges, and thickets in riverine forests. This species inhabits both young and mature forests but is most abundant in the latter. A dense shrub layer and scant ground cover are important. Hooded warblers generally favor large tracts of uninterrupted forest, but sometimes nest in forest patches as small as 12.4 acres, probably where these are close to larger forested areas.

Potential for occurrence: Moderate. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County, but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys. The moderate potential for this species' occurrence is based upon a review of information contained in the *Breeding Bird Atlas Explorer (*online resource, 2011. U.S. Geological Survey Patuxent Wildlife

Research Center & National Biological Information Infrastructure. http://www.pwrc.usgs.gov/bba. Data compiled from: Indiana Breeding Bird Atlas 2005-2010. Interim results used with permission.).

Potential impact: Impacts are possible. Habitat utilized by this species is present in the Section 4 corridor. Bird surveys in Section 4 in 1993 did not report any Hooded Warblers.

Cerulean Warbler (*Dendroica cerulea*) SE: The cerulean warbler nests in mature hardwood forests in mesic or wetter situations such as floodplains or other mesic conditions, with a closed canopy. The size of the trees is of primary importance and their species identity secondary.

Potential for occurrence: Moderate. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County, but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys. The moderate potential for this species' occurrence is based upon a review of information contained in the *Breeding Bird Atlas Explorer (*online resource, 2011. U.S. Geological Survey Patuxent Wildlife Research Center & National Biological Information Infrastructure. http://www.pwrc.usgs.gov/bba. Data compiled from: Indiana Breeding Bird Atlas 2005-2010. Interim results used with permission.).

Potential impact: Impacts are possible. Habitat utilized by this species is present in the Section 4 corridor. Bird surveys in Section 4 in 1993 did not report any Cerulean Warblers.

Loggerhead shrike (*Lanius ludovicianus*) SE: The loggerhead shrike can be found in habitats such as open areas, fencerows, rangeland, and open woodland. The species is threatened throughout the northeastern and Midwestern United States and is a rare and declining permanent resident in southwestern Indiana. The strongholds for this species are in Daviess and Dubois counties. There are breeding records for the species in Lawrence County as recently as 1985 (Whitaker and Gammon 1988), and a single bird was observed in Perry County (1993).

Potential for occurrence: Moderate. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County, but is listed for Greene County. The strongholds for this species are in Daviess and Dubois counties. The northeast corner of Daviess County is located approximately one mile to the southwest of the south terminus of Section 4, and suitable habitats are present throughout and adjacent to the Section 4 corridor, especially west of Black Ankle Creek.

Potential impact: Impacts are possible. All four alternatives would result in similar impacts upon suitable habitat. This species was not observed or heard in the Section 4 corridor during pedestrian field surveys nor in bird surveys in 1993.

Northern harrier (*Circus cyaneus*) SE (Figure 5.17-9, p. 5-510)**:** The northern harrier is a medium-sized, long-winged, long-tailed hawk. Its habitat includes prairies, savannas, sloughs, wet meadows, and marshes. This ground-nesting raptor is an uncommon migrant and winter resident in grassy areas in Indiana, and a rare and local breeder. Although near the southern limit of its breeding range in Indiana, large strip mines reclaimed as grasslands are attractive to it, and

some pairs breed in the southwestern counties. This species is found often in strip-mining areas restored to grasslands.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. One individual of this species was observed just north of the Section 4 corridor in flight over a field just east of Breeden Road, and along First Creek in 1993.

Potential impact: None anticipated.

Red-shouldered hawk (*Buteo lineatus*) SSC: The red-shouldered hawk's habitat includes bottomland hardwood forests, riparian areas, upland deciduous forest, mixed deciduous-conifer forest, swamps, marshes, and rivers. It reaches a length of 16 inches and a wingspan of 40 inches and has a fairly long tail and broad wings. The red-shouldered hawk preys on small mammals, birds, reptiles, and amphibians. It is most common in the southern third of the state.

Potential for occurrence: Moderate. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys nor in bird surveys in 1993.

Potential impact: Impacts are possible. All four alternatives impact upland deciduous forest and some bottomland hardwood forests throughout the length of the Section 4 corridor.

Sharp-shinned hawk (*Accipiter striatus*) SSC (Figure 5.17-10, p. 5-511**):** The sharp-shinned hawk's habitat includes coniferous, mixed and deciduous forests and open woodlands. This robin- to pigeon-sized woodland hawk migrates through various habitats, mainly along ridges. It nests in wooded stands averaging 29 acres in size. The sharp-shinned hawk preys on small to medium birds, rodents, and young rabbits.

Potential for occurrence: Present. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County and Greene County. This species was observed within the corridor during pedestrian field surveys.

Potential impact: Impacts are possible. All four alternatives impact upland deciduous forest throughout the length of the Section 4 corridor.

—Mammals—

Indiana bat (*Myotis sodalis*) SE, FE: Refer to the Federally-Listed Fauna section for its description.

Evening bat (*Nycticeius humeralis*) SE: The species is found from the eastern coast of the United States to the Midwest, and from Southern Michigan south into Eastern Mexico. Summer maternity colonies have been found in buildings and hollow trees; in the winter, bats of this species have been found roosting in palm fronds in Florida. Females and young appear to migrate fairly long distances. They roost in trees and man-made structures. The evening bat

rarely enters caves or mines. The evening bat prefers to forage along edges of mature forests, in clearings, and over waterways.

Potential for occurrence: Moderate. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. No individuals of this species were found among the bats captured during the mist-netting surveys conducted for Section 4 in 2004, 2005, or 2010. No evening bats were observed within the Section 4 corridor during pedestrian surveys. However, 55 individuals of this species were found among the bats captured within 2.5 miles of the Section 4 corridor centerline during the mist-netting surveys conducted for Section 3 in 2004. An additional 12 bats were found the following year. Evening bats were captured at a Section 3 mist netting site along Doan's Creek, just south of the Section 4 terminus. Evening bats are likely to be present along larger rivers near farmlands as noted in Sections 1-3.

Potential impact: Impacts are possible, but not expected because of the predominant forested landscape.

Little brown bat (*Myotis lucifugus*) SSC (Figure 5.17-12, p. 5-511**):** The species is found throughout most of North America. Little brown bats feed near or over water, mainly on aquatic insects such as caddis flies, mayflies, and midges, and typically consume half their body weight in insects each night.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. Twenty-three (23) individuals of this species were captured during the mist-netting surveys conducted for Section 4 in 2004, 5 were captured in 2005, and 11 were captured in 2010. Little brown bats are present in and near the Section 4 corridor.

Potential impact: Impacts are possible.

Eastern tricolored or pipistrelle (*Perimyotis subflavus*) SSC: This small bat occurs throughout most of eastern North and Central America and in parts of the Midwestern United States. This species is a forest species. Some eastern pipistrelles migrate several hundred miles in late summer and early fall to caves where they hibernate.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. Seventy-one (71) individuals of this species were found during the mist-netting surveys conducted for Section 4 in 2004, 24 were captured in 2005, and 1 was captured in 2010. Forest areas are being impacted throughout the length of the Section 4 corridor. Eastern pipistrelles are present in and near the Section 4 corridor.

Potential impact: Impacts are possible.

Eastern red bat (*Lasiurus borealis*) SSC: This species is common, and its range is from far southern Canada throughout most of the United States and Mexico, and farther south through Central America and into South America. This species is a forest species. The eastern red bat

requires trees and shrubs for roosting. Although the eastern red bat is solitary, it migrates in groups.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. Sixty-nine (69) individuals of this species were among the bats captured during the mist-netting surveys conducted for Section 4 in 2004, 27 were captured in 2005, and 11 were captured in 2010. Eastern red bats are present in and near the Section 4 corridor.

Potential impact: Impacts are possible.

Northern myotis (*Myotis septentrionalis*) SSC: The species is widely but sparsely distributed across forested regions of the Eastern United States, across Southern Canada and extending down into Florida. They roost in buildings, under loose bark, and in tree cavities, and hibernate in caves and mines.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. Forty-three (43) individuals of this species were among the bats captured during the mist-netting surveys conducted for Section 4 in 2004, 23 were captured in 2005, and 4 were captured in 2010. Northern bats are present in and near the Section 4 corridor.

Potential impact: Impacts are possible.

Silver-haired bat (*Lasionycteris noctivagans)* SSC: Silver-haired bats occur in both grassland and forest and are abundant in old-growth forest. They start foraging after sunset, finding their prey at treetop level or over streams and ponds. Seasonal changes in the numbers of bats have been observed: more individuals are seen farther north in the summer and farther south in winter, suggesting that the species is probably migratory. However, some individuals may not migrate.

Potential for occurrence: Low. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. No individuals of this species were among the bats captured during the mist-netting surveys conducted for Section 4.

Potential impact: None anticipated.

Hoary bat (*Lasiurus cinereus*) SSC: Hoary bats are the most widespread of all bats in the United States, although they are rare in most of the Eastern United States. They are thought to prefer trees at the edge of clearings, but have been found in trees in heavy forests, open wooded glades, and shade trees along urban streets.

Potential for occurrence: Present. This species is not listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County or Greene County. Two individuals of this species were among the bats captured during the mist-netting surveys conducted for Section 4 in 1993 and two individuals in 2004. No individuals of this species were captured in 2005.

Potential impact: None anticipated.

Bobcat (*Lynx rufus*) SSC (Figure 5.17-13, p. 5-512**):** The bobcat is a medium-sized cat that prefers to prey upon rabbits but will also prey on smaller mammals. This species' habitat includes large tracts of various habitats including deciduous-coniferous woodlands, forest edge, hardwood forests, swamps, forested river bottomlands, and brushlands.

Potential for occurrence: Present. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County and Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys; however, it has been tracked by IDNR in Section 4. Any large, wooded areas along the Tier 2 Section 4 corridor could harbor bobcats. Crane NSWC and its associated large forested area abut the south edge of Greene County and are located near the Section 4 corridor. Large forested tracts are also present throughout the length of Section 4.

Potential impact: Impacts are possible.

Badger (*Taxidea taxus*) SSC: The American badger inhabits open areas and brushlands. The badger is not common anywhere in Indiana, but it has been increasing its range and now occurs essentially throughout the state.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County and Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated. Impacts to brushlands are minor.

Least weasel (*Mustela nivalis*) SSC (Figure 5.17-14, p. 5-512**):** The least weasel inhabits open areas, farmland, riparian areas, and woodlands, and it often co-exists with humans. It is a tiny weasel with brown fur above and white below. It is presumably a northern species in Indiana, but has been found in Indiana south to Vigo, Clay, and Monroe counties.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated.

—Reptiles—

Kirtland's snake (*Clonophis kirtlandii*) SE: The Kirtland's snake is a small, slender snake that inhabits moist to wet "grassy" habitats in close proximity to water bodies, such as open and woodland ponds, streams and marshes (Center for Reptile and Amphibian Conservation and Management, 2006).

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: None anticipated. Wet "grassy" habitat in close proximity to water bodies is being impacted, but such areas are generally mowed for hay or grazed.

Western ribbon snake (*Thamnophis proximus*) SSC: Although records for this snake are for the most part in northwestern Indiana, there is one record from Monroe County and apparently valid literature records from Vigo County. It has an inferred range in Southwestern Indiana principally within the Wabash Lowland Region.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: Little to none anticipated. The Section 4 corridor is not located in the Wabash Lowland Region, which is noted to be the principal range of this species in Southwestern Indiana.

Rough green snake (*Ophoedrys aestivus*) SSC: The rough green snake inhabits small trees, shrubs and vines, especially near lakes and streams along forest edges. The snake can reach a length of 2 ½ to 3 feet and is non-venomous.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County but is not listed for Greene County. This species was not observed in the Section 4 corridor during pedestrian field surveys.

Potential impact: Little to none anticipated.

Timber rattlesnake (*Crotalus horridus*) SE (Figure 5.17-15, p. 5-512**):** The timber rattlesnake has a large range in the eastern U.S., but occurrence is spotty. Greatest abundance of this species is found at the high-density denning sites of the Appalachian Mountains from Northeastern Alabama to Pennsylvania (Brown 1993). In Indiana, the species has been reported in Brown, Lawrence, Jackson, Martin, Orange, Perry, and Clark counties. Ideal habitat for the species in the central Midwest is described by Minton (1972) as consisting of high, dry ridges with oak-hickory forests and open areas.

Potential for occurrence: Low. This species is listed in IDNR's Indiana County Endangered, Threatened and Rare Species Lists for Monroe County but is not listed for Greene County. This species was not observed in the Section 4 corridor during field surveys.

Potential impact: Little to none anticipated.

Eastern box turtle (*Terrapene carolina*) SSC (Figure 5.17-11, p. 5-511**):** This is a small terrestrial turtle that possesses a high, domelike shell and a hinged plastron that allows for total shell closure. The carapace can be of variable coloration, but is usually brownish or black with a

yellowish or orangish radiating pattern of lines, spots or blotches. They have a horny beak, stout limbs, and their feet are webbed only at the base. Males usually have red irises (Center for Reptile and Amphibian Conservation and Management, 2006).

This terrestrial turtle lives in moderately drained deciduous or mixed woodlands, particularly ones with sandy soil. They are found almost exclusively on land and can be observed in thickets, fields, pastures, vegetated dunes, marshes and the edges of bogs. Areas with the highest turtle densities favor moist, open forest with ravines or mid-sized slopes (Center for Reptile and Amphibian Conservation and Management, 2006).

This turtle is found primarily in the eastern half of the United States. Its range extends as far north as Southern Maine and the northwest of the Michigan Lower Peninsula, south to southern Florida and west to Eastern Kansas, Oklahoma, and Texas. The eastern box turtle is considered uncommon to rare in the Great Lakes region; however, populations can be locally common in areas not bisected by heavily-traveled roads. In the Midwest, they are a species of Special Interest in Ohio, and of Special Concern in Michigan. They are not found in Wisconsin, Minnesota, Iowa or Missouri (Center for Reptile and Amphibian Conservation and Management, 2006).

Potential for occurrence: Present. This species was observed in the Section 4 corridor during field surveys.

Potential impact: Impacts are possible.

5.17.4 Mitigation

Federally-Listed Species

The following reasonable and prudent measures were included in the Section 4 Tier 2 BO and will be completed as part of this project. Reasonable and prudent measures area actions the USFWS believes necessary or appropriate to minimize the impacts to the Indiana bat.

1. In the Section 4 Tier 2 BA (p. 114), the FHWA proposed to implement numerous conservation measures and mitigation efforts as part of their proposed action and these measures are hereby incorporated by reference. These measures will benefit a variety of wildlife species, including Indiana bats. FHWA should take necessary steps to ensure that successful implementation of all conservation measures is achieved to the fullest extent practicable in a timely manner.

2. The implementation status of all the proposed conservation measures, mitigation efforts, and research and any related problems need to be monitored and clearly communicated to the Service on an annual basis.

The following terms and conditions were included in the Section 4 Tier 2 BO and will be completed as part of this project.

1. *The FHWA, in consultation with the Service, must develop detailed, site-specific final mitigation plans for each secured mitigation site within six (6) months of securing the site or within six (6) months of the issuance of this BO, whichever is later. All mitigation sites must be identified and secured within 3 years of the issuance of this biological opinion, including the development of final mitigation plans. The mitigation plans will not be conceptual, but rather will contain detailed descriptions for each phase of mitigation including 1) initial construction and establishment, 2) 5-year, post-construction monitoring phase, and 3) long-term management. The Section 4 final mitigation plans will address and/or establish the following: quantifiable criteria and methods for assessing success of all mitigation plantings and functionality of constructed wetlands and streams, approved lists of tree/plant species to be planted (and their relative abundance/%), approved lists of herbicides for weed control, proposed construction schedules, annual post-construction monitoring schedules, and a long-term, ongoing management/stewardship strategy.*

   To ensure timeliness, the FHWA must begin construction and/or reforestation within the Section 4 Mitigation Areas either before (the most preferable option) or during the first summer reproductive season (1 April – 30 September) immediately after any I-69 related tree clearing or construction begins in Section 4 anywhere within each 2.5-mile radius maternity area. Once initiated, all Service-approved construction and tree plantings within the Section 4 Mitigation Areas must be completed within 3 calendar years.

2. *FHWA will provide the Service with a written annual report that summarizes the previous year's monitoring, conservation and mitigation accomplishments, remaining efforts, and any problems encountered within Section 4. This annual report will be completed throughout the 5-year post-construction monitoring period. The annual report for Section 4 may be a stand-alone document or included as part of the annual report required under the Tier 1 Term and Condition Number 2 (amended May 25, 2011). (pg. 70)*

The revised Tier 1 Biological Opinion issued by USFWS listed conservation measures to minimize impacts and ensure that the construction of I-69 is not likely to jeopardize the continued existence of any federally-listed threatened or endangered species or result in the destruction or adverse modification of their critical habitat. The following conservation measures were jointly developed by the FHWA, INDOT, and the USFWS during informal consultation and were subsequently incorporated into the Tier 1 BA and the Tier 1 BA Addendum as part of the official Proposed Action for the I-69 project. Since conservation measures are part of the Proposed Action, their implementation is required under the terms of the consultation. These measures were specifically designed to avoid and minimize impacts of the proposed action on Indiana bats and bald eagles and to further their recovery. Only those conservation measures applicable to Section 4 are listed below. Where text included in the Section 4 Tier 2 DEIS has received a status update in the Tier 2 BA or has otherwise changed due to planning or design modifications, it is noted as *Update* following the applicable text. In the event of any differences of wording between the conservation measures listed below and the Section 4 Tier 2 BA and BO, the BA and BO take precedence over the FEIS.

INDIANA BAT (*Myotis sodalis*)

CONTEXT SENSITIVE SOLUTIONS

WINTER HABITAT

1. **Alignment Planning—**Efforts will be made to locate Interstate alignments beyond 0.5 miles from known Indiana bat hibernacula.

   Status – All four alternatives have been located greater than 0.5 miles from any of the 15 known Indiana bat hibernacula.

2. **Blasting** – Blasting will be avoided between September 15 and April 15 in areas within 0.5 miles of known Indiana bat hibernacula. All blasting in the WAA will follow the specifications developed in consultation with the USFWS and will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of nearby caves serving as Indiana bat hibernacula.

   Status – To be completed.

3. **Hibernacula Surveys** – A plan for hibernacula surveys will be developed and conducted in consultation with and approved by USFWS during Tier 2 studies.

   Status – The survey plan was developed in consultation with USFWS and fieldwork has been completed. To date, 373 cave records were evaluated and 250 caves were visited in the field. Of these, 61 caves were surveyed for Indiana bats in 2004-2005 and 16 caves had fall harp trapping in 2005. The 16 caves that were harp trapped in the fall of 2005 also had internal cave surveys completed in December 2005. Three new Indiana bat hibernacula were identified as a result of these surveys.

4. **Karst Hydrology –** To avoid and minimize the potential for flooding, dewatering, and/or microclimate (i.e., temperature and humidity) changes within hibernacula, site-specific efforts will be made to minimize changes in the amount, frequency, and rate of flow of roadway drainage that enters karst systems that are determined to be hydrologically connected to Indiana bat hibernacula.

   Update – There is one hibernaculum for which hydrological connectivity with the corridor has been established. Karst feature dye tracing from inputs within the corridor established a positive dye trace to this cave in December 2005. Additional dye tracing in 2009 also had a positive dye trace for this cave. Efforts will be made to minimize any disturbance to the hydraulic/hydrologic function of these features, and their relationship to this cave, thus minimizing any potential changes to the hibernaculum microclimate. Where appropriate and practical, special planning should be conducted to insure drainage to these recharge features is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, special consideration, where appropriate and practicable, should be made to insure that construction does not sever these recharge features by sedimentation or impervious cover.

AUTUMN/SPRING HABITAT

5. **Tree Removal** - To minimize adverse effects on bat habitat, tree (three or more inches in diameter) cutting will be avoided within five miles of a known hibernaculum. If unavoidable, cutting will only occur between November 15 and March 31.

   Update – USFWS has clarified that cutting can only occur within the Winter Action Area between November 16 and March 31. No tree cutting within the Winter Action Area will occur between April 1 and November 15.

SUMMER HABITAT

6. **Alignment Planning—**Efforts will be made to locate Interstate alignments so they avoid transecting forested areas and fragmenting core forest where reasonable.

   Status – Efforts have been made to avoid and minimize fragmenting forests.

7. **Tree Removal—**Tree and snag removal will be avoided or minimized as follows:

   a. **Tree Cutting—**To avoid any direct take of Indiana bats, no trees with a diameter of 3 or more inches will be removed between April 1 and September 30. Tree clearing and snag removal will be kept to a minimum and limited to within the construction limits. In the median, outside the clear zone, tree clearing will be kept to a minimum with woods kept in as much a natural state as reasonable. Forested medians will be managed following the IDNR State Forest timber management plan.

   Update – The Revised Tier 1 BO and the Section 1 Tier 2 BO include the dates of April 15 to September 15. However, after that BO was issued, USFWS provided (on February 14, 2008) revised tree clearing restriction dates of April 1 to September 30 for areas not within the Indiana bat Winter Action Area. Within the Winter Action Area, tree cutting can only occur between November 16 and March 31. No tree cutting within the Winter Action Area will occur between April 1 and November 15. The I-69 project is governed by the conditions of the BO; however, INDOT and FHWA have adopted the updated tree clearing restriction dates for the project.

   b. **Mist Netting—**In areas with suitable summer habitat for the Indiana bat, mist net surveys will be conducted between May 15 and August 15 at locations determined in consultation with USFWS as part of Tier 2 studies. If Indiana bats are captured, some will be fitted with radio transmitters and tracked to their diurnal roosts for at least 5 days unless otherwise determined by USFWS.

      Status – Completed. A total of 148 mist net sites was surveyed (30 in Section 4) in 2004 and 49 sites (three in Section 4) were surveyed or resurveyed in the summer of 2005. (Note: Nine federally listed Indiana bats were captured in the Indiana bat study area for Section 4 in 2004. None of these were captured within the project corridor. Five roosts were found in Section 4 from radio tagging of the bats. None of these

were located within the Section 4 corridor. Two Indiana bats were captured during a second round of bat studies performed in 2005).

8. **Bridges**—Bridges will include the following design features:

   a. **Surveys**—The undersides of existing bridges that must be removed for construction of I-69 will be visually surveyed and/or netted to determine their use as night roosts by Indiana bats during the summer.

      Status – Completed. A total of 259 bridges and culverts were inspected for Indiana bats. Of the bridges surveyed, Indiana bats were found under one bridge. (Note: Sixty-six bridges and culverts were surveyed in Section 4. No Indiana bats were found roosting under the bridges and culverts associated with the Section 4 corridor.) At a bridge associated with the Section 3 corridor, five of the 13 Indiana bats captured in the 2004 Indiana bat study area were found. In 2005, an assessment at the same location found nine Indiana bats during the day and six at night. INDOT and FHWA have worked with USFWS to provide fencing below this bridge at both ends to prevent human disturbance. USFWS monitoring of this location is ongoing.

   b. **Bat-friendly Bridges**—Where feasible and appropriate, Interstate and frontage road bridges will be designed to provide suitable night roosts for Indiana bats and other bat species in consultation with USFWS.

      Update – Due to concerns relative to attracting bats to the high-speed interstate facility, it is currently proposed to not include any bat friendly bridges on I-69.

   c. **Floodplains**—Where reasonable and appropriate, floodplains and oxbows will be bridged to protect environmentally sensitive areas.

      Update – To be completed. (Although it is not anticipated that any floodplains in Section 4 will be bridged in their entirety, floodplain encroachments will be minimized, where reasonable, through design practices such as longer bridges and perpendicular stream crossings. There are five Federal Emergency Management Agency (FEMA) mapped floodplains crossed in Section 4: Black Ankle Creek, Dry Branch, Plummer Creek, Indian Creek, and an unnamed tributary to Clear Creek (formerly May Creek). A hydraulic study during final design will determine the length of the spans. A final hydraulic design study will be completed during the design phase, and a summary of this will be included with the Field Check Plans and Design Summary. The channels of Black Ankle, Dry Branch, Plummer, Mitchell Branch, Indian Creek and a portion of their overbanks will be bridged to minimize stream and riparian impacts.)

9. **Stream Relocations**—Site-specific plans for stream relocations will be developed in design considering the needs of sensitive species and environmental concerns. Plans will include the planting of woody and herbaceous vegetation to stabilize the banks. Such plantings will provide foraging cover for many species. Stream Mitigation and Monitoring plans will be developed for stream relocations, as appropriate.

Status – To be completed.

ALL HABITATS

10. **Medians and Alignments—**Variable-width medians will be used where appropriate to minimize impacts to sensitive and/or significant habitats. Context Sensitive Solutions will be used, where possible. This may involve vertical and horizontal shifts in the interstate.

    Status – It was determined that there were no locations where variable-width medians would reduce impacts to sensitive and/or significant habitats. A typical median width of 60 feet is proposed for Section 4. No trees will be left in the median.

11. **Minimize Interchanges -** Efforts have been made to limit interchanges in karst areas, thereby limiting access and discouraging secondary growth and impacts. In Tier 2, further consideration will be given to limiting the location and number of interchanges in karst areas.

    Status – No additional interchanges are proposed in Section 4. A potential interchange near the Greene/Monroe County line identified in Tier 2 is included in the Alternatives. A potential interchange at SR 54 identified in Tier 1 was studied in Tier 2 and is no longer under consideration.

12. **Memoranda of Understandings (MOUs)—**Construction will adhere to the Wetland MOU (dated January 28, 1991) and the Karst MOU (dated October 13, 1993). The Wetland MOU minimizes impacts to the Indiana bat by mitigating for wetland loss; and creating bat foraging areas at greater ratios than that lost to the project. The Karst MOU avoids and minimizes impacts to the Indiana bat by numerous measures which protect sensitive karst features including hibernacula.

    Status – Wetland impacts associated with Section 4 will be mitigated in accordance with the Wetlands MOU. Procedural steps 1-4 of 17 procedural steps outlined in the Karst MOU are being addressed in Tier 2. Additional procedural steps to be completed.

13. **Water Quality—**Water contamination will be avoided/minimized by the following:

    a. **Equipment Service—**Equipment servicing and maintenance areas will be designated to areas away from streambeds, sinkholes, or areas draining into sinkholes.

       Status - Procedural steps 1-4 of the Karst MOU are being addressed in Tier 2. Additional procedural steps to be completed.

    b. **Roadside Drainage—**Where appropriate, roadside ditches will be constructed that are grass-lined and connected to filter strips and containment basins.

       Update - Specific impacts to karst features and treatment of drainage has not been determined at this time. Impacts to specific karst features will be addressed via consideration of alternative drainage and other appropriate mitigation features during

final design. Such treatment measures include peat and sand filters, gravel filters, vegetated buffers, and lined spill or run-off containment structures.

c. **Equipment Maintenance—**Construction equipment will be maintained in proper mechanical condition.

Status - To be completed.

d. **Spill Prevention/Containment—**The design for the roadway will include appropriate measures for spill prevention/containment.

Status - Special measures including diversions of highway runoff from direct discharge off of bridge decks into streams, and containment basins to detain accidental spills, will be incorporated into final design plans for perennial streams within the Indiana bat maternity colony areas to address water quality concerns associated with Indiana bats. This will include the bridges crossing Black Ankle Creek, Dry Branch, and the 3 most northern Indian Creek crossings. The remaining perennial streams Plummer Creek, Mitchell Branch, the southernmost Indian Creek, an Unnamed Tributary to Clear Creek (also known as Happy Creek), and an Unnamed Tributary to Clear Creek (also known as May Creek) crossings all fall within the Winter Action Area.

Measures for spill prevention/containment will be included in the roadway design. Contractors will be required to provide an acceptable spill response plan. This response plan will include telephone numbers for emergency response personnel and copies of agreements with any agencies which are part of the spill response effort. An emergency response telephone number is also required. The Rule 5 Permit that contractors must obtain will require that each contractor have spill containment plans in their contract documents.

e. **Herbicide Use Plan -** The use of herbicides will be minimized in environmentally sensitive areas, such as karst areas that are protective of Indiana bats and their prey. Environmentally sensitive areas will be determined in coordination with INDOT as appropriate. Appropriate signage will be posted along the interstate to alert maintenance staff.

Update – The use of herbicides will be minimized within the environmentally sensitive habitats. Environmentally sensitive habitats within Section 4 include Black Ankle Creek/Koleen Bottoms and all Indian Creek crossings. In addition, the herbicide use plan will include any drainage area of a karst feature which is used for highway drainage.

f. **Revegetation—**Revegetation of disturbed areas will occur in accordance with INDOT standard specifications. Woody vegetation will only be utilized beyond the clear zone. Revegetation of disturbed soils in the right-of-way and medians will utilize native grasses and wildflowers, as appropriate, similar to the native seed mixes of other nearby states.

Update – Revegetation of disturbed areas will occur in accordance with INDOT standard specifications. Woody vegetation will only be used a reasonable distance beyond the clear zone to ensure a safe facility. Revegetation of disturbed soils in the right-of-way and medians will utilize native grasses and wildflowers as appropriate, such as those cultivated through INDOT's Roadside Heritage program. Locations that may be considered, but are not limited to, include Black Ankle Creek crossing, Indian Creek Crossings, and an Unnamed Tributary to Clear Creek (also known as May Creek) crossing. Other areas that may be considered will be at the interchange locations.

g. **Low Salt Zones—**A low salt and no spray strategy will be developed for this project. A signing strategy for these items will also be developed. The low-salt zones will be determined in coordination with INDOT. The low salt zones will be delineated in the section-specific Tier 2 BAs.

   Update – The karst region begins at Taylor Ridge Road and extends north to SR 37 within Section 4. The low salt zones will be defined within any drainage area of a karst feature which is used for highway drainage.

h. **Bridge Design—**Where feasible and appropriate, bridges will be designed with no or a minimum number of in-span drains. To the extent possible, the water flow will be directed towards the ends of the bridge and to the riprap drainage turnouts.

   Status – To be completed.

14. **Erosion Control—**Temporary erosion control devices will be used to minimize sediment and debris. Timely revegetation after soil disturbance will be implemented and monitored. Revegetation will consider site specific needs for water and karst. Erosion control measures will be put in place as a first step in construction and maintained throughout construction.

    Update – BMPs will be used in the construction of this project to minimize impacts of erosion. Erosion control measures will be put in place as a first step in construction and maintained throughout construction. Temporary erosion control devices, such as silt fencing, check dams, sediment basins, inlet protection, sodding, and other appropriate BMPs will be used to minimize sediment and debris in tributaries and karst features within the project area. Timely revegetation will be implemented after soil disturbance and monitored. Any riprap used will be of a large diameter in order to allow space for habitat for aquatic species after placement. Slopes will be designed that resist erosion. If slopes exceed 2 to 1, they will include stabilization techniques. Soil bioengineering techniques for bank stabilization will be considered where situations allow.

15. **Parking and Turning Areas—**Parking and turning areas for heavy equipment will be confined to sites that will minimize soil erosion and tree clearing, and will avoid environmentally sensitive areas, such as karst.

    Status – To be completed.

RESTORATION / REPLACEMENT

SUMMER HABITAT

1. **Summer Habitat Creation / Enhancement—** Indiana bat summer habitat will be created and enhanced in the Action Area through wetland and forest mitigation focused on riparian corridors and existing forest blocks to provide habitat connectivity. The following areas and possibly others will be investigated for wetland and forest mitigation to create and enhance summer habitat for the Indiana bat: Pigeon Creek, Patoka River bottoms, East Fork of the White River, Thousand Acre Woods, White River (Elnora), First Creek, American Bottoms, Ray's Cave, Sexton Springs Cave, Garrison Chapel Valley, Beanblossom Bottoms, White River (Gosport), White River (Blue Bluff), and Bradford Woods.

   In selecting sites for summer habitat creation and enhancement, priority will be given to sites located within a 2.5 mile radius from a recorded capture site or roost tree. If willing sellers cannot be found within these areas, other areas may be used as second choice areas as long as they are within the Action Area and close enough to benefit these maternity colonies, or are outside the Action Area but still deemed acceptable to the USFWS.

   Where appropriate, mitigation sites will be planted with a mixture of native trees that are largely comprised of species that have been identified as having relatively high value as potential Indiana bat roost trees. Tree plantings will be monitored for five years after planting to ensure establishment and protected in perpetuity via conservation easements.

   Update*:* The Section 4 Tier 2 BA identifies a total of 36 properties for mitigation. Seven (7) focus areas were targeted for the Section 4 mitigation: SR 57, Doan's Creek Maternity Colony, Plummer Creek Maternity Colony, Little Clifty Branch Maternity Colony, Indian Creek Maternity Colony Area, Cave[11], and Garrison Chapel Valley. The 36 sites also include sites acquired by INDOT for preservation and sites that have been acquired or are in the acquisition process which have anticipated future restoration and replanting activities. These 36 sites are expected to provide a total of more than 2,636 acres of forest preservation and over 1,168 acres of reforestation. The combined sites will also provide 2.0 acres of Scrub-shrub Wetlands, more than 12 acres of Emergent Wetlands and more than 13 acres of Forested Wetlands. Additional details on these sites is presented in the Section 4 Tier 2 BA in Appendix JJ1.

2. **Wetland MOU—**Wetlands will be mitigated at ratios agreed on in the Wetland MOU (dated January 28, 1991). Wetland replacement ratios are as follows:

   a. Farmed wetlands 1 to 1.

   b. Scrub/shrub and palustrine/lacustrine emergent wetlands 2 - 3 to 1 depending upon quality.

[11] The cave is an important Indiana bat hibernaculum.

c. Bottomland hardwood forest wetlands 3 - 4 to 1 depending upon quality.

d. Exceptional, unique, critical (i.e. cypress swamps) 4 and above to 1 depending upon quality.

Update – To be completed (Note: Refined Preferred Alternative 2 (Low-Cost and initial design criteria) impacts approximately 3.33 to 5.34 acres of emergent, 0.18 to 0.45 acres of scrub/shrub wetlands, 1.71 to 2.35 acres palustrine unconsolidated bottom and 1.81 to 3.76 acres of forested wetlands. Based on the range of mitigation ratios described in Section 7.3.9, *Wetland Impacts*, the total area needed for mitigation of impacts to wetlands for Refined Preferred Alternative 2 ranges from approximately 15.79 to 29.14 acres (including a 25% buffer), depending on the mitigation ratios applied and the design criteria implemented.) The 36 Section 4 mitigation sites identified to date are estimated to provide a combined 12 acres of Emergent Wetlands, 2.0 acres of Scrub-shrub Wetlands, and 13 acres of Forested Wetlands.

3. **Forest Mitigation—**The Tier 1 *Forest and Wetland Mitigation and Enhancement Plan* (Appendix P) identifies the general location of potential mitigation sites for upland and bottomland forests. Preference will be given to areas contiguous to large forested tracts that have recorded federal-and state-listed species. The actual mitigation sites implemented will be determined in or following Tier 2 in consultation with the USFWS and other environmental review agencies. Coordination with the environmental review agencies will assure that these forest mitigation sites are strategically situated in biologically attractive ecosystems. Forest impacts will be mitigated at a ratio of 3 to 1. All forest mitigation lands will be protected in perpetuity via conservation easements. The 3 to 1 forest mitigation may not be located entirely within the Action Area. Forest impacts occurring within each of the 13 2.5-mile radius maternity colony areas would be mitigated by replacement (i.e. planting of new forest and purchase of existing) at approximately 3 to 1, preferably in the vicinity of the known roosting habitat.

   Update – To be completed. (Note: Forest impacts will be mitigated at a ratio of 3 to 1. Section 4 will require approximately 2,616 (low-cost design criteria) to 3,262 acres (initial design criteria) of upland forest mitigation for Refined Preferred Alternative 2. All forest mitigation lands will be protected in perpetuity via direct purchase or conservation easements. **Figure 7-6** (p. 7-66) shows an example of reforestation. The 36 mitigation properties that have been identified are expected to provide for 1,168 acres of reforestation and 2,636 acres of forest preservation, for a total forest mitigation of 3,804 acres, or 542 acres more than needed to fulfill the agreed-upon mitigation ratios. These extra acres may be applied as necessary to other future INDOT mitigation projects.

CONSERVATION / PRESERVATION

WINTER HABITAT

1. **Hibernacula Purchase -** Opportunities will be investigated to purchase at fair market value from "willing sellers," one or more Indiana bat hibernaculum(a) including associated autumn swarming/spring staging habitat. After purchase and

implementation of all management efforts, the hibernaculum(a) and all buffered areas will be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

Update – Property owners of Indiana bat hibernacula within the winter action area and one hibernaculum outside of the winter action area were contacted to determine if they would be willing sellers. Currently, three hibernacula (including two Priority 1A caves) have been secured, and an offer is outstanding on a fourth hibernaculum.

2. **Hibernacula Protection** – With landowner permission, investigations will be coordinated with the USFWS on acquiring easements to erect bat-friendly angle-iron gates at cave entrances. These gates prevent unauthorized human access and disturbance of hibernacula, while maintaining free airflow within the hibernacula within the Action Area. Gates will be constructed according to designs from the American Cave Conservation Association. Effects of gates on water flow and flash flooding debris will be carefully evaluated before and after gates are installed. Other structures (e.g., perimeter fencing) or techniques (e.g., alarm systems and signs) may also be used.

   Status – To be completed.

AUTUMN/SPRING HABITAT

3. **Autumn/Spring Habitat Purchase -** Any hibernaculum(a) purchased as part of conservation for Indiana bat winter habitat will include associated autumn swarming/spring staging habitat to the maximum extent practicable. Any purchase will be from a willing seller at fair market value. In addition, some parcels containing important autumn swarming/spring staging habitat may be acquired near key hibernacula regardless of whether the hibernacula are acquired themselves. Any acquired autumn swarming/spring staging habitat would be turned over to an appropriate government conservation and management agency for protection in perpetuity via conservation easements. The purchase of forest would be included as part of the 3 to 1 forest mitigation.

   Status – Property owners of Indiana bat hibernacula within the winter action area and one hibernaculum outside of the winter action area were contacted to determine if they would be willing sellers. Currently, three hibernacula (including two Priority 1A caves) have been secured, and an offer is outstanding on a fourth hibernaculum. Autumn/Spring habitat will be included for those parcels referenced above that are purchased as part of the I-69 project.

SUMMER HABITAT

4. **Summer Habitat—**Investigations will be coordinated with the USFWS on purchasing lands at fair market value in the Action Area from "willing sellers" to preserve summer habitat. Any acquired summer habitat area would be turned over to

an appropriate government conservation and management agency for protection in perpetuity via conservation easements.

Status – To be completed.

EDUCATION / RESEARCH / MONITORING

WINTER HABITAT

1. **Monitor Gated Caves -** All caves that have gates erected as mitigation for this project will have their temperature, humidity, bat activity and populations monitored before and for three years after gate installation. Infra-red video monitoring or other techniques deemed acceptable by USFWS will be conducted for a minimum of two nights in the appropriate season at each newly installed cave gate to ensure the bats are able to freely ingress and egress. Data acquisition will use a number of data loggers minimizing the need for entry into these caves. All precautionary measures will be taken to minimize potential impacts to hibernating Indiana bats.

   Status – To be completed.

2. **Cave Warning Signs -** Where deemed appropriate by USFWS, the following may be done: signs will be posted that warn the public and discourage cave entry at hibernacula within/near the Action Area. Signs should be placed so that they do not block air flow into the cave and do not draw attention to the entrance and attract violators (USFWS 1999). Also, light-sensitive data loggers may be placed within the caves to assess the effectiveness of the warning signs at deterring unauthorized entries. Permission from the landowners must be obtained before erecting such signs and installing data loggers.

   Status – To be completed.

3. **Biennial Census –** Total funding of $50,000 will be provided to supplement the biennial winter census of hibernacula within/near the proposed Action Areas. Funding will be made available in consultation with the USFWS.

   Status – To be completed.

AUTUMN/SPRING HABITAT

4. **Autumn/Spring Habitat Research -** Total funding of $125,000 will be provided for research on the relationship between quality autumn/spring habitat near hibernacula and hibernacula use within/near the Action Area. This research should include methods attempting to track bats at longer distances such as aerial telemetry or a sufficient ground workforce. A research work plan will be developed in consultation with the USFWS. Funding will be made available as soon as practical after Notice to Proceed is given to the construction contractor for the applicable Tier 2 Section (or earlier).

Status – To be completed.

SUMMER HABITAT

5. **Mist Netting—** A work plan for surveying, monitoring, and reporting will be developed and conducted in consultation with and approved by USFWS. This mist netting effort will be beyond the Tier 2 sampling requirements. Fifty mist netting sampling sites are anticipated. Monitoring surveys focused at each of the 13 known maternity colonies will be completed the summer before construction begins in a given section and will continue each subsequent summer during the construction phase and for at least five summers after construction has been completed. If Indiana bats are captured, radio transmitters will be used in an attempt to locate roost trees, and multiple emergence counts will be made at each located roost tree. These monitoring efforts will be documented and summarized within an annual report prepared for USFWS.

   Update – Five of the 30 total sites in Section 4 were mist netted in the summer of 2010. One male Indiana bat was captured and was tracked to a primary roost. This resulted in the identification of a fourth Indiana bat maternity colony in Section 4. Fourteen maternity colonies have been identified within I-69.

GENERAL

6. **Educational Poster—**Total funding of $25,000 will be provided for the creation of an educational poster or exhibit and/or other educational outreach media to inform the public about the presence and protection of bats, particularly the Indiana bat. Funding would be provided after a Notice to Proceed is issued for construction of the first section of the project.

   Status – To be completed.

7. **GIS Information—**GIS maps and databases developed and compiled for use in proposed I-69 planning will be made available to the public. These data provide information that can be used to determine suitable habitats, as well as highlight other environmental concerns in local, county, and regional planning. Digital data and on-line maps are being made available from a server accessed on the Indiana Geological Survey (IGS) Website at IU: http://igs.indiana.edu/arcims/statewide/index.html. In addition, detailed GIS forest data (five-meter resolution) has been developed for the 13 maternity colony foraging areas (circles with 2.5-mile radius) and WAA. This data was developed in order to better determine habitat impacts to the Indiana bat. This is the most accurate and detailed forest data known to exist for those areas. This data could potentially be used by USFWS, other government agencies, or students to examine effects on the Indiana bat, other species, or ecosystems over time.

   Status – Completed.

In addition to the conservation measures listed above, the following conservation recommendations for the Indiana bat were included in the BO. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action/program on listed species or critical habitat, to help implement recovery plans, or to develop information. Conservation recommendations generally do not focus on a specific project, but rather on an agency's overall program.

1. Provide funding for scientific research on White-nose syndrome in bats.

2. Working with the Service, develop national best management practices (BMPs) for addressing Indiana bat issues associated with FHWA-funded projects within the range of the Indiana bat.

3. In coordination with the BFO, purchase or otherwise protect additional Indiana bat hibernacula and forested swarming habitat in Indiana.

4. Provide funding to expand on scientific research and educational outreach efforts on Indiana bats in coordination with the Service's BFO.

5. Provide funding to staff a full-time Indiana Bat Conservation Coordinator position within the BFO, which has the Service's national lead for recovering this wide-ranging species.

FHWA and INDOT have no current plan to commit additional funding to implement these conservation recommendations. However, both INDOT and FHWA continue to work with the USFWS to provide information and develop BMPs associated with highway development, management and maintenance to assist in the conservation of the Indiana bat.

BALD EAGLE (Haliaeetus leucocephalus)

Most conservation measures for the bald eagle are also measures for the Indiana bat, and have been updated in the Indiana bat Conservation Measures section, described above. The conservation measures for the bald eagle are described in the revised Tier 1 BO, provided in **Appendix DD**.

Regarding the recent change in status of the bald eagle, on June 28, 2007, the Secretary of the Interior announced that the bald eagle would be removed from the endangered species list. In the announcement the Secretary noted that the bald eagle would continue to be protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Both of these federal laws prohibit the "taking" of bald eagles. In guidance issued in June 2007 the Department of the Interior stated that USFWS would honor existing Endangered Species Act authorizations in place before the effective date of the delisting. The guidance indicates that USFWS does not intend to seek prosecution of a "take" of any bald eagle under either the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act, if the "take" is in full compliance with the terms and conditions of an incidental take statement issued to the action agency.

A Bald and Golden Eagle Protection Act permit from the USFWS was acquired for this project for the bald eagle on June 25, 2009 (**Appendix Y**). This permit includes all six Sections of I-69. FHWA and INDOT intend to comply fully with the terms and conditions imposed by the incidental take statement that is included in the August 24, 2006, revised Tier 1 BO, as it proceeds with this project. Conservation measures developed for the bald eagle as part of the Tier 1 BA and Tier 1 BA Addendum will be completed as a condition of the permit, despite the species delisting. A review of the IDNR Heritage Database current through 2009 showed that there were no bald eagle observations of any type near Section 4.

Indiana's forests are an important resource for wildlife, including providing summer roosting trees for Indiana bats and several species of state-listed bats. The revised Tier 1 BO identifies 1,132 acres as the estimated direct forest impact for Section 4. Throughout the development of Build Alternatives in Section 4, efforts have been made to avoid or minimize impacts to forests. Due to the fact that expansive forest tracts span the entire Section 4 corridor, avoidance is not possible in many cases. Between 872.12 to 1,087.37 acres of upland forest and an additional 1.81 to 3.76 acres of forested wetland are potentially impacted by Refined Preferred Alternative 2 (low-cost and initial design criteria).

Upland forest impacts will be mitigated at a ratio of 3 to 1 for the I-69 Evansville to Indianapolis project as a whole, through the preservation and/or replacement of forested lands within Southwest Indiana. The 3 to 1 mitigation ratio may not necessarily be provided within each Tier 2 section; however, the total mitigation for all forest impacts will be 3 to 1. For purposes of discussing the potential mitigation requirements for forest impacts in Section 4 in this FEIS, the 3 to 1 ratio has been used. Given this ratio, mitigation for Refined Preferred Alternative 2's impact to 872.12 to 1,087.37 acres of upland forest would be approximately 2,616 to 3,262 acres.

As noted in the list of conservation measures above, 36 specific properties have been identified to date within Section 4 to provide mitigation of forest impacts. These 36 properties are expected to provide 1,168 acres of reforestation and 2,636 acres of forest preservation, for a total forest mitigation of 3,804 acres, or 542 acres more than needed to fulfill the agreed-upon mitigation ratios in Section 4. These extra acres may be applied as necessary to other future INDOT mitigation projects. Field investigations and review of aerial photography resulted in the identification of four USDA forest classification types in the corridor for Section 4. **Table 5.20-1** in Section 5.20, *Forests*, lists the four types and describes the habitat(s) associated with each. Section 5.18, *Wildlife Considerations*, provides more detailed information about habitat types in the corridor. Chapter 7, *Mitigation and Commitments*, describes proposed measures to avoid and/or mitigate impacts to forest and wetland habitats, and Indiana bats.

INDOT will continue to coordinate with the IDNR to minimize impacts to the eastern box turtle in Section 4.

5.17.5 Summary

This study has included an evaluation of potential impacts on federally-listed threatened and endangered species, as well as state-listed species. The evaluation of impacts on federally-listed

species has been carried out in consultation with USFWS under Section 7 of the Endangered Species Act.

In Section 7 consultation during the preparation of the Tier 1 EIS, USFWS initially identified six species in the 26-county Study Area that required evaluation. All six of those species were evaluated in the Tier 1 DEIS. In comments on the Tier 1 DEIS, USFWS requested that FHWA and INDOT prepare a Biological Assessment (BA) for a single Preferred Alternative prior to publication of the FEIS. Subsequently, INDOT identified the Alternative 3C as the Tier 1 Preferred Alternative. FHWA and INDOT then proceeded with Section 7 consultation regarding the impacts of Preferred Alternative 3C.

Of the six species evaluated in the Tier 1 DEIS, USFWS identified three species that may be present in the Action Area for Preferred Alternative 3C. Those three species were the Indiana bat, the bald eagle, and the eastern fanshell mussel. It should be noted that the bald eagle is no longer a listed species but remains protected under other laws.

FHWA and INDOT initiated formal consultation with USFWS on the Indiana bat, the bald eagle,[12] and the eastern fanshell mussel. FHWA and INDOT prepared a Tier 1 BA for all three species identified by USFWS and an addendum to the Tier 1 BA for the Indiana bat. Based on these, USFWS concurred that the project "is not likely to adversely affect" the eastern fanshell mussel. Formal consultation concluded with the issuance of a revised Tier 1 BO by USFWS on August 24, 2006. The revised BO concluded that Preferred Alternative 3C "is not likely to jeopardize the continued existence" of the Indiana bat or the bald eagle nor would it be "likely to destroy or adversely modify [Indiana bat] designated Critical Habitat." (p. 98) It also noted, "Because no Critical Habitat has been designated for the bald eagle, none will be adversely modified by this project." (p. 37) The revised Tier 1 BO also included an incidental take statement for both species. The BO specifies the procedures to be followed for Section 7 consultation in Tier 2.

A Tier 2 BA for Section 4 on Refined Preferred Alternative 2 has been prepared for the USFWS in accordance with those procedures. It provides the USFWS new and/or more detailed information including a discussion of the expanded SAA and WAA for the Indiana bat, revised direct forest impact data, and a proposed mitigation site plan; and documents compliance with the requirements of the revised Tier 1 BO. In its Section 4 Tier 2 BO issued on July 6, 2011 (see Appendix JJ2), the USFWS noted that "it is the Service's biological opinion that Section 4 of the I-69 Project, by itself or when considered in conjunction with the larger I-69 project from Evansville to Indianapolis, is not likely to jeopardize the continued existence of the Indiana bat." (pg. 65) USFWS further stated: "with successful implementation and maturation of the proposed mitigation projects, permanent protection of two Priority 1A hibernacula, and other proposed mitigation and conservation measures, we anticipate that long-term habitat conditions for these colonies will be suitable and sustainable for the long-term survival and recovery of the species." (pg. 50) The issuance of the BO concluded formal Section 7 consultation in I-69 Section 4. The Tier 2 BO confirmed the Indiana bat may be adversely affected and ensured the level of effect is

[12] Delisted effective August 8, 2007. See footnote p. 5.17-347.

commensurate with the Tier 1 RPBO. This verifies the determination that I-69 Section 4 will not jeopardize the continued existence of the Indiana bat.

The Tier 2 biological surveys conducted in Section 4 included generalized pedestrian surveys during project field work, harp and mist netting for Indiana bats, and cave fauna survey. No federally-listed species of flora or fauna were identified within the Section 4 corridor during the generalized survey. Nine Indiana bats were captured during the 2004 bat survey. Five bat roosts were identified outside of the project corridor using radio tracking. In the areas where Indiana bats were captured additional mist netting was completed in the summer of 2005. Two Indiana bats were captured during that mist netting. Based on the results of these mist net surveys, three Indiana bat maternity colonies were originally identified near Section 4, in the vicinity of Doan's, Plummer and Indian Creeks. Pre-construction mist netting was conducted in the summer of 2010. One Indiana bat was captured and tracked to four roost trees. An additional maternity colony was identified near Little Clifty Branch based on the results of the 2010 surveys. A total of four Indiana bat maternity colonies were identified in Section 4. Based on the results of these surveys no direct or indirect impacts on threatened or endangered federally-listed species that would jeopardize the continued existence of such species are anticipated as a result of any of the alternatives in Section 4. Due to the availability of habitat or their known presence in the Section 4 study area, impacts to the following state listed species are possible: Indiana cave springtail, Packard's groundwater amphipod, Bollman's cave millipede, Jeannel's groundwater ostracod, Ray's cave beetle, Krekeler's cave ant beetle, Ashcraft cave springtail, hilly springtail, Fountain cave springtail, Weingartner's cave flatworm, Indiana cave amphipod, eastern spadefoot, eastern box turtle, barn owl, loggerhead shrike, red-shouldered hawk, sharp-shinned hawk, Henslow's sparrow, hooded warbler, cerulean warbler, , little brown bat, eastern pipistrelle, eastern red bat, northern myotis and the bobcat. Forest and wetland mitigation for Section 4 is anticipated to benefit both state and federally listed species.

Figure 5.17-1: Indiana Bat (*Myotis sodalis*) SE, FE

Figure 5.17-2: Bald Eagle (*Haliaeetus leucocephalis*) SSC

Figure 5.17-3: Eastern Fanshell Mussel (*Cyprogenia stegaria*) SE, FE

Figure 5.17-4: Packard's Groundwater Amphipod (*Crangonyx packardi*) WL

Figure 5.17-5: Crawfish Frog (*Rana areolata circulosa*) SE

Figure 5.17-6: Eastern Spadefoot (*Scaphiopus holbrookii)* SSC

Figure 5.17-7: Barn Owl (*Tyto alba*) SE

Figure 5.17-8: Henslow's Sparrow (*Ammodramus henslowii*) SE

Figure 5.17-9: Northern Harrier (*Circus cyaneus*) SE

Figure 5.17-10: Sharp-shinned Hawk (*Accipiter striatus*) SSC

Figure 5.17-11: Eastern box turtle (*Terrapene carolina*) SSC

Figure 5.17-12: Little Brown Bat (left, *Myotis lucifugus*) SSC, and Indiana Bat (right, *Myotis sodalis*) SE, FE

Figure 5.17-13: Bobcat (*Lynx rufus*) SSC

Figure 5.17-14: Least weasel (*Mustela nivalis*) SSC

Figure 5.17-15: Timber rattlesnake (*Crotalus horridus*) SE

5.18 Wildlife Considerations

Since the DEIS, the following substantive changes have been made to this section:

- Section 5.18.2 was updated to include the pre-construction Indiana bat mist netting report.
- Section 5.18.3 and **Table 5.18-2** have been modified to present the impacts of Refined Preferred Alternative 2.
- Section 5.18.4 has been modified to include reference to the Tier 2 Section 4 BO.
- **Figure 5.18-1** (p. 5-529) was updated to depict Refined Preferred Alternative 2.
- Section 5.18.4 was updated to provide discussion of commitments relating to the placement of riprap and continued coordination with IDNR regarding eastern box turtles.
- Section 5.18.4 was updated to clarify that INDOT is committing to providing 11 structures that will meet the minimum dimensions for deer crossings and 18 structures may or may not provide these dimension but still provide opportunities for wildlife movement.

5.18.1 Introduction

Land development and transportation needs are growing quickly and with this growth comes an increase in road density (Evink, 2002). Wildlife populations may be able to tolerate roadway impacts beneath a certain threshold. However, as road density and development increase, animals are pressed into smaller spaces or must cross roads more frequently. Road densities are one of the best measures of the impact upon wildlife (Rudolph, 2000).

To ensure that wildlife and ecosystems remain healthy in the future, some connectivity and permeability must be provided in what would otherwise become another barrier to wildlife and ecosystem flow. Connectivity between habitats crossed by roadways can be maintained by a range of actions from simply modifying planned culverts to planning extensive span bridges over habitat corridors. Context sensitive designs can help create roads with fewer impacts on wildlife.

Highways are long linear features that have impacts on wildlife and wildlife habitat that are disproportionate to the acreage they occupy. Impacts do not occur only at the time of construction, but also accumulate over time (Jackson, 2000).

Wildlife and vehicle collisions, particularly involving deer, cause significant injury and damage to motorists and property (Evink, 2002). It is estimated that 1.5 million deer-vehicle collisions occur annually throughout the United States. Each year, these accidents cause 29,000 human injuries and at least 200 deaths (Conover et al., 1995). Annual damage to vehicles from these collisions exceeds $1.1 billion (Ibid.). There are no data available to estimate the number of accidents and amount of damage caused by drivers trying to avoid animals crossing roadways, or from motorists hitting smaller animals such as skunks, raccoons, opossums, squirrels, and turtles.

Appropriate planning and mitigation during construction can go far to prevent long-term degradation of wildlife populations and their associated ecosystems, as well as improve public safety (Jackson, 2000).

Highways impact wildlife directly by their effects on habitat and mortality. They indirectly impact wildlife through increased human exploitation of wildlife and wildlife avoidance of roads. Highways have the potential to affect broad ecological processes in a landscape by fragmenting the wildlife population, restricting wildlife movement, and disrupting gene flow and metapopulation dynamics (Evink, 2002; Jackson, 2000). Metapopulation dynamics are defined as the group dynamics of distinct populations occupying areas of suitable habitat. The impacts of highways on local/regional populations, habitat fragmentation, and metapopulation dynamics are important factors affecting the long-term persistence of populations. Highways do not affect all wildlife species equally. They may act as filters, stopping some individuals or species while letting others through. Over time this filtering of species based on habitat barriers can have important impacts on species distribution across a landscape (Jackson, 2000).

Maintaining the ecological health of the project area requires that mitigation measures for highway impacts consider all species populations. By designing the highway to include structures that increase landscape permeability and provide habitat "stepping stones" between habitat core areas, the ecological infrastructure of the project area can be maintained. ***Mitigation for impacts on wildlife populations will focus on creating connectivity for all species that are a part of the natural community.*** In doing so, natural processes, wildlife movement, population dynamics, and species distribution in the community will experience less impact from the construction of the interstate.

The following sections identify the natural communities located within the project corridor, the potential impacts to habitat as a result of the project, actions taken to avoid or minimize impacts and potential mitigation measures where impacts would be unavoidable.

5.18.2 Methodology

A literature investigation and field surveys were conducted to identify existing natural resources and endangered and threatened species located with the Section 4 project corridor. Biological surveys conducted for Section 4 involving bat mist netting, wetlands analysis and streams analysis are described in greater detail in Section 5.17, *Threatened and Endangered Species,* and Section 5.19, *Water Resources*. The methodology and results of these studies are detailed in the following reports provided in the FEIS appendices, as noted:

- *Summer Habitat for the Indiana Bat (Myotis sodalis) within the Crawford Upland and Mitchell Plain from Scotland to Bloomington, Indiana* (ESI, 2004), in **Appendix** O, *Indiana Bat Surveys*.
- *Additional Telemetry and Roost Studies of Summer Habitat For the Indiana Bat (Myotis sodalis) Within the Wabash Lowland, Crawford Upland, and Mitchell Plain Regions From Elberfeld to Bloomington, Indiana* (ESI, 2005), in **Appendix O**.
- *Pre-Construction Mist Netting for the Indiana Bat (Myotis sodalis) for Sites 2, 3, 8, 11, and 14 from US 231 to SR 45 Lower White River Watershed in Section 4 (Greene County, IN),* in

Appendix O *I-69 Evansville to Indianapolis Tier 2 Studies, Cave Reconnaissance for Indiana bat Hibernacula,* (IGS, 2006), in **Appendix O**.

- *Surveys for Indiana bats in Caves in Greene and Monroe Counties, Indiana 2006, (BHE, 2006), in* **Appendix O**.
- *Autumn 2005 and Winter 2006 Habitat for the Indiana Bat (Myotis sodalis) within the Crawford Upland and Mitchell Plain from Scotland to Bloomington, Indiana* (ESI, 2006), in **Appendix O**.
- *Interstate 69 Evansville to Indianapolis Tier 2 Studies: Section 4 Cave Fauna* (Cave, Karst and Groundwater Biological Consulting, 2006), included in **Appendix AA**, *Final Karst Report/Addendum to Karst Report (Redacted)*.
- *I-69 Evansville to Indianapolis Tier 2 Studies: Survey of Karst Features Draft Report, Section 4, US 231 to SR 37* (Hydrogeology Inc., 2009), in **Appendix AA.**
- *Final Wetlands Technical Report,* in **Appendix F**, *Final Wetland Technical Report*.
- *Final Stream Assessment Report,* in **Appendix M**, *Final Stream Assessment Report*.

Classification of natural communities within the Section 4 project corridor by habitat type facilitates the evaluation of impacts resulting from implementation of the project. The habitat types listed below were developed according to the vegetative characteristics of each community as documented during the field investigations conducted during the field surveys.

Based on the results of the field investigations, nine habitat types were developed within the corridor: (1) old field; (2) early to mid-successional forest; (3) forest fragment (4) mesic floodplain forest; (5) dry-mesic forest; (6) mesic upland forest; (7) emergent wetland; (8) forested wetlands (including scrub/shrub wetlands); and (9) open water. **Figure 5.18-1** (p. 5.18-529) shows the locations of all habitat communities identified by the field investigations within the Section 4 corridor. The basic characteristics of these habitat types are described below and summarized in **Table 5.18.1**. Active agricultural areas were not included as a habitat type because these areas typically occur within a matrix of other habitat types and provide little habitat when isolated. In addition, depending on management intensity or cultivation method, agricultural habitat may vary substantially from year to year; cultivated agricultural lands are typified by periods of bare soil and harvest as pastures are mowed, hayed, or grazed one or more times during the growing season.

HABITAT TYPES AND ASSOCIATED SPECIES[1]

(1) Old Field — (224.92 Acres)

[1] Some of these habitat types are assigned names similar to those used for resources in other chapters. For example, six of the nine habitat types use "forest" as part of the name. However, not all satisfy the USDA definition of "forest" which is used to define forests in Section 5.20, *Forest Impacts*. See explanation with Table 5.18-2 for more details.

Habitat: Old field habitat is typically considered land that has been previously managed as active agricultural land including pasture, hay fields, or row cropland such as corn (*Zea mays*) or soybeans (*Glycine max*) fields. Following managed use, these habitats lay fallow for several years, eventually reverting to an assemblage of various native and naturalized grasses and forbs. Old fields are a valuable habitat type for wildlife in the Midwest and this habitat type typically supports a variety of species; however, exact species composition is dependent upon the successional stage of a given old field. Succession is defined as the transition from one biotic community to another in a given habitat (Jackson, 1997). Old field succession typically progresses from meadow to scrub/shrub through a process that occurs over an approximately three-year time frame. For the purposes of this project, the scrub/shrub old field habitats have been included in the old field habitat type.

Species: As a result of the variety of plant species inhabiting old fields, this habitat type serves as natural food plots for a wide variety of birds, butterflies, and mammals. Common plant species provide an important source of nutritious forage for seed-eating birds such as northern bobwhite (*Colinus virginianus),* mourning dove (*Zenaida macroura*), finches (Fringillidae family), northern cardinal (*Cardinalis cardinalis*), and sparrows (Passeridae and Emberizidae families). Additionally, wild turkey (*Meleagris gallopavo*), eastern meadowlark (*Sturnella magna*), and eastern bluebird (*Sialia sialis*) frequent old fields in search of insects, while rodents such as voles (*Microtus* sp.), moles (*Scalopus aquaticus*), field mice (Cricetidae family), and groundhogs (*Marmota monax*) feed on the green vegetation and seeds found in old fields. Predators such as barn owl (*Tyto alba*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), common garter snake (*Thamnophis sirtalis*), and racer (*Coluber constrictor*) in turn feed on the rodents. Various flowering plants provide nectar and pollen for butterflies, moths, and bees. The nighthawk (*Chordeiles minor*) and various species of bats feed on moths that emerge from old fields.

In addition to foraging in old fields, several species of wildlife use this habitat for nesting and shelter, including the cottontail rabbit (*Sylvilagus floridanus*), badger (*Taxidea taxus*), meadow vole (*Microtus pennsylvanicus*), red fox (*Vulpes vulpes*), American woodcock (*Scolopax minor*), field sparrow (*Spizella pusilla*), northern bobwhite (*Colinus virginianus*), song sparrow (*Melospiza melodia*), and American goldfinch (*Carduelis tristis*). Butterflies such as the monarch (*Danaus plexippus*) and eastern black swallowtail (*Papilio polyxenes*) also frequent this habitat type. Note that this is only a partial list of species that use old fields.

(2) Early to Mid-Successional Forest — (110.94 Acres)

Habitat: Early to mid-successional forest communities resemble a later stage of old field and are sometimes included under the same category. The early to mid-successional forest community typically develops by year three of succession and is characterized by a community consisting of between 10% and 50% woody plants (seedlings or saplings). An area is considered woodland once it consists of greater than 50% saplings. Early to mid-successional forest was not included in the forest impacts in Section 5.20, *Forest Impacts*, because it does not meet the U.S. Department of Agriculture (USDA) definition of forest.

Species: The early to mid-successional forest communities provide food sources and shelter for a variety of wildlife. As with all vegetative communities, the specific plant species will determine

the species of wildlife present. Representative wildlife found in this habitat type includes northern mockingbird (*Mimus polyglottos*), catbird (*Dumetella carolinensis*), brown thrasher (*Toxostoma rufum*), loggerhead shrike (*Lanius ludovicianus*), Bell's vireo (*Vireo bellii)*, field sparrow (*Spizella pusilla)*, opossum (*Didelphis virginiana)*, cottontail rabbit (*Sylvilagus floridanus*), northern bobwhite (*Colinus virginianus)*, wild turkey (*Meleagris gallopavo*), and most resident and migratory songbirds (IDNR, 2002).

(3) Forest Fragment — (58.31 Acres)

Habitat: While forest fragment is not typically classified as a community type, it represents unique and valuable wildlife habitat worthy of recognition. Forest fragment primarily consists of fencerows, shrubby ditches and partially forested waterways that lack floodplain; such as small intermittent creeks. This habitat type generally represents those areas between agricultural fields that are too small to be classified as old field or forest. Given the scale and extent of most agricultural landscapes, forest fragments are often the only refuge readily available to wildlife in some areas. Forest fragments were not included in the forest impacts in Section 5.20, *Forest Impacts*, because they did not meet the U.S. Department of Agriculture (USDA) definition of forest.

Species: Wildlife species that commonly utilize forest fragments include cottontail rabbit (*Sylvilagus floridanus*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), white-tailed deer (*Odocoileus virginianus*), white-footed mouse (*Permyscus maniculatus*), gray squirrel (*Sciurus carolinensis*), American robin (*Turdus migratorius*), American tree sparrow (*Spizella arborea*), song sparrow (*Melospiza melodia*), blue jay (*Cyanocitta cristata*), brown-headed cowbird (*Molothrus ater*) and grackle (*Quiscalus quiscula*).

(4) Mesic Floodplain Forests — (179.68 Acres)

Habitat: Mesic floodplain forests occur in lower elevation areas within riparian corridors and often have prolonged periods of standing water. Wetland habitat types sometimes can be found within forested floodplains. This description focuses on the floodplain forest; forested wetlands are discussed later in this section.

Species: Mesic floodplain forests provide valuable habitat for birds, mammals, amphibians, reptiles, and insects. Mesic floodplain forests with dense herbaceous cover provide ideal nesting grounds for waterfowl. Tree snags and cottonwoods provide food and shelter for many species of songbirds (Sullivan, 1995). Wildlife that typically utilize floodplain forests include Indiana bat (*Myotis sodalis)*, bald eagle (*Haliaeetus leucocephalus),* red-tailed hawk (*Buteo jamaicensis),* red-eyed vireo (*Vireo olivaceus),* northern cardinal (*Cardinalis cardinalis)*, catbird (*Dumetella carolinensis),* house wren (*Troglodytes aedon),* eastern mole (*Scalopus aquaticus),* raccoon (*Procyon lotor),* common muskrat *(Ondatra zibethicus*), white-tailed deer (*Odocoileus virginiana),* and turtles (*Chelydra serpentina*, *Kinosternon subrubrum*, *Trachemys scripta*.) (Sullivan 1995).

(5) Dry-Mesic Forest — (2,118.73 Acres)

Habitat: The dry-mesic forest natural community is one of the most common community types in Indiana. In terms of moisture gradient, it is intermediate between dry upland forest and mesic upland forest. It is often found on north and east facing slopes as well as the transition from floodplain forests to dry upland forests in areas with little topographical relief. This forest type is the most prevalent type within Section 4 and is found throughout the 27-mile corridor.

Species: Because dry-mesic forests often are dominated by oaks and hickories, they provide an abundance of food readily utilized by wildlife. This diverse plant system also provides habitat for many different species of birds, mammals, and amphibians such as white-tailed deer (*Odocoileus virginianus)*, gray squirrels (*Sciurus niger)*, raccoons (*Procyon lotor)*, striped skunks (*Mephitis mephitis)*, bats (*Myotis* spp., *Epeisicus* fuscus, *Perimyotis subflavus*), eastern box turtles (*Terrapene carolina)*, broad-headed skinks (*Eumeces laticeps*), wild turkey (*Meleagris gallopavo)*, and great horned owl (*Bubo virginianus*).

(6) Mesic Upland Forest — (2,110.33 Acres)

Habitat: Mesic upland forests are often characterized by a dense canopy and an understory of shade-tolerant species. These areas are typically found on north-facing slopes and level ground with moderately high moisture availability. Within this general community type, species composition varies as a result of topographic variation, soil types, level of anthropogenic disturbance, and available moisture. These forests, where extensive, also assist in regional climate control as the dense canopy shades forested wetlands and associated creeks and ephemeral streams, thus buffering temperature extremes. This forest type is the second-most prevalent type within Section 4 and is found throughout the 27-mile corridor.

Species: These areas may provide food chain support for many different wildlife species. For example, many bird species such as tufted titmouse (*Baeolophus bicolor*), Carolina chickadee (*Poecile carolinensis*), wood thrush (*Hylocichla mustelina*), blue jay (*Cyanocitta cristata*) and downy woodpecker (*Picoides pubescens*) utilize these areas and associated wetlands as a source of food, water, nesting material, and shelter. Mammals such as woodchuck (*Marmota monax*), striped skunk (*Mephitis mephitis*), red fox (*Vulpes vulpes*) and white-tailed deer (*Odocoileus virginianus*) also commonly are found in mesic upland forest where they procure food and shelter from this diverse forest community.

(7) Emergent Wetlands — (27.01 Acres)

Habitat: Emergent wetlands support erect, largely herbaceous perennial species and permanent water for most of the growing year during years of normal precipitation levels. These wetlands maintain the same appearance each year unless extreme climatic conditions cause flooding or other extreme local changes. Emergent wetlands traditionally include marsh, meadow, and fen. Dominant herbs in these wetlands include: cattails, bulrush, sedges, manna grass, smartweeds, pickerelweed, arrow arum and arrowheads. Emergent wetlands in the project corridor are discussed in greater detail in Section 5.19, *Water Resources*.

Species: Emergent wetlands are dominated by herbaceous vegetation. The hydrology can vary from saturated soils near the surface to several inches of inundation, dictating the vegetative community and associated wildlife species usage. The high productivity and availability of food, water, and cover allow wetlands to provide ideal habitat for a diverse array of wildlife. Emergent wetlands harbor resident and migratory waterfowl including geese, ducks, herons, and other birds such as American bittern (*Botaurus lentiginosus*), sora (*Porzana carolina*), marsh wren (*Cistothorus platensis*), swamp sparrow (*Melospiza georgiana),* and sandpiper (Scolopacidae family). Depending on hydrology levels, emergent wetlands may also provide habitat for muskrat (*Ondatra zibethicus)*, snakes, frogs, salamanders, turtles, various beneficial insects and their larvae, dragonflies (Order Odonata), damselflies (Order Odonata), and water boatmen (Corixidae family).

(8) Forested Wetlands — (14.51 Acres)

Habitat: Forested wetlands support largely woody species greater than 20 feet in height. They include various hydrological regimes and various layers of vegetation including canopy trees, subcanopy trees, shrubs, and ground layer herbaceous vegetation. Forested wetlands traditionally include bottomland hardwood and swamp communities. For the purposes of this wildlife habitat analysis, scrub-shrub wetlands are grouped with forested wetlands. Forested and scrub/shrub wetlands in the project corridor are discussed in greater detail in Section 5.19.

Species: Many forested wetlands are located within larger tracts of forests (including the various types described earlier in this section); therefore, wildlife in forested areas also may be found in forested wetlands. Often, forested wetlands are inundated seasonally, which provides an ideal habitat for emergence of spring aquatic life. Representative wildlife dependent upon forested wetlands include waterfowl and songbirds such as wood ducks (*Aix sponsa)*, great blue heron (*Ardea herodias*), green heron (*Butorides striatus*), and swamp sparrow (*Melospiza georgiana)*; and other wildlife such as turtles, salamanders, frogs, snakes, and mammals.

(9) Open Water — (25.02 Acres)

Habitat: Open Water habitat types in the Section 4 corridor consist of lakes and ponds. Open water habitat is described in Section 5.19.

Species: Open water habitat can provide breeding, foraging, and resting habitat for a variety of wildlife species including amphibians, birds, mammals, fish, and insects. Although natural open water habitats provide spawning sites, nursery areas, feeding sites, and cover for various species of fish, many man-made features (e.g. stock and detention ponds, flooded gravel pits) may not provide suitable habitat for certain species of fish or other aquatic species.

Table 5.18-1: Section 4 Corridor Habitat and Wildlife Species

Habitat Type & Representative Plant Species *(Number of acres in Section 4 Corridor)*	Representative Wildlife Species Using Habitat Type
(1) Old Field (224.92 Ac)— Agricultural lands that, following managed use, lay fallow for several years, eventually reverting to native and naturalized grasses and forbs. • Timothy, smooth brome, orchard grass, Kentucky bluegrass, foxtails, Queen Anne's lace, tall goldenrod, pigweeds, ironweeds, chicory, milkweeds, fleabanes, yarrow, plantains, ox-eye daisy, field thistle, wild strawberry	• Eastern bluebird, song sparrow, northern bobwhite, Baltimore oriole, Eastern kingbird, dickcissel, grasshopper sparrow, eastern phoebe, white-eyed vireo, yellow-breasted chat, willow flycatcher, Bell's vireo, eastern towhee, Wilson's warbler • Groundhog, cottontail rabbit, badger, red fox, bat, field mouse, vole • Common garter snake, racer • Monarch and eastern black swallowtail butterflies, various species of moths, bees
(2) Early to Mid-Successional Forest (110.94 Ac)— Communities resemble later stage of Old Field, and consist of between 10% and 50% woody plants (seedlings or saplings). • Locust species, haw horn, wild crabapple, sassafras, sumac, viburnum, flowering dogwood, black cherry, red elm, blackberry, raspberry, red cedar, shingle oak, black walnut	• American robin, eastern kingbird, eastern wood pewee, Acadian flycatcher, Carolina wren, northern mockingbird, yellow-breasted chat, orchard oriole, ruby-throated hummingbird, tree swallow, American crow, Carolina chickadee, brown thrasher, cedar waxwing, American redstart • Opossum, cottontail rabbit
(3) Forest Fragment (58.31 Ac)—Generally located between agricultural fields, often along fencerows and stream-creek fringes. In farmed areas, often the only refuge readily available to wildlife. Thus, they are a unique and valuable habitat type. • Black cherry, honey locust, smooth brome, tall fescue, hawthorns, sumacs, trumpet creeper, Eastern cottonwood, willows, poison ivy, Virginia creeper	• American robin, American tree sparrow, song sparrow, blue jay, brown-headed cowbird, grackle • Cottontail rabbit, Virginia opossum, raccoon, white-tailed deer, white-footed mouse, gray squirrel
(4) Mesic Floodplain Forest (179.68 Ac)—Occur in lower elevation areas within riparian corridors and often have prolonged periods of standing water. Wetland habitat types can sometimes be found within forested floodplains. • American elm, Eastern cottonwood, willow species, silver maple, American sycamore, oak species, green ash, blackhaw viburnum, spicebush, net les, clearweed, poison ivy, grapes	• Least flycatcher, turkey vulture, wood duck, northern bobwhite, killdeer, mourning dove, yellow-billed cuckoo, red-bellied woodpecker, downy woodpecker, northern flicker, pileated woodpecker, eastern wood pewee, Acadian flycatcher, eastern phoebe, great-crested flycatcher, warbling vireo, red-eyed vireo, blue jay, northern rough-winged swallow, tufted titmouse, Carolina wren, house wren, blue-gray gnatcatcher, American robin, European starling, magnolia warbler, black-throated green warbler, common yellowthroat, summer tanager, chipping sparrow, field sparrow, song sparrow, Lincoln's sparrow, northern cardinal, indigo bunting, red-winged blackbird, eastern meadowlark, common grackle, brown-headed cowbird, American goldfinch American kestrel, barn swallow, Carolina chickadee • Eastern mole, raccoon, common muskrat, white-tailed deer • Turtles
(5) Dry-Mesic Forest (2,118.73 Ac)—One of the most common community types in Indiana; often found on north and east facing slopes and the transition from floodplain forests to dry upland forests. • Oak species, mockernut hickory, flowering dogwood, black haw, ear-leaved brome, nodding fescue, downy yellow violet, bluestem goldenrod, Virginia knotweed	• Lincoln's sparrow, eastern wood pewee, Acadian flycatcher, eastern phoebe, great-crested flycatcher, red-eyed vireo, blue-gray gnatcatcher, magnolia warbler, black-throated green warbler, prothonotary warbler, red-tailed hawk, wild turkey, hairy woodpecker, pileated woodpecker, Swainson's thrush, wood thrush, northern parula, Kentucky warbler, summer tanager, rose-breasted grosbeak, white-breasted nuthatch, mourning warbler, wood thrush • White-tailed deer, gray squirrel, raccoon, striped skunk, bat • Eastern box turtle, broad-headed skink
(6) Mesic Upland Forest (2,110.33 Ac)—Often characterized by a dense canopy and an understory of shade-tolerant species. Typically found on north-facing slopes and level ground with moderately high moisture. Where extensive, they assist in regional climate control, as the dense canopy shades forested wetlands and associated creeks and ephemeral streams. • Sugar maple, beech, oak species, basswood, bitternut hickory, white ash; honeysuckle, spicebush, American elm; black snakeroot, cream white violet, may apple, annual bedstraw	• Tufted titmouse, Carolina chickadee, wood hrush, blue jay, downy woodpecker • Woodchuck, striped skink, red fox, white-tailed deer

Table 5.18-1: Section 4 Corridor Habitat and Wildlife Species

Habitat Type & Representative Plant Species *(Number of acres in Section 4 Corridor)*	Representative Wildlife Species Using Habitat Type
(7) Emergent Wetlands (27.01 Ac)—Support erect, largely herbaceous perennial species and permanent water for most of the growing year, during years of normal precipitation levels. They traditionally include marsh, meadow, and fen. • Cattails, bulrush, sedges, manna grass, smartweeds, pickerelweed, arrow arum and arrowheads	• Resident and migratory waterfowl including geese, ducks, herons, and other birds: American bittern, sora, marsh wren, swamp sparrow, sandpiper • Muskrat • Various species of snakes, frogs, salamanders, turtles • Dragonflies, damselflies, water boatmen and other insects
(8) Forested (and Scrub/Shrub) Wetlands (14.51 Ac)—Support largely woody species greater than 20' in height. They include canopy trees, subcanopy trees, shrubs, and ground layer herbaceous vegetation. They traditionally include bottomland hardwood and swamp communities. • Maples, elms, ash, and oaks	• Wood duck, great blue heron, green heron, swamp sparrow • Various species of mammals • Various species of turtles, salamanders, frogs, snakes
(9) Open Water (25.02 Ac)—In Section 4, most are agricultural ponds.	• Can provide for a variety of wildlife; however, those with man-made features such as detention ponds/flooded coal pits may not provide suitable habitat for certain species

5.18.3 Analysis

Where possible, the alternative alignments were located to minimize impacts on wildlife habitat areas. Avoidance of wetland habitat types was prioritized during the development and screening of alternatives. The Section 4 corridor crosses extensive forested tracts which in many areas span the entire corridor width. Impacts upon forest habitat types are unavoidable. The field investigations for this study did not include extensive trapping or other observations that would confirm the presence of the listed species in the project corridor.

The following paragraphs summarize the potential impacts the Section 4 Alternatives will have on upland forest habitat, wetland habitat, old field habitat, ponds, and streams. Total alternative acreages (right-of-way) and habitat impact acreages (within the right-of-way) are presented as a range for two sets of design criteria; low-cost design criteria and initial design criteria. Alternative 2 is the Preferred Alternative. **Table 5.18-2** identifies the impact to each habitat community within the right-of-way, by Section 4 Alternative including the low-cost and initial design criteria. More detailed descriptions of impacts to forests, wetlands, and streams are located in Section 5.20, *Forest Impacts,* and Section 5.19, *Water Resources.* There may be slight discrepancies in some totals due to rounding.

Alternative 1 traverses a total of 1,030.15 to 1,298.73 acres of the following habitat types: upland habitat including old field, mid-successional forest, forest fragment, dry-mesic upland forest, mesic floodplain forest, and mesic upland forest (1,019.22 to 1,281.32 acres), forested/scrub-shrub/emergent wetlands (7.56 to 13.09 acres), and open water ponds (3.37 to 4.32 acres). A total of 93,467 to 111,725 linear feet of perennial, intermittent, and ephemeral streams[2] are within the Alternative 1 right-of-way.

Alternative 2 (Preferred Alternative) traverses a total of 971.03 to 1,214.97 acres of the following habitat types: upland habitat including old field, mid-successional forest, forest fragment, dry-mesic upland forest, mesic floodplain forest, and mesic upland forest (963.18 to

1,201.91 acres), forested/scrub-shrub/emergent wetlands (5.32 to 9.58 acres), and open water ponds (2.53 to 3.48 acres). A total of 93,110 to 112,801 linear feet of perennial, intermittent, and ephemeral streams are within the Alternative 2 right-of-way.

Alternative 3 traverses a total of 991.17 to 1,243.63 acres of the following habitat types: upland habitat including old field, mid-successional forest, forest fragment, dry-mesic upland forest, mesic floodplain forest, and mesic upland forest (983.13 to 1,230.96 acres), forested/scrub-shrub/emergent wetlands (5.26 to 9.43 acres), and open water ponds (2.78 to 3.24 acres). A total of 93,610 to 112,698 linear feet of perennial, intermittent, and ephemeral streams are within the Alternative 3 right-of-way.

Alternative 4 traverses a total of 994.15 to 1254.34 acres of the following habitat types: upland habitat including old field, mid-successional forest, forest fragment, dry-mesic upland forest, mesic floodplain forest, and mesic upland forest (983.11 to 1,236.92 acres), forested/scrub-shrub/emergent wetlands (7.43 to 12.86 acres), and open water ponds (3.61 to 4.56 acres). A total of 90,053 to 108,083 linear feet of perennial, intermittent, and ephemeral streams are within the Alternative 4 right-of-way.

Refined Preferred Alternative 2 traverses a total of 969.32 to 1,203.56 acres of the following habitat types: upland habitat including old field, mid-successional forest, forest fragment, dry-mesic upland forest, mesic floodplain forest, and mesic upland forest (962.29 to 1,191.66 acres), forested/scrub-shrub/emergent wetlands (5.32 to 9.55 acres), and open water ponds (1.71 to 2.35 acres). A total of 93,196 to 111,247 linear feet of perennial, intermittent, and ephemeral streams are within the Refined Preferred Alternative 2 right-of-way.

The Section 4 Alternatives (low-cost and initial design criteria) are similar in their impacts to wildlife habitat. The alternatives have generally similar impacts on the most notable features in Section 4. Alternative 1 would impact approximately 934.01 to 1,168.40 acres of upland forest habitat (1 to 1,124.50 acres of core forest habitat). Alternative 2 (Preferred Alternative) would impact approximately 872.01 to 1,094.59 acres of upland forest habitat (895.64 to 994.30 acres of core forest habitat);. Alternative 3 would impact approximately 898.64 to 1,134.15 acres of upland forest habitat (957.51 to 1,068.55 acres of core forest habitat). Alternative 4 would impact approximately 891.04 to 1,115.71 acres of upland forest habitat (960.18 to 1,064.98 acres of core forest habitat). Refined Preferred Alternative 2 would impact approximately 872.12 to 1,087.37 acres of upland forest habitat (894.59 to 987.23 acres of core forest habitat). The Refined Preferred Alternative 2 showed the smallest total wildlife habitat impacts of any of the alternatives.

Fragmentation of core forest habitat can affect migratory birds in a number of ways. Some birds require large blocks of forest to successfully nest and fledge their young. Nests deep in a forest tract are also often less susceptible to cowbird parasitism and predation by edge species such as raccoons. Fragmentation also can affect bird use by separating habitat blocks so they no longer function as one habitat unit.

In addition, all of the alternatives must cross Section 4's seven perennial streams: Black Ankle Creek; Dry Branch; Plummer Creek, Mitchell Branch; Indian Creek, and two unnamed tributaries of Clear Creek.

All of the alternatives cross Black Ankle Creek, Mitchell Branch, Dry Branch, Plummer Creek, Indian Creek at the South Connector Road and the north crossing of Indian Creek (west of Breeden Road in Monroe County) on the same or essentially the same alignments and will therefore have the same potential for wildlife impacts at these crossings. The alternatives cross Indian Creek (south and middle crossings), and the unnamed tributaries to Clear Creek in locations where the alternatives do not share a common alignment. The potential for wildlife impacts at these latter set of crossing locations is discussed below.

Indian Creek, South Crossing (two general crossing locations):

Alternatives 2, 4 and Refined Preferred Alternative 2 cross Indian Creek approximately 300 feet south of Carmichael Road in Greene County on a common alignment. This crossing location minimizes impacts to the Indian Creek floodplain by crossing where it is narrow in a perpendicular orientation. No riparian habitat is present; active agricultural fields are present on both sides of Indian Creek in this location. Alternatives 1 and 3 cross Indian Creek approximately one mile south of Carmichael Road in Greene County on a common alignment. This crossing location would cause greater impacts to the Indian Creek floodplain as it crosses the floodplain where it is broader in a longitudinal orientation. This crossing would also impact wetlands located within the floodplain and would impact forest and riparian habitat along the south side of Indian Creek.

Indian Creek, Middle Crossing:

Alternatives 1 and 4 will cross Indian Creek in Greene County along the west edge of the corridor on a common alignment. Alternatives 2, 3 and Refined Preferred Alternative 2 cross Indian Creek along the east edge of the Section 4 corridor east of the Greene/Monroe County Line in Monroe County on a common alignment. All alternatives would impact wetlands along the south side of Indian Creek at this location. Alternatives 2, 3 and Refined Preferred Alternative 2 would impact less wetland habitat than Alternatives 1 and 4. These crossing locations are essentially the same with regard to other potential wildlife habitat impacts. A narrow strip of riparian forest and actively pastured land is present along the south side of the creek, and early successional habitat is present along the north side of the creek at both crossing locations. The floodplain crossings are generally perpendicular and similar in width.

Unnamed Tributary to Clear Creek (Monroe County, south of Tramway Road):

Alternative 1 crosses this creek along the west edge of the corridor. Alternatives 2, 4 and Refined Preferred Alternative 2 cross near the middle of the Section 4 corridor. Alternative 3 crosses this creek along the east edge of the corridor. Although several hundred feet apart, these three crossing locations have essentially the same potential to impact wildlife habitat. Forest and riparian habitats are present across the width of the Section 4 corridor. Actively pastured land is present across the width of the corridor just north of the creek. No floodplain is present along this creek within the Section 4 corridor.

Unnamed Tributary to Clear Creek (Monroe County, north of Tramway Road):

Alternative 1 crosses this creek near the middle of the corridor. Alternatives 2, 3, 4 and Refined Preferred Alternative 2 cross along the east edge of the Section 4 corridor. These crossing locations have essentially the same potential to impact wildlife habitat. Forest and riparian habitat are equally present in both locations. Agricultural land is present across the width of the corridor just north of the creek. Alternatives 2, 3, 4 and Refined Preferred Alternative 2 would impact the Clear Creek floodplain which extends westward into the Section 4 corridor along this creek. No floodplain is present along this creek within the right-of-way associated with Alternative 1.

Table 5.18-2: Potential Wildlife Habitat Impacts, by Alternative

Habitat Type	Total Acres in Corridor	Alternative 1 (Acres)		Alternative 2 (Preferred) (Acres)		Alternative 3 (Acres)		Alternative 4 (Acres)		Refined Preferred Alternative 2 (Acres)	
		Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria	Low Cost Design Criteria	Initial Design Criteria
Dry-Mesic Upland Forest	2,118.73	434 88	558.44	414.49	533 34	417.43	543 28	437 85	563 80	414.46	532.26
Forest Fragment	58.31	9.68	12.10	10.84	13.29	11.48	14.25	8 97	11.41	10.90	12.93
Mesic Floodplain Forest	179.68	42.82	56.75	37.78	51.43	38.95	51.01	40.09	54.11	37.92	51.45
Mesic Upland Forest	2,110.33	456 31	553 21	419.74	509 82	442 26	539 86	413.10	497 80	419.74	503.66
Early to Mid Successional Forest	110 94	20.86	28.55	37.51	43.71	29.73	32.50	24.24	32.47	37.52	42.86
Old Field	224 92	54.67	72.27	42.82	50.32	43.28	50.06	58.86	77.33	41.75	48.50
Upland Habitat Subtotal	4,802.91	1,019.22	1,281.32	963.18	1,201.91	983.13	1,230.96	983.11	1,236.92	962 29	1,191.66
Open Water (PUB)	25.02	3 37	4 32	2 53	3.48	2.78	3 24	3.61	4 56	1.71	2 35
Wetlands (PEM/PSS/PFO)	41.52	7 56	13.09	5 32	9 58	5 26	9.43	7.43	12.86	5 32	9 55
Total Natural Habitat Acres	4,869.45	1,030.15	1,298.73	971 03	1,214.97	991.17	1,243.63	994.15	1,254.34	969 32	1,203.56
Percent of Corridor Natural Habitat Acreage	100%	21%	27%	20%	25%	20%	26%	20%	26%	20%	25%
Total Acres in Corridor	7,498.26	1,030.15	1,298.73	971 03	1,214.97	991.17	1,243.63	994.15	1,254.34	969 32	1,203.56
Percent of Corridor Acreage	100%	14%	17%	13%	16%	13%	17%	13%	17%	13%	16%
Streams (LF) in ROW[3]		**93,467**	**111,725**	**93,110**	**112,801**	**93,610**	**112,698**	**90,053**	**108,083**	**93,196**	**111,247**
Ephemeral		68,787	79,603	66,312	77,997	66,699	78,414	65,750	76,453	66,379	77,206
Intermittent		18,496	23,355	20,124	25,400	20,882	25,798	17,534	22,551	20,143	25,035
Perennial		6,184	8,767	6,674	9,404	6,029	8,486	6,769	9,079	6,674	9,006

Note: Dry-Mesic Upland Forest, Mesic Floodplain Forest, and Mesic Upland Forest are included in the forest impacts in Chapter 5.20, *Forest Impacts*. Mid Successional Forest and Forest Fragments are not included in the forest impacts in Chapter 5.20, *Forest Impacts*, because they do not meet the USDA definition of forest. Comparable forest numbers reported in this chapter may differ slightly from those reported in Section 5.20 due to rounding.

Note: In some areas, the Section 4 Alternatives are outside of the Tier 1 corridor. The percentages in this table include impacts outside the corridor.

Each of the alternatives will directly impact forested and wetland areas that provide wildlife habitat. These impacts may be addressed by recognizing the long-term effects of the highway,

[3] Perennial streams are generally free-flowing year-round and support a wide variety of aquatic life. Intermittent streams flow seasonally and support some aquatic life. Ephemeral streams flow only after rainfall and generally do not support aquatic life. Perennial and intermittent streams are charged by groundwater during dry weather, ephemeral streams depend entirely on rainwater.

documenting the highway effects on wildlife populations, using landscape analyses to identify "connectivity zones" for wildlife and their habitat, working with transportation engineers to solve technical problems, and designing good monitoring studies to evaluate mitigation techniques.

Initial measures to avoid sensitive biological communities were taken when the corridor was selected in Tier 1. One notable effort to reduce impacts to wildlife/wildlife habitat was the decision during the development and screening of alternatives to prioritize the avoidance/minimization of wetland habitats. As a result, there is effectively only one alignment for the crossing of the Black Ankle Creek valley, where a substantial percentage of the wetlands within the Section 4 corridor are located. In this location, direct impacts to wetlands and floodplain functions and values will be minimized as much of the highway crossing of the valley will be constructed on bridge structure. In addition to the Black Ankle Creek valley, sizable wetlands exist at the middle crossing of Indian Creek. Alternatives were developed in this area to avoid/minimize impacts to these wetlands.

Increases in edge habitat can promote unwanted forest conditions. All of the alternatives attempt to minimize new forest fragmentation. However, the Section 4 corridor traverses extensive forested tracts for the majority of its distance. Fragmentation of forest habitat is unavoidable in Section 4. For each alternative (low-cost and initial design criteria), impacts upon forest tracts were assessed and characterized by type, i.e., whether a tract would be impacted on its edge, bisected (fragmented), or totally impacted. In comparison, the alternatives are similar regarding the characterization of impacts. Impact types for these design criteria are expressed as a range. Alternative 1 would cause 34 to 36 edge impacts, 67 bisection impacts and 0 to 2 total impacts to forest tracts. Alternative 2 would cause 34 to 37 edge impacts, 61 bisection impacts and 1 to 2 total impacts to forest tracts. Alternative 3 would cause 35 to 38 edge impacts, 63 to 64 bisection impacts and 0 to 1 total impact to forest tracts. Alternative 4 would cause 36 to 37 edge impacts, 64 bisection impacts and 1 to 2 total impacts to forest tracts. Refined Preferred Alternative 2 would cause 34 to 37 edge impacts, 61 bisection impacts and 1 to 2 total impacts to forest tracts.

5.18.4 Mitigation

Initial measures to avoid sensitive biological communities were taken when the corridor was selected in Tier 1. To address the remaining potential impacts of the project on wildlife, mitigation measures have been developed, including: providing financial and technical assistance to support land use planning efforts by local governments to facilitate protection of sensitive areas from development; mitigation of wetland impacts at appropriate ratios pursuant to INDOT's Wetlands Memorandum of Understanding (MOU); mitigation of upland forest impacts at a 3 to 1 ratio (with a goal of 1 to 1 replacement and 2 to 1 preservation for each acre impacted); compliance with the terms and conditions of the United States Fish and Wildlife (USFWS)'s revised Tier 1 Biological Opinion (BO) for the project, issued August 24, 2006 (including the Amendment issued May 25, 2011) and the Tier 2 Section 4 BO, issued July 6, 2011; and adoption of measures to protect wildlife, such as wildlife crossings. Mitigation for impacts to wetlands and forests are described in detail in Section 5.19, *Water Resources*; Section 5.20, *Forest Impacts*; and Chapter 7, *Mitigation and Commitments.* The revised Tier 1 BO is provided in **Appendix DD**, *Revised Tier 1 BO*.

In a letter dated September 28, 2006, the Indiana Department of Natural Resources (IDNR) made several recommendations related to wildlife crossings. The IDNR recommended crossings where habitat is present on both sides of the road, and in lowland and upland locations. The IDNR recommended that any new bridges and redesigned bridges in areas of high wildlife use to have design specifications that provide for wildlife habitat connectivity including an adequate space under bridges with dry land unarmored with riprap with minimum dimensions (8 feet tall by 24 feet wide) to allow for wildlife passage. In addition, the IDNR recommended deer exclusion fencing. The IDNR recommended that bridges and culverts should extend beyond top of bank or contain an above-water ledge for wildlife use, and culverts should consist of a natural bottom.

In addition, they stated because of the width of the roads and right-of-ways, grated culverts may be required in some areas to provide light in the passage, thus facilitating their use. According to the IDNR, areas with heavy white-tailed deer traffic should provide bridges or culverts large enough to pass a male deer with antlers. Smaller culverts can be used for passage of smaller animals (e.g. small mammals, reptiles and amphibians). The IDNR also recommended other appropriate mitigation measures be implemented where the highway crosses significant habitat area, including placing any lights on the shortest poles possible to limit the spread of light and shielding the light so it only shines on the highway and not up or out from the road. In the Tier 2 Section 4 BA, it has been committed that any lights installed will be at least 40 feet above the highway in order to avoid collisions between bats and vehicles. Non-diffuse lighting will be used when possible. Details of lighting will be identified during the final design.

Based on habitat and landscape connectivity and in coordination with the IDNR, mitigation measures specific to Section 4 include 37 potential wildlife crossings. The IDNR recommended several crossings in Section 4. Of these recommended crossings, INDOT is committing to providing wildlife crossings that meet or exceed the minimum dimensions of 8 feet tall by 24 feet wide (of dry crossing) at the following 11 locations:

1. Black Ankle Creek (including CR 600E)
2. Dry Branch (including Dry Branch Road/CR750E)
3. Plummer Creek (including Mineral Koleen Road/CR 360S)
4. Mitchell Branch
5. Mitchell Branch Tributary (including SR 54)
6. Indian Creek A (including Carmichael Road)
7. Indian Creek B
8. Indian Creek C
9. Indian Creek D
10. Clear Creek Tributary D (formerly Happy Creek)
11. Clear Creek Tributary E (formerly May Creek)

Structures at the following 18 locations will provide additional opportunities for wildlife movement across the interstate, but may or may not meet the minimum 8 feet by 24 feet (of dry crossing) dimension requirements. When feasible, these crossings will be designed to meet the specified dimensions. The majority of the crossings below are intermittent or ephemeral in nature, thus potentially providing crossing opportunities within the stream channel during dry periods.

1. Doans Creek Tributary A
2. Doans Creek Tributary B
3. Bogard Creek Tributary
4. Flyblow Branch
5. Black Ankle Creek Tributary
6. Plummer Creek Tributary
7. Little Clifty Branch Tributary A
8. Little Clifty Branch Tributary B
9. Mitchell Creek Minor Tributary
10. Indian Creek Tributary A
11. Indian Creek Tributary B
12. Indian Creek Swale
13. Indian Creek Tributary Swale
14. Indian Creek Tributary C
15. Clear Creek Tributary A
16. Clear Creek Tributary B
17. Clear Creek Tributary C
18. Clear Creek Tributary F

In addition, two other possible wildlife crossings are recommended. They include:

1. Dowden Branch Tributary
2. Dowden Branch

Roadway designs for Section 4 also show bridges crossing over the following six roads, which could also provide additional opportunity wildlife movement across the interstate.

1. Carter Road (connector roadway)
2. Breeden Road
3. Rockport Road
4. Lodge Road
5. Tramway Road
6. Bolin Lane

The above proposed structures are located where habitat is present on both sides of the road and are in lowland and upland areas. Eleven of the above structures, as currently proposed, will provide a wildlife crossing in excess of the minimum dimensions required to allow larger mammals (i.e. deer) to pass (at least 8 feet high by 24 feet wide of dry crossing) beneath the highway. The larger dimensions of these structures as well as using 3-sided structures will help promote the maintenance of aquatic communities and wildlife movement. The remainder of crossings will also provide additional crossing opportunities for smaller wildlife including small mammals, amphibians and reptiles using smaller culverts and pipes. In addition, overpasses will be constructed at the Carter Road, Breeden Road, Rockport Road, Lodge Road, Tramway Road and Bolin Lane locations which could also aid in wildlife movement.

During the design phase, consideration will be given to using deer exclusion fencing in association with bridges. Consideration will also be given to grating culverts in order to provide

natural lighting. Specific information on these factors will not be available until the final design phase of the project.

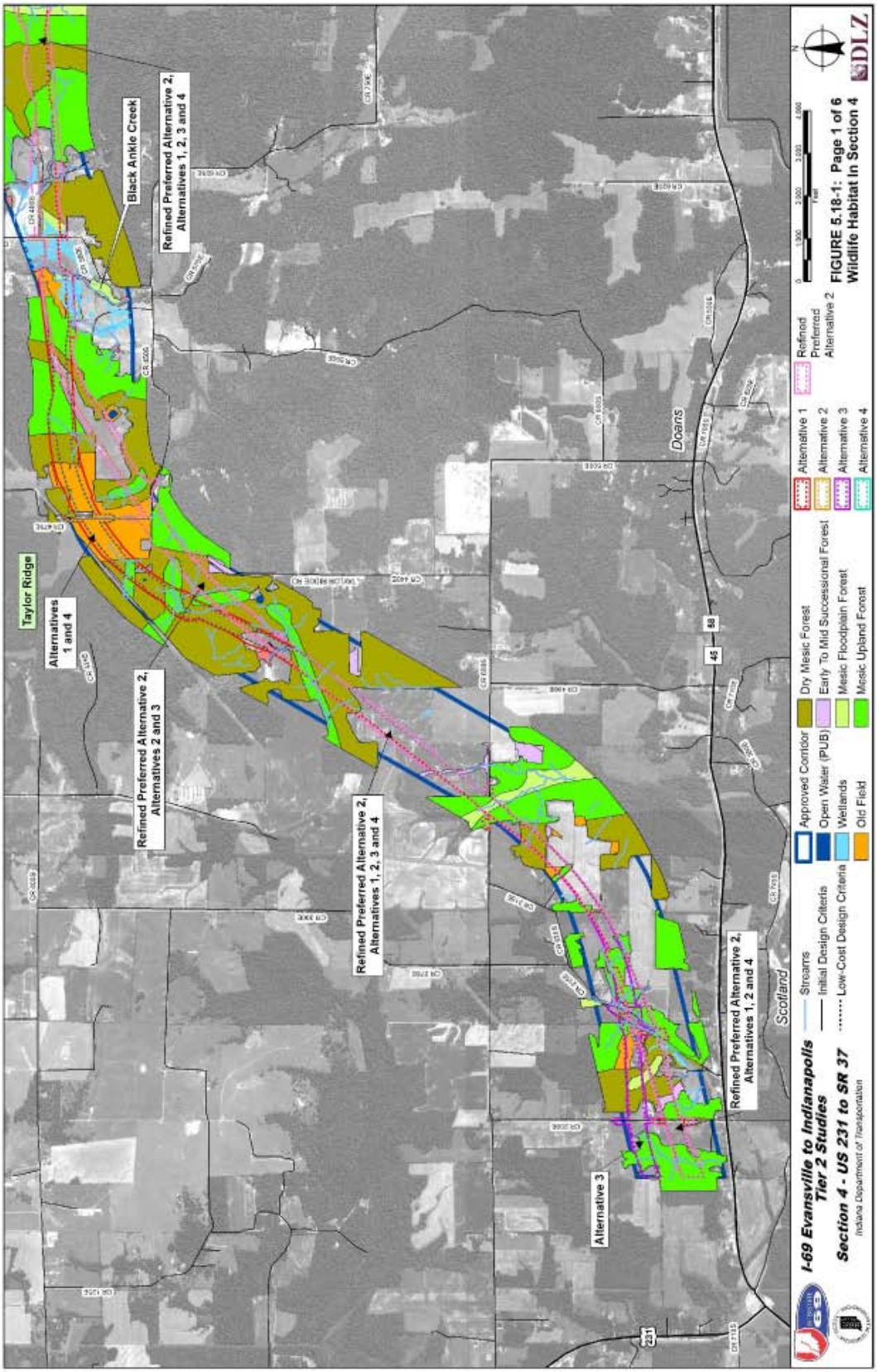
During the final design phase, consideration may also be given to incorporating vegetation plantings that will provide adequate cover for wildlife to access these crossings from adjacent areas of cover. Fencing to funnel wildlife toward these crossings will also be evaluated during design. Vegetation plantings and fencing will be assessed in regards to the habitat remaining after final design, the final size of structures, topography, fill material used in the roadway, and cost. Natural bottoms for the box culverts will be used for these crossings where feasible to further promote maintenance of aquatic communities and wildlife movement.

IDNR provided written comments dated October 28, 2010, pertaining to the Section 4 Public Hearing held on August 26, 2010. IDNR commented that rip-rapped areas should not be considered in determining the provided wildlife crossing dimensions. Specific information related to locations where riprap will be used and quantities to be used will not be available until the final design phase of the project. During the design phase, consideration will be given to using alternative armoring materials and including portions of dry land under the bridge opening that is not armored with riprap. The use of bio-engineering techniques and native vegetation to provide natural armoring of stream banks will be considered and implemented where practicable. Installation of riprap will be limited to areas necessary to protect the integrity of structures being installed. If riprap is required, it will be installed outside the thalweg and between the toe of slope and the ordinary high water mark (OHWM) where possible. In some instances, such as culvert inlets and outlets, riprap may need to be placed within the thalweg to prevent scour. Riprap will be installed at the same elevation as the thalweg to avoid fish passage issues. Riprap may also be needed above the OHWM to protect bridge piers and abutments from scour where bio-engineering will not suffice. In addition, INDOT and FHWA will continue to coordinate with IDNR with regard to potential impacts upon eastern box turtles.

Efforts will be made to promote cross-connectivity and permeability for wildlife in Section 4. In addition, a number of the wildlife crossings are located within or near proposed mitigation properties. On April 6, 2010, the Indiana Department of Transportation (INDOT) and the IDNR met and discussed the above 37 wildlife crossings proposed in Section 4. The meeting presented information that showed the distribution, permeability and connectivity for wildlife crossings, all of which followed the IDNR's earlier recommendations. Meeting minutes for this meeting can be found in **Appendix C**, *Agency Coordination Correspondence*.

5.18.5 Summary

Section 4 is predominately forested with numerous wildlife habitat areas. Alternative alignments have been located to minimize impacts to wildlife habitats where possible. **Table 5.18-2** shows the impacts to the habitat types within the Section 4 corridor by alternative. Mitigation measures include potential wildlife crossings in the areas of Doans Creek, Bogard Creek, Flyblow Branch, Black Ankle Creek, Plummer Creek, Dry Branch, Clifty Branch, Little Clifty Branch, Mitchell Creek, Indian Creek, and unnamed tributaries to Clear Creek. Additional opportunity for wildlife movement may be provided at overpass locations over Carter Road, Breeden Road, Rockport Road, Lodge Road, Tramway Road and Bolin Lane.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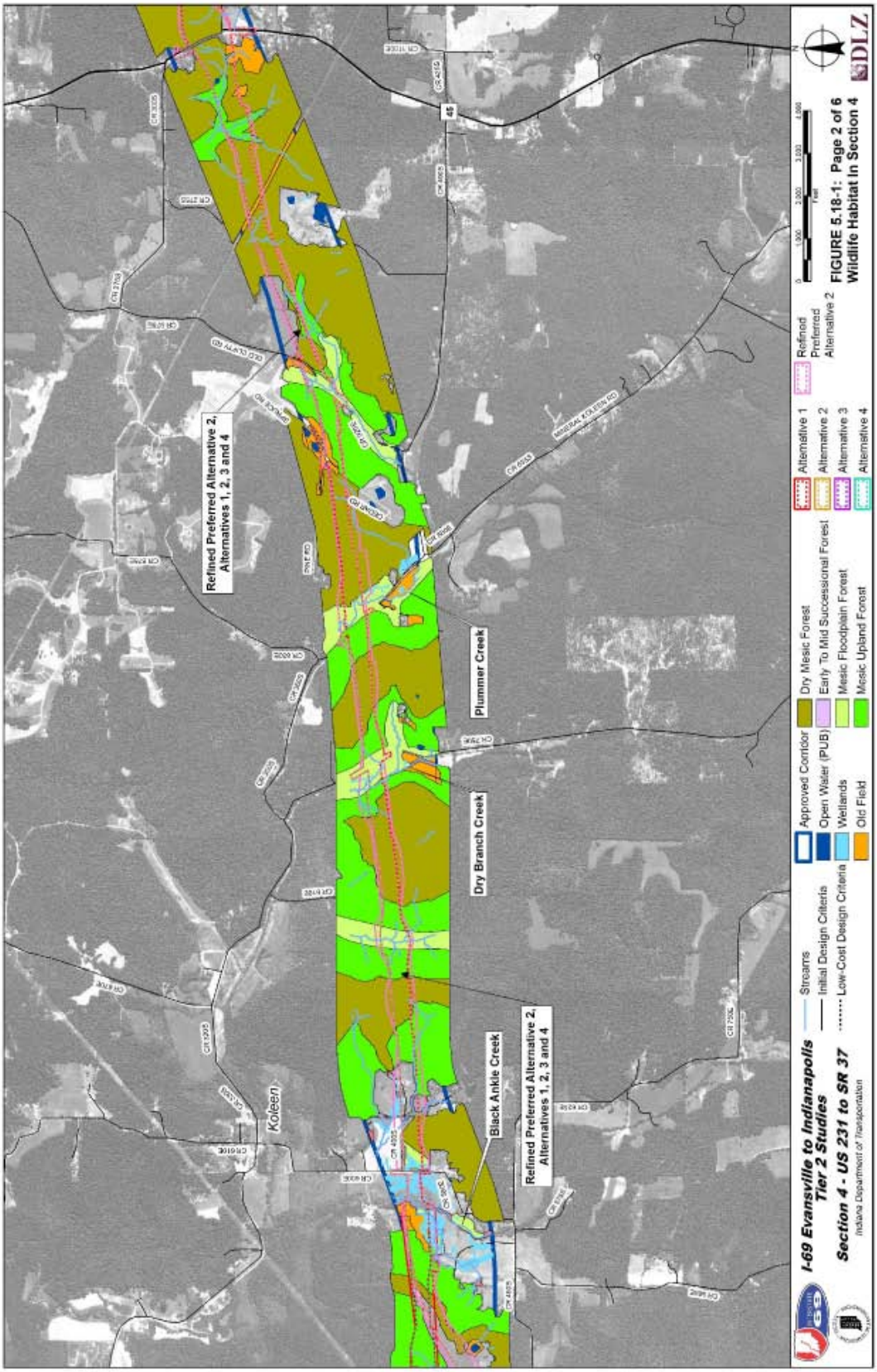
Alternatives 1 and 4
Black Ankle Creek
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 2 and 3
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 1, 2 and 4
Alternative 3
Doans
Scotland
231
45
50
Approved Corridor
Open Water (PUB)
Wetlands
Old Field
Dry Mesic Forest
Early To Mid Successional Forest
Mesic Floodplain Forest
Mesic Upland Forest
Streams
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.18-1: Page 1 of 6
Wildlife Habitat In Section 4
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ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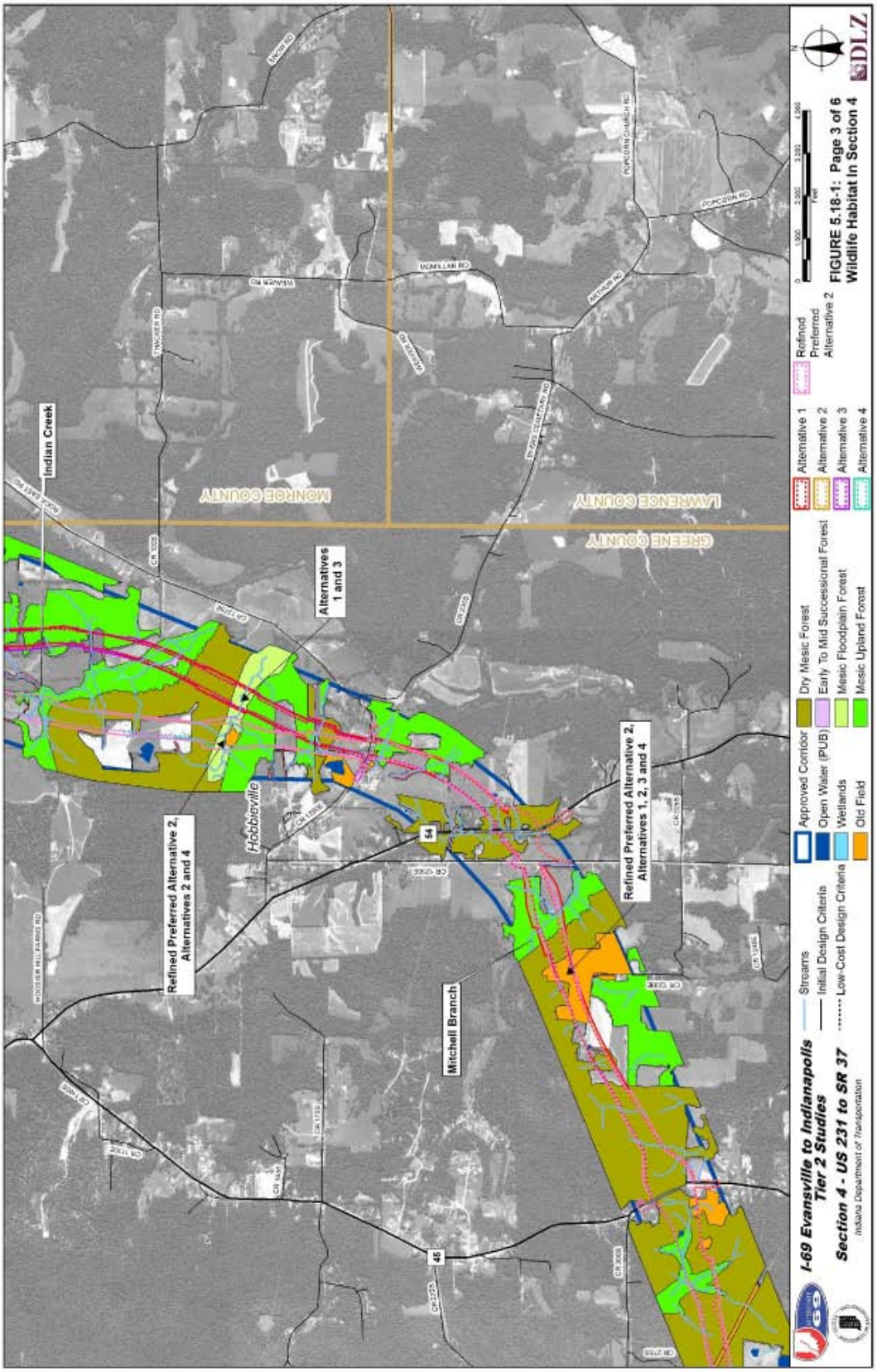
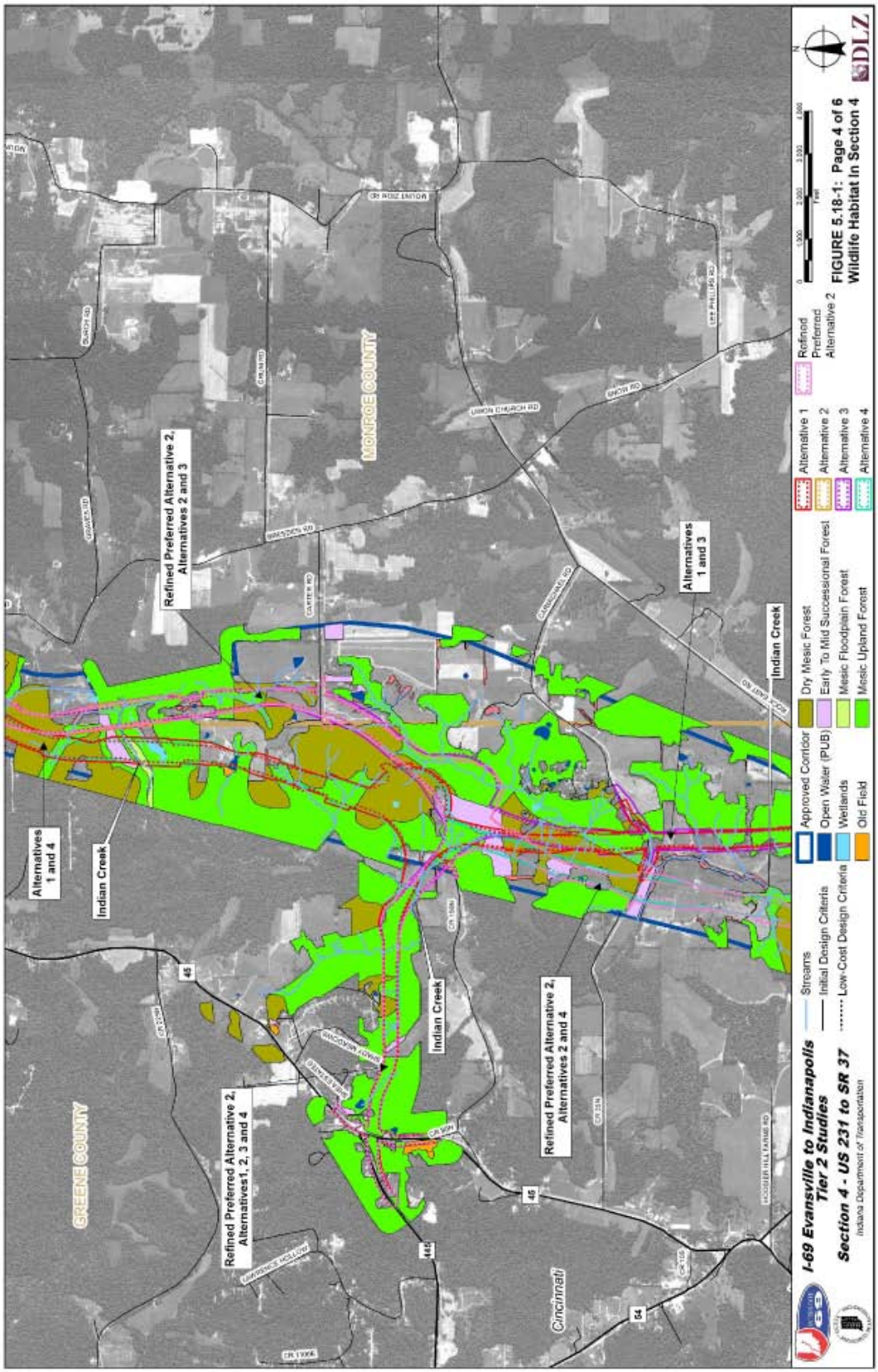
Plummer Creek
Dry Branch Creek
Black Ankle Creek
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Koleen
45
Approved Corridor
Open Water (PUB)
Wetlands
Old Field
Dry Mesic Forest
Early To Mid Successional Forest
Mesic Floodplain Forest
Mesic Upland Forest
Streams
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.18-1: Page 2 of 6
Wildlife Habitat In Section 4
DLZ


Indian Creek
Alternatives 1 and 3
Refined Preferred Alternative 2, Alternatives 2 and 4
Hobbieville
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Mitchell Branch
MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Approved Corridor
Open Water (PUB)
Wetlands
Old Field
Dry Mesic Forest
Early To Mid Successional Forest
Mesic Floodplain Forest
Mesic Upland Forest
Streams
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.18-1: Page 3 of 6
Wildlife Habitat in Section 4
DLZ


GREENE COUNTY
MONROE COUNTY
Refined Preferred Alternative 2, Alternatives 2 and 3
Refined Preferred Alternative 2, Alternatives 2 and 4
Refined Preferred Alternative 2, Alternatives1, 2, 3 and 4
Alternatives 1 and 4
Alternatives 1 and 3
Indian Creek
Cincinnati
Approved Corridor
Open Water (PUB)
Wetlands
Old Field
Dry Mesic Forest
Early To Mid Successional Forest
Mesic Floodplain Forest
Mesic Upland Forest
Streams
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.18-1: Page 4 of 6
Wildlife Habitat In Section 4
DLZ

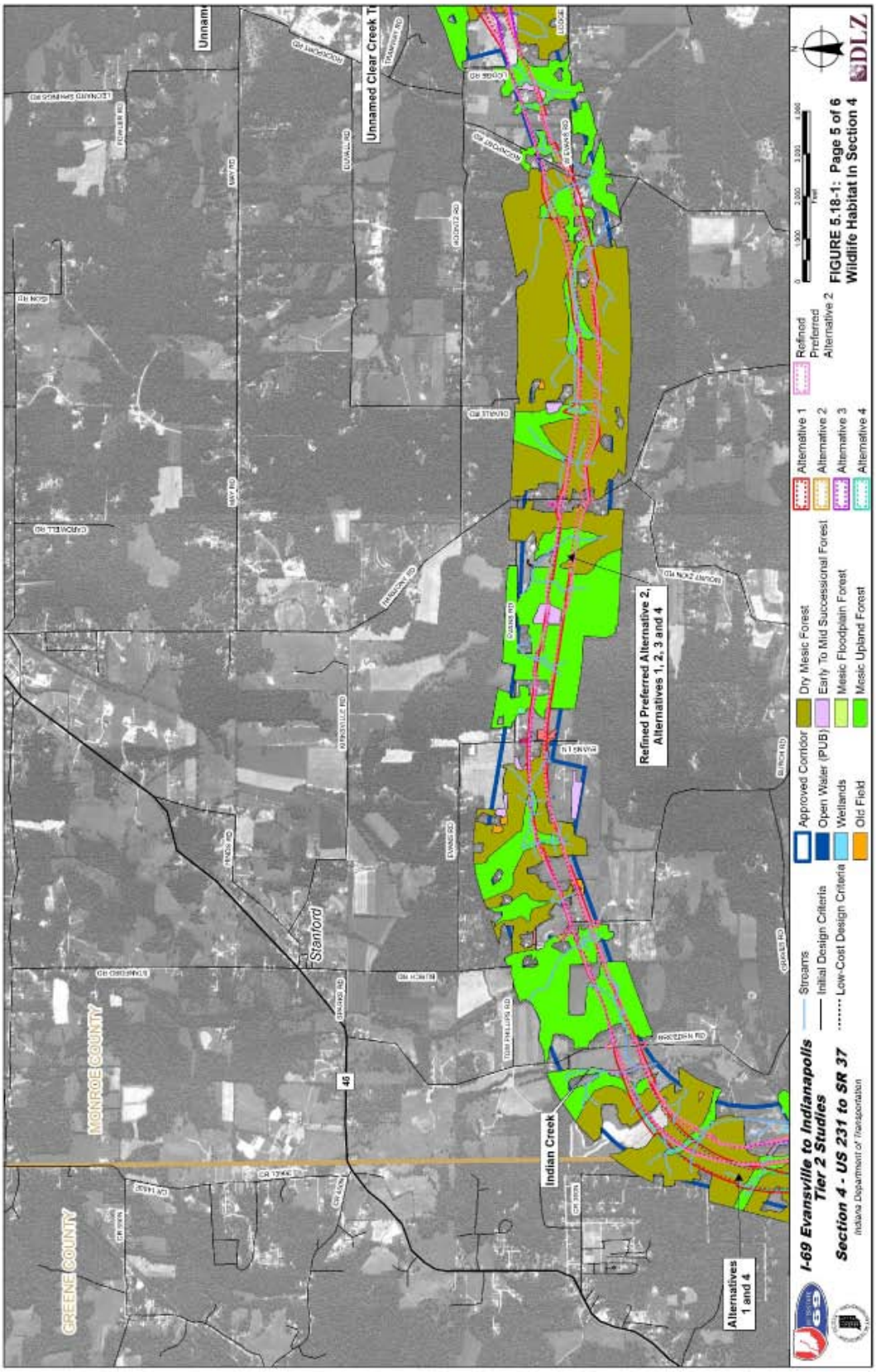

GREENE COUNTY
MONROE COUNTY
Stanford
Unnamed Clear Creek T
Indian Creek
Alternatives 1 and 4
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Approved Corridor
Open Water (PUB)
Wetlands
Old Field
Dry Mesic Forest
Early To Mid Successional Forest
Mesic Floodplain Forest
Mesic Upland Forest
Streams
Initial Design Criteria
Low-Cost Design Criteria
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
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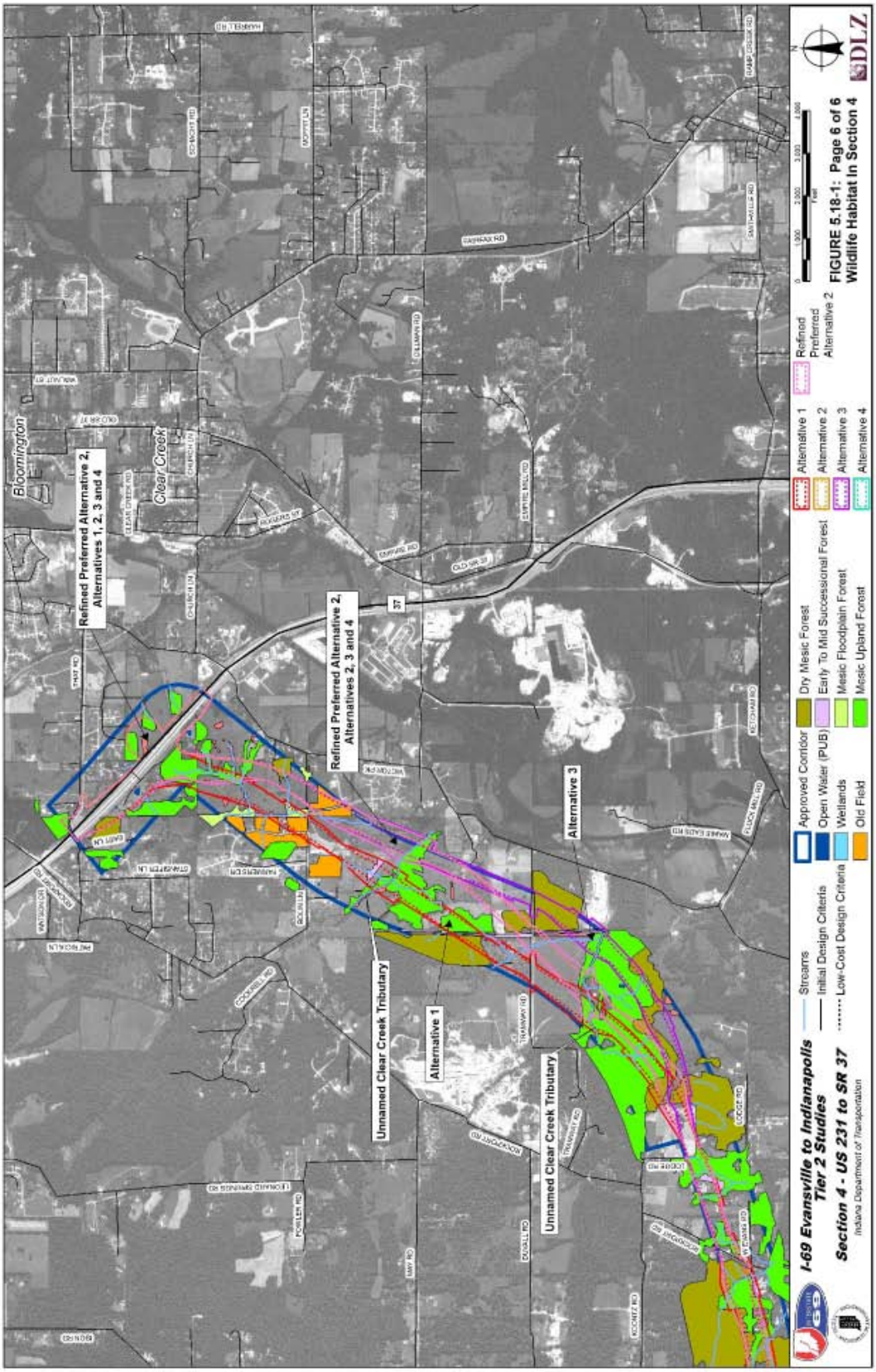
FIGURE 5.18-1: Page 5 of 6
Wildlife Habitat In Section 4
DLZ


Bloomington
Clear Creek
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 2, 3 and 4
Alternative 1
Alternative 3
Unnamed Clear Creek Tributary
Unnamed Clear Creek Tributary
37
Approved Corridor
Open Water (PUB)
Wetlands
Old Field
Dry Mesic Forest
Early To Mid Successional Forest
Mesic Floodplain Forest
Mesic Upland Forest
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Streams
Initial Design Criteria
Low-Cost Design Criteria
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.18-1: Page 6 of 6
Wildlife Habitat in Section 4
DLZ

5.19 Water Resources

Since the DEIS, the following substantive changes have been made to this section:

- Section 5.19.2.2 – Added a reference to Routine Wetland Delineation Datasheets for Refined Preferred Alternative 2.
- Section 5.19.2.3 – Added clarification that the USEPA reviews jurisdictional determinations by the USACE under the CWA.
- Section 5.19.2.3 – Impact discussions revised to include Refined Preferred Alternative 2.
- Section 5.19.2.3 – Updated to present revised stream relocation impact information. Stream relocation impacts are higher than presented in the DEIS, as some relocated stream were incorrectly classified as stream crossings (i.e. culverts, pipes). These impacts have been reclassified as relocations in the FEIS.
- Section 5.19.2.4 - A firm commitment was added that wetlands and other water resources will be actively avoided throughout the final design of the Section 4 roadway. All avoided water resource areas within the right-of-way will be identified on the design plans and these areas will have erosion control measures as approved by IDEM as part of the overall erosion control plan for the roadway project to prevent any filling or contamination of these areas during construction of the Section 4 project.
- Section 5.19.2.4 - A firm commitment was added that consideration will be given in the design phase to planting trees and shrubs along relocated streams and the outside right-of-way edge.
- Section 5.19.2.4 - A firm commitment was added to evaluate measures for bank stabilization, reinforcement and erosion control for final design of the South Connector Road bridge over Indian Creek to minimize natural channel migration.
- Section 5.19.2.4 - Discussion revised to include Refined Preferred Alternative 2.
- Section 5.19.2.4 – Clarification provided that the channels of Black Ankle, Dry Branch, Plummer, Mitchell Branch, Indian Creek and a portion of their overbanks will be bridged to minimize stream and riparian impacts. **Table 5.19-2**, **Table 5-19-3**, **Table 5.19-4**, **Table 5.19-5**, **Table 5.19-6**, **Table 5.19-7**, **Table 5.19-8**, **Table 5.19-9**, **Table 5.19-10**, **Table 5.19-11**, **Table 5.19-12**, and **Table 5.19-13** were revised to include Refined Preferred Alternative 2.
- **Table 5.19-6a**, Stream Impacts by Alternative, Weighted by Habitat Evaluation Score was added to address USEPA comments on the DEIS.
- Section 5.19.2.5 – Summary revised to include Refined Preferred Alternative 2.
- Section 5.19.2.4 was updated to provide discussion of commitments relating to the placement of riprap, the use of alternative armoring materials, the use of deer exclusion fencing and the use of bio-engineering techniques. Section 5.19.3.1 – Discussion was added regarding USEPA Underground Injection Control and Class V Permits.
- 5.19.3.3 - An affirmative commitment has been added that if active groundwater flow paths are discovered, measures will be taken to perpetuate the flow and protect water quality.

5.19.1 Introduction

This chapter evaluates the project's potential impacts on water resources. The analysis of water resource impacts includes an assessment of the existing condition of water bodies affected by this project, as well as an assessment of the project's potential impact on those resources. This analysis takes into account both surface water resources and groundwater resources.

5.19.2 Surface Waters

5.19.2.1 Introduction

Wetlands

Wetlands are important ecologically, socially, and economically to the health of Indiana's environment. Some ecological functions of wetlands are:

- Nutrient primary production and transport
- Habitat and sanctuary for animals
- Hydrological support for adjacent communities
- Shoreline protection
- Storm/flood water storage and peak flow reduction
- Groundwater recharge
- Water purification
- Water supply
- Affect climatic conditions (temperature, oxygen, and carbon dioxide cycles)
- Support isolated genetic population pools
- Species reproduction and development

In addition, wetlands support many human activities. Some activities are as follows:

- Commercial fisheries
- Recreation (hunting, fishing, boating, and swimming)
- Forestry products
- Agricultural products
- Aesthetics
- Educational centers
- Peat mining

Wetlands cover about 813,000 acres (3.5% of total area) of Indiana. Wetlands are an important natural resource because they support rich biological communities across the state. Because of their functions and values, there are several federal and state laws that regulate activities that affect wetlands. The major laws protecting wetlands include the Federal Clean Water Act, the River and Harbors Act, and Indiana's Flood Control Act. There are a number of definitions for a

wetland; however, all definitions have three common criteria that define whether an area is a wetland. These criteria are:

- Wetland's vegetation—plants that are adapted to a wet environment.
- Hydric soils—soils that are characterized by anaerobic conditions.
- Hydrology—an area that is inundated or saturated to the surface for at least 5% of the growing season in most years.

Rivers and Streams

The Tier 1 EIS listed the names (if available) of all streams and rivers identified on the USGS quadrangle maps impacted by the preferred alternative. The Tier 2 streams and rivers evaluation includes a more detailed analysis of the streams and rivers impacted by the Section 4 Alternatives carried forward for detailed analysis. This analysis includes identifying all streams and rivers that may be impacted (including small streams that may not be on the U.S. Geological Survey [USGS] quadrangle maps), identifying the type of rivers and streams impacted (i.e., perennial, intermittent, or ephemeral), taking photographs, measuring the ordinary high water mark (OHWM), estimating the amount of riparian corridor, and completing a quality assessment using the Qualitative Habitat Evaluation Index (QHEI) or the Headwater Habitat Evaluation Index (HHEI) on each river or stream at the point of impact. This information will provide a more complete description of the rivers and streams impacted than the information provided in the Tier 1 EIS. The Tier 2 FEIS will also include measures to minimize impacts to rivers and streams.

Floodplains

Floodplains are a vital part of a river's or stream's ecosystem. They are important because they act as flood buffers, water filters, nurseries, and are major centers of biological life in the river or stream ecosystem. Floodplains are also important for maintenance of water quality because they provide fresh water to wetlands and backwaters, dilute salts and nutrients, and improve the overall health of the habitat used by many species of birds, fish, and plants. They are vital biologically because they represent areas where many species reproduce and are important for breeding and regeneration cycles.

The Tier 1 EIS evaluated the potential impacts to floodplains for all alternatives using FEMA maps and estimating the total amount of floodplains impacted. The Tier 2 EIS further refines potential floodplain impacts from the Tier 1 selected alternative by estimating the total amount of impacts for each Tier 2 alternatives carried forward for detailed analysis. The Tier 2 EIS quantifies and describes the floodplains being crossed and describes efforts that are being made to reduce the amount of floodplain impacts (see Section 5.19.2.3).

5.19.2.2 Methodology

Information from several different sources was used to evaluate potential impacts to existing surface water resources:

- A GIS stream layer derived from the National Hydrography Dataset was used to identify the main streams within the project corridor and calculate the lengths of impacts within the project corridor.

- The on-line Geographic Information System (GIS) program and the Hydrologic Map Server-Online Watershed Delineator (HYMAPS-OWL), developed by Purdue University were used to determine the watershed of several of the major streams within the project corridor boundary.

- Natural Resource Conservation Service (NRCS) County Soil Surveys (USDA-NRCS 1979, 1989) were used to identify smaller headwater streams within the project corridor in accordance with HHEI protocol. The Indiana Department of Environmental Management's (IDEM's) *How to Complete the Qualitative Habitat Evaluation Index* (IDEM, 2002) provided guidance for the QHEI analysis.

- Field observations provided information on small drainageways and streams as well as the width and substrate of the named streams.

- The IDEM 303(d) Impaired Streams list was reviewed to identify any impaired streams in the project corridor.

- General water quality information about the watershed basins was taken from publications by Indiana Department of Natural Resources (IDNR), USGS, and the IGS.

- Greene and Monroe county officials were contacted to identify legal drains in the area.

- Interagency water resource meetings were held December 14, 2004, February 23, 2005, and February 9, 2007, to establish procedures for coordinating with resource agencies regarding water-related issues during the Tier 2 studies, and identify guidelines for evaluating and mitigating impacts to water resources. Agencies having representatives attending the meetings in addition to FHWA and INDOT were USEPA Region 5, USACE, IDEM, and IDNR. The minutes of the meetings are included in **Appendix C**, *Agency Coordination Correspondence.*

- A USACE/IDEM Wetland and Stream Field Review was conducted in Section 4 on September 28, 2005. The purpose of the review was to review waters identified within the Section 4 corridor during field studies to evaluate jurisdictional status of the identified water resources. In addition, interpretations of various scenarios were considered to establish a consistent approach to jurisdictional determinations to be implemented for all six I-69 Tier 2 sections. Several wetland and stream crossing locations were selected for review as representative of conditions within the corridor. A summary of the field review is in **Appendix C**.

Methods employed in the analysis and evaluation of wetlands, streams, floodplains, and surface water quality are identified in the following paragraphs. Water resources discussed in Section 5.19 are shown, in relation to the Section 4 Alternatives (low-cost design criteria and initial design criteria), on **Figures 5.19-1** (Field Verified Wetlands, p. 5-603), **Figure 5.19-2** (NWI

Wetlands, p. 5-609), **Figure 5.19-3** (Streams, p. 5-615) and **Figure 5.19-4** (Impaired Streams, p. 5-621).

Wetland Assessment

Several sources of information were consulted to identify potential wetlands and wetland soil units within the Section 4 corridor. These included the U.S. Fish and Wildlife Service's (USFWS's) *National Wetland Inventory* (NWI) and the Natural Resources Conservation Service's (NRCS) *Soil Survey* for Greene and Monroe counties. These maps identified potential wetland areas within the corridor.

The delineation of wetlands and other "waters of the U.S." within the preferred alternative were based on the methodology described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) as required by current Corps policy that was in effect during the time this survey was completed. Prior to the fieldwork, the background information was reviewed to establish the probability and approximate location of wetlands. Next, a general reconnaissance of the project area was conducted to determine site conditions. The alternatives carried forward for detailed analysis were then walked with the specific intent of determining wetland boundaries. Data stations were established at locations within and near the wetland areas to document soil characteristics, evidence of hydrology, and dominant vegetation. Although a full soil profile was not examined to confirm soil series designations, soils were examined to a depth of at least 16 inches to assess soil characteristics and site hydrology. Complete descriptions of typical soil series can be found in the soil survey for Greene and Monroe counties. The I-69 Evansville to Indianapolis Section 4 field survey of surface water resources was completed during 2004 – 2006, 2009 and 2010.

A complete wetland assessment report was prepared as a separate report, entitled *Wetland Technical Report, I-69 Section 4: US 231 to SR 37 in Greene and Monroe Counties, Indiana (Final Wetland Technical Report)* (DLZ, 2011). The report is in **Appendix F.** In addition to descriptions of each wetland within the construction limits of the alternatives carried forward for detailed analysis, the report includes the following:

- *Site Photographs*. Photographs of each identified wetland are provided in Appendix A of the Wetland Technical Report. These photographs are the visual documentation of site conditions at the time of inspection and are intended to provide representative visual samples of the wetlands.

- *INWRAP documentation, Routine Wetland Data Sheets.* Routine Wetland Data Sheets are included for wetlands impacted by Refined Preferred Alternative 2.

INWRAP

The Indiana Wetland Rapid Assessment Protocol (INWRAP) was developed by Taylor University Environmental Research Group (TERG) in response to a need by state and federal agencies to have a better way of quickly and, with some certainty, accurately depicting the quality of a wetland. The INWRAP assessment method was identified in the February 22, 2005, Interagency Water Resource Meeting as being the assessment method used during the Tier 2

studies for assessing the quality of the wetlands impacted by the alternatives carried forward for detailed analysis. None of the agencies in attendance objected to the use of INWRAP. This effort was initiated by IDNR and TERG was eventually funded in 1998 to begin the process of developing the INWRAP methodology by the U.S. Environmental Protection Agency (USEPA) under Section 104(b) of the Clean Water Act (CWA) (Grant #CD 985484-0100).

INWRAP results in the documentation of various wetland characteristics on field data sheets using a three-tiered approach, as follows:

1) An Assessment Overview records information on the size of the wetland complex and its associated wetland polygons, general classification, setting, and connection relative to other wetlands on the landscape and adjacent land use, as well as standard date, personnel and identification data.

2) An individual polygon approach was adopted wherein 11 preliminary assessment features are recorded for each polygon ranging from presence of standing water, soil type, hydrology disturbances, presence of exotic species, and the presence of "red flag" indicators, such as threatened and endangered species.

3) This step provides a more detailed perspective on the hydrology (water quality and flood/stormwater storage) and vegetative structure of the individual wetland polygons within the complex.

The INWRAP data is included in the *Final Wetland Technical Report* (DLZ, 2011). The report and associated maps and data sheets are provided in **Appendix F.**

Streams: QHEI/HHEI

QHEI Score (Max. 100)

	Indicates
Above 64	Habitat capable of supporting a balanced warm water community.
51 – 64	Stream partially supportive of its aquatic life use designation.
Less than 51	Stream may be non-supporting of its aquatic life use designation.

Qualitative Habitat Evaluation Index (QHEI): Streams possessing drainage areas larger than one square mile or with maximum pool depths greater than 40 centimeters (cm) (15.75 inches) were evaluated using the IDEM Qualitative Habitat Evaluation Index (QHEI) protocol (IDEM, 2002). While the Ohio Environmental Protection Agency (EPA) originally developed the QHEI to evaluate fish habitat in streams, the IDEM and other agencies routinely utilize the QHEI as a measure of general habitat health. Various attributes of habitat within the survey reach were scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic faunas. The type(s) and quality of substrate; amount and quality of in-stream cover; channel morphology; extent and quality of riparian vegetation; pool, riffle, run development and quality; and gradient are the metrics used to determine the QHEI score. Each metric was scored individually then summed to provide the total QHEI score that typically ranges from 20 to 100.

The QHEI is used to evaluate the characteristics of a stream segment (reach), as opposed to the characteristics of a single sampling site. As such, individual sites may have poorer physical

habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. IDEM indicates that QHEI scores above 64 suggest that the habitat is capable of supporting a balanced warm water community; scores between 51 and 64 suggest the streams are partially supportive of a stream's aquatic life use designation; and scores less than 51 suggest the streams are non-supporting for aquatic life use[1] (IDEM, 2002).

Headwater Habitat Evaluation Index (HHEI): Primary headwater streams[2] were assessed using the Ohio EPA's Headwaters Habitat Evaluation Index (HHEI). Each stream with a drainage area less than one square mile and pool depth of less than 40 cm identified within the right-of-way of the alternatives carried forward for detailed analysis was inspected for its ability to provide headwaters habitat. Habitat stations represent the entirety of the habitat available along a representative 200-foot reach of stream. Each time the habitat changed along the length of the tributary within the right-of-way another assessment was completed. Each segment and tributary of each stream was assessed individually.

The HHEI method of stream habitat assessment classifies streams as Class I, II, or III, and also categorizes them according to whether their channels have been modified (Modified Class I, II, or III). Class I streams have the lowest potential to support a diverse array of aquatic fauna typically found in stream environments. For perennial or interstitial natural channels HHEI scores of Class III streams will range between 60 and 80 out of a maximum of 100 points and indicate a potential to support a unique assemblage of headwater species. One of the criteria for a Class III stream is that its channel be in its "natural" state; therefore, no modified primary headwater streams may be classified as Class III streams. Class II streams, which have scores that range between 40 and 60, Modified Class II streams typically score between 30 and 60. Class I streams, which range between 20 and 40, represent reaches that are normally dry (ephemeral) and do not support a diversity of aquatic life. Scores for modified Class I streams range between 0 and 30. Class I streams have the lowest potential to support a diverse array of aquatic fauna typically found in stream environments.

HHEI Class /*Score (Max. 100)*

Class 1 /*up to 40* Indicates lowest potential to support diverse array of aquatic fauna. If channel is modified, score range is up to 30.

Class II / *40 to 60* Indicates moderate potential to support diverse warm-water aquatic fauna. If channel is modified, score range is 30 and above.

Class III / *60 and above* Indicates greatest potential to support a diverse array of fauna adapted to headwater habitat. Channel must be in natural state, not modified.

The scores were developed specifically for the I-69 project to aid in the interpretation of information obtained in the HHEI assessments. The general theory is that the higher the HHEI

[1] A supporting / non-supporting designation indicates that a stream may / may not provide suitable habitat to sustain the flora (plants) and fauna (animals) typically found in this region of Indiana.

[2] As described in detail in the *Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams* (Ohio EPA, 2002), a primary headwater habitat stream is "a surface water of the state, having a defined bed and bank, with either continuous or periodical flowing water, with watershed area less than or equal to 1.0 square mile (259 hectares), and a maximum depth of water pools equal to or less than 40 cm." Primary headwater habitat streams are defined based on substrate type, quality, maximum pool depth, and bank full width, i.e., the total width of the stream at the boundary line of terrestrial vegetation.

score, the higher the probability that the stream supports a more diverse aquatic fauna community. Corollary to this theory, a stream expected to support a more diverse aquatic community is a higher quality stream compared to one that would not be expected to support a diverse aquatic community. This stream quality interpretation was developed based on input from the I-69 Water Resources Technical Committee composed of representatives of FHWA, INDOT, USEPA Region 5, USACE, USFWS, IDEM, and IDNR.

The QHEI/HHEI evaluations and supporting data are presented in a separate *Stream Assessment Report* (DLZ, 2011), which includes a brief description of each stream segment surveyed. The report and associated maps are provided in **Appendix M** (*Final Stream Assessment Report*) of this document. Tributary and segment data sheets for each unique stream and/or unique habitat, prepared as part of the evaluation, are included in the report.

In addition to the above-listed information, each stream was further classified as ephemeral, intermittent, or perennial. The classification was based upon USGS map identifications.

Ephemeral Streams: An ephemeral stream is a stream that flows only during and for short periods following precipitation (less than 30% of the time) and flows in low areas that may or may not have a well-defined channel. Some commonly used names for ephemeral streams include: stormwater channel, drain, swale, gully, hollow, or saddle. Since ephemeral streams are often headwater streams, it is typically recommended that roads, site-prep, and other soil-disturbing activities be minimized in ephemeral streams to avoid erosion and sedimentation of stormwater runoff that will flow downstream into larger streams or waterbodies. All streams identified in the field that were not represented on the USGS maps were classified as ephemeral streams for this study.

Intermittent Streams: An intermittent stream is a stream that flows only during wet periods of the year (30% - 90% of the time) and flows in a continuous well-defined channel. During dry periods, especially in summer months, intermittent streams may go down to a trickle of water and appear dry when, in fact, there is water flowing through the stream bottom or "substrate." All streams that were identified on the USGS maps by a broken blue line were considered intermittent streams for this report.

Perennial Streams: Perennial streams are streams that flow throughout the majority of the year (greater than 90% of the time) and flow in a well-defined channel. However, perennial streams can "dry up," particularly during extended periods of drought. All streams that were identified on the USGS maps by a solid blue line were considered perennial streams for this report.

Floodplains

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map Numbers 1804360005A, 1804360006A, 1804360003A, 1804440005B, 1804440003C, and 1801690040C for Greene and Monroe counties were consulted to identify floodplains within the right-of-way of the alternatives carried forward for detailed analysis. The floodplain area within the right-of-way of each of these alternatives was calculated to identify potential impacts as a result of the project.

Surface Water Quality

Two main regional studies were used to evaluate water quality in the project corridor. The first was "White River Basin" published by the USGS (Hoover and Durbin, website last modified 2001). The second was "Environmental Setting and Natural Factors and Human Influences Affecting Water Quality in the White River Basin, Indiana" published by the USGS (Schnoebelen et al, 1999).

5.19.2.3 Analysis

Wetlands

The following are short descriptions of the types of wetlands in the Section 4 corridor based on NWI mapping used during the Tier 1 study as the basis for estimating potential wetland impacts within the study's alternative corridors. **Table 5.19-1** provides information about the NWI mapped wetlands in the Section 4 corridor.

Table 5.19-1: USFWS NWI Mapped Wetlands in Section 4 Corridor

Wetland Type	Number of Wetlands	NWI Wetland Acreage	Number of Field Verified Wetlands	Field Verified Wetland Acreage
Palustrine Emergent (PEM)	3	2.08	28	27.01
Palustrine Forested (PFO)	19	70.93	18	11.45
Palustrine Scrub-Shrub (PSS)	2	0.35	8	3.06
Palustrine Unconsolidated Bottom (PUB)	36	14.35	68	25.02
Total	**60**	**87.71**	**122**	**66.54**

Palustrine Emergent Wetlands (PEM)—NWI data indicated approximately 2.08 acres of emergent wetlands located within the study corridor. These wetlands support erect, largely herbaceous perennial species and contain permanent water for most of the growing season during years with normal precipitation levels. These wetlands maintain the same appearance each year unless extreme climatic conditions cause flooding or other atypical local changes. Emergent wetlands traditionally include marsh, meadow, and fen communities.

Palustrine Scrub/Shrub Wetlands (PSS)-- NWI data indicated approximately 0.35 acres of scrub-shrub wetlands located within the study corridor. These wetlands support largely woody species less than 20 feet tall. The species include shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Many of the scrub/shrub wetlands in the Midwest develop into forested wetlands.

Palustrine Forested Wetlands (PFO)—NWI data indicated approximately 70.93 acres of forested wetlands located within the study corridor. These wetlands support largely woody species greater than 20 feet in height and include various hydrological regimes. This class generally possesses various layers of vegetation including canopy trees, subcanopy trees, shrubs,

and ground layer herbaceous vegetation. Forested wetlands traditionally include bottomland hardwood and swamp communities.

Palustrine Unconsolidated Bottom Wetlands (PUB)—NWI data indicated approximately 14.35 acres of unconsolidated bottom wetlands located within the study corridor. All of these are man-made. These are wetlands and deepwater habitats that support less than 30% cover of vegetation, contain at least 25% cover of substrate smaller than stones, and have various permanent or semi-permanent water regimes. These communities rarely comprise a stable substrate for aquatic vegetative growth.

Wetland Assessments Within 2,000-foot Study Corridor

Generally speaking, NWI wetlands are identified by aerial mapping and are not field-verified. Because of this, wetlands are sometimes erroneously identified, missed, or misidentified. In addition, the criteria used in identifying these wetlands were different from those currently used by the Corps. To determine whether the project would impact wetlands in the corridor, it is necessary to verify the accuracy of the NWI data in the field. Therefore, for the Tier 2 study in Section 4, wetland resources within the 2,000-foot-wide study corridor were identified through a combination of field reconnaissance surveys and GIS mapping. To keep consistent with the previous NWI discussion, this section characterizes the field confirmed wetlands according to the *Classification of Wetlands and Deepwater Habitats of the United States.* A complete wetland assessment report was submitted as a separate report (See the *Final Wetland Technical Report* in **Appendix F**). This section (5.19) provides a summary of the report findings and includes an evaluation of the potential impacts to the wetlands assessed within the project corridor.

As noted above, NWI data indicated the presence of 60 palustrine wetland systems (PEM, PSS, PFO, and PUB) totaling approximately 87.71 acres in the Section 4 corridor. However, the field reconnaissance resulted in the identification and assessment of a total of 122 wetlands in the corridor. Of these, 28 wetlands were identified as palustrine emergent (PEM), 8 as palustrine scrub-shrub (PSS), 18 as palustrine forested (PFO), and 68 as open water (PUB). In addition, 5 open water features (ponds) were identified outside of the Section 4 approved corridor in the location of the proposed County Line interchange. No other wetlands were identified in this area.

The field reconnaissance identified wetlands within the corridor ranging in size from less than one tenth of an acre to approximately 10.86 acres. The total area of all forested wetlands within the Section 4 corridor is approximately 11.45 acres. The total area of all scrub/shrub wetlands within the Section 4 corridor is approximately 3.06 acres. The total area of all emergent wetlands within the Section 4 corridor is approximately 27.01 acres. The total area of the open water within the corridor is approximately 25.02 acres. The total area of open water features identified outside of the Section 4 approved corridor in the location of the proposed County Line interchange is 1.29 acres. No other wetlands were identified in this area. **Figure 5.19-1** (p. 5-603) shows the field verified wetlands in the project corridor. **Figure 5.19-2** (p. 5-609) shows the Section 4 corridor in relation to the NWI wetlands within the Section 4 Study Area and portions of surrounding Greene and Monroe counties. **Table 5.19-1** compares the amount and acreage of NWI mapped wetlands and field verified wetlands in the Section 4 corridor.

Potential Wetland Impacts for Alternatives Carried Forward for Detailed Analysis

INWRAP was used to assess the quality of the wetlands potentially impacted by the alternatives carried forward for detailed analysis. As a part of this analysis, two or more individual wetlands could be combined to create wetland complexes. Of these 54 wetlands (excluding open water) or wetland complexes, the following 23 wetlands are within the construction limits of one or more alternatives carried forward for detailed analysis; W8, W12, W13, W19, W20, W21, W22, W26, W27, W28, W31, W36, W37, W40, W41, W42, W43, W45, W47, W48, W49, W50, and W55.

Most of the wetlands potentially impacted in Section 4 are preliminarily identified as "waters of the U.S." and would fall under USACE and IDEM jurisdiction. Twenty–two (22) of the wetland complexes and eight of the ponds that are impacted by at least one alternative are included in this category. IDEM regulates wetlands that do not fall under USACE jurisdiction. These are regulated as isolated wetlands under the IDEM Isolated Wetlands Regulatory Program. They are considered isolated wetlands because they are not connected or adjacent to "waters of the U.S," which are regulated by the USACE. One wetland and seven ponds are included in this category. Descriptions of the 23 wetlands are provided in the *Final Wetland Technical Report*, **Appendix F**. **Table 5.19-2** identifies the potentially impacted wetlands in the Section 4 corridor by type and number of acres, and it indicates whether they should be considered "waters of the U.S." or "waters of the state."[3]

Note that the identification of wetlands as "waters of the U.S." was based on definitions and guidance found in 33 CFR 328.3, USACE Regulatory Guidance Letters, the wetland delineation manual, and field observations performed as part of the INWRAP evaluation. IDEM and USACE conducted a preliminary field review in September 2005 to evaluate the potential jurisdiction of identified water resources within the Section 4 corridor. The USACE will make the final determinations regarding the jurisdictional status of wetlands during permitting. USEPA will review the final decision on the Federal jurisdictional determinations made by the USACE as part of its responsibility in jointly administering Section 404 of the Clean Water Act and has the ability of overturn the USACE determination if deemed necessary.

No alternative impacts all 38 wetlands or open water features; each alternative has impacts to 20 to 32 wetlands and open water features, depending on the alternative. Total impacts for the alternatives range from approximately 7.03 acres to 11.90 acres (Refined Preferred Alternative 2 – Low-

[3] "Waters of the U.S." are within the jurisdiction of USACE under the Clean Water Act (CWA). The term includes waters that are used or could be used for interstate commerce. This includes wetlands, ponds, lakes, territorial seas, rivers, tributary streams including any definable intermittent waterways, and some ditches below the "ordinary high water mark" (OHWM). Also included are manmade water bodies such as quarries and ponds, which are no longer actively being mined or constructed and are connected to other "waters." A specific, detailed definition of "waters of the U.S." can be found in the *Federal Register* (33 CFR 328.3). In Indiana, "waters of the U.S." are also subject to regulation by IDEM, which maintains jurisdiction over the state's water quality issues.

"Waters of the state" are within the jurisdiction of IDEM. They are generally defined as surface and underground water bodies that extend through or exist wholly in the state. They include but are not limited to streams and both isolated and non-isolated wetlands. Private ponds, or any pond, reservoir, or facility built for reduction of pollutants prior to discharge are not included in this definition. In addition to "waters of the U.S.," IDEM regulates and issues permits for isolated wetland impacts.

Cost Design Criteria to Initial Design Criteria respectively) and 11.04 acres to 17.42 acres (Alternative 4 – Low-Cost Design Criteria to Initial Design Criteria respectively). The majority of the impacts are to emergent wetlands (PEM) and forested wetlands (PFO). **Table 5.19-2** lists each of the 38 wetlands and open water features impacted by one or more of the four alternatives, their potential jurisdictional status, and the acreage impacted by each alternative. The Tier 1 study estimated 20 acres of wetland impacts in the Section 4 corridor (Tier 1 FEIS, Table 6-29, based on NWI data). It should be noted that the Tier 1 estimation of impacts was based on NWI data while the Tier 2 evaluation was based on field reconnaissance and determinations of wetlands within the construction limits of the Section 4 alternatives.

Table 5.19-2: Potential Wetland Impacts, by Wetland Site – (Construction Limits)

Wetland Site ID	Type	Jurisdiction		Total Wetland Acres	Acres of Impact, by Alternative									
		Waters of the U.S.	Waters of the State		1		2		3		4		Refined Preferred Alternative 2	
					Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial
S4P01	PUB	x	x	0.15	0.00	0.15	0.00	0.15	0.00	0.15	0.00	0.15	0.00	0.00
S4P06	PUB		x	0.49	0.00	0.49	0.00	0.49	0.49	0.49	0.00	0.49	0.00	0.49
S4P08	PUB		x	0.09	0.09	0.09	0.00	0.00	0.00	0.00	0.09	0.09	0.00	0.00
S4P14	PUB		x	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.00	0.00
S4P18	PUB	x	x	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
S4P21	PUB		x	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
S4P31	PUB		x	0.06	0.06	0.06	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00
S4P45	PUB		x	0.30	0.00	0.00	0.30	0.30	0.00	0.00	0.30	0.30	0.30	0.30
S4P51	PUB	x	x	0.14	0.00	0.00	0.14	0.14	0.14	0.14	0.00	0.00	0.14	0.14
S4P53	PUB	x	x	0.16	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.00
S4P54	PUB	x	x	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
S4P57	PUB	x	x	0.15	0.00	0.15	0.00	0.15	0.00	0.15	0.00	0.15	0.00	0.15
S4P65	PUB	x	x	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
S4P66	PUB	x	x	1.13	1.13	1.13	0.00	0.00	0.00	0.00	1.13	1.13	0.00	0.00
S4P76	PUB		x	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
S4W08	PSS	x	x	0.76	0.18	0.45	0.18	0.45	0.00	0.00	0.18	0.45	0.18	0.45
S4W12	PEM	x	x	5.85	0.00	0.10	0.00	0.11	0.00	0.11	0.00	0.10	0.00	0.11
S4W13	PFO/PEM/PEM	x	x	7.25 (4.61/1.81/0.83)	1.43 (0/1.43/0)	3.98 (2.17/1.81/0)	1.45 (0.01/1.44/0)	3.32 (1.51/1.81/0)	1.45 (0.01/1.44/0)	3.32 (1.51/1.81/0)	1.43 (0/1.43/0)	3.98 (2.17/1.81/0)	1.45 (0.01/1.44/0)	3.31 (1.51/1.81/0)
S4W19	PEM	x	x	10.86	1.73	1.74	1.73	1.73	1.73	1.73	1.73	1.74	1.73	1.73
S4W20	PFO	x	x	1.69	1.44	1.64	1.42	1.62	1.42	1.62	1.44	1.64	1.42	1.62
S4W21	PEM	x	x	0.04	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04
S4W22	PEM	x	x	0.07	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
S4W26	PEM	x	x	3.27	0.05	1.41	0.05	1.41	0.05	1.41	0.05	1.41	0.05	1.41
S4W27	PFO	x	x	0.50	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
S4W28	PFO	x	x	0.09	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
S4W31	PFO	x	x	0.81	0.09	0.25	0.09	0.25	0.09	0.25	0.09	0.25	0.09	0.25
S4W36	PFO	x	x	0.15	0.06	0.15	0.06	0.15	0.06	0.15	0.06	0.15	0.06	0.15
S4W37	PEM	x	x	0.27	0.11	0.22	0.11	0.22	0.11	0.22	0.11	0.22	0.11	0.20
S4W40	PFO	x	x	0.38	0.04	0.10	0.00	0.00	0.04	0.12	0.00	0.00	0.00	0.00
S4W41	PFO	x	x	0.03	0.03	0.03	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00
S4W42	PFO	x	x	0.12	0.05	0.08	0.00	0.00	0.05	0.08	0.00	0.00	0.00	0.00
S4W43	PSS	x	x	0.28	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00

Table 5.19-2: Potential Wetland Impacts, by Wetland Site – (Construction Limits)

Wetland Site ID	Type	Jurisdiction		Total Wetland Acres	Acres of Impact, by Alternative									
		Waters of the U.S.	Waters of the State		1		2		3		4		Refined Preferred Alternative 2	
					Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial
S4W45	PFO		x	0.33	0.33	0.33	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00
S4W47	PEM	x	x	2.83	1.90	2.41	0.00	0.01	0.00	0.01	1.89	2.36	0.00	0.00
S4W48	PSS	x	x	0.13	0.04	0.07	0.00	0.00	0.00	0.00	0.04	0.07	0.00	0.00
S4W49	PFO	x	x	0.09	0.00	0.00	0.09	0.09	0.09	0.09	0.00	0.00	0.09	0.09
S4W50	PFO	x	x	0.06	0.00	0.00	0.06	0.06	0.06	0.06	0.00	0.00	0.06	0.06
S4W55	PEM	x	x	0.03	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03
				TOTAL	**10.93**	**17.41**	**7.85**	**13.06**	**8.04**	**12.67**	**11.04**	**17.42**	**7.03**	**11.90**
				PUB	3.37	4.32	2.53	3.48	2.78	3.24	3.61	4.56	1.71	2.35
				PEM	5.22	7.74	3.33	5.37	3.33	5.37	5.21	7.72	3.33	5.34
				PSS	0.22	0.52	0.18	0.45	0.00	0.07	0.22	0.52	0.18	0.45
				PFO	2.12	4.83	1.81	3.76	1.93	3.99	2.00	4.62	1.81	3.76

Table 5.19-3: Potential Wetland Impacts, by Wetland Site – (Right-of-way Limits)

Wetland Site ID	Type	Jurisdiction		Total Wetland Acres	Acres of Impact, by Alternative									
		Waters of the U.S.	Waters of the State		1		2		3		4		Refined Preferred Alternative 2	
					Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial
S4P01	PUB	x	x	0.15	0.00	0.15	0.00	0.15	0.00	0.15	0.00	0.15	0.00	0.15
S4P06	PUB		x	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
S4P08	PUB		x	0.09	0.09	0.09	0.00	0.00	0.00	0.00	0.09	0.09	0.00	0.00
S4P14	PUB		x	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.00	0.00
S4P18	PUB	x	x	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
S4P21	PUB		x	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
S4P24	PUB	x	x	0.22	0.00	0.22	0.00	0.22	0.00	0.22	0.00	0.22	0.00	0.22
S4P26	PUB		x	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.02
S4P31	PUB		x	0.06	0.06	0.06	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00
S4P45	PUB		x	0.30	0.00	0.00	0.30	0.30	0.00	0.00	0.30	0.30	0.30	0.30
S4P51	PUB	x	x	0.14	0.00	0.00	0.14	0.14	0.14	0.14	0.00	0.00	0.14	0.14
S4P53	PUB	x	x	0.16	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.16
S4P54	PUB	x	x	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
S4P56	PUB		x	0.06	0.00	0.06	0.00	0.06	0.00	0.06	0.00	0.06	0.00	0.00
S4P57	PUB	x	x	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
S4P65	PUB	x	x	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35

Table 5.19-3: Potential Wetland Impacts, by Wetland Site – (Right-of-way Limits)

Wetland Site ID	Type	Jurisdiction		Total Wetland Acres	Acres of Impact, by Alternative									
		Waters of the U.S.	Waters of the State		1		2		3		4		Refined Preferred Alternative 2	
					Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial	Low-Cost	Initial
S4P66	PUB	x	x	1.13	1.13	1.13	0.00	0.00	0.00	0.00	1.13	1.13	0.00	0.00
S4P76	PUB		x	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
S4P80	PUB		x	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
S4W08	PSS	x	x	0.76	0.31	0.57	0.31	0.57	0.00	0.00	0.31	0.57	0.31	0.57
S4W12	PEM	x	x	5.85	0.00	0.12	0.00	0.14	0.00	0.14	0.00	0.12	0.00	0.14
S4W13	PFO/PEM/PEM	x	x	7.25 (4.61/1.81/0.83)	1.94 (0.13/1.81/0)	4.66 (2.85/1.81/0)	1.96 (0.15/1.81/0)	4.33 (2.52/1.81/0)	1.96 (0.15/1.81/0)	4.33 (2.52/1.81/0)	1.94 (0.13/1.81/0)	4.66 (2.85/1.81/0)	1.97 (0.16/1.81/0)	4.33 (2.52/1.81/0)
S4W19	PEM	x	x	10.86	2.61	2.47	2.58	2.46	2.58	2.46	2.61	2.47	2.58	2.46
S4W20	PFO	x	x	1.69	1.48	1.69	1.47	1.69	1.47	1.69	1.48	1.69	1.47	1.69
S4W21	PEM	x	x	0.04	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04
S4W22	PEM	x	x	0.07	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03
S4W26	PEM	x	x	3.27	0.11	1.64	0.11	1.64	0.11	1.64	0.11	1.64	0.11	1.64
S4W27	PFO	x	x	0.50	0.07	0.33	0.07	0.33	0.07	0.33	0.07	0.33	0.07	0.33
S4W28	PFO	x	x	0.09	0.05	0.09	0.05	0.09	0.05	0.09	0.05	0.09	0.05	0.09
S4W31	PFO	x	x	0.81	0.13	0.32	0.13	0.32	0.13	0.32	0.13	0.32	0.13	0.32
S4W36	PFO	x	x	0.15	0.12	0.15	0.12	0.15	0.12	0.15	0.12	0.15	0.12	0.15
S4W37	PEM	x	x	0.27	0.17	0.27	0.17	0.27	0.17	0.27	0.17	0.27	0.17	0.27
S4W40	PFO	x	x	0.38	0.07	0.13	0.00	0.00	0.07	0.14	0.00	0.00	0.00	0.00
S4W41	PFO	x	x	0.03	0.03	0.03	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00
S4W42	PFO	x	x	0.12	0.07	0.08	0.00	0.00	0.07	0.09	0.00	0.00	0.00	0.00
S4W43	PSS	x	x	0.28	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00
S4W45	PFO		x	0.33	0.33	0.33	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00
S4W47	PEM	x	x	2.83	2.09	2.48	0.00	0.01	0.00	0.02	2.07	2.45	0.00	0.01
S4W48	PSS	x	x	0.13	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.09	0.00	0.00
S4W49	PFO	x	x	0.09	0.00	0.00	0.09	0.09	0.09	0.09	0.00	0.00	0.09	0.09
S4W50	PFO	x	x	0.06	0.00	0.00	0.06	0.06	0.06	0.06	0.00	0.00	0.06	0.06
S4W55	PEM	x	x	0.03	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03
S4W56	PSS	x	x	0.08	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				TOTAL	**13.72**	**20.24**	**10.37**	**16.07**	**9.99**	**15.66**	**13.77**	**20.18**	**9.56**	**15.21**
				PUB	4.07	4.66	3.23	3.82	2.99	3.58	4.31	4.90	2.41	2.96
				PEM	6.81	8.86	4.69	6.43	4.69	6.44	6.79	8.86	4.69	6.43
				PSS	0.36	0.72	0.31	0.57	0.00	0.13	0.36	0.66	0.31	0.57
				PFO	2.48	6.00	2.14	5.25	2.31	5.51	2.31	5.76	2.15	5.25

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As has been noted, many impacts to high quality wetlands within the Tier 1 study area were avoided during the Tier 1 study and in the selection of the location of the preferred 3C corridor. During Tier 2, wetlands in the approved corridor were mapped based upon wetland determinations and were included as a key resource for avoidance in the initial development of the Preliminary Alternatives (mainline alignments). At some locations along the corridor, riparian wetlands cross the entire corridor width and were thus unavoidable. However, where possible, such as at the Black Ankle Creek floodplain, the Preliminary Alternatives were adjusted to cross streams where the widths of adjacent wetlands were narrower. During the screening analysis of the Preliminary Alternatives, wetland impacts were again considered in the recommendation of alternatives to be carried forward for detailed analysis. These recommendations included additional minor alignment shifts (up to 200 feet) that could further avoid and/or minimize wetland impacts. However, a variety of constraints limited the alignment options available in some locations—including engineering requirements related to roadway and interchange configurations and design standards; and the need to avoid or minimize impacts to other resources, such as streams and forested areas, within the relatively narrow corridor.

Anticipated indirect impacts for wetlands could be wetlands bought by a developer to build a service facility such as a gas station and/or convenience food mart at an interchange. However, the federal "no net loss of wetlands" policy in Clean Water Act permitting requirements nearly eliminates the possibility of future cumulative wetland acreage losses.[4] The no net loss policy, including mitigation requirements associated with the USACE regulatory program have actually increased the amount of wetlands in the area based on coordination with local elected officials. Therefore, no long-term indirect or direct loss of wetlands is anticipated due to the implementation of I-69.

INWRAP

The *Final Wetland Technical Report* (see **Appendix F**) contains detailed INWRAP data on 23 of the 38 wetland complexes (these 23 wetland complexes contain 25 wetland units) that would be impacted by the alternatives carried forward for detailed analysis, including a description of each wetland and its rating ("poor," "fair," or "good") for quality of animal habitat, botanical measures, and hydrology. No quality assessments were completed on the 15 wetland complexes consisting entirely of open water ponds. **Table 5.19-4** illustrates the general quality of each wetland or wetland complex and provides a comparison of wetlands affected by each proposed alternative. In summary, the INWRAP evaluation of each of the 23 non-PUB wetland complexes (25 units) potentially impacted by the project yielded the following ratings for animal habitat, botanical measures and hydrology:

Animal habitat: 11 are "poor" 14 are "fair" 0 are "good"

[4] In 1993, the executive branch adopted the "no net loss" of wetlands strategy as a basic principle for Section 404 permitting. See White House Office on Environmental Policy, *Protecting America's Wetlands: A Fair, Flexible and Effective Approach* (August 24, 1993) at http://www.wetlands.com/fed/aug93wet.htm.

Botanical:	13 are "poor"	12 are "fair"	0 are "good"
Hydrology:	0 are "poor"	8 are "fair"	17 are "good"

Note that each individual wetland unit within the wetland complexes was assigned a quality rating. The total amount of non-PUB individual wetland units being potentially impacted is 25.

The general quality of the wetlands impacted by alternatives carried forward for detailed analysis is fair to poor. The majority of the wetlands are fair quality in their regard to animal habitat; poor to fair in botanical quality; and, good quality in their hydrology measure.

Table 5.19-4: Wetland Impacts Matrix Table for Section 4 Alternatives

Wetland ID		Data	Alternative 1 Low Cost Design Criteria			Alternative 1 Initial Design Criteria			Alternative 2 Low Cost Design Criteria			Alternative 2 Initial Design Criteria			Alternative 3 Low Cost Design Criteria			Alternative 3 Initial Design Criteria			Alternative 4 Low Cost Design Criteria			Alternative 4 Initial Design Criteria			Refined Preferred Alternative 2 Low Cost Design Criteria			Refined Preferred Alternative 2 Initial Design Criteria		
S4W8	USACE Jurisdiction: Yes	Cowardin et al. Classification	PSS			PSS			PSS			PSS									PSS			PSS			PSS			PSS		
		Indiana Community Type	SC			SC			SC			SC									SC			SC			SC			SC		
		Size (acres)	0.76			0.76			0.76			0.76									0.76			0.76			0.76			0.76		
		Impact (acres)	0.18			0.45			0.18			0.45									0.18			0.45			0.18			0.45		
		Animal Habitat	fair			fair			fair			fair									fair			fair			fair			fair		
		Botanical	fair			fair			fair			fair									fair			fair			fair			fair		
		Hydrology	fair			fair			fair			fair									fair			fair			fair			fair		
		Red Flags	Y			Y			Y			Y									Y			Y			Y			Y		
S4W12	USACE Jurisdiction: Yes	Cowardin et al. Classification				PEM						PEM						PEM						PEM						PEM		
		Indiana Community Type				WM						WM						WM						WM						WM		
		Size (acres)				5.85						5.85						5.85						5.85						5.85		
		Impact (acres)				0.10						0.11						0.11						0.10						0.11		
		Animal Habitat				poor						poor						poor						poor						poor		
		Botanical				poor						poor						poor						poor						poor		
		Hydrology				fair						fair						fair						fair						fair		
		Red Flags				N						N						N						N						N		
S4W13	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM	PFO	PEM	PEM
		Indiana Community Type	FF	WM	WM	FF	WM	WM	FF	WM	WM	FF	WM	WM	FF	WM	WM	FF	WM	WM	FF	WM	WM	FF	WM	WM	FF	WM	WM	FF	WM	WM
		Size (acres)	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83	4.61	1.81	0.83
		Impact (acres)	0.00	1.43	0.00	2.17	1.81	0.00	0.01	1.44	0.00	1.51	1.81	0.00	0.01	1.44	0.00	1.51	1.81	0.00	0.00	1.43	0.00	2.17	1.81	0.00	0.01	1.44	0.00	1.51	1.81	0.00
		Animal Habitat	fair	poor	poor	fair	poor	poor	fair	poor	poor	fair	poor	poor	fair	poor	poor	fair	poor	poor	fair	poor	poor	fair	poor	poor	fair	poor	poor	fair	poor	poor
		Botanical	fair	poor	fair	fair	poor	fair	fair	poor	fair	fair	poor	fair	fair	poor	fair	fair	poor	fair	fair	poor	fair	fair	poor	fair	fair	poor	fair	fair	poor	fair
		Hydrology	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good
		Red Flags	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
S4W19	USACE Jurisdiction: Yes	Cowardin et al. Classification	PEM			PEM			PEM			PEM			PEM			PEM			PEM			PEM			PEM			PEM		
		Indiana Community Type	SM			SM			SM			SM			SM			SM			SM			SM			SM			SM		
		Size (acres)	10.86			10.86			10.86			10.86			10.86			10.86			10.86			10.86			10.86			10.86		
		Impact (acres)	1.73			1.74			1.73			1.73			1.73			1.73			1.73			1.74			1.73			1.73		
		Animal Habitat	fair			fair			fair			fair			fair			fair			fair			fair			fair			fair		
		Botanical	fair			fair			fair			fair			fair			fair			fair			fair			fair			fair		
		Hydrology	good			good			good			good			good			good			good			good			good			good		
		Red Flags	N			N			N			N			N			N			N			N			N			N		
S4W20	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO			PFO			PFO			PFO			PFO			PFO			PFO			PFO			PFO			PFO		
		Indiana Community Type	SW			SW			SW			SW			SW			SW			SW			SW			SW			SW		
		Size (acres)	1.69			1.69			1.69			1.69			1.69			1.69			1.69			1.69			1.69			1.69		
		Impact (acres)	1.44			1.64			1.42			1.62			1.42			1.62			1.44			1.64			1.42			1.62		
		Animal Habitat	fair			fair			fair			fair			fair			fair			fair			fair			fair			fair		
		Botanical	fair			fair			fair			fair			fair			fair			fair			fair			fair			fair		
		Hydrology	good			good			good			good			good			good			good			good			good			good		
		Red Flags	N			N			N			N			N			N			N			N			N			N		
S4W21	USACE Jurisdiction: Yes	Cowardin et al. Classification				PEM						PEM						PEM						PEM						PEM		
		Indiana Community Type				WM						WM						WM						WM						WM		
		Size (acres)				0.04						0.04						0.04						0.04						0.04		
		Impact (acres)				0.04						0.04						0.04						0.04						0.04		

Table 5.19-4: Wetland Impacts Matrix Table for Section 4 Alternatives

Wetland ID		Data	Alternative 1 Low Cost Design Criteria	Alternative 1 Initial Design Criteria	Alternative 2 Low Cost Design Criteria	Alternative 2 Initial Design Criteria	Alternative 3 Low Cost Design Criteria	Alternative 3 Initial Design Criteria	Alternative 4 Low Cost Design Criteria	Alternative 4 Initial Design Criteria	Refined Preferred Alternative 2 Low Cost Design Criteria	Refined Preferred Alternative 2 Initial Design Criteria
		Animal Habitat		poor		poor		poor		poor		poor
		Botanical		poor		poor		poor		poor		poor
		Hydrology		fair		fair		fair		fair		fair
		Red Flags		N		N		N		N		N
S4W22	USACE Jurisdiction: Yes	Cowardin et al. Classification		PEM		PEM		PEM		PEM		PEM
		Indiana Community Type		WM		WM		WM		WM		WM
		Size (acres)		0.07		0.07		0.07		0.07		0.07
		Impact (acres)		0.01		0.01		0.01		0.01		0.01
		Animal Habitat		poor		poor		poor		poor		poor
		Botanical		poor		poor		poor		poor		poor
		Hydrology		fair		fair		fair		fair		fair
		Red Flags		N		N		N		N		N
S4W26	USACE Jurisdiction: Yes	Cowardin et al. Classification	PEM	PEM	PEM	PEM	PEM	PEM	PEM	PEM	PEM	PEM
		Indiana Community Type	WM	WM	WM	WM	WM	WM	WM	WM	WM	WM
		Size (acres)	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27
		Impact (acres)	0.05	1.41	0.05	1.41	0.05	1.41	0.05	1.41	0.05	1.41
		Animal Habitat	poor	poor	poor	poor	poor	poor	poor	poor	poor	poor
		Botanical	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Hydrology	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Red Flags	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
S4W27	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO
		Indiana Community Type	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
		Size (acres)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
		Impact (acres)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
		Animal Habitat	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Botanical	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Hydrology	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Red Flags	N	N	N	N	N	N	N	N	N	N
S4W28	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO
		Indiana Community Type	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
		Size (acres)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
		Impact (acres)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
		Animal Habitat	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Botanical	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Hydrology	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Red Flags	N	N	N	N	N	N	N	N	N	N
S4W31	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO
		Indiana Community Type	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
		Size (acres)	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
		Impact (acres)	0.09	0.25	0.09	0.25	0.09	0.25	0.09	0.25	0.09	0.25
		Animal Habitat	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Botanical	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Hydrology	good	good	good	good	good	good	good	good	good	good
		Red Flags	N	N	N	N	N	N	N	N	N	N

Table 5.19-4: Wetland Impacts Matrix Table for Section 4 Alternatives

Wetland ID		Data	Alternative 1 Low Cost Design Criteria	Alternative 1 Initial Design Criteria	Alternative 2 Low Cost Design Criteria	Alternative 2 Initial Design Criteria	Alternative 3 Low Cost Design Criteria	Alternative 3 Initial Design Criteria	Alternative 4 Low Cost Design Criteria	Alternative 4 Initial Design Criteria	Refined Preferred Alternative 2 Low Cost Design Criteria	Refined Preferred Alternative 2 Initial Design Criteria
S4W36	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO	PFO
		Indiana Community Type	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
		Size (acres)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
		Impact (acres)	0.06	0.15	0.06	0.15	0.06	0.15	0.06	0.15	0.06	0.15
		Animal Habitat	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Botanical	fair	fair	fair	fair	fair	fair	fair	fair	fair	fair
		Hydrology	good	good	good	good	good	good	good	good	good	good
		Red Flags	N	N	N	N	N	N	N	N	N	N
S4W37	USACE Jurisdiction: Yes	Cowardin et al. Classification	PEM	PEM	PEM	PEM	PEM	PEM	PEM	PEM	PEM	PEM
		Indiana Community Type	WM	WM	WM	WM	WM	WM	WM	WM	WM	WM
		Size (acres)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
		Impact (acres)	0.11	0.22	0.11	0.22	0.11	0.22	0.11	0.22	0.11	0.20
		Animal Habitat	poor	poor	poor	poor	poor	poor	poor	poor	poor	poor
		Botanical	poor	poor	poor	poor	poor	poor	poor	poor	poor	poor
		Hydrology	good	good	good	good	good	good	good	good	good	good
		Red Flags	N	N	N	N	N	N	N	N	N	N
S4W40	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PFO			PFO	PFO				
		Indiana Community Type	FF	FF			FF	FF				
		Size (acres)	0.38	0.38			0.38	0.38				
		Impact (acres)	0.04	0.10			0.04	0.12				
		Animal Habitat	fair	fair			fair	fair				
		Botanical	poor	poor			poor	poor				
		Hydrology	good	good			good	good				
		Red Flags	N	N			N	N				
S4W41	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PFO			PFO	PFO				
		Indiana Community Type	FF	FF			FF	FF				
		Size (acres)	0.03	0.03			0.03	0.03				
		Impact (acres)	0.03	0.03			0.03	0.03				
		Animal Habitat	fair	fair			fair	fair				
		Botanical	poor	poor			poor	poor				
		Hydrology	good	good			good	good				
		Red Flags	N	N			N	N				
S4W42	USACE Jurisdiction: Yes	Cowardin et al. Classification	PFO	PFO			PFO	PFO				
		Indiana Community Type	FF	FF			FF	FF				
		Size (acres)	0.12	0.12			0.12	0.12				
		Impact (acres)	0.05	0.08			0.05	0.08				
		Animal Habitat	fair	fair			fair	fair				
		Botanical	poor	poor			poor	poor				
		Hydrology	good	good			good	good				
		Red Flags	N	N			N	N				
S4W43	USACE Jurisdiction: Yes	Cowardin et al. Classification						PSS				
		Indiana Community Type						SC				
		Size (acres)						0.28				
		Impact (acres)						0.07				

Table 5.19-4: Wetland Impacts Matrix Table for Section 4 Alternatives

Wetland ID		Data	Alternative 1 Low Cost Design Criteria	Alternative 1 Initial Design Criteria	Alternative 2 Low Cost Design Criteria	Alternative 2 Initial Design Criteria	Alternative 3 Low Cost Design Criteria	Alternative 3 Initial Design Criteria	Alternative 4 Low Cost Design Criteria	Alternative 4 Initial Design Criteria	Refined Preferred Alternative 2 Low Cost Design Criteria	Refined Preferred Alternative 2 Initial Design Criteria
		Animal Habitat						poor				
		Botanical						poor				
		Hydrology						fair				
		Red Flags						N				
S4W45	USACE Jurisdiction: No	Cowardin et al. Classification	PFO	PFO					PFO	PFO		
		Indiana Community Type	SW	SW					SW	SW		
		Size (acres)	0.33	0.33					0.33	0.33		
		Impact (acres)	0.33	0.33					0.33	0.33		
		Animal Habitat	fair	fair					fair	fair		
		Botanical	fair	fair					fair	fair		
		Hydrology	good	good					good	good		
		Red Flags	N	N					N	N		
S4W47	USACE Jurisdiction: Yes	Cowardin et al. Classification	PEM	PEM		PEM		PEM	PEM	PEM		
		Indiana Community Type	WM	WM		WM		WM	WM	WM		
		Size (acres)	2.83	2.83		2.83		2.83	2.83	2.83		
		Impact (acres)	1.90	2.41		0.01		0.01	1.89	2.36		
		Animal Habitat	fair	fair		fair		fair	fair	fair		
		Botanical	fair	fair		fair		fair	fair	fair		
		Hydrology	good	good		good		good	good	good		
		Red Flags	Y	Y		Y		Y	Y	Y		
S4W48	USACE Jurisdiction: Yes	Cowardin et al. Classification	PSS	PSS					PSS	PSS		
		Indiana Community Type	SC	SC					SC	SC		
		Size (acres)	0.13	0.13					0.13	0.13		
		Impact (acres)	0.04	0.07					0.04	0.07		
		Animal Habitat	fair	fair					fair	fair		
		Botanical	poor	poor					poor	poor		
		Hydrology	good	good					good	good		
		Red Flags	N	N					N	N		
S4W49	USACE Jurisdiction: Yes	Cowardin et al. Classification			PFO	PFO	PFO	PFO			PFO	PFO
		Indiana Community Type			FF	FF	FF	FF			FF	FF
		Size (acres)			0.09	0.09	0.09	0.09			0.09	0.09
		Impact (acres)			0.09	0.09	0.09	0.09			0.09	0.09
		Animal Habitat			poor	poor	poor	poor			poor	poor
		Botanical			poor	poor	poor	poor			poor	poor
		Hydrology			good	good	good	good			good	good
		Red Flags			N	N	N	N			N	N
S4W50	USACE Jurisdiction: Yes	Cowardin et al. Classification			PFO	PFO	PFO	PFO			PFO	PFO
		Indiana Community Type			FF	FF	FF	FF			FF	FF
		Size (acres)			0.06	0.06	0.06	0.06			0.06	0.06
		Impact (acres)			0.06	0.06	0.06	0.06			0.06	0.06
		Animal Habitat			poor	poor	poor	poor			poor	poor
		Botanical			poor	poor	poor	poor			poor	poor
		Hydrology			good	good	good	good			good	good
		Red Flags			N	N	N	N			N	N

Table 5.19-4: Wetland Impacts Matrix Table for Section 4 Alternatives

Wetland ID		Data	Alternative 1 Low Cost Design Criteria			Alternative 1 Initial Design Criteria			Alternative 2 Low Cost Design Criteria			Alternative 2 Initial Design Criteria			Alternative 3 Low Cost Design Criteria			Alternative 3 Initial Design Criteria			Alternative 4 Low Cost Design Criteria			Alternative 4 Initial Design Criteria			Refined Preferred Alternative 2 Low Cost Design Criteria			Refined Preferred Alternative 2 Initial Design Criteria		
S4W55	USACE Jurisdiction: Yes	Cowardin et al. Classification										PEM						PEM						PEM						PEM		
		Indiana Community Type										WM						WM						WM						WM		
		Size (acres)										0.03						0.03						0.03						0.03		
		Impact (acres)										0.03						0.03						0.03						0.03		
		Animal Habitat										poor						poor						poor						poor		
		Botanical										poor						poor						poor						poor		
		Hydrology										good						good						good						good		
		Red Flags										N						N						N						N		

Indiana Community Type Abbreviations

B = bog
DM = deep marsh
F = fen
FF = floodplain forest
SMF - sand/muck flat
SFB = seasonally flooded basin
SM = sedge meadow
SHM = shallow marsh
SOW = shallow open water
SC = scrub-carr
SW = swamp forest
WM = wet meadow
WP = wet prairie

Cowardin et al. Classifications

PEM = palustrine emergent
PSS = palustrine scrub/shrub
PFO = palustrine forest
PAB = palustrine aquatic bed

Red Flag: Indicators (for specific information regarding the nature of a red flag indicator designated by "Y", consult the InWRAP data sheets)

Y = yes
N = no

Note: USACE jurisdictional status is based on professional opinion only. Official correspondence on jurisdictional verification will be completed during permitting.

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Farmed Wetlands

According to the USDA National Food Security Act Manual, 3rd Edition, September 2000, farmed wetlands are "wetlands that were drained, dredged, filled, leveled, or otherwise manipulated before December 23, 1985, for the purpose of, or to have the effect of, making the production of an agricultural commodity possible, and continue to meet specific wetland hydrology criteria." All of these criteria must be met before an area can be considered "farmed wetland." If an existing agricultural wetland is not cultivated, i.e., is left fallow, for five years or more, it becomes regulated as a wetland and farming cannot be reinitiated. A review of USDA-NRCS records in Greene and Monroe counties revealed that no farmed wetlands would be impacted by the Section 4 Alternatives.

Stream Assessments—Thumbnail Sketch

The 287 QHEI and HHEI assessments revealed the following about the streams evaluated:

QHEI Evaluation

- 7 perennial streams in the Section 4 corridor met the criteria for QHEI evaluation
- 14 stream crossings met the criteria for evaluation using IDEM's QHEI protocol
- QHEI scores ranged from 42 to 75.5.
  - Score less than 51: 1 - the stream may be non-supportive of its aquatic life use designation.
  - Score from 51-64: 5 - the streams are partially supportive of their aquatic life use designations.
  - Score greater than 64: 8 - the streams are capable of supporting a balance warm water community.

HHEI Evaluation

- 274 crossings met the criteria for evaluation using the Ohio EPA's HHEI protocol, and were classified as follows:
  - Class I Natural (Score up to 40): 108
  - Class I Modified (Score up to 30): 7
  - Class II Natural (Score 40 to 60): 64
  - Class II Modified (Score 30 to 60): 13
  - Class II Modified (Score 60 and over): 4
  - Class III Natural (Score 50 to 59): 24
  - Class III Natural (Score 60 and over): 54
- HHEI scores for 115 stream crossings suggest the streams have low potential to support diversity in stream plants and animals
- HHEI scores for 159 stream crossings suggest the streams have at least moderate potential to support diversity in stream plants and animals

Open Water

U.S. Geological Survey 1:24,000 series topographic maps of the Section 4 corridor were reviewed and no named lakes were identified. However, a review of the Indiana Geological Survey (IGS) GIS data and 2003 aerial photography, combined with field observations, identified 68 water bodies in the project corridor. Five water bodies were identified outside of the corridor in the area of the County Line interchange. All of the areas were artificially created for the purposes of aesthetics, recreational use, agricultural use, wildlife habitat, or stormwater treatment. The water bodies are shown on **Figure 5.19-1** (p. 5-603) as palustrine unconsolidated bottom wetlands (PUB). The impacts to these water bodies are included in **Table 5.19-2**. Only 15 of the 73 water bodies would be impacted by any one alternative. Alternatives 1, 2, 3 and 4 impact from 8 to 13 water bodies. Refined Preferred Alternative 2 using the Low Cost and Initial Design Criteria has an impact range between 7 and 9 water bodies. Explanations of their jurisdictional status assessment are found in the *Final Wetland Technical Report*, **Appendix F**.

Rivers and Streams

A review of USGS topographic mapping and field investigations show there are no rivers within the Section 4 corridor.

A total of 288 stream crossings and/or impact locations associated with the Section 4 alternatives were identified. QHEI or HHEI assessments were completed for these locations, as appropriate. If the habitat along the length of the stream changed, a separate assessment was made. If two or more alternatives cross a stream in the same location and the habitat was consistent throughout the stream reach, only one assessment was made. The streams were generally assessed from the south end to the north end of the corridor, and the numbering system generally follows that course. As the QHEI/HHEI scores indicate, the majority (about 60%) of streams crossed by the alternatives have at least moderate water quality. About 57% of the QHEI scores (8 of the 14 crossing locations) fell into the highest quality category. About 29% of the HHEI scores (78 of the 274 crossing locations) fell into the highest quality categories.

Figure 5.19-3 (p. 5-615) shows the streams by type (perennial, intermittent, and ephemeral), location, and relationship to the alternatives in Section 4.

Of the 287 stream crossing locations assessed, 14 were identified as **perennial**, 37 as **intermittent**, and 237 as **ephemeral**.

- **Perennial Streams**: Black Ankle Creek (S4-076), Dry Branch (S4-101), Plummer Creek (S4-108), Mitchell Branch (S4-156), Indian Creek (S4-189 Pt. 1, S4-189 Pt.2, S4-245, S4-282 Pt. 1, S4-282 Pt. 2, and S4-292), unnamed tributary to Clear Creek (S4-365 and S4-366, south of Tramway Road in Monroe County) and another unnamed tributary to Clear Creek (S4- 372 Pt.1 and S4-372 Pt. 2, north of Tramway Road in Monroe County) are the perennial streams in the Section 4 corridor identified as being potentially impacted by the alternatives. These perennial streams are located throughout the Section 4 corridor. The identification numbers represent the assessment completed where an alternative crosses the stream. All the perennial streams met the criteria for evaluation using QHEI protocol.

  The QHEI score at the westerly crossing of Indian Creek south of Carmichael Road (S4-189pt1) in Greene County (Alternatives 2, 4 and Refined Preferred Alternative 2) was 42. Based on IDEM criteria (See Section 5.19.2.2), a score of less than 51 indicates a stream that may not provide suitable habitat to sustain the plants and animals typically found in this region of Indiana. In this location, the creek has been modified by channelization.

  The QHEI scores at the crossings of Dry Branch (S4-101), Plummer Creek (S4-108), Mitchell Branch (S4-156), the north crossing of Indian Creek (S4-245) and the South Connector Road crossing of Indian Creek (4-292) fell between 55 and 63.5. Based on IDEM criteria, a score between 51 and 64 indicates a stream that may be partially supportive of their aquatic life use designations. These six streams have either not been modified by channelization or had recovered from channelization.

  The QHEI scores at Black Ankle Creek (S4-076), the south crossing of Indian Creek associated with Alternatives 1 and 3 (S4-189pt2), the middle crossings of Indian Creek (S4-282pt1 and S4-282pt2) and the crossings of two unnamed tributaries to Clear Creek in Monroe County (S4-365, S4-366, S4-372pt1 and S4-372pt2) were above 64. Based on IDEM criteria, a score over 64 indicates a stream may be capable of supporting a balanced warm water community.

The Section 4 Alternatives share or essentially share, a common alignment when crossing Black Ankle Creek, Dry Branch, Plummer Creek, Mitchell Branch, and the north crossing of Indian Creek. The alternatives will therefore cause similar impacts to these perennial streams in these locations.

Overall impacts (approximate linear feet of stream within the right of way) to perennial streams associated with the alternatives (low-cost design criteria and initial design criteria) are as follows: Alternative 1 – 6,184 to 8,767 linear feet, Alternative 2 – 6,674 to 9,404 linear feet, Alternative 3 – 6,029 to 8,486 linear feet, Alternative 4 – 6,769 to 9,079 linear feet, and Refined Preferred Alternative 2 - 6,674 to 9,006 linear feet

- **Intermittent Streams:** 37 HHEI evaluations were performed for intermittent streams/stream segments intersected by the Section 4 Alternatives. These intermittent streams are tributaries of Doans Creek, Black Ankle Creek, Plummer Creek, Mitchell Branch, Indian Creek, Little Clifty Branch, and Clear Creek. No intermittent streams/stream sections met the criteria for evaluation using the QHEI protocol.

  Of the 37 assessments of intermittent streams based on HHEI protocol, 1 was identified as a Class I PHWH stream. Such streams have the lowest potential to support a diverse array of flora/fauna. HHEI scores ranging from 41 to 57 were identified as Class II PHWH, 7 streams were identified as Class II PHWH streams. HHEI scores of over 30 and modified were identified as Modified Class II PHWH, 4 streams were identified as Modified Class II PHWH streams. HHEI scores of 60 and over (or from 50 to 59, with greater than 20% substrate being boulder, boulder/slab, cobble or bedrock) were identified as Class III PHWH, 25 streams were identified as Class III PHWH streams. Scores above 60 suggest that these streams have the highest quality and potential to support a diverse array of flora/fauna.

- **Ephemeral Streams**: 237 HHEI evaluations were performed for ephemeral streams/stream segments intersected by the Section 4 Alternatives. These intermittent streams are tributaries of Doans Creek, Black Ankle Creek, Plummer Creek, Mitchell Branch, Indian Creek, Little Clifty Branch and Clear Creek. None of the ephemeral streams had drainage areas large enough to warrant evaluations using QHEI protocol; therefore, all were evaluated using HHEI protocol.

  Of the 237 assessments of ephemeral streams 107 were identified as Class I PHWH streams with scores below 40. With scores up to 30, 7 were identified as Modified Class I PHWH streams. With scores above 30, 13 were identified as Modified Class II PHWH streams. These streams have the lowest potential to support a diverse array of flora/fauna. With scores ranging from 40 to 60, 57 were identified as Class II PHWH streams. Scores between 41 and 60 suggest these streams have moderate potential to support a diversity of stream flora/fauna. With scores above 60 (or from 50 to 59, with greater than 20% substrate being boulder, boulder/slab, cobble or bedrock), 53 were identified as Class III PHWH streams. Scores above 60 suggest that these streams have the highest quality and potential to support a diverse array of flora/fauna.

Potential Stream and Riparian Impacts

Water body modification impacts affect wetlands and streams, and their associated riparian communities. Riparian communities are plant communities such as upland forest areas adjacent to streams that are at least moderately affected by their proximity to water. These areas provide habitat for many species and function similar to wetlands such as sediment stabilization and toxicant retention.

Streams: Stream crossings are generally provided using bridges, culverts and/or pipes. The bridges proposed in Section 4 are at the crossings of Dowden Branch, Black Ankle Creek, Dry Branch, Plummer Creek, Mitchell Branch, a tributary of Mitchell Branch, Indian Creek (4 general crossing locations), and two unnamed tributaries of Clear Creek. There are also 34 locations where the crossings of other ephemeral or intermittent streams will require large culverts or three-side structures wider than 20 feet. Tables of preliminary recommended structure types from the Draft Engineers Report (2010) are included in **Appendix M**, *Final Stream Assessment Report*. These structure types should be viewed as preliminary. Structure size and type as well as specific design information for mitigation will not be determined until final design after the FEIS and ROD.

All other crossings would provide culverts or pipes in existing channels. In some cases, these activities would require an alteration to the natural shape of the stream. Such alterations—which could include channel widening, enclosure, straightening and realignment; and bank shaping and stabilization—can produce the following impacts:

- Channel widening - Reduction in stream velocity allowing accumulation of sediments, or altering riffle-pool complexes.
- Channel enclosure (pipes/culverts) - Restriction of flow during peak flood events; accumulation of backwater; and/or disruption of the natural ecology of a water body by blocking sunlight, removing natural aquatic and wildlife habitat, and destroying bottom substrate important to macroinvertebrate communities.
- Channel realignment - By removing meanders, an increase in stream velocity and energy resulting in stream bank erosion, loss of stream bank vegetation, and destruction of riffle/pool complexes.
- Bank shaping and stabilization - Loss of habitat or bank-side vegetation.
- Placing bridge piers in a water body - Loss of habitat in the area of the piers.

With regard to perennial stream crossings, it is anticipated that the majority of these crossings will require implementation of some stability measures with associated dredging and/or filling of streams and their banks. Exceptions may be where such streams are located in broad floodplains, where the majority of the floodplain will be bridged, and no bridge abutment or pier is located in close proximity to the stream. Where stability measures are proposed, alternatives to rip rap such as bioengineering methods will be considered, where practicable.

During the development and evaluation of alternatives for this project, careful consideration was given to stream crossings to avoid or minimize their associated impacts. As noted, bridging the listed perennial streams was proposed for all alternatives. Locations chosen for all stream crossings were evaluated for design feasibility as well as environmental impact. The total linear feet of streams *within the right-of-way* of the alternatives ranges from approximately 90,053 linear feet (Alternative 4 – low-cost design criteria) to approximately 112,801 linear feet (Alternative 2 – initial design criteria). In addition to comparing linear feet of stream impacts associated with the alternatives, a weighted comparison of the alternatives' stream impacts was made. This comparison was made by summing the values of stream impact lengths multiplied by habitat evaluation scores, and then comparing those sums as percents. For comparison purposes, Refined Preferred Alternative 2 was assigned the value of 100%. Weighted stream impact values for all other alternatives fell within the range of 92% to100%. Refer to **Table 5.19-6a**.

The Section 4 Alternatives could require relocation of sections of up to 105 streams, although not all would be impacted by any one alternative. Alternative 1 would relocate 65 to 68, Alternative 2 would relocate 63 to 71, Alternative 3 would relocate 67 to 72, Alternative 4 would relocate 56 to 62 of these streams and Refined Preferred Alternative 2 would relocate 63 to 69. The lengths of relocations depend on the alternatives considered, ranging from a total of approximately 24,876 linear feet (Alternative 4 – low-cost design criteria) to 38,556 linear feet (Alternative 2 – initial design criteria).

Riparian Corridors: This analysis considers a riparian zone to be any forested area that is adjacent to the stream within 100 feet either side of the stream centerline. Impacts to plant communities within this zone are identified by calculating the total area of the community within the zone, and also by measuring the linear feet the community extends along the stream. While coordination with IDEM has determined that mitigation for impacts would be based on the linear feet measurement, knowing the total acres potentially impacted contributes to a fuller understanding of the potential effects of the project on flora and fauna in the vicinity of the stream.

Potential riparian corridor impacts range from approximately 315.72 acres (Alternative 4 – low-cost design criteria) to 400.08 acres (Alternative 1 – initial design criteria). All riparian areas within the right-of-way of an alternative are considered to be potentially impacted.

Table 5.19-5 identifies the streams having riparian corridors that could be impacted and the acres of potential impact, by alternative. **Table 5.19-6** briefly summarizes the potential stream and riparian corridor impact with each of the alternatives. **Table 5.19-6a** provides a comparison of the alternatives' stream impacts, weighted by habitat evaluation score. **Table 5.19-7** provides a more detailed review of the QHEI and HHEI data and potential stream impacts and stream relocation impacts.

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Table 5.19.5: Potential Riparian Habitat Impacts (Acres) by Alternative

Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-001	Unnamed Trib. Doans Creek	Ephemeral	0.12	2.70	3.28	2.70	3.28	0.00	0.00	2.70	3.28	2.70	3.28
S4-002	Unnamed Trib. Doans Creek	Ephemeral	0.03	0.11	0.26	0.11	0.26	0.00	0.00	0.11	0.26	0.11	0.26
S4-003	Unnamed Trib. Doans Creek	Ephemeral	0.09	0.00	0.00	0.00	0.00	1.83	1.84	0.00	0.00	0.00	0.00
S4-004	Unnamed Trib. Doans Creek	Ephemeral	0.08	0.00	0.00	0.00	0.00	1.30	1.35	0.00	0.00	0.00	0.00
S4-005	Unnamed Trib. Doans Creek	Ephemeral	0.16	0.08	0.05	0.08	0.05	0.00	0.00	0.08	0.05	0.13	0.15
S4-006	Unnamed Trib. Doans Creek	Ephemeral	0.08	0.73	0.83	0.73	0.83	0.00	0.00	0.73	0.83	0.73	0.83
S4-007	Unnamed Trib. Doans Creek	Ephemeral	0.21	0.34	0.71	0.34	0.71	0.00	0.00	0.34	0.71	0.34	0.71
S4-008	Unnamed Trib. Doans Creek	Ephemeral	0.03	0.07	0.44	0.07	0.44	0.00	0.00	0.07	0.44	0.07	0.44
S4-009	Unnamed Trib. Doans Creek	Intermittent	0.67	3.65	4.28	3.65	4.28	1.22	1.76	3.65	4.28	3.55	4.21
S4-010	Unnamed Trib. Doans Creek	Ephemeral	0.3	0.60	0.66	0.60	0.66	0.88	1.20	0.60	0.66	0.61	0.61
S4-013	Unnamed Trib. Doans Creek	Ephemeral	0.09	1.96	2.11	1.96	2.11	1.65	1.94	1.96	2.11	1.96	2.11
S4-014	Unnamed Trib. Doans Creek	Ephemeral	0.02	0.86	0.87	0.86	0.87	0.76	0.83	0.86	0.87	0.86	0.87
S4-015	Unnamed Trib. Doans Creek	Ephemeral	0.15	2.97	3.53	2.97	3.53	2.51	3.46	2.97	3.53	2.99	3.56
S4-016	Unnamed Trib. Doans Creek	Ephemeral	0.04	0.24	0.31	0.24	0.31	0.19	0.57	0.24	0.31	0.24	0.31
S4-020	Unnamed Trib. Dowden Branch	Ephemeral	0.05	1.76	2.04	1.76	2.04	1.76	2.04	1.76	2.04	1.76	2.04
S4-021	---	Ephemeral	0	0.18	0.28	0.18	0.28	0.18	0.28	0.18	0.28	0.18	0.28
S4-023	Dowden Branch	Intermittent	0.21	1.93	2.19	1.93	2.19	1.93	2.19	1.93	2.19	1.93	2.19
S4-031	Unnamed Trib. Bogard Creek	Intermittent	0.2	3.51	3.19	3.63	3.37	3.63	3.37	3.51	3.19	3.63	3.37
S4-032	Unnamed Trib. Bogard Creek	Ephemeral	0.1	1.99	1.89	1.99	1.89	1.99	1.89	1.99	1.89	1.99	1.89
S4-033	Unnamed Trib. Bogard Creek	Ephemeral	0.01	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
S4-034	Unnamed Trib. Bogard Creek	Ephemeral	0.04	1.62	1.57	1.62	1.57	1.62	1.57	1.62	1.57	1.62	1.55
S4-036	Unnamed Trib. Bogard Creek	Ephemeral	0.01	0.28	0.22	0.32	0.26	0.32	0.26	0.28	0.22	0.32	0.26
S4-037	Unnamed Trib. Bogard Creek	Ephemeral	0.15	1.14	1.07	1.07	1.13	1.07	1.13	1.14	1.07	1.07	1.13
S4-040	Unnamed Trib. Bogard Creek	Ephemeral	0.01	0.33	0.76	2.31	2.59	2.31	2.59	0.33	0.76	2.31	2.59
S4-041	Unnamed Trib. Bogard Creek	Ephemeral	0.01	0.00	0.00	0.04	0.24	0.04	0.24	0.00	0.00	0.04	0.24
S4-046	---	Ephemeral	0	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
S4-048	---	Ephemeral	0	0.05	0.12	0.00	0.00	0.00	0.00	0.05	0.12	0.00	0.00
S4-049pt1	Unnamed Trib. Flyblow Branch	Ephemeral	0.36	0.01	0.03	1.96	2.50	1.96	2.50	0.01	0.03	1.96	2.50
S4-049pt2	Unnamed Trib. Flyblow Branch	Ephemeral	0.1	3.53	3.84	0.05	0.19	0.05	0.19	3.53	3.84	0.05	0.19
S4-050	Unnamed Trib. Flyblow Branch	Intermittent	0.01	2.60	3.34	0.00	0.00	0.00	0.00	2.60	3.34	0.00	0.00
S4-051	Unnamed Trib. Flyblow Branch	Ephemeral	0.17	0.00	0.00	2.04	2.13	2.04	2.13	0.00	0.00	2.04	2.13
S4-053	Unnamed Trib. Flyblow Branch	Ephemeral	0.01	0.00	0.00	2.35	2.75	2.35	2.75	0.00	0.00	2.35	2.75
S4-054	Unnamed Trib. Flyblow Branch	Ephemeral	0.01	0.00	0.00	0.50	0.98	0.50	0.98	0.00	0.00	0.50	0.99
S4-055	Unnamed Trib. Flyblow Branch	Ephemeral	0.02	1.24	1.45	0.26	0.95	0.26	0.95	1.24	1.45	0.26	0.96
S4-056	Unnamed Trib. Flyblow Branch	Ephemeral	0.01	2.17	2.17	0.00	0.00	0.00	0.00	2.17	2.17	0.00	0.00
S4-057	---	Ephemeral	0	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00

Table 5.19.5: Potential Riparian Habitat Impacts (Acres) by Alternative

Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-058	Unnamed Trib. Flyblow Branch	Intermittent	0.02	2.42	2.55	0.00	0.00	0.00	0.00	2.42	2.55	0.00	0.00
S4-059	Unnamed Trib. Flyblow Branch	Ephemeral	0.02	0.08	0.40	0.00	0.00	0.00	0.00	0.08	0.40	0.00	0.00
S4-060	Unnamed Trib. Black Ankle Creek	Ephemeral	0.01	0.00	0.00	0.82	0.99	0.82	0.99	0.00	0.00	0.82	0.99
S4-061	Unnamed Trib. Black Ankle Creek	Ephemeral	0.01	0.00	0.00	1.28	1.28	1.28	1.28	0.00	0.00	1.28	1.28
S4-062	Unnamed Trib. Black Ankle Creek	Ephemeral	0.01	0.00	0.00	1.28	1.19	1.28	1.19	0.00	0.00	1.28	1.19
S4-063	Unnamed Trib. Black Ankle Creek	Ephemeral	0.01	0.00	0.00	1.22	1.15	1.22	1.15	0.00	0.00	1.22	1.28
S4-064	Unnamed Trib. Black Ankle Creek	Intermittent	0.05	0.00	0.00	2.44	2.72	2.44	2.72	0.00	0.00	2.44	2.72
S4-065	Unnamed Trib. Black Ankle Creek	Ephemeral	0.01	0.00	0.00	0.03	0.09	0.03	0.09	0.00	0.00	0.03	0.09
S4-068	---	Ephemeral	0	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00
S4-069	Unnamed Trib. Plummer Creek	Intermittent	0.02	4.15	5.83	0.00	0.00	0.00	0.00	4.15	5.83	0.00	0.00
S4-071	Unnamed Trib. Plummer Creek	Ephemeral	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
S4-072	---	Ephemeral	0.01	0.00	0.00	0.00	0.18	0.00	0.18	0.00	0.00	0.00	0.18
S4-076	Black Ankle Creek	Perennial	7.9	1.15	1.67	1.15	1.63	1.15	1.63	1.15	1.67	1.15	1.63
S4-077	Unnamed Trib. Black Ankle Creek	Ephemeral	0.02	0.01	1.11	0.01	0.85	0.01	0.85	0.01	1.11	0.01	0.85
S4-080	Unnamed Trib. Black Ankle Creek	Intermittent	0.05	0.01	1.68	0.02	1.59	0.02	1.59	0.01	1.68	0.02	1.59
S4-082	Unnamed Trib. Black Ankle Creek	Intermittent	0.4	1.05	1.73	1.05	1.73	1.05	1.73	1.05	1.73	1.05	1.73
S4-084	---	Ephemeral	0	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
S4-088	Unnamed Trib. Black Ankle Creek	Intermittent	0.12	2.77	5.64	2.77	5.64	2.77	5.64	2.77	5.64	2.77	5.64
S4-090	Unnamed Trib. Plummer Creek	Intermittent	0.38	2.41	2.87	2.41	2.87	2.41	2.87	2.41	2.87	2.41	2.87
S4-092	Unnamed Trib. Plummer Creek	Ephemeral	0.03	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
S4-093	Unnamed Trib. Plummer Creek	Ephemeral	0.02	2.39	2.46	2.39	2.46	2.39	2.46	2.39	2.46	2.39	2.46
S4-095	Unnamed Trib. Plummer Creek	Ephemeral	0.03	0.41	0.75	0.41	0.75	0.41	0.75	0.41	0.75	0.41	0.75
S4-096	Unnamed Trib. Plummer Creek	Ephemeral	0.03	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22
S4-099	Unnamed Trib. Dry Branch Creek	Ephemeral	0.03	2.52	4.32	2.52	4.32	2.52	4.32	2.52	4.32	2.52	4.32
S4-100	Unnamed Trib. Dry Branch Creek	Ephemeral	0.02	0.28	0.85	0.28	0.85	0.28	0.85	0.28	0.85	0.28	0.85
S4-101	Dry Branch	Perennial	1.91	1.80	3.37	1.80	3.37	1.80	3.37	1.80	3.37	1.80	3.37
S4-102	Unnamed Trib. Dry Branch Creek	Ephemeral	0.3	2.33	2.72	2.33	2.72	2.33	2.72	2.33	2.72	2.33	2.72
S4-103	Unnamed Trib. Dry Branch Creek	Ephemeral	0.3	0.00	0.22	0.00	0.22	0.00	0.22	0.00	0.22	0.00	0.22
S4-108	Plummer Creek	Perennial	6.4	4.41	5.58	4.41	5.58	4.41	5.58	4.41	5.58	4.45	5.58
S4-109	Unnamed Trib. Plummer Creek	Ephemeral	0.33	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
S4-111	Unnamed Trib. Plummer Creek	Ephemeral	0.01	1.79	2.00	1.79	2.00	1.79	2.00	1.79	2.00	1.79	2.00
S4-112	Unnamed Trib. Plummer Creek	Ephemeral	0.01	1.31	1.46	1.31	1.46	1.31	1.46	1.31	1.46	1.31	1.46
S4-113	Unnamed Trib. Plummer Creek	Intermittent	0.73	2.12	2.81	2.12	2.81	2.12	2.81	2.12	2.81	2.12	2.82
S4-114	Unnamed Trib. Plummer Creek	Ephemeral	0.27	3.54	3.10	3.54	3.10	3.54	3.10	3.54	3.10	3.54	3.10
S4-116	Unnamed Trib. Plummer Creek	Ephemeral	0.01	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
S4-117	Unnamed Trib. Plummer Creek	Ephemeral	0.01	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
S4-118	Unnamed Trib. Plummer Creek	Ephemeral	0.01	0.47	0.18	0.47	0.18	0.47	0.18	0.47	0.18	0.47	0.18

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Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-121	Unnamed Trib. Plummer Creek	Ephemeral	0.01	2.13	2.48	2.13	2.48	2.13	2.48	2.13	2.48	2.13	2.48
S4-125	Unnamed Trib. Little Clifty Branch	Ephemeral	0.02	2.71	3.06	2.71	3.06	2.71	3.06	2.71	3.06	2.71	3.07
S4-126	Unnamed Trib. Little Clifty Branch	Intermittent	0.2	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
S4-127	Unnamed Trib. Little Clifty Branch	Ephemeral	0.01	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
S4-128	Unnamed Trib. Little Clifty Branch	Ephemeral	0.01	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04
S4-129	Unnamed Trib. Little Clifty Branch	Ephemeral	0.01	0.43	0.48	0.43	0.48	0.43	0.48	0.43	0.48	0.43	0.48
S4-130	Unnamed Trib. Little Clifty Branch	Ephemeral	0.21	2.52	2.97	2.52	2.97	2.52	2.97	2.52	2.97	2.52	2.97
S4-131	Unnamed Trib. Little Clifty Branch	Ephemeral	0.01	1.13	1.48	1.13	1.48	1.13	1.48	1.13	1.48	1.13	1.48
S4-133	Unnamed Trib. Little Clifty Branch	Intermittent	0.33	3.03	3.55	3.03	3.55	3.03	3.55	3.03	3.55	3.03	3.55
S4-134	Unnamed Trib. Little Clifty Branch	Ephemeral	0.14	4.82	4.75	4.82	4.75	4.82	4.75	4.82	4.75	4.82	4.75
S4-137	Unnamed Trib. Little Clifty Branch	Ephemeral	0.03	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06
S4-138	Unnamed Trib. Little Clifty Branch	Ephemeral	0.02	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41
S4-139	Unnamed Trib. Little Clifty Branch	Ephemeral	0.02	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
S4-140	Unnamed Trib. Little Clifty Branch	Ephemeral	0.02	0.96	0.93	0.96	0.93	0.96	0.93	0.96	0.93	0.96	0.93
S4-142	Unnamed Trib. Little Indian Creek	Ephemeral	0.12	1.12	1.10	1.12	1.10	1.12	1.10	1.12	1.10	1.12	1.10
S4-143	Unnamed Trib. Little Indian Creek	Ephemeral	0.03	2.94	3.16	2.94	3.16	2.94	3.16	2.94	3.16	2.94	3.16
S4-144	Unnamed Trib. Little Indian Creek	Ephemeral	0.02	4.33	4.10	4.33	4.10	4.33	4.10	4.33	4.10	4.33	4.10
S4-147	Unnamed Trib. Mitchell Branch	Ephemeral	0.01	2.20	2.60	2.20	2.60	2.20	2.60	2.20	2.60	2.20	2.60
S4-150	Unnamed Trib. Mitchell Branch	Ephemeral	0.01	1.81	1.67	1.81	1.67	1.81	1.67	1.81	1.67	1.81	1.77
S4-151	Unnamed Trib. Mitchell Branch	Ephemeral	0.01	0.68	0.74	0.68	0.74	0.68	0.74	0.68	0.74	0.68	0.71
S4-154	Unnamed Trib. Mitchell Branch	Ephemeral	0.01	0.15	0.21	0.15	0.21	0.15	0.21	0.15	0.21	0.15	0.16
S4-155	Unnamed Trib. Mitchell Branch	Ephemeral	0.15	0.32	0.66	0.32	0.66	0.32	0.66	0.32	0.66	0.33	0.57
S4-156	Mitchell Branch	Perennial	3.84	2.54	3.68	2.54	3.68	2.54	3.68	2.54	3.68	2.54	3.10
S4-159	Unnamed Trib. Mitchell Branch	Ephemeral	0.14	1.90	1.94	1.90	1.94	1.90	1.94	1.90	1.94	1.90	1.94
S4-160	Unnamed Trib. Mitchell Branch	Ephemeral	0.38	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
S4-161	Unnamed Trib. Mitchell Branch	Ephemeral	0.02	0.20	0.28	0.20	0.28	0.20	0.28	0.20	0.28	0.20	0.20
S4-162	Unnamed Trib. Mitchell Branch	Intermittent	0.55	1.40	1.74	1.40	1.74	1.40	1.74	1.40	1.74	1.40	1.67
S4-164	Unnamed Trib. Mitchell Branch	Ephemeral	0.03	2.46	2.45	2.46	2.45	2.46	2.45	2.46	2.45	2.46	2.45
S4-165pt1	Unnamed Trib. Mitchell Branch	Ephemeral	0.01	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
S4-165pt2	Unnamed Trib. Mitchell Branch	Ephemeral	0.02	2.34	2.26	2.34	2.26	2.34	2.26	2.34	2.26	2.34	2.44
S4-166	Unnamed Trib. Mitchell Branch	Ephemeral	0.01	1.09	1.36	1.09	1.36	1.09	1.36	1.09	1.36	1.09	1.41
S4-171	Unnamed Trib. Plummer Creek	Ephemeral	0.03	1.12	1.30	1.12	1.30	1.12	1.30	1.12	1.30	1.12	1.30
S4-172	Unnamed Trib. Indian Creek	Ephemeral	0.02	0.91	0.90	0.91	0.90	0.91	0.90	0.91	0.90	0.91	0.91
S4-173	Unnamed Trib. Indian Creek	Ephemeral	0.11	2.52	2.46	2.52	2.46	2.52	2.46	2.52	2.46	2.52	2.53
S4-174	Unnamed Trib. Indian Creek	Ephemeral	0.02	2.08	2.34	2.09	2.52	2.08	2.47	2.19	2.44	2.09	2.43
S4-175	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.09	0.13	0.09	0.15	0.09	0.14	0.09	0.14	0.09	0.15
S4-176	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44

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Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
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S4-177	Unnamed Trib. Indian Creek	Ephemeral	0.03	0.19	0.24	0.20	0.24	0.19	0.24	0.20	0.24	0.20	0.24
S4-178	Unnamed Trib. Indian Creek	Ephemeral	0.11	0.58	0.59	0.45	0.56	0.58	0.60	0.59	0.55	0.45	0.59
S4-179	Unnamed Trib. Indian Creek	Ephemeral	0.14	0.41	0.40	0.41	0.40	0.41	0.40	0.41	0.40	0.41	0.40
S4-180	Unnamed Trib. Indian Creek	Ephemeral	0.03	0.51	0.68	1.64	1.73	0.51	0.53	1.52	1.73	1.64	1.66
S4-181	Unnamed Trib. Indian Creek	Ephemeral	0.12	2.28	2.76	2.19	2.73	2.28	2.57	2.26	2.70	2.19	2.52
S4-182	Unnamed Trib. Indian Creek	Ephemeral	0.03	0.00	0.00	0.04	0.16	0.00	0.00	0.04	0.08	0.04	0.15
S4-183	Unnamed Trib. Indian Creek	Ephemeral	0.8	0.00	0.00	3.67	4.16	0.00	0.00	3.68	4.17	3.67	4.16
S4-184	Unnamed Trib. Indian Creek	Ephemeral	0.12	0.01	0.23	0.00	0.00	0.01	0.29	0.00	0.00	0.00	0.00
S4-185	---	Ephemeral	0	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.02
S4-186pt1	Unnamed Trib. Indian Creek	Intermittent	0.86	0.00	0.07	0.80	1.59	0.00	0.01	0.82	1.53	0.80	1.59
S4-186pt2	Unnamed Trib. Indian Creek	Intermittent	0.92	2.33	2.78	0.00	0.00	2.33	2.68	0.00	0.00	0.00	0.00
S4-188	Unnamed Trib. Indian Creek	Ephemeral	0.25	0.00	0.00	2.71	3.09	0.00	0.00	2.64	3.09	2.71	3.09
S4-189pt1	Indian Creek	Perennial	22.6	0.00	0.00	1.33	2.29	0.00	0.00	1.43	1.90	1.33	2.29
S4-189pt2	Indian Creek	Perennial	24.32	1.94	2.66	0.00	0.00	2.04	2.85	0.00	0.00	0.00	0.00
S4-190pt1	Unnamed Trib. Indian Creek	Ephemeral	0.12	2.18	3.10	0.00	0.00	2.28	3.29	0.00	0.00	0.00	0.00
S4-190pt2	Unnamed Trib. Indian Creek	Ephemeral	0.21	0.00	0.00	1.55	1.66	0.00	0.00	1.58	1.70	1.41	1.66
S4-191	---	Ephemeral	0	0.00	0.05	0.00	0.00	0.01	0.18	0.00	0.00	0.00	0.00
S4-192	Unnamed Trib. Indian Creek	Ephemeral	0.17	0.00	0.00	1.38	1.94	0.00	0.00	1.41	1.94	1.38	1.94
S4-193	Unnamed Trib. Indian Creek	Ephemeral	0.11	0.00	0.00	0.49	0.58	0.00	0.00	0.46	0.58	0.49	0.58
S4-194	---	Ephemeral	0	0.00	0.00	0.33	0.29	0.00	0.00	0.21	0.29	0.33	0.29
S4-195	Unnamed Trib. Indian Creek	Ephemeral	0.06	0.66	0.67	0.00	0.00	0.64	0.84	0.00	0.00	0.00	0.00
S4-197	Unnamed Trib. Indian Creek	Ephemeral	0.02	1.03	1.12	0.00	0.00	1.01	1.42	0.00	0.00	0.00	0.00
S4-198	Unnamed Trib. Indian Creek	Ephemeral	0.12	0.00	0.00	1.84	2.75	0.00	0.00	1.86	2.77	1.84	2.75
S4-199	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.63	0.84	0.00	0.00	0.65	0.84	0.63	0.84
S4-200	Unnamed Trib. Indian Creek	Ephemeral	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
S4-201	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.02	0.05	0.00	0.00	0.02	0.06	0.02	0.05
S4-202	Unnamed Trib. Indian Creek	Ephemeral	0.02	1.03	1.13	0.00	0.00	1.00	1.21	0.00	0.00	0.00	0.00
S4-203	Unnamed Trib. Indian Creek	Ephemeral	0.04	0.24	0.34	0.00	0.00	0.22	0.42	0.00	0.00	0.00	0.00
S4-204	Unnamed Trib. Indian Creek	Ephemeral	0.04	1.70	1.88	0.00	0.00	1.66	1.98	0.00	0.00	0.00	0.00
S4-205	Unnamed Trib. Indian Creek	Ephemeral	0.12	0.49	0.63	0.00	0.00	0.46	0.91	0.00	0.00	0.00	0.00
S4-208pt1	Unnamed Trib. Indian Creek	Intermittent	0.74	5.17	6.58	0.15	0.11	5.35	6.72	0.15	0.14	0.15	0.11
S4-208pt2	Unnamed Trib. Indian Creek	Intermittent	0.33	0.00	0.00	6.39	7.26	6.42	6.75	0.00	0.00	6.39	7.26
S4-208pt3	Unnamed Trib. Indian Creek	Intermittent	0.15	0.00	0.00	4.90	6.61	6.18	6.28	0.00	0.00	4.90	6.61
S4-210	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.61	0.79	0.00	0.00	0.55	0.81	0.00	0.00	0.00	0.00
S4-211	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.24	0.26	0.00	0.00	0.17	0.33	0.00	0.00	0.00	0.00
S4-212pt1	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.14	0.33	0.00	0.00	0.41	0.73	0.14	0.33
S4-212pt2	Unnamed Trib. Indian Creek	Ephemeral	0.02	1.27	1.21	0.00	0.00	1.03	1.31	0.00	0.00	0.00	0.00

Table 5.19.5: Potential Riparian Habitat Impacts (Acres) by Alternative

Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-213	Unnamed Trib. Indian Creek	Ephemeral	0.04	0.00	0.11	0.00	0.00	0.01	0.35	0.00	0.00	0.00	0.00
S4-217	Unnamed Trib. Indian Creek	Ephemeral	0.04	1.68	2.05	1.25	1.25	1.66	2.33	1.32	1.23	1.25	1.25
S4-218	Unnamed Trib. Indian Creek	Ephemeral	0.01	1.38	1.59	0.00	0.00	0.88	1.15	0.00	0.00	0.00	0.00
S4-219	Unnamed Trib. Indian Creek	Ephemeral	0.04	2.14	2.50	2.39	2.64	2.05	2.28	1.62	1.92	2.39	2.64
S4-220	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.77	0.86	0.00	0.00	1.24	1.47	0.00	0.00	0.00	0.00
S4-225	Unnamed Trib. Indian Creek	Ephemeral	0.09	0.00	0.00	0.88	1.21	1.23	1.09	0.00	0.00	0.88	1.21
S4-226	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.00	0.07	0.48	0.50	0.00	0.00	0.00	0.07
S4-228	Unnamed Trib. Indian Creek	Ephemeral	0.02	3.10	3.33	1.40	1.38	1.49	1.91	2.81	3.10	1.42	1.38
S4-229	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	2.26	2.82	2.26	3.20	0.00	0.00	2.05	2.82
S4-230	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	1.69	2.88	1.81	3.43	0.00	0.00	1.70	2.88
S4-233	---	Ephemeral	0	0.00	0.00	0.00	0.01	0.00	0.23	0.00	0.00	0.00	0.01
S4-235	Unnamed Trib. Indian Creek	Ephemeral	0.01	2.72	2.58	3.43	3.43	1.53	2.65	3.07	3.13	3.43	3.43
S4-236	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.24	0.24	0.24	0.24	0.24	0.24	0.20	0.24	0.24	0.24
S4-237	Unnamed Trib. Indian Creek	Ephemeral	0.01	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
S4-238	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
S4-239	Unnamed Trib. Indian Creek	Ephemeral	0.09	1.75	1.25	4.13	4.18	4.13	4.18	2.49	2.27	4.13	4.18
S4-240	Unnamed Trib. Indian Creek	Ephemeral	0.01	2.91	3.38	4.14	4.14	4.14	4.14	2.79	2.81	4.14	4.14
S4-241	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.65	0.65	0.28	0.32	0.29	0.37	0.65	0.65	0.30	0.32
S4-242	Unnamed Trib. Indian Creek	Ephemeral	0.18	1.08	1.08	0.51	0.54	0.52	0.64	1.08	1.08	0.54	0.54
S4-243	Unnamed Trib. Indian Creek	Ephemeral	0.01	6.75	6.75	0.00	0.00	0.00	0.00	6.75	6.75	0.00	0.00
S4-244	Unnamed Trib. Indian Creek	Ephemeral	0.02	0.00	0.15	0.00	0.00	0.00	0.00	0.87	0.01	0.00	0.00
S4-245	Indian Creek	Perennial	19.76	0.72	1.04	1.52	1.84	1.63	1.71	1.07	0.94	1.52	1.84
S4-246	Unnamed Trib. Indian Creek	Ephemeral	0.09	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01
S4-247	Unnamed Trib. Indian Creek	Ephemeral	0.14	0.76	1.19	0.01	0.25	0.08	0.06	0.76	1.02	0.01	0.25
S4-248	Unnamed Trib. Indian Creek	Ephemeral	0.1	1.84	2.11	1.79	2.00	1.81	1.98	1.84	2.03	1.79	2.00
S4-249	Unnamed Trib. Indian Creek	Ephemeral	0.21	1.41	1.55	1.50	1.52	1.52	1.52	1.43	1.71	1.50	1.52
S4-250	Unnamed Trib. Indian Creek	Ephemeral	0.03	0.64	0.74	0.64	0.71	0.64	0.71	0.64	0.71	0.64	0.71
S4-251	Unnamed Trib. Indian Creek	Ephemeral	0.13	2.46	2.78	2.42	2.75	2.46	2.75	2.48	2.75	2.42	2.75
S4-252	Unnamed Trib. Indian Creek	Ephemeral	0.21	3.35	3.31	3.10	3.27	3.40	3.31	3.24	3.19	3.11	3.27
S4-258	Unnamed Trib. Indian Creek	Ephemeral	0.05	3.59	4.33	0.00	0.00	0.00	0.00	3.51	4.12	0.00	0.00
S4-260	Unnamed Trib. Indian Creek	Ephemeral	0.05	2.05	2.28	0.00	0.00	0.00	0.00	1.91	2.25	0.00	0.00
S4-261	Unnamed Trib. Indian Creek	Ephemeral	0.09	0.57	1.20	0.00	0.00	0.00	0.00	0.57	1.20	0.00	0.00
S4-262	---	Ephemeral	0.09	0.01	0.13	0.00	0.00	0.00	0.00	0.01	0.06	0.00	0.00
S4-264	Unnamed Trib. Indian Creek	Ephemeral	0.02	2.51	2.52	0.00	0.00	0.00	0.00	1.59	2.18	0.00	0.00
S4-265	Unnamed Trib. Indian Creek	Ephemeral	0.03	0.44	0.71	0.00	0.00	0.00	0.00	0.31	0.55	0.00	0.00
S4-266	Unnamed Trib. Indian Creek	Ephemeral	0.01	2.31	2.31	0.00	0.00	0.00	0.00	2.26	2.31	0.00	0.00
S4-267	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.72	0.81	0.00	0.00	0.00	0.00	0.74	0.83	0.00	0.00

Table 5.19.5: Potential Riparian Habitat Impacts (Acres) by Alternative

Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-268	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	1.68	2.37	1.68	2.41	0.00	0.00	1.69	2.37
S4-269	---	Ephemeral	0	0.00	0.00	0.00	0.04	0.00	0.14	0.00	0.00	0.00	0.04
S4-270	Unnamed Trib. Indian Creek	Ephemeral	0.3	0.00	0.00	1.56	1.92	1.53	1.85	0.00	0.00	1.56	1.93
S4-273	Unnamed Trib. Indian Creek	Ephemeral	0.02	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01
S4-274	Unnamed Trib. Indian Creek	Ephemeral	0.02	0.00	0.00	0.40	0.39	0.28	0.49	0.00	0.00	0.40	0.61
S4-275pt1	Unnamed Trib. Indian Creek	Ephemeral	0.56	0.00	0.00	5.20	5.54	4.66	5.47	0.00	0.00	5.20	5.60
S4-275pt2	Unnamed Trib. Indian Creek	Intermittent	0.6	0.00	0.00	1.85	3.71	1.74	3.43	0.00	0.00	1.85	3.16
S4-276	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.38	0.42	0.35	0.42	0.00	0.00	0.38	0.42
S4-277	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.25	0.25	0.25	0.25	0.00	0.00	0.25	0.25
S4-278	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.93	0.93	0.93	0.93	0.00	0.00	0.93	0.93
S4-279	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.96	1.06	0.00	0.00	0.00	0.00	1.00	1.12	0.00	0.00
S4-280	Unnamed Trib. Indian Creek	Ephemeral	0.02	0.15	0.13	0.00	0.00	0.00	0.00	0.17	0.11	0.00	0.00
S4-282pt1	Indian Creek	Perennial	18.49	2.72	3.90	0.00	0.00	0.00	0.00	2.48	3.79	0.00	0.00
S4-282pt2	Indian Creek	Perennial	18.35	0.00	0.01	2.34	3.24	2.28	3.25	0.00	0.00	2.34	2.94
S4-283pt1	Unnamed Trib. Indian Creek	Intermittent	0.25	0.11	0.25	4.23	4.93	3.80	4.96	0.03	0.27	4.25	4.71
S4-283pt2	Unnamed Trib. Indian Creek	Intermittent	0.19	2.79	3.14	0.00	0.00	0.00	0.00	2.70	3.10	0.00	0.00
S4-284	Unnamed Trib. Indian Creek	Ephemeral	0.5	2.64	3.16	0.00	0.00	0.00	0.00	2.68	3.13	0.00	0.00
S4-285	Unnamed Trib. Indian Creek	Intermittent	0.23	0.00	0.00	0.16	0.67	0.20	0.60	0.00	0.00	0.16	0.61
S4-287	Unnamed Trib. Indian Creek	Ephemeral	0.03	2.07	2.02	0.79	1.01	0.77	0.95	1.77	2.02	0.80	1.09
S4-288	Unnamed Trib. Indian Creek	Ephemeral	0.13	0.70	0.97	0.01	0.20	0.01	0.12	0.50	1.36	0.01	0.30
S4-290	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.25	0.63	0.99	1.29	1.04	1.29	0.29	0.62	0.99	1.35
S4-291	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.00	0.00	0.01	0.11	0.01	0.11	0.00	0.00	0.01	0.16
S4-292	Indian Creek	Perennial	14.23	0.59	0.93	0.57	0.95	0.58	0.94	0.59	0.98	0.57	0.74
S4-296	Unnamed Trib. Indian Creek	Ephemeral	0.1	3.66	3.95	3.55	3.94	3.33	3.95	3.67	3.94	3.55	3.95
S4-297	Unnamed Trib. Indian Creek	Ephemeral	0.12	0.01	0.05	0.00	0.05	0.00	0.06	0.01	0.04	0.00	0.06
S4-298	Unnamed Trib. Indian Creek	Ephemeral	0.05	0.04	0.20	0.04	0.20	0.04	0.20	0.04	0.20	0.04	0.32
S4-299	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.96	1.54	0.96	1.54	0.96	1.54	0.96	1.54	0.96	1.56
S4-300	Unnamed Trib. Indian Creek	Ephemeral	0.02	2.31	2.74	2.31	2.74	2.31	2.74	2.31	2.74	2.31	2.71
S4-301	Unnamed Trib. Indian Creek	Ephemeral	0.07	0.99	1.16	0.99	1.16	0.99	1.16	0.99	1.16	0.99	1.09
S4-302	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
S4-303	Unnamed Trib. Indian Creek	Ephemeral	0.02	0.64	0.94	0.64	0.94	0.64	0.94	0.64	0.94	0.64	0.94
S4-304	Unnamed Trib. Indian Creek	Ephemeral	0.05	0.27	0.42	0.27	0.42	0.27	0.42	0.27	0.42	0.27	0.42
S4-305	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.22	0.38	0.22	0.38	0.22	0.38	0.22	0.38	0.22	0.38
S4-306	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.92	0.95	0.92	0.95	0.92	0.95	0.92	0.95	0.92	0.95
S4-307	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.81	1.00	0.81	1.00	0.81	1.00	0.81	1.00	0.81	0.97
S4-309	---	Ephemeral	0	0.01	0.07	0.01	0.07	0.01	0.07	0.01	0.07	0.01	0.07
S4-310	Unnamed Trib. Indian Creek	Ephemeral	0.13	2.39	2.56	2.39	2.56	2.39	2.56	2.39	2.56	2.39	2.96

Table 5.19.5: Potential Riparian Habitat Impacts (Acres) by Alternative

Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-312	Unnamed Trib. Indian Creek	Ephemeral	0.04	0.18	0.22	0.18	0.22	0.18	0.22	0.18	0.22	0.18	0.46
S4-313	Unnamed Trib. Indian Creek	Ephemeral	0.02	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
S4-314	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.56	0.58	0.56	0.58	0.56	0.58	0.56	0.58	0.56	0.58
S4-315	---	Ephemeral	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
S4-316	Unnamed Trib. Indian Creek	Intermittent	0.4	5.57	5.52	5.57	5.52	5.57	5.52	5.57	5.52	5.58	5.77
S4-317	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
S4-318	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
S4-319	Unnamed Trib. Indian Creek	Ephemeral	0.02	1.10	1.15	1.10	1.15	1.10	1.15	1.10	1.15	1.11	1.15
S4-321	Unnamed Trib. Indian Creek	Ephemeral	0.04	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00
S4-322	Unnamed Trib. Indian Creek	Ephemeral	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
S4-323	Unnamed Trib. Indian Creek	Ephemeral	0.02	2.44	2.24	2.44	2.24	2.44	2.24	2.44	2.24	2.44	2.31
S4-324	Unnamed Trib. Indian Creek	Ephemeral	0.02	0.87	0.95	0.87	0.95	0.87	0.95	0.87	0.95	0.87	0.84
S4-325	Unnamed Trib. Indian Creek	Ephemeral	0.01	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
S4-327	Unnamed Trib. Indian Creek	Ephemeral	0.12	0.32	0.29	0.32	0.29	0.32	0.29	0.32	0.29	0.32	0.32
S4-328	Unnamed Trib. Indian Creek	Ephemeral	0.19	2.43	2.17	2.43	2.17	2.43	2.17	2.43	2.17	2.43	3.12
S4-329	Unnamed Trib. Indian Creek	Intermittent	0.11	2.26	2.54	2.26	2.54	2.26	2.54	2.26	2.54	2.26	2.89
S4-330	Unnamed Trib. Clear Creek	Ephemeral	0.01	1.05	1.48	1.05	1.48	1.05	1.48	1.05	1.48	1.05	1.31
S4-331	Unnamed Trib. Clear Creek	Ephemeral	0.1	0.34	0.61	0.34	0.61	0.34	0.61	0.34	0.61	0.34	0.62
S4-332	Unnamed Trib. Clear Creek	Ephemeral	0.05	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71
S4-333	---	Ephemeral	0	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.01
S4-334	Unnamed Trib. Clear Creek	Ephemeral	0.1	1.65	2.90	1.65	2.90	1.65	2.90	1.65	2.90	1.65	2.58
S4-335	Unnamed Trib. Clear Creek	Ephemeral	0.15	1.59	3.24	1.59	3.24	1.59	3.24	1.59	3.24	1.59	2.57
S4-336	---	Ephemeral	0	0.00	0.11	0.00	0.11	0.00	0.11	0.00	0.11	0.00	0.10
S4-337	---	Ephemeral	0	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.16	0.00	0.23
S4-338	Unnamed Trib. Clear Creek	Ephemeral	0.16	2.64	3.30	2.64	3.30	2.64	3.30	2.64	3.30	2.64	3.53
S4-340	Unnamed Trib. Clear Creek	Ephemeral	0.19	0.01	0.10	0.01	0.10	0.01	0.10	0.01	0.10	0.01	0.04
S4-342	Unnamed Trib. Clear Creek	Intermittent	0.19	2.02	2.45	2.02	2.45	2.02	2.45	2.02	2.45	2.02	2.32
S4-343	Unnamed Trib. Clear Creek	Intermittent	0.31	3.52	6.22	3.52	6.22	3.52	6.22	3.52	6.22	3.52	5.06
S4-344	---	Ephemeral	0	0.00	0.23	0.00	0.23	0.00	0.23	0.00	0.23	0.00	0.02
S4-346	Unnamed Trib. Clear Creek	Ephemeral	0.09	0.29	2.65	0.29	2.65	0.29	2.65	0.29	2.65	0.29	1.44
S4-348	Unnamed Trib. Clear Creek	Intermittent	0.13	3.12	4.28	3.12	4.28	3.12	4.28	3.12	4.28	3.12	3.76
S4-349	Unnamed Trib. Clear Creek	Ephemeral	0.17	1.71	1.76	1.71	1.76	1.71	1.76	1.71	1.76	1.71	1.76
S4-350	Unnamed Trib. Clear Creek	Ephemeral	0.13	1.57	2.05	1.57	2.05	1.57	2.05	1.57	2.05	1.57	1.89
S4-351	Unnamed Trib. Clear Creek	Ephemeral	0.16	1.80	2.36	1.80	2.36	1.80	2.36	1.80	2.36	1.80	2.15
S4-352	Unnamed Trib. Clear Creek	Ephemeral	0.02	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68
S4-353	Unnamed Trib. Clear Creek	Ephemeral	0.01	2.10	1.99	2.10	2.04	2.10	2.05	2.10	2.04	2.10	2.04
S4-354	Unnamed Trib. Clear Creek	Ephemeral	0.64	1.41	1.83	1.41	1.83	1.41	1.83	1.41	1.83	1.41	1.60

Table 5.19.5: Potential Riparian Habitat Impacts (Acres) by Alternative

Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-355	Unnamed Trib. Clear Creek	Ephemeral	0.1	0.94	1.18	0.94	1.18	0.94	1.18	0.94	1.18	0.94	1.18
S4-357	---	Ephemeral	0	0.00	0.00	0.00	0.00	0.09	0.04	0.00	0.00	0.00	0.00
S4-358	---	Ephemeral	0	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
S4-359	Unnamed Trib. Clear Creek	Ephemeral	0.97	1.12	2.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-360	Unnamed Trib. Clear Creek	Ephemeral	0.8	1.79	2.05	1.75	1.97	0.00	0.00	1.75	1.97	1.75	1.98
S4-361	Unnamed Trib. Clear Creek	Ephemeral	0.85	1.06	1.24	1.69	2.22	0.00	0.01	1.69	2.22	1.69	2.22
S4-363	Unnamed Trib. Clear Creek	Ephemeral	0.9	0.00	0.00	0.00	0.00	1.89	2.33	0.00	0.00	0.00	0.00
S4-364	Unnamed Trib. Clear Creek	Ephemeral	0.48	0.00	0.00	0.01	0.49	0.00	0.00	0.01	0.49	0.01	0.49
S4-365	Unnamed Trib. Clear Creek	Perennial	1.9	2.85	3.59	2.29	3.16	0.00	0.00	2.29	3.16	2.29	3.16
S4-366	Unnamed Trib. Clear Creek	Perennial	4.59	0.00	0.00	0.01	0.14	2.37	2.92	0.01	0.14	0.01	0.14
S4-367pt1	Unnamed Trib. Clear Creek	Ephemeral	0.43	0.00	0.00	0.00	0.00	0.65	0.70	0.00	0.00	0.00	0.00
S4-367pt3	Unnamed Trib. Clear Creek	Ephemeral	0.29	0.14	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-368	Unnamed Trib. Clear Creek	Ephemeral	0.16	0.26	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-369	---	Ephemeral	0	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-370	Unnamed Trib. Clear Creek	Ephemeral	0.02	3.01	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-372pt1	Unnamed Trib. Clear Creek	Perennial	13.88	1.84	3.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-372pt2	Unnamed Trib. Clear Creek	Perennial	12.24	0.00	0.00	1.28	2.23	1.08	2.27	1.28	2.23	1.28	2.23
S4-373	Unnamed Trib. Clear Creek	Ephemeral	0.71	1.21	1.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-374pt2	Unnamed Trib. Clear Creek	Intermittent	0.65	1.78	2.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S4-375	Unnamed Trib. Clear Creek	Ephemeral	0.03	0.25	0.57	0.80	0.83	0.75	0.83	0.80	0.83	0.72	0.83
S4-377	Unnamed Trib. Clear Creek	Ephemeral	0.04	3.58	4.03	2.54	3.20	2.54	3.16	2.54	3.20	2.55	3.20
S4-378	Unnamed Trib. Clear Creek	Ephemeral	0.09	0.01	0.13	1.58	1.67	1.60	1.67	1.58	1.67	1.58	1.67
S4-379	Unnamed Trib. Clear Creek	Ephemeral	0.09	0.00	0.17	0.71	0.74	0.71	0.74	0.71	0.74	0.71	0.74
S4-380	Unnamed Trib. Clear Creek	Ephemeral	0.04	0.20	0.23	0.67	0.83	0.67	0.83	0.67	0.83	0.67	0.83
S4-381	Unnamed Trib. Clear Creek	Ephemeral	0.12	4.09	4.09	3.83	4.07	3.83	4.08	3.83	4.07	3.83	4.07
S4-382	---	Ephemeral	0	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
S4-383	Unnamed Trib. Clear Creek	Ephemeral	0.01	0.70	0.70	0.71	0.70	0.71	0.70	0.71	0.70	0.71	0.71
S4-384	---	Intermittent	0.17	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
S4-385	Unnamed Trib. Clear Creek	Ephemeral	0.02	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
S4-389	Unnamed Trib. Indian Creek	Ephemeral	0.8	1.15	1.40	0.01	0.00	1.19	1.47	0.01	0.01	0.01	0.00
S4-391	Unnamed Trib. Indian Creek	Ephemeral	0.16	1.63	2.84	2.17	2.54	1.78	2.59	1.77	2.48	2.17	2.15
S4-393	Unnamed Trib. Black Ankle Creek	Ephemeral	0.09	0.73	1.65	0.73	1.65	0.73	1.65	0.73	1.65	0.74	1.65
S4-394	Unnamed Trib. Plummer Creek	Intermittent	0.24	1.01	1.31	1.01	1.31	1.01	1.31	1.01	1.31	1.01	1.31
S4-395	Unnamed Trib. Dry Branch Creek	Ephemeral	0.03	1.67	2.68	1.67	2.68	1.67	2.68	1.67	2.68	1.67	2.68
S4-396	Unnamed Trib. Plummer Creek	Ephemeral	0.4	0.03	2.27	0.03	2.27	0.03	2.27	0.03	2.27	0.03	2.27
S4-397	Unnamed Trib. Little Clifty Branch	Ephemeral	0.12	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
S4-398	Unnamed Trib. Little Clifty Branch	Ephemeral	0.11	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78

Table 5.19.5: Potential Riparian Habitat Impacts (Acres) by Alternative

Stream ID#	Stream Name	USGS Stream Type	Drain. Area (mi^2)	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
				Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
S4-399	Unnamed Trib. Little Clifty Branch	Ephemeral	0.12	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09
S4-400	Unnamed Trib. Mitchell Branch	Ephemeral	0.51	0.06	0.71	0.06	0.71	0.06	0.71	0.06	0.71	0.06	0.45
S4-401	Unnamed Trib. Mitchell Branch	Intermittent	0.48	1.03	0.98	1.03	0.98	1.03	0.98	1.03	0.98	1.04	0.98
S4-402	Unnamed Trib. Indian Creek	Intermittent	0.79	0.00	0.00	1.07	1.59	0.00	0.00	1.06	1.56	1.07	1.59
S4-403	Unnamed Trib. Indian Creek	Intermittent	0.17	2.84	2.89	2.84	3.18	2.84	3.09	2.68	3.38	2.85	3.30
S4-404	Unnamed Trib. Indian Creek	Ephemeral	0.4	0.16	0.45	0.16	0.45	0.16	0.45	0.16	0.45	0.17	0.26
S4-405	Unnamed Trib. Clear Creek	Ephemeral	0.1	1.34	1.91	1.34	1.91	1.34	1.91	1.34	1.91	1.34	1.73
S4-406	Unnamed Trib. Clear Creek	Intermittent	0.3	1.35	3.58	1.35	3.58	1.35	3.58	1.35	3.58	1.35	2.68
S4-407	Unnamed Trib. Clear Creek	Intermittent	0.88	0.01	0.08	0.01	0.08	0.01	0.08	0.01	0.08	0.01	0.08
S4-408	Unnamed Trib. Clear Creek	Ephemeral	0.1	1.07	1.41	1.07	1.42	1.07	1.42	1.07	1.42	1.07	1.40
			Grand Total	**327.56**	**400.08**	**323.79**	**397.74**	**323.08**	**398.83**	**315.72**	**385.03**	**323.59**	**391.81**

Note: zeroes entered in the table above indicate that a stream's riparian habitat is not impacted by an alternative.

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Table 5.19-6: Summary of Potential Stream and Riparian Corridor Impacts

	Alternatives									
	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Stream Types - Linear Feet in Right-of-Way										
Ephemeral	68,787	79,603	66,312	77,997	66,699	78,414	65,750	76,453	66,379	77,206
Intermittent	18,496	23,355	20,124	25,400	20,882	25,798	17,534	22,551	20,143	25,035
Perennial	6,184	8,767	6,674	9,404	6,029	8,486	6,769	9,079	6,674	9,006
Totals	**93,467**	**111,725**	**93,110**	**112,801**	**93,610**	**112,698**	**90,053**	**108,083**	**93,196**	**111,247**
Stream Relocation: Linear Feet	28,338	34,069	30,827	38,556	31,328	37,950	24,876	32,367	30,861	37,325
Riparian Corridor Acres	327.56	400.08	323.79	397.74	323.08	398.83	315.72	385.03	323.59	391.81

Table 5.19-6a: Stream Impacts by Alternatives, Weighted by Habitat Evaluation Score

Habitat Eval. / Score Ranges	Alternatives – Linear Feet of Impact									
	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
HHEI Streams										
0-40	37,377	43,066	33,583	38,978	36,904	43,873	33,227	37,956	33,523	38,556
41-60	31,835	38,218	32,976	40,215	32,559	38,843	31,558	38,718	33,110	40,033
61-100	18,071	21,674	19,877	24,204	18,118	21,496	18,499	22,330	19,889	23,652
Totals	87,283	102,958	86,436	103,397	87,581	104,212	83,284	99,004	86,522	102,241
QHEI Streams										
0-51	-	-	415	733	-	-	451	611	415	733
51-64	2,843	4,044	2,853	4,367	2,893	4,300	2,958	4,059	2,853	4,033
>64	3,341	4,723	3,406	4,304	3,136	4,186	3,360	4,409	3,406	4,240
Totals	6,184	8,767	6,674	9,404	6,029	8,486	6,769	9,079	6,674	9,006
Impact Lengths Multiplied by Habitat Evaluation Score, Percent Comparison										
HHEI	3,927,167	4,646,503	3,978,022	4,767,790	3,956,972	4,693,412	3,814,453	4,554,491	3,984,172	4,702,116
	99%	99%	100%	101%	99%	100%	96%	97%	100%	100%
QHEI	395,520	563,340	426,257	596,172	390,320	550,622	426,003	571,263	426,257	570,983
	93%	99%	100%	104%	92%	96%	100%	100%	100%	100%

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Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
S4-001	Unnamed Trib. Doans Creek	Ephemeral	72.0	0.0	0.12	Class III PHWH	619	0.10	0	784	0.13	0	619	0.10	0	784	0.13	0	0	0.00	0	0	0.00	0	619	0.10	0	784	0.13	0	619	0.10	0	784	0.13	0
S4-002	Unnamed Trib. Doans Creek	Ephemeral	46.0	0.0	0.03	Class II PHWH	148	0.02	148	218	0.03	218	148	0.02	148	218	0.03	218	0	0.00	0	0	0.00	0	148	0.02	148	218	0.03	218	148	0.02	148	218	0.03	218
S4-003	Unnamed Trib. Doans Creek	Ephemeral	71.0	0.0	0.09	Class III PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	403	0.06	0	404	0.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-004	Unnamed Trib. Doans Creek	Ephemeral	60.0	0.0	0.08	Class III PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	413	0.06	0	419	0.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-005	Unnamed Trib. Doans Creek	Ephemeral	59.0	0.0	0.16	Class II PHWH	57	0.01	0	21	0.01	0	57	0.01	0	21	0.01	0	0	0.00	0	0	0.00	0	57	0.01	0	21	0.01	0	68	0.01	0	68	0.01	0
S4-006	Unnamed Trib. Doans Creek	Ephemeral	22.0	0.0	0.08	Class I PHWH	81	0.01	0	102	0.01	0	81	0.01	0	102	0.01	0	0	0.00	0	0	0.00	0	81	0.01	0	102	0.01	0	81	0.01	0	102	0.01	0
S4-007	Unnamed Trib. Doans Creek	Ephemeral	60.0	0.0	0.21	Modified Class II PHWH	0	0.00	0	77	0.01	0	0	0.00	0	77	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0	77	0.01	0	0	0.00	0	77	0.01	0
S4-008	Unnamed Trib. Doans Creek	Ephemeral	65.0	0.0	0.03	Class III PHWH	0	0.00	0	24	0.01	0	0	0.00	0	24	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0	24	0.01	0	0	0.00	0	24	0.01	0
S4-009	Unnamed Trib. Doans Creek	Intermittent	74.0	0.0	0.67	Class III PHWH	1,080	0.29	1,080	1,245	0.33	1,245	1,080	0.29	1,080	1,245	0.33	1,245	467	0.12	0	701	0.19	0	1,080	0.29	1,080	1,245	0.33	1,245	1,088	0.29	1,088	1,270	0.34	1,270
S4-010	Unnamed Trib. Doans Creek	Ephemeral	49.0	0.0	0.30	Modified Class II PHWH	733	0.07	133	830	0.08	133	733	0.07	133	830	0.08	133	786	0.07	233	916	0.08	233	733	0.07	133	830	0.08	133	819	0.08	123	819	0.08	123
S4-013	Unnamed Trib. Doans Creek	Ephemeral	49.0	0.0	0.09	Class II PHWH	499	0.05	0	539	0.05	0	499	0.05	0	539	0.05	0	383	0.04	269	544	0.05	293	499	0.05	0	539	0.05	0	500	0.05	0	539	0.05	0
S4-014	Unnamed Trib. Doans Creek	Ephemeral	31.0	0.0	0.02	Modified Class II PHWH	482	0.03	0	504	0.03	0	482	0.03	0	504	0.03	0	332	0.02	0	363	0.03	0	482	0.03	0	504	0.03	0	482	0.03	0	504	0.03	0
S4-015	Unnamed Trib. Doans Creek	Ephemeral	43.0	0.0	0.15	Class II PHWH	582	0.05	0	818	0.08	0	582	0.05	0	818	0.08	0	549	0.05	0	637	0.06	0	582	0.05	0	818	0.08	0	588	0.05	0	821	0.08	0
S4-016	Unnamed Trib. Doans Creek	Ephemeral	39.0	0.0	0.04	Class I PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	22	0.01	22	245	0.02	245	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-020	Unnamed Trib. Dowden Branch	Ephemeral	42.0	0.0	0.05	Class II PHWH	400	0.03	0	464	0.04	0	400	0.03	0	464	0.04	0	400	0.03	0	464	0.04	0	400	0.03	0	464	0.04	0	401	0.04	0	465	0.04	0
S4-023	Dowden Branch	Intermittent	41.0	0.0	0.21	Modified Class II PHWH	420	0.08	0	476	0.09	0	420	0.08	0	476	0.09	0	420	0.08	0	476	0.09	0	420	0.08	0	476	0.09	0	420	0.08	0	476	0.09	0
S4-031	Unnamed Trib. Bogard Creek	Intermittent	62.0	0.0	0.20	Class III PHWH	708	0.10	708	664	0.09	664	725	0.10	725	698	0.10	698	725	0.10	725	698	0.10	698	708	0.10	708	664	0.09	664	725	0.10	725	698	0.10	698
S4-032	Unnamed Trib. Bogard Creek	Ephemeral	36.0	0.0	0.10	Class I PHWH	462	0.03	0	449	0.03	0	462	0.03	0	449	0.03	0	462	0.03	0	449	0.03	0	462	0.03	0	449	0.03	0	462	0.03	0	449	0.03	0
S4-033	Unnamed Trib. Bogard Creek	Ephemeral	14.0	0.0	0.01	Class I PHWH	233	0.02	0	233	0.02	0	233	0.02	0	233	0.02	0	233	0.02	0	233	0.02	0	233	0.02	0	233	0.02	0	233	0.02	0	233	0.02	0
S4-034	Unnamed Trib. Bogard Creek	Ephemeral	47.0	0.0	0.04	Class II PHWH	419	0.03	0	407	0.03	0	419	0.03	0	407	0.03	0	419	0.03	0	407	0.03	0	419	0.03	0	407	0.03	0	419	0.03	0	401	0.03	0
S4-036	Unnamed Trib. Bogard Creek	Ephemeral	21.0	0.0	0.01	Class I PHWH	250	0.02	250	233	0.02	233	252	0.02	0	245	0.02	245	252	0.02	0	245	0.02	245	250	0.02	250	233	0.02	233	252	0.02	0	245	0.02	245
S4-037	Unnamed Trib. Bogard Creek	Ephemeral	27.0	0.0	0.15	Class I PHWH	614	0.04	614	564	0.04	564	564	0.04	564	561	0.04	561	564	0.04	564	561	0.04	561	614	0.04	614	564	0.04	564	564	0.04	564	561	0.04	561
S4-040	Unnamed Trib. Bogard Creek	Ephemeral	14.0	0.0	0.01	Class I PHWH	0	0.00	0	11	0.01	0	404	0.03	0	507	0.03	0	404	0.03	0	507	0.03	0	0	0.00	0	11	0.01	0	404	0.03	0	507	0.03	0
S4-041	Unnamed Trib. Bogard Creek	Ephemeral	39.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	0	0.00	0	68	0.01	68	0	0.00	0	68	0.01	68	0	0.00	0	0	0.00	0	0	0.00	0	68	0.01	68
S4-049pt1	Unnamed Trib. Flyblow Branch	Ephemeral	40.0	0.0	0.36	Class II PHWH	0	0.00	0	0	0.00	0	473	0.03	0	563	0.04	0	473	0.03	0	563	0.04	0	0	0.00	0	0	0.00	0	473	0.03	0	563	0.04	0
S4-049pt2	Unnamed Trib. Flyblow Branch	Ephemeral	16.0	0.0	0.10	Class I PHWH	906	0.06	906	980	0.07	980	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	906	0.06	906	980	0.07	980	0	0.00	0	0	0.00	0
S4-050	Unnamed Trib. Flyblow Branch	Intermittent	81.0	0.0	0.01	Class III PHWH	585	0.09	0	765	0.12	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	585	0.09	0	765	0.12	0	0	0.00	0	0	0.00	0
S4-051	Unnamed Trib. Flyblow Branch	Ephemeral	61.0	0.0	0.17	Class III PHWH	0	0.00	0	0	0.00	0	438	0.04	0	460	0.04	0	438	0.04	0	460	0.04	0	0	0.00	0	0	0.00	0	438	0.04	0	460	0.04	0
S4-053	Unnamed Trib. Flyblow Branch	Ephemeral	39.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	520	0.04	0	595	0.04	0	520	0.04	0	595	0.04	0	0	0.00	0	0	0.00	0	521	0.04	0	596	0.04	0
S4-054	Unnamed Trib. Flyblow Branch	Ephemeral	16.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	150	0.01	150	353	0.02	0	150	0.01	150	353	0.02	0	0	0.00	0	0	0.00	0	150	0.01	150	353	0.02	0
S4-055	Unnamed Trib. Flyblow Branch	Ephemeral	67.0	0.0	0.02	Class III PHWH	496	0.05	496	536	0.05	536	0	0.00	0	195	0.02	195	0	0.00	0	195	0.02	195	496	0.05	496	536	0.05	536	0	0.00	0	195	0.02	195
S4-056	Unnamed Trib. Flyblow Branch	Ephemeral	37.0	0.0	0.01	Class I PHWH	592	0.04	0	592	0.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	592	0.04	0	592	0.04	0	0	0.00	0	0	0.00	0
S4-058	Unnamed Trib. Flyblow Branch	Intermittent	72.0	0.0	0.02	Class III PHWH	1,133	0.18	0	1,122	0.18	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	1,133	0.18	0	1,122	0.18	0	0	0.00	0	0	0.00	0

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
S4-059	Unnamed Trib. Flyblow Branch	Ephemeral	25.0	0.0	0.02	Class I PHWH	62	0.01	0	190	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	62	0.01	0	190	0.01	0	0	0.00	0	0	0.00	0
S4-060	Unnamed Trib. Black Ankle Creek	Ephemeral	42.0	0.0	0.01	Class II PHWH	0	0.00	0	0	0.00	0	0	0.00	0	58	0.01	0	0	0.00	0	58	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0	58	0.01	0
S4-061	Unnamed Trib. Black Ankle Creek	Ephemeral	20.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	272	0.02	0	252	0.02	0	272	0.02	0	252	0.02	0	0	0.00	0	0	0.00	0	272	0.02	0	252	0.02	0
S4-062	Unnamed Trib. Black Ankle Creek	Ephemeral	26.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	260	0.02	0	235	0.02	0	260	0.02	0	235	0.02	0	0	0.00	0	0	0.00	0	260	0.02	0	235	0.02	0
S4-063	Unnamed Trib. Black Ankle Creek	Ephemeral	20.0	0.0	0.01	Modified Class I PHWH	0	0.00	0	0	0.00	0	278	0.02	0	244	0.02	0	278	0.02	0	244	0.02	0	0	0.00	0	0	0.00	0	278	0.02	0	304	0.02	0
S4-064	Unnamed Trib. Black Ankle Creek	Intermittent	80.0	0.0	0.05	Class III PHWH	0	0.00	0	0	0.00	0	552	0.10	0	601	0.11	0	552	0.10	0	601	0.11	0	0	0.00	0	0	0.00	0	552	0.10	0	601	0.11	0
S4-065	Unnamed Trib. Black Ankle Creek	Ephemeral	67.0	0.0	0.01	Class III PHWH	0	0.00	0	0	0.00	0	37	0.01	37	82	0.01	82	37	0.01	37	82	0.01	82	0	0.00	0	0	0.00	0	37	0.01	37	82	0.01	82
S4-069	Unnamed Trib. Plummer Creek	Intermittent	49.0	0.0	0.02	Class II PHWH	884	0.33	0	1,224	0.46	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	884	0.33	0	1,224	0.46	0	0	0.00	0	0	0.00	0
S4-071	Unnamed Trib. Plummer Creek	Ephemeral	39.0	0.0	0.01	Class I PHWH	1	0.01	1	65	0.01	65	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	1	0.01	1	65	0.01	65	0	0.00	0	0	0.00	0
S4-076	Black Ankle Creek	Perennial	0.0	65.5	7.90	Warmwater Habitat	1,220	0.22	444	1,374	0.25	444	1,220	0.22	444	1,351	0.25	444	1,220	0.22	444	1,351	0.25	444	1,220	0.22	444	1,374	0.25	444	1,220	0.22	444	1,351	0.25	444
S4-077	Unnamed Trib. Black Ankle Creek	Ephemeral	50.0	0.0	0.02	Class II PHWH	0	0.00	0	380	0.06	380	0	0.00	0	260	0.04	260	0	0.00	0	260	0.04	260	0	0.00	0	380	0.06	380	0	0.00	0	260	0.04	260
S4-080	Unnamed Trib. Black Ankle Creek	Intermittent	51.0	0.0	0.05	Class II PHWH	0	0.00	0	515	0.07	515	0	0.00	0	496	0.07	496	0	0.00	0	496	0.07	496	0	0.00	0	515	0.07	515	0	0.00	0	495	0.07	495
S4-082	Unnamed Trib. Black Ankle Creek	Intermittent	52.0	0.0	0.40	Modified Class II PHWH	526	0.05	0	1,055	0.10	0	526	0.05	0	1,055	0.10	0	526	0.05	0	1,055	0.10	0	526	0.05	0	1,055	0.10	0	526	0.05	0	1,055	0.10	0
S4-088	Unnamed Trib. Black Ankle Creek	Intermittent	51.0	0.0	0.12	Class III PHWH	1,564	0.41	1,564	1,926	0.51	1,926	1,564	0.41	1,564	1,926	0.51	1,926	1,564	0.41	1,564	1,926	0.51	1,926	1,564	0.41	1,564	1,926	0.51	1,926	1,564	0.41	1,564	1,926	0.51	1,926
S4-090	Unnamed Trib. Plummer Creek	Intermittent	70.0	0.0	0.38	Class III PHWH	618	0.21	0	718	0.25	0	618	0.21	0	718	0.25	0	618	0.21	0	718	0.25	0	618	0.21	0	718	0.25	0	618	0.21	0	718	0.25	0
S4-092	Unnamed Trib. Plummer Creek	Ephemeral	42.0	0.0	0.03	Class II PHWH	282	0.03	0	282	0.03	0	282	0.03	0	282	0.03	0	282	0.03	0	282	0.03	0	282	0.03	0	282	0.03	0	282	0.03	0	282	0.03	0
S4-093	Unnamed Trib. Plummer Creek	Ephemeral	32.0	0.0	0.02	Class I PHWH	565	0.04	0	565	0.04	0	565	0.04	0	565	0.04	0	565	0.04	0	565	0.04	0	565	0.04	0	565	0.04	0	565	0.04	0	565	0.04	0
S4-095	Unnamed Trib. Plummer Creek	Ephemeral	41.0	0.0	0.03	Class II PHWH	188	0.02	188	276	0.03	276	188	0.02	188	276	0.03	276	188	0.02	188	276	0.03	276	188	0.02	188	276	0.03	276	188	0.02	188	276	0.03	276
S4-096	Unnamed Trib. Plummer Creek	Ephemeral	14.0	0.0	0.03	Class I PHWH	522	0.04	0	522	0.04	0	522	0.04	0	522	0.04	0	522	0.04	0	522	0.04	0	522	0.04	0	522	0.04	0	522	0.04	0	522	0.04	0
S4-099	Unnamed Trib. Dry Branch Creek	Ephemeral	41.0	0.0	0.03	Class II PHWH	545	0.05	0	1,055	0.10	0	545	0.05	0	1,055	0.10	0	545	0.05	0	1,055	0.10	0	545	0.05	0	1,055	0.10	0	545	0.05	0	1,055	0.10	0
S4-100	Unnamed Trib. Dry Branch Creek	Ephemeral	47.0	0.0	0.02	Class II PHWH	75	0.01	0	379	0.03	0	75	0.01	0	379	0.03	0	75	0.01	0	379	0.03	0	75	0.01	0	379	0.03	0	75	0.01	0	379	0.03	0
S4-101	Dry Branch	Perennial	0.0	62.0	1.91	Warmwater Habitat	382	0.06	0	737	0.12	0	382	0.06	0	737	0.12	0	382	0.06	0	737	0.12	0	382	0.06	0	737	0.12	0	382	0.06	0	737	0.12	0
S4-102	Unnamed Trib. Dry Branch Creek	Ephemeral	19.0	0.0	0.30	Class I PHWH	518	0.04	518	678	0.05	0	518	0.04	518	678	0.05	0	518	0.04	518	678	0.05	0	518	0.04	518	678	0.05	0	518	0.04	518	678	0.05	0
S4-103	Unnamed Trib. Dry Branch Creek	Ephemeral	19.0	0.0	0.30	Class I PHWH	0	0.00	0	127	0.01	0	0	0.00	0	127	0.01	0	0	0.00	0	127	0.01	0	0	0.00	0	127	0.01	0	0	0.00	0	127	0.01	0
S4-108	Plummer Creek	Perennial	0.0	55.0	6.40	Warmwater Habitat	1,048	0.31	0	1,296	0.39	0	1,048	0.31	0	1,296	0.39	0	1,048	0.31	0	1,296	0.39	0	1,048	0.31	0	1,296	0.39	0	1,048	0.31	0	1,296	0.39	0
S4-109	Unnamed Trib. Plummer Creek	Ephemeral	11.0	0.0	0.33	Class I PHWH	0	0.00	0	56	0.01	56	0	0.00	0	56	0.01	56	0	0.00	0	56	0.01	56	0	0.00	0	56	0.01	56	0	0.00	0	56	0.01	56
S4-111	Unnamed Trib. Plummer Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	363	0.03	0	444	0.03	0	363	0.03	0	444	0.03	0	363	0.03	0	444	0.03	0	363	0.03	0	444	0.03	0	363	0.03	0	444	0.03	0
S4-112	Unnamed Trib. Plummer Creek	Ephemeral	16.0	0.0	0.01	Class I PHWH	214	0.01	0	247	0.02	0	214	0.01	0	247	0.02	0	214	0.01	0	247	0.02	0	214	0.01	0	247	0.02	0	214	0.01	0	247	0.02	0
S4-113	Unnamed Trib. Plummer Creek	Intermittent	76.0	0.0	0.73	Class III PHWH	587	0.15	587	710	0.18	710	587	0.15	587	710	0.18	710	587	0.15	587	710	0.18	710	587	0.15	587	710	0.18	710	587	0.15	587	710	0.18	710
S4-114	Unnamed Trib. Plummer Creek	Ephemeral	46.0	0.0	0.27	Class II PHWH	972	0.16	0	833	0.13	0	972	0.16	0	833	0.13	0	972	0.16	0	833	0.13	0	972	0.16	0	833	0.13	0	972	0.16	0	833	0.13	0
S4-115	Unnamed Trib. Plummer Creek	Ephemeral	35.0	0.0	0.03	Class I PHWH	129	0.01	0	129	0.01	0	129	0.01	0	129	0.01	0	129	0.01	0	129	0.01	0	129	0.01	0	129	0.01	0	129	0.01	0	129	0.01	0
S4-116	Unnamed Trib. Plummer Creek	Ephemeral	21.0	0.0	0.01	Class I PHWH	133	0.01	0	133	0.01	0	133	0.01	0	133	0.01	0	133	0.01	0	133	0.01	0	133	0.01	0	133	0.01	0	133	0.01	0	133	0.01	0
S4-117	Unnamed Trib. Plummer Creek	Ephemeral	35.0	0.0	0.01	Class I PHWH	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0
S4-118	Unnamed Trib. Plummer Creek	Ephemeral	54.0	0.0	0.01	Class III PHWH	217	0.03	217	136	0.02	136	217	0.03	217	136	0.02	136	217	0.03	217	136	0.02	136	217	0.03	217	136	0.02	136	217	0.03	217	136	0.02	136

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
S4-121	Unnamed Trib. Plummer Creek	Ephemeral	20.0	0.0	0.01	Class I PHWH	454	0.03	0	523	0.04	0	454	0.03	0	523	0.04	0	454	0.03	0	523	0.04	0	454	0.03	0	523	0.04	0	454	0.03	0	523	0.04	0
S4-122	Unnamed Trib. Plummer Creek	Ephemeral	31.0	0.0	0.01	Class I PHWH	156	0.01	0	156	0.01	0	156	0.01	0	156	0.01	0	156	0.01	0	156	0.01	0	156	0.01	0	156	0.01	0	156	0.01	0	156	0.01	0
S4-125	Unnamed Trib. Little Clifty Branch	Ephemeral	26.0	0.0	0.02	Class I PHWH	629	0.04	629	619	0.04	619	629	0.04	629	619	0.04	619	629	0.04	629	619	0.04	619	629	0.04	629	619	0.04	619	630	0.04	630	620	0.04	620
S4-126	Unnamed Trib. Little Clifty Branch	Intermittent	66.0	0.0	0.20	Class III PHWH	541	0.05	0	519	0.05	0	541	0.05	0	519	0.05	0	541	0.05	0	519	0.05	0	541	0.05	0	519	0.05	0	541	0.05	0	519	0.05	0
S4-127	Unnamed Trib. Little Clifty Branch	Ephemeral	46.0	0.0	0.01	Class II PHWH	111	0.01	0	111	0.01	0	111	0.01	0	111	0.01	0	111	0.01	0	111	0.01	0	111	0.01	0	111	0.01	0	111	0.01	0	111	0.01	0
S4-128	Unnamed Trib. Little Clifty Branch	Ephemeral	22.0	0.0	0.01	Class I PHWH	81	0.01	0	81	0.01	0	81	0.01	0	81	0.01	0	81	0.01	0	81	0.01	0	81	0.01	0	81	0.01	0	81	0.01	0	81	0.01	0
S4-129	Unnamed Trib. Little Clifty Branch	Ephemeral	27.0	0.0	0.01	Class I PHWH	151	0.01	0	151	0.01	0	151	0.01	0	151	0.01	0	151	0.01	0	151	0.01	0	151	0.01	0	151	0.01	0	151	0.01	0	151	0.01	0
S4-130	Unnamed Trib. Little Clifty Branch	Ephemeral	81.0	0.0	0.21	Class III PHWH	672	0.15	0	761	0.17	0	672	0.15	0	761	0.17	0	672	0.15	0	761	0.17	0	672	0.15	0	761	0.17	0	672	0.15	0	761	0.17	0
S4-131	Unnamed Trib. Little Clifty Branch	Ephemeral	46.0	0.0	0.01	Class II PHWH	170	0.01	0	241	0.02	0	170	0.01	0	241	0.02	0	170	0.01	0	241	0.02	0	170	0.01	0	241	0.02	0	170	0.01	0	241	0.02	0
S4-133	Unnamed Trib. Little Clifty Branch	Intermittent	72.0	0.0	0.33	Class III PHWH	686	0.17	627	799	0.20	700	686	0.17	627	799	0.20	700	686	0.17	627	799	0.20	700	686	0.17	627	799	0.20	700	686	0.17	627	799	0.20	700
S4-134	Unnamed Trib. Little Clifty Branch	Ephemeral	53.0	0.0	0.14	Class III PHWH	967	0.16	967	960	0.15	960	967	0.16	967	960	0.15	960	967	0.16	967	960	0.15	960	967	0.16	967	960	0.15	960	967	0.16	967	960	0.15	960
S4-137	Unnamed Trib. Little Clifty Branch	Ephemeral	55.0	0.0	0.03	Class III PHWH	133	0.02	133	127	0.01	127	133	0.02	133	127	0.01	127	133	0.02	133	127	0.01	127	133	0.02	133	127	0.01	127	133	0.02	133	127	0.01	127
S4-138	Unnamed Trib. Little Clifty Branch	Ephemeral	31.0	0.0	0.02	Class I PHWH	588	0.04	0	588	0.04	0	588	0.04	0	588	0.04	0	588	0.04	0	588	0.04	0	588	0.04	0	588	0.04	0	588	0.04	0	588	0.04	0
S4-139	Unnamed Trib. Little Clifty Branch	Ephemeral	29.0	0.0	0.02	Class I PHWH	346	0.02	0	346	0.02	0	346	0.02	0	346	0.02	0	346	0.02	0	346	0.02	0	346	0.02	0	346	0.02	0	346	0.02	0	346	0.02	0
S4-140	Unnamed Trib. Little Clifty Branch	Ephemeral	37.0	0.0	0.02	Class I PHWH	343	0.02	0	343	0.02	0	343	0.02	0	343	0.02	0	343	0.02	0	343	0.02	0	343	0.02	0	343	0.02	0	343	0.02	0	343	0.02	0
S4-141	Unnamed Trib. Little Indian Creek	Ephemeral	35.0	0.0	0.02	Modified Class II PHWH	57	0.01	0	57	0.01	0	57	0.01	0	57	0.01	0	57	0.01	0	57	0.01	0	57	0.01	0	57	0.01	0	57	0.01	0	57	0.01	0
S4-142	Unnamed Trib. Little Indian Creek	Ephemeral	20.0	0.0	0.12	Class I PHWH	251	0.01	0	202	0.01	0	251	0.01	0	202	0.01	0	251	0.01	0	202	0.01	0	251	0.01	0	202	0.01	0	252	0.01	0	203	0.01	0
S4-143	Unnamed Trib. Little Indian Creek	Ephemeral	56.0	0.0	0.03	Class III PHWH	707	0.06	0	742	0.07	0	707	0.06	0	742	0.07	0	707	0.06	0	742	0.07	0	707	0.06	0	742	0.07	0	707	0.06	0	743	0.07	0
S4-144	Unnamed Trib. Little Indian Creek	Ephemeral	31.0	0.0	0.02	Class I PHWH	870	0.06	0	817	0.06	0	870	0.06	0	817	0.06	0	870	0.06	0	817	0.06	0	870	0.06	0	817	0.06	0	870	0.06	0	817	0.06	0
S4-147	Unnamed Trib. Mitchell Branch	Ephemeral	23.0	0.0	0.01	Class I PHWH	519	0.04	0	556	0.04	0	519	0.04	0	556	0.04	0	519	0.04	0	556	0.04	0	519	0.04	0	556	0.04	0	519	0.04	0	556	0.04	0
S4-150	Unnamed Trib. Mitchell Branch	Ephemeral	30.0	0.0	0.01	Class I PHWH	352	0.02	0	305	0.02	0	352	0.02	0	305	0.02	0	352	0.02	0	305	0.02	0	352	0.02	0	305	0.02	0	352	0.02	0	337	0.02	0
S4-151	Unnamed Trib. Mitchell Branch	Ephemeral	14.0	0.0	0.01	Class I PHWH	246	0.02	0	246	0.02	0	246	0.02	0	246	0.02	0	246	0.02	0	246	0.02	0	246	0.02	0	246	0.02	0	246	0.02	0	246	0.02	0
S4-154	Unnamed Trib. Mitchell Branch	Ephemeral	49.0	0.0	0.01	Class II PHWH	112	0.01	0	148	0.01	0	112	0.01	0	148	0.01	0	112	0.01	0	148	0.01	0	112	0.01	0	148	0.01	0	112	0.01	0	117	0.01	0
S4-155	Unnamed Trib. Mitchell Branch	Ephemeral	20.0	0.0	0.15	Class I PHWH	79	0.01	0	154	0.01	0	79	0.01	0	154	0.01	0	79	0.01	0	154	0.01	0	79	0.01	0	154	0.01	0	80	0.01	0	125	0.01	0
S4-156	Mitchell Branch	Perennial	0.0	63.5	3.84	Warmwater Habitat	607	0.17	0	927	0.26	0	607	0.17	0	927	0.26	0	607	0.17	0	927	0.26	0	607	0.17	0	927	0.26	0	607	0.17	0	735	0.20	0
S4-159	Unnamed Trib. Mitchell Branch	Ephemeral	26.0	0.0	0.14	Modified Class I PHWH	848	0.04	848	848	0.04	848	848	0.04	848	848	0.04	848	848	0.04	848	848	0.04	848	848	0.04	848	848	0.04	848	848	0.04	848	848	0.04	848
S4-160	Unnamed Trib. Mitchell Branch	Ephemeral	30.0	0.0	0.38	Class I PHWH	397	0.02	0	397	0.02	0	397	0.02	0	397	0.02	0	397	0.02	0	397	0.02	0	397	0.02	0	397	0.02	0	397	0.02	0	397	0.02	0
S4-161	Unnamed Trib. Mitchell Branch	Ephemeral	28.0	0.0	0.02	Modified Class I PHWH	0	0.00	0	88	0.01	0	0	0.00	0	88	0.01	0	0	0.00	0	88	0.01	0	0	0.00	0	88	0.01	0	0	0.00	0	17	0.01	0
S4-162	Unnamed Trib. Mitchell Branch	Intermittent	72.0	0.0	0.55	Class III PHWH	456	0.21	0	502	0.23	0	456	0.21	0	502	0.23	0	456	0.21	0	502	0.23	0	456	0.21	0	502	0.23	0	456	0.21	0	497	0.23	0
S4-164	Unnamed Trib. Mitchell Branch	Ephemeral	45.0	0.0	0.03	Modified Class II PHWH	752	0.05	752	752	0.05	752	752	0.05	752	752	0.05	752	752	0.05	752	752	0.05	752	752	0.05	752	752	0.05	752	752	0.05	752	753	0.05	753
S4-165pt1	Unnamed Trib. Mitchell Branch	Ephemeral	35.0	0.0	0.01	Class I PHWH	410	0.02	0	410	0.02	410	410	0.02	0	410	0.02	410	410	0.02	0	410	0.02	410	410	0.02	0	410	0.02	410	410	0.02	0	410	0.02	0
S4-165pt2	Unnamed Trib. Mitchell Branch	Ephemeral	26.0	0.0	0.02	Modified Class I PHWH	597	0.04	0	596	0.04	596	597	0.04	0	596	0.04	596	597	0.04	0	596	0.04	596	597	0.04	0	596	0.04	596	597	0.04	0	597	0.04	0
S4-166	Unnamed Trib. Mitchell Branch	Ephemeral	59.0	0.0	0.01	Class III PHWH	452	0.04	0	542	0.05	0	452	0.04	0	542	0.05	0	452	0.04	0	542	0.05	0	452	0.04	0	542	0.05	0	452	0.04	0	556	0.05	0
S4-171	Unnamed Trib. Plummer Creek	Ephemeral	38.0	0.0	0.03	Class I PHWH	217	0.01	0	257	0.02	0	217	0.01	0	257	0.02	0	217	0.01	0	257	0.02	0	217	0.01	0	257	0.02	0	217	0.01	0	257	0.02	0

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
S4-172	Unnamed Trib. Indian Creek	Ephemeral	57.0	0.0	0.02	Class II PHWH	448	0.04	448	461	0.04	461	448	0.04	448	461	0.04	461	448	0.04	448	461	0.04	461	448	0.04	448	461	0.04	461	448	0.04	448	446	0.04	446
S4-173	Unnamed Trib. Indian Creek	Ephemeral	70.0	0.0	0.11	Class III PHWH	638	0.06	0	666	0.06	0	638	0.06	0	666	0.06	0	638	0.06	0	666	0.06	0	638	0.06	0	666	0.06	0	638	0.06	0	647	0.06	0
S4-174	Unnamed Trib. Indian Creek	Ephemeral	60.0	0.0	0.02	Class III PHWH	497	0.05	0	544	0.05	0	494	0.05	0	586	0.05	0	497	0.05	0	570	0.05	0	519	0.05	0	569	0.05	0	494	0.05	0	576	0.05	0
S4-175	Unnamed Trib. Indian Creek	Ephemeral	35.0	0.0	0.01	Class I PHWH	96	0.01	0	96	0.01	0	96	0.01	0	96	0.01	0	96	0.01	0	96	0.01	0	96	0.01	0	96	0.01	0	96	0.01	0	96	0.01	0
S4-176	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.01	Class II PHWH	120	0.02	0	120	0.02	0	120	0.02	0	120	0.02	0	120	0.02	0	120	0.02	0	120	0.02	0	120	0.02	0	120	0.02	0	120	0.02	0
S4-177	Unnamed Trib. Indian Creek	Ephemeral	67.0	0.0	0.03	Class III PHWH	95	0.01	0	95	0.01	0	95	0.01	0	95	0.01	0	95	0.01	0	95	0.01	0	95	0.01	0	95	0.01	0	95	0.01	0	95	0.01	0
S4-178	Unnamed Trib. Indian Creek	Ephemeral	43.0	0.0	0.11	Class II PHWH	241	0.06	0	241	0.06	0	228	0.05	0	241	0.06	0	241	0.06	0	241	0.06	0	241	0.06	0	241	0.06	0	228	0.05	0	241	0.06	0
S4-179	Unnamed Trib. Indian Creek	Ephemeral	57.0	0.0	0.14	Class III PHWH	130	0.03	0	129	0.03	0	130	0.03	0	129	0.03	0	130	0.03	0	129	0.03	0	130	0.03	0	129	0.03	0	130	0.03	0	129	0.03	0
S4-180	Unnamed Trib. Indian Creek	Ephemeral	46.0	0.0	0.03	Modified Class II PHWH	258	0.02	258	284	0.02	284	628	0.04	628	728	0.05	728	258	0.02	258	263	0.02	263	628	0.04	628	728	0.05	728	628	0.04	628	704	0.05	704
S4-181	Unnamed Trib. Indian Creek	Ephemeral	77.0	0.0	0.12	Class III PHWH	542	0.10	0	651	0.12	0	516	0.09	0	623	0.11	0	542	0.10	0	608	0.11	0	533	0.10	0	623	0.11	0	516	0.09	0	586	0.11	0
S4-182	Unnamed Trib. Indian Creek	Ephemeral	71.0	0.0	0.03	Class III PHWH	0	0.00	0	0	0.00	0	48	0.01	48	106	0.02	106	0	0.00	0	0	0.00	0	14	0.01	14	77	0.01	77	48	0.01	48	61	0.01	61
S4-183	Unnamed Trib. Indian Creek	Ephemeral	44.0	0.0	0.80	Class II PHWH	0	0.00	0	0	0.00	0	855	0.12	855	1,041	0.14	1,041	0	0.00	0	0	0.00	0	861	0.12	861	1,043	0.14	1,043	855	0.12	855	1,041	0.14	1,041
S4-186pt1	Unnamed Trib. Indian Creek	Intermittent	74.0	0.0	0.86	Class III PHWH	0	0.00	0	0	0.00	0	331	0.16	0	504	0.24	0	0	0.00	0	0	0.00	0	336	0.16	0	493	0.24	0	331	0.16	0	504	0.24	0
S4-186pt2	Unnamed Trib. Indian Creek	Intermittent	54.0	0.0	0.92	Class III PHWH	516	0.28	0	628	0.35	0	0	0.00	0	0	0.00	0	516	0.28	0	592	0.33	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-188	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.25	Class II PHWH	0	0.00	0	0	0.00	0	678	0.08	678	901	0.10	901	0	0.00	0	0	0.00	0	665	0.08	665	901	0.10	901	678	0.08	678	901	0.10	901
S4-189pt1	Indian Creek	Perennial	0.0	42.0	22.60	Modified Warmwater Habitat	0	0.00	0	0	0.00	0	415	0.29	0	733	0.50	0	0	0.00	0	0	0.00	0	451	0.31	0	611	0.42	0	415	0.29	0	733	0.50	0
S4-189pt2	Indian Creek	Perennial	0.0	71.0	24.32	Warmwater Habitat	440	0.25	0	623	0.36	0	0	0.00	0	0	0.00	0	465	0.27	0	672	0.39	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-190pt1	Unnamed Trib. Indian Creek	Ephemeral	27.0	0.0	0.12	Class I PHWH	486	0.03	0	686	0.05	0	0	0.00	0	0	0.00	0	510	0.04	0	722	0.05	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-190pt2	Unnamed Trib. Indian Creek	Ephemeral	27.0	0.0	0.21	Class I PHWH	0	0.00	0	0	0.00	0	408	0.06	0	532	0.08	0	0	0.00	0	0	0.00	0	431	0.07	0	568	0.09	0	346	0.05	0	532	0.08	0
S4-192	Unnamed Trib. Indian Creek	Ephemeral	59.0	0.0	0.17	Class III PHWH	0	0.00	0	0	0.00	0	355	0.06	0	495	0.08	0	0	0.00	0	0	0.00	0	362	0.06	0	495	0.08	0	355	0.06	0	495	0.08	0
S4-193	Unnamed Trib. Indian Creek	Ephemeral	61.0	0.0	0.11	Class III PHWH	0	0.00	0	0	0.00	0	126	0.04	0	185	0.06	0	0	0.00	0	0	0.00	0	128	0.04	0	185	0.06	0	127	0.04	0	185	0.06	0
S4-195	Unnamed Trib. Indian Creek	Ephemeral	35.0	0.0	0.06	Modified Class II PHWH	361	0.03	0	362	0.03	0	0	0.00	0	0	0.00	0	357	0.03	0	444	0.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-197	Unnamed Trib. Indian Creek	Ephemeral	25.0	0.0	0.02	Class I PHWH	183	0.01	0	209	0.01	0	0	0.00	0	0	0.00	0	176	0.01	0	295	0.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-198	Unnamed Trib. Indian Creek	Ephemeral	54.0	0.0	0.12	Class II PHWH	0	0.00	0	0	0.00	0	478	0.05	105	693	0.08	197	0	0.00	0	0	0.00	0	483	0.06	110	699	0.08	198	478	0.05	105	693	0.08	197
S4-199	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	209	0.01	0	209	0.01	0	0	0.00	0	0	0.00	0	209	0.01	0	209	0.01	0	209	0.01	0	209	0.01	0
S4-200	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.03	Class II PHWH	0	0.00	0	0	0.00	0	65	0.01	0	158	0.01	0	0	0.00	0	0	0.00	0	70	0.01	0	158	0.01	0	65	0.01	0	158	0.01	0
S4-201	Unnamed Trib. Indian Creek	Ephemeral	20.0	0.0	0.01	Modified Class I PHWH	0	0.00	0	0	0.00	0	455	0.03	455	612	0.04	612	0	0.00	0	0	0.00	0	418	0.03	418	629	0.04	629	455	0.03	455	612	0.04	612
S4-202	Unnamed Trib. Indian Creek	Ephemeral	26.0	0.0	0.02	Class I PHWH	453	0.03	0	535	0.04	0	0	0.00	0	0	0.00	0	441	0.03	0	636	0.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-203	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.04	Class II PHWH	152	0.01	152	184	0.02	184	0	0.00	0	0	0.00	0	147	0.01	147	205	0.02	205	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-204	Unnamed Trib. Indian Creek	Ephemeral	35.0	0.0	0.04	Class I PHWH	470	0.03	470	532	0.04	532	0	0.00	0	0	0.00	0	459	0.03	459	553	0.04	553	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-205	Unnamed Trib. Indian Creek	Ephemeral	34.0	0.0	0.12	Modified Class II PHWH	408	0.04	0	454	0.04	0	0	0.00	0	0	0.00	0	397	0.04	0	631	0.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-208pt1	Unnamed Trib. Indian Creek	Intermittent	57.0	0.0	0.74	Class II PHWH	1,300	0.21	1,052	1,547	0.25	1,229	76	0.01	0	85	0.01	0	1,323	0.21	1,075	1,518	0.24	1,384	76	0.01	0	95	0.02	0	76	0.01	0	85	0.01	0
S4-208pt2	Unnamed Trib. Indian Creek	Intermittent	79.0	0.0	0.33	Class III PHWH	0	0.00	0	0	0.00	0	1,435	0.48	1,435	1,546	0.51	1,546	1,336	0.44	1,336	1,437	0.48	1,437	0	0.00	0	0	0.00	0	1,436	0.48	1,436	1,546	0.51	1,546
S4-	Unnamed Trib. Indian	Intermittent	67.0	0.0	0.15	Class III	0	0.00	0	0	0.00	0	1,213	0.22	1,213	1,624	0.30	1,624	1,484	0.27	1,484	1,528	0.28	1,528	0	0.00	0	0	0.00	0	1,213	0.22	1,213	1,624	0.30	1,624

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
208pt3	Creek					PHWH																														
S4-210	Unnamed Trib. Indian Creek	Ephemeral	23.0	0.0	0.01	Class I PHWH	223	0.02	223	264	0.02	264	0	0.00	0	0	0.00	0	210	0.01	210	269	0.02	269	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-211	Unnamed Trib. Indian Creek	Ephemeral	55.0	0.0	0.01	Class III PHWH	298	0.02	298	308	0.02	308	0	0.00	0	0	0.00	0	272	0.02	272	330	0.02	330	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-212pt1	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.01	Class II PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	12	0.01	0	81	0.01	0	0	0.00	0	0	0.00	0
S4-212pt2	Unnamed Trib. Indian Creek	Ephemeral	46.0	0.0	0.02	Class II PHWH	368	0.03	368	348	0.03	348	0	0.00	0	0	0.00	0	316	0.03	316	376	0.03	376	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-213	Unnamed Trib. Indian Creek	Ephemeral	33.0	0.0	0.04	Class I PHWH	30	0.01	30	97	0.01	97	0	0.00	0	0	0.00	0	83	0.01	83	195	0.02	195	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-217	Unnamed Trib. Indian Creek	Ephemeral	70.0	0.0	0.04	Class III PHWH	369	0.07	0	450	0.08	0	199	0.04	0	199	0.04	0	366	0.07	0	512	0.09	0	221	0.04	0	194	0.04	0	199	0.04	0	199	0.04	0
S4-218	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	390	0.03	0	390	0.03	0	0	0.00	0	0	0.00	0	286	0.02	286	344	0.02	344	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-219	Unnamed Trib. Indian Creek	Ephemeral	60.0	0.0	0.04	Class III PHWH	481	0.09	0	558	0.10	0	497	0.09	0	549	0.10	0	561	0.10	0	615	0.11	0	333	0.06	0	354	0.07	0	497	0.09	0	549	0.10	0
S4-220	Unnamed Trib. Indian Creek	Ephemeral	20.0	0.0	0.01	Class I PHWH	147	0.01	0	166	0.01	0	0	0.00	0	0	0.00	0	375	0.03	0	444	0.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-225	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.09	Class II PHWH	0	0.00	0	0	0.00	0	308	0.04	308	381	0.04	381	386	0.04	386	352	0.04	352	0	0.00	0	0	0.00	0	308	0.04	308	381	0.04	381
S4-226	Unnamed Trib. Indian Creek	Ephemeral	15.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	0	0.00	0	167	0.01	167	240	0.01	240	246	0.01	246	0	0.00	0	0	0.00	0	0	0.00	0	167	0.01	167
S4-228	Unnamed Trib. Indian Creek	Ephemeral	60.0	0.0	0.02	Class III PHWH	610	0.06	0	654	0.06	0	432	0.04	0	426	0.04	0	453	0.04	0	543	0.05	0	539	0.05	0	609	0.06	0	438	0.04	0	426	0.04	0
S4-229	Unnamed Trib. Indian Creek	Ephemeral	44.0	0.0	0.01	Class II PHWH	0	0.00	0	0	0.00	0	515	0.05	515	751	0.07	0	706	0.06	706	751	0.07	0	0	0.00	0	0	0.00	0	526	0.05	526	751	0.07	0
S4-230	Unnamed Trib. Indian Creek	Ephemeral	18.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	447	0.03	0	909	0.06	0	469	0.03	0	1,002	0.07	0	0	0.00	0	0	0.00	0	448	0.03	0	909	0.06	0
S4-235	Unnamed Trib. Indian Creek	Ephemeral	35.0	0.0	0.01	Class I PHWH	659	0.08	160	527	0.06	0	772	0.09	0	772	0.09	0	298	0.03	103	772	0.09	0	772	0.09	0	772	0.09	0	772	0.09	0	772	0.09	0
S4-236	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.01	Class II PHWH	117	0.01	0	117	0.01	0	117	0.01	0	117	0.01	0	52	0.01	0	117	0.01	0	117	0.01	0	117	0.01	0	117	0.01	0	117	0.01	0
S4-237	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.01	Class II PHWH	360	0.02	0	360	0.02	0	360	0.02	0	360	0.02	0	360	0.02	0	360	0.02	0	360	0.02	0	360	0.02	0	360	0.02	0	360	0.02	0
S4-238	Unnamed Trib. Indian Creek	Ephemeral	22.0	0.0	0.01	Class I PHWH	135	0.01	0	135	0.01	0	135	0.01	0	135	0.01	0	135	0.01	0	135	0.01	0	135	0.01	0	135	0.01	0	135	0.01	0	135	0.01	0
S4-239	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.09	Class II PHWH	294	0.03	255	219	0.03	179	1,162	0.13	0	1,162	0.13	0	1,162	0.13	0	1,162	0.13	0	504	0.06	144	401	0.05	42	1,162	0.13	0	1,162	0.13	0
S4-240	Unnamed Trib. Indian Creek	Ephemeral	65.0	0.0	0.01	Class III PHWH	781	0.07	0	775	0.07	0	1,003	0.09	0	1,003	0.09	0	1,003	0.09	0	1,003	0.09	0	771	0.07	0	735	0.07	0	1,003	0.09	0	1,003	0.09	0
S4-241	Unnamed Trib. Indian Creek	Ephemeral	20.0	0.0	0.01	Class I PHWH	211	0.01	0	211	0.01	0	195	0.01	195	208	0.01	208	198	0.01	198	211	0.01	0	211	0.01	0	211	0.01	0	201	0.01	201	208	0.01	208
S4-242	Unnamed Trib. Indian Creek	Ephemeral	31.0	0.0	0.18	Class I PHWH	317	0.03	0	317	0.03	0	230	0.02	230	236	0.02	236	232	0.02	232	262	0.02	262	317	0.03	0	317	0.03	0	236	0.02	236	236	0.02	236
S4-243	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.01	Class II PHWH	1,335	0.12	0	1,335	0.12	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	1,335	0.12	0	1,335	0.12	0	0	0.00	0	0	0.00	0
S4-244	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.02	Class II PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	101	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-245	Indian Creek	Perennial	0.0	63.5	19.76	Warmwater Habitat	338	0.23	0	393	0.27	0	363	0.25	0	707	0.49	0	403	0.28	0	645	0.44	0	463	0.32	0	383	0.26	0	363	0.25	0	707	0.49	0
S4-246	Unnamed Trib. Indian Creek	Ephemeral	38.0	0.0	0.09	Modified Class II PHWH	216	0.02	0	195	0.02	0	581	0.05	0	591	0.05	0	591	0.05	0	591	0.05	0	367	0.03	0	182	0.02	0	581	0.05	0	591	0.05	0
S4-247	Unnamed Trib. Indian Creek	Ephemeral	31.0	0.0	0.14	Class I PHWH	10	0.01	10	309	0.03	309	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	276	0.03	276	309	0.03	309	0	0.00	0	0	0.00	0
S4-248	Unnamed Trib. Indian Creek	Ephemeral	85.0	0.0	0.10	Class III PHWH	393	0.16	0	489	0.20	0	382	0.16	0	466	0.19	0	388	0.16	0	461	0.19	0	393	0.16	0	472	0.20	0	382	0.16	0	466	0.19	0
S4-249	Unnamed Trib. Indian Creek	Ephemeral	37.0	0.0	0.21	Class I PHWH	307	0.05	0	337	0.05	0	328	0.05	0	332	0.05	0	333	0.05	0	332	0.05	0	312	0.05	0	354	0.06	0	328	0.05	0	332	0.05	0
S4-250	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.03	Class II PHWH	315	0.03	315	341	0.03	341	315	0.03	315	334	0.03	334	315	0.03	315	334	0.03	334	315	0.03	315	334	0.03	334	315	0.03	315	334	0.03	334
S4-251	Unnamed Trib. Indian Creek	Ephemeral	56.0	0.0	0.13	Class III PHWH	698	0.21	0	730	0.22	0	692	0.21	0	724	0.22	0	698	0.21	0	724	0.22	0	703	0.21	0	724	0.22	0	692	0.21	0	724	0.22	0
S4-252	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.21	Class II PHWH	730	0.13	0	735	0.13	0	687	0.13	0	748	0.14	0	774	0.14	0	735	0.13	0	706	0.13	0	712	0.13	0	689	0.13	0	748	0.14	0
S4-258	Unnamed Trib. Indian Creek	Ephemeral	66.0	0.0	0.05	Class III PHWH	803	0.07	803	1,025	0.09	854	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	778	0.07	778	961	0.09	961	0	0.00	0	0	0.00	0

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
S4-260	Unnamed Trib. Indian Creek	Ephemeral	72.0	0.0	0.05	Class III PHWH	619	0.13	0	629	0.13	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	599	0.12	0	619	0.13	0	0	0.00	0	0	0.00	0
S4-261	Unnamed Trib. Indian Creek	Ephemeral	24.0	0.0	0.09	Class I PHWH	40	0.01	0	228	0.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	40	0.01	0	227	0.02	0	0	0.00	0	0	0.00	0
S4-264	Unnamed Trib. Indian Creek	Ephemeral	61.0	0.0	0.02	Class III PHWH	586	0.07	0	535	0.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	336	0.04	0	443	0.05	0	0	0.00	0	0	0.00	0
S4-265	Unnamed Trib. Indian Creek	Ephemeral	62.0	0.0	0.03	Class III PHWH	243	0.04	243	323	0.05	323	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	154	0.02	154	294	0.05	294	0	0.00	0	0	0.00	0
S4-266	Unnamed Trib. Indian Creek	Ephemeral	37.0	0.0	0.01	Class I PHWH	542	0.04	0	542	0.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	542	0.04	0	542	0.04	0	0	0.00	0	0	0.00	0
S4-267	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	378	0.03	0	378	0.03	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	378	0.03	0	378	0.03	0	0	0.00	0	0	0.00	0
S4-268	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	405	0.04	0	540	0.05	0	371	0.03	0	511	0.05	0	0	0.00	0	0	0.00	0	416	0.04	0	540	0.05	0
S4-270	Unnamed Trib. Indian Creek	Ephemeral	80.0	0.0	0.30	Class III PHWH	0	0.00	0	0	0.00	0	456	0.07	456	611	0.10	611	436	0.07	436	571	0.09	571	0	0.00	0	0	0.00	0	458	0.07	458	617	0.10	617
S4-273	Unnamed Trib. Indian Creek	Ephemeral	60.0	0.0	0.02	Class III PHWH	0	0.00	0	0	0.00	0	82	0.01	82	109	0.01	109	84	0.01	84	83	0.01	83	0	0.00	0	0	0.00	0	82	0.01	82	109	0.01	109
S4-274	Unnamed Trib. Indian Creek	Ephemeral	19.0	0.0	0.02	Class I PHWH	0	0.00	0	0	0.00	0	213	0.01	213	213	0.01	213	169	0.01	169	207	0.01	207	0	0.00	0	0	0.00	0	213	0.01	213	247	0.01	247
S4-275pt1	Unnamed Trib. Indian Creek	Ephemeral	76.0	0.0	0.56	Class III PHWH	0	0.00	0	0	0.00	0	1,097	0.15	1,097	1,154	0.16	1,154	1,060	0.15	1,060	1,143	0.16	1,143	0	0.00	0	0	0.00	0	1,097	0.15	1,097	1,154	0.16	1,154
S4-275pt2	Unnamed Trib. Indian Creek	Intermittent	49.0	0.0	0.60	Modified Class II PHWH	0	0.00	0	0	0.00	0	906	0.31	906	1,099	0.38	1,099	895	0.31	895	1,080	0.37	1,080	0	0.00	0	0	0.00	0	906	0.31	906	989	0.34	989
S4-276	Unnamed Trib. Indian Creek	Ephemeral	19.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	182	0.01	182	187	0.01	187	153	0.01	153	191	0.01	191	0	0.00	0	0	0.00	0	182	0.01	182	187	0.01	187
S4-277	Unnamed Trib. Indian Creek	Ephemeral	29.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0	0	0.00	0	0	0.00	0	215	0.01	0	215	0.01	0
S4-278	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	221	0.02	0	221	0.02	0	221	0.02	0	221	0.02	0	0	0.00	0	0	0.00	0	221	0.02	0	221	0.02	0
S4-279	Unnamed Trib. Indian Creek	Ephemeral	46.0	0.0	0.01	Class II PHWH	167	0.01	0	197	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	173	0.01	0	206	0.01	0	0	0.00	0	0	0.00	0
S4-280	Unnamed Trib. Indian Creek	Ephemeral	55.0	0.0	0.02	Class III PHWH	98	0.01	0	77	0.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	103	0.01	0	80	0.01	0	0	0.00	0	0	0.00	0
S4-282pt1	Indian Creek	Perennial	0.0	66.0	18.49	Warmwater Habitat	593	0.44	0	836	0.61	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	519	0.38	0	824	0.61	0	0	0.00	0	0	0.00	0
S4-282pt2	Indian Creek	Perennial	0.0	75.5	18.35	Exceptional Warmwater Habitat	0	0.00	0	0	0.00	0	565	0.26	0	742	0.34	0	555	0.25	0	724	0.33	0	0	0.00	0	0	0.00	0	565	0.26	0	678	0.31	0
S4-283pt1	Unnamed Trib. Indian Creek	Intermittent	46.0	0.0	0.25	Class II PHWH	0	0.00	0	0	0.00	0	1,625	0.50	1,625	1,700	0.53	1,700	1,617	0.50	1,617	1,705	0.53	1,705	0	0.00	0	0	0.00	0	1,630	0.51	1,630	1,669	0.52	1,669
S4-283pt2	Unnamed Trib. Indian Creek	Intermittent	54.0	0.0	0.19	Class III PHWH	682	0.34	0	781	0.39	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	638	0.32	0	777	0.39	0	0	0.00	0	0	0.00	0
S4-284	Unnamed Trib. Indian Creek	Ephemeral	50.0	0.0	0.50	Class III PHWH	573	0.07	104	785	0.09	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	591	0.07	66	785	0.09	0	0	0.00	0	0	0.00	0
S4-285	Unnamed Trib. Indian Creek	Intermittent	46.0	0.0	0.23	Class II PHWH	0	0.00	0	0	0.00	0	178	0.03	0	323	0.05	0	217	0.03	0	310	0.05	0	0	0.00	0	0	0.00	0	179	0.03	0	317	0.05	0
S4-287	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.03	Class II PHWH	485	0.04	485	491	0.05	491	348	0.03	348	396	0.04	396	342	0.03	342	381	0.03	381	423	0.04	0	514	0.05	514	350	0.03	350	415	0.04	415
S4-288	Unnamed Trib. Indian Creek	Ephemeral	31.0	0.0	0.13	Class I PHWH	64	0.01	0	159	0.02	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	211	0.02	0	0	0.00	0	0	0.00	0
S4-290	Unnamed Trib. Indian Creek	Ephemeral	35.0	0.0	0.01	Class I PHWH	0	0.00	0	57	0.01	0	134	0.01	0	204	0.01	0	147	0.01	0	203	0.01	0	0	0.00	0	52	0.01	0	134	0.01	0	216	0.01	0
s4-291	Unnamed Trib. Indian Creek	Ephemeral	35.0	0.0	0.01	Class I PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	6	0.01	0
S4-292	Indian Creek	Perennial	0.0	57.5	14.23	Warmwater Habitat	468	0.19	0	691	0.29	0	453	0.19	0	700	0.29	0	453	0.19	0	695	0.29	0	458	0.19	0	716	0.30	0	453	0.19	0	558	0.23	0
S4-296	Unnamed Trib. Indian Creek	Ephemeral	31.0	0.0	0.10	Modified Class II PHWH	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819	1,819	0.17	1,819
S4-297	Unnamed Trib. Indian Creek	Ephemeral	55.0	0.0	0.12	Class III PHWH	130	0.07	130	148	0.08	148	125	0.07	125	148	0.08	148	110	0.06	110	149	0.08	149	135	0.07	135	147	0.08	147	125	0.07	125	151	0.08	151
S4-298	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.05	Class II PHWH	104	0.01	104	160	0.01	160	104	0.01	104	160	0.01	160	104	0.01	104	160	0.01	160	104	0.01	104	160	0.01	160	104	0.01	104	202	0.02	202
S4-299	Unnamed Trib. Indian Creek	Ephemeral	24.0	0.0	0.01	Class I PHWH	150	0.01	0	238	0.02	0	150	0.01	0	238	0.02	0	150	0.01	0	238	0.02	0	150	0.01	0	238	0.02	0	150	0.01	0	241	0.02	0
S4-300	Unnamed Trib. Indian Creek	Ephemeral	50.0	0.0	0.02	Class III PHWH	674	0.06	674	728	0.07	728	674	0.06	674	728	0.07	728	674	0.06	674	728	0.07	728	674	0.06	674	728	0.07	728	674	0.06	674	722	0.07	722
S4-301	Unnamed Trib. Indian	Ephemeral	70.0	0.0	0.07	Class III	139	0.03	0	176	0.03	0	139	0.03	0	176	0.03	0	139	0.03	0	176	0.03	0	139	0.03	0	176	0.03	0	139	0.03	0	159	0.03	0

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
	Creek					PHWH																														
S4-302	Unnamed Trib. Indian Creek	Ephemeral	23.0	0.0	0.01	Class I PHWH	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0	215	0.01	0
S4-303	Unnamed Trib. Indian Creek	Ephemeral	36.0	0.0	0.02	Class I PHWH	251	0.02	251	317	0.02	317	251	0.02	251	317	0.02	317	251	0.02	251	317	0.02	317	251	0.02	251	317	0.02	317	251	0.02	251	317	0.02	317
S4-304	Unnamed Trib. Indian Creek	Ephemeral	69.0	0.0	0.05	Class III PHWH	285	0.03	0	353	0.03	0	285	0.03	0	353	0.03	0	285	0.03	0	353	0.03	0	285	0.03	0	353	0.03	0	285	0.03	0	353	0.03	0
S4-305	Unnamed Trib. Indian Creek	Ephemeral	41.0	0.0	0.01	Class II PHWH	143	0.01	143	178	0.02	0	143	0.01	143	178	0.02	0	143	0.01	143	178	0.02	0	143	0.01	143	178	0.02	0	143	0.01	143	178	0.02	0
S4-306	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.01	Class II PHWH	250	0.02	0	250	0.02	0	250	0.02	0	250	0.02	0	250	0.02	0	250	0.02	0	250	0.02	0	250	0.02	0	250	0.02	0	250	0.02	0
S4-307	Unnamed Trib. Indian Creek	Ephemeral	24.0	0.0	0.01	Class I PHWH	322	0.02	0	377	0.03	0	322	0.02	0	377	0.03	0	322	0.02	0	377	0.03	0	322	0.02	0	377	0.03	0	322	0.02	0	370	0.03	0
S4-310	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.13	Class II PHWH	525	0.08	0	563	0.09	0	525	0.08	0	563	0.09	0	525	0.08	0	563	0.09	0	525	0.08	0	563	0.09	0	525	0.08	0	652	0.10	0
S4-312	Unnamed Trib. Indian Creek	Ephemeral	44.0	0.0	0.04	Class II PHWH	107	0.02	107	120	0.02	120	107	0.02	107	120	0.02	120	107	0.02	107	120	0.02	120	107	0.02	107	120	0.02	120	107	0.02	107	197	0.03	197
S4-313	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.02	Class I PHWH	332	0.02	0	332	0.02	0	332	0.02	0	332	0.02	0	332	0.02	0	332	0.02	0	332	0.02	0	332	0.02	0	332	0.02	0	332	0.02	0
S4-314	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	203	0.01	0	203	0.01	0	203	0.01	0	203	0.01	0	203	0.01	0	203	0.01	0	203	0.01	0	203	0.01	0	203	0.01	0	203	0.01	0
S4-316	Unnamed Trib. Indian Creek	Intermittent	60.0	0.0	0.40	Class III PHWH	1,403	0.23	1,403	1,363	0.22	1,363	1,403	0.23	1,403	1,363	0.22	1,363	1,403	0.23	1,403	1,363	0.22	1,363	1,403	0.23	1,403	1,363	0.22	1,363	1,405	0.23	1,405	1,418	0.23	1,418
S4-317	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	251	0.02	0	215	0.01	0	251	0.02	0	215	0.01	0	251	0.02	0	215	0.01	0	251	0.02	0	215	0.01	0	251	0.02	0	245	0.02	0
S4-318	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	113	0.01	113	58	0.01	58	113	0.01	113	58	0.01	58	113	0.01	113	58	0.01	58	113	0.01	113	58	0.01	58	113	0.01	113	73	0.01	73
S4-319	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.02	Class I PHWH	338	0.02	0	338	0.02	0	338	0.02	0	338	0.02	0	338	0.02	0	338	0.02	0	338	0.02	0	338	0.02	0	338	0.02	0	338	0.02	0
S4-320	Unnamed Trib. Indian Creek	Ephemeral	31.0	0.0	0.01	Class I PHWH	82	0.01	82	96	0.01	96	82	0.01	82	96	0.01	96	82	0.01	82	96	0.01	96	82	0.01	82	96	0.01	96	82	0.01	82	98	0.01	98
S4-321	Unnamed Trib. Indian Creek	Ephemeral	45.0	0.0	0.04	Class II PHWH	22	0.01	22	36	0.01	36	22	0.01	22	36	0.01	36	22	0.01	22	36	0.01	36	22	0.01	22	36	0.01	36	22	0.01	22	23	0.01	23
S4-322	Unnamed Trib. Indian Creek	Ephemeral	55.0	0.0	0.03	Class III PHWH	0	0.00	0	37	0.01	37	0	0.00	0	37	0.01	37	0	0.00	0	37	0.01	37	0	0.00	0	37	0.01	37	0	0.00	0	0	0.00	0
S4-323	Unnamed Trib. Indian Creek	Ephemeral	40.0	0.0	0.02	Class II PHWH	540	0.05	540	487	0.04	487	540	0.05	540	487	0.04	487	540	0.05	540	487	0.04	487	540	0.05	540	487	0.04	487	540	0.05	540	510	0.05	510
S4-324	Unnamed Trib. Indian Creek	Ephemeral	29.0	0.0	0.02	Class I PHWH	538	0.04	0	514	0.04	0	538	0.04	0	514	0.04	0	538	0.04	0	514	0.04	0	538	0.04	0	514	0.04	0	538	0.04	0	513	0.04	0
S4-325	Unnamed Trib. Indian Creek	Ephemeral	30.0	0.0	0.01	Class I PHWH	157	0.01	0	157	0.01	0	157	0.01	0	157	0.01	0	157	0.01	0	157	0.01	0	157	0.01	0	157	0.01	0	157	0.01	0	157	0.01	0
S4-327	Unnamed Trib. Indian Creek	Ephemeral	23.0	0.0	0.12	Class I PHWH	107	0.01	0	107	0.01	0	107	0.01	0	107	0.01	0	107	0.01	0	107	0.01	0	107	0.01	0	107	0.01	0	107	0.01	0	107	0.01	0
S4-328	Unnamed Trib. Indian Creek	Ephemeral	41.0	0.0	0.19	Class II PHWH	533	0.13	0	485	0.12	0	533	0.13	0	485	0.12	0	533	0.13	0	485	0.12	0	533	0.13	0	485	0.12	0	533	0.13	0	688	0.17	0
S4-329	Unnamed Trib. Indian Creek	Intermittent	20.0	0.0	0.11	Class I PHWH	494	0.03	0	557	0.04	0	494	0.03	0	557	0.04	0	494	0.03	0	557	0.04	0	494	0.03	0	557	0.04	0	494	0.03	0	631	0.04	0
S4-330	Unnamed Trib. Clear Creek	Ephemeral	38.0	0.0	0.01	Class I PHWH	162	0.01	0	301	0.02	0	162	0.01	0	301	0.02	0	162	0.01	0	301	0.02	0	162	0.01	0	301	0.02	0	162	0.01	0	208	0.01	0
S4-331	Unnamed Trib. Clear Creek	Ephemeral	43.0	0.0	0.10	Class II PHWH	232	0.03	0	287	0.03	0	232	0.03	0	287	0.03	0	232	0.03	0	287	0.03	0	232	0.03	0	287	0.03	0	232	0.03	0	293	0.03	0
S4-332	Unnamed Trib. Clear Creek	Ephemeral	41.0	0.0	0.05	Class II PHWH	595	0.05	0	595	0.05	0	595	0.05	0	595	0.05	0	595	0.05	0	595	0.05	0	595	0.05	0	595	0.05	0	595	0.05	0	595	0.05	0
S4-334	Unnamed Trib. Clear Creek	Ephemeral	50.0	0.0	0.10	Class II PHWH	371	0.04	0	781	0.09	0	371	0.04	0	781	0.09	0	371	0.04	0	781	0.09	0	371	0.04	0	781	0.09	0	371	0.04	0	571	0.07	0
S4-335	Unnamed Trib. Clear Creek	Ephemeral	33.0	0.0	0.15	Class I PHWH	346	0.05	0	646	0.09	0	346	0.05	0	646	0.09	0	346	0.05	0	646	0.09	0	346	0.05	0	646	0.09	0	346	0.05	0	549	0.08	0
S4-338	Unnamed Trib. Clear Creek	Ephemeral	13.0	0.0	0.16	Class I PHWH	591	0.03	0	728	0.04	0	591	0.03	0	728	0.04	0	591	0.03	0	728	0.04	0	591	0.03	0	728	0.04	0	591	0.03	0	778	0.04	0
S4-340	Unnamed Trib. Clear Creek	Ephemeral	61.0	0.0	0.19	Class III PHWH	0	0.00	0	53	0.01	0	0	0.00	0	53	0.01	0	0	0.00	0	53	0.01	0	0	0.00	0	53	0.01	0	0	0.00	0	0	0.00	0
S4-342	Unnamed Trib. Clear Creek	Intermittent	41.0	0.0	0.19	Class II PHWH	519	0.12	0	659	0.15	0	519	0.12	0	659	0.15	0	519	0.12	0	659	0.15	0	519	0.12	0	659	0.15	0	519	0.12	0	623	0.14	0
S4-343	Unnamed Trib. Clear Creek	Intermittent	65.0	0.0	0.31	Modified Class II PHWH	858	0.22	0	1,412	0.36	1,412	858	0.22	0	1,412	0.36	1,412	858	0.22	0	1,412	0.36	1,412	858	0.22	0	1,412	0.36	1,412	858	0.22	0	1,227	0.31	1,227
S4-346	Unnamed Trib. Clear Creek	Ephemeral	35.0	0.0	0.09	Class I PHWH	0	0.00	0	893	0.12	893	0	0.00	0	893	0.12	893	0	0.00	0	893	0.12	893	0	0.00	0	893	0.12	893	0	0.00	0	465	0.06	465

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
S4-348	Unnamed Trib. Clear Creek	Intermittent	65.0	0.0	0.13	Class III PHWH	691	0.19	0	861	0.24	0	691	0.19	0	861	0.24	0	691	0.19	0	861	0.24	0	691	0.19	0	861	0.24	0	691	0.19	0	765	0.21	0
S4-349	Unnamed Trib. Clear Creek	Ephemeral	30.0	0.0	0.17	Class I PHWH	517	0.04	0	517	0.04	0	517	0.04	0	517	0.04	0	517	0.04	0	517	0.04	0	517	0.04	0	517	0.04	0	517	0.04	0	517	0.04	0
S4-350	Unnamed Trib. Clear Creek	Ephemeral	20.0	0.0	0.13	Class I PHWH	442	0.01	442	509	0.01	0	442	0.01	442	509	0.01	0	442	0.01	442	509	0.01	0	442	0.01	442	509	0.01	0	442	0.01	442	509	0.01	0
S4-351	Unnamed Trib. Clear Creek	Ephemeral	34.0	0.0	0.16	Class I PHWH	410	0.07	0	563	0.09	0	410	0.07	0	563	0.09	0	410	0.07	0	563	0.09	0	410	0.07	0	563	0.09	0	410	0.07	0	496	0.08	0
S4-352	Unnamed Trib. Clear Creek	Ephemeral	26.0	0.0	0.02	Class I PHWH	676	0.05	0	676	0.05	0	676	0.05	0	676	0.05	0	676	0.05	0	676	0.05	0	676	0.05	0	676	0.05	0	676	0.05	0	676	0.05	0
S4-353	Unnamed Trib. Clear Creek	Ephemeral	44.0	0.0	0.01	Class II PHWH	633	0.12	0	592	0.11	592	633	0.12	0	617	0.11	617	633	0.12	0	620	0.11	620	633	0.12	0	617	0.11	617	633	0.12	0	617	0.11	617
S4-354	Unnamed Trib. Clear Creek	Ephemeral	78.0	0.0	0.64	Class III PHWH	403	0.05	0	504	0.06	0	403	0.05	0	504	0.06	0	403	0.05	0	504	0.06	0	403	0.05	0	504	0.06	0	403	0.05	0	454	0.05	0
S4-355	Unnamed Trib. Clear Creek	Ephemeral	39.0	0.0	0.10	Class I PHWH	310	0.03	0	369	0.03	0	310	0.03	0	369	0.03	0	310	0.03	0	369	0.03	0	310	0.03	0	369	0.03	0	310	0.03	0	369	0.03	0
S4-359	Unnamed Trib. Clear Creek	Ephemeral	70.0	0.0	0.97	Class III PHWH	233	0.05	0	565	0.12	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-360	Unnamed Trib. Clear Creek	Ephemeral	52.0	0.0	0.80	Class III PHWH	511	0.08	511	579	0.09	0	306	0.05	0	357	0.06	0	0	0.00	0	0	0.00	0	306	0.05	0	357	0.06	0	306	0.05	0	357	0.06	0
S4-361	Unnamed Trib. Clear Creek	Ephemeral	41.0	0.0	0.85	Class II PHWH	400	0.04	0	444	0.05	0	397	0.04	0	475	0.05	0	0	0.00	0	0	0.00	0	397	0.04	0	475	0.05	0	397	0.04	0	476	0.05	0
S4-363	Unnamed Trib. Clear Creek	Ephemeral	40.0	0.0	0.90	Class II PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	413	0.04	0	481	0.04	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-364	Unnamed Trib. Clear Creek	Ephemeral	49.0	0.0	0.48	Class II PHWH	0	0.00	0	0	0.00	0	179	0.02	179	332	0.03	332	0	0.00	0	0	0.00	0	179	0.02	179	332	0.03	332	179	0.02	179	332	0.03	332
S4-365	Unnamed Trib. Clear Creek	Perennial	0.0	72.5	1.90	Warmwater Habitat	668	0.58	0	1,086	0.95	0	1,161	1.01	0	1,398	1.22	0	0	0.00	0	0	0.00	0	1,161	1.01	0	1,398	1.22	0	1,161	1.01	0	1,398	1.22	0
S4-366	Unnamed Trib. Clear Creek	Perennial	0.0	71.0	4.59	Warmwater Habitat	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	526	0.56	0	609	0.64	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-367pt1	Unnamed Trib. Clear Creek	Ephemeral	60.0	0.0	0.43	Modified Class II PHWH	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	564	0.08	564	688	0.09	688	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-367pt2	Unnamed Trib. Clear Creek	Ephemeral	67.0	0.0	0.40	Modified Class II PHWH	0	0.00	0	0	0.00	0	490	0.13	0	647	0.17	0	0	0.00	0	0	0.00	0	490	0.13	0	647	0.17	0	490	0.13	0	647	0.17	0
S4-367pt3	Unnamed Trib. Clear Creek	Ephemeral	45.0	0.0	0.29	Class II PHWH	472	0.09	0	549	0.10	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-368	Unnamed Trib. Clear Creek	Ephemeral	44.0	0.0	0.16	Class II PHWH	530	0.09	530	413	0.07	413	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-370	Unnamed Trib. Clear Creek	Ephemeral	37.0	0.0	0.02	Class I PHWH	656	0.11	560	1,158	0.19	1,000	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-372pt1	Unnamed Trib. Clear Creek	Perennial	0.0	68.0	13.88	Warmwater Habitat	420	0.37	0	804	0.70	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-372pt2	Unnamed Trib. Clear Creek	Perennial	0.0	72.0	12.24	Warmwater Habitat	0	0.00	0	0	0.00	0	460	0.20	0	813	0.35	0	370	0.16	0	830	0.36	0	460	0.20	0	813	0.35	0	460	0.20	0	813	0.35	0
S4-373	Unnamed Trib. Clear Creek	Ephemeral	13.0	0.0	0.71	Class I PHWH	1,006	0.06	1,006	1,324	0.08	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-374pt1	Unnamed Trib. Clear Creek	Intermittent	48.0	0.0	0.75	Class II PHWH	0	0.00	0	0	0.00	0	994	0.18	0	1,366	0.25	0	994	0.18	0	1,390	0.26	0	994	0.18	0	1,366	0.25	0	994	0.18	0	1,366	0.25	0
S4-374pt2	Unnamed Trib. Clear Creek	Intermittent	51.0	0.0	0.65	Class III PHWH	727	0.17	0	1,045	0.24	1,045	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-375	Unnamed Trib. Clear Creek	Ephemeral	20.0	0.0	0.03	Class I PHWH	228	0.01	228	322	0.01	322	503	0.01	0	512	0.01	0	479	0.01	0	504	0.01	0	503	0.01	0	512	0.01	0	474	0.01	0	512	0.01	0
S4-376	Unnamed Trib. Clear Creek	Ephemeral	22.0	0.0	0.03	Class I PHWH	0	0.00	0	34	0.01	34	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
S4-377	Unnamed Trib. Clear Creek	Ephemeral	27.0	0.0	0.04	Modified Class I PHWH	1,336	0.21	0	1,455	0.23	0	553	0.09	0	783	0.13	0	553	0.09	0	753	0.12	0	553	0.09	0	783	0.13	0	553	0.09	0	783	0.13	0
S4-378	Unnamed Trib. Clear Creek	Ephemeral	21.0	0.0	0.09	Class I PHWH	77	0.01	77	133	0.01	133	364	0.03	0	463	0.03	0	364	0.03	0	462	0.03	0	364	0.03	0	463	0.03	0	365	0.03	0	463	0.03	0
S4-379	Unnamed Trib. Clear Creek	Ephemeral	35.0	0.0	0.09	Class I PHWH	133	0.01	133	196	0.02	196	489	0.04	0	533	0.05	533	495	0.05	0	533	0.05	533	489	0.04	0	533	0.05	533	489	0.04	0	533	0.05	533
S4-380	Unnamed Trib. Clear Creek	Ephemeral	21.0	0.0	0.04	Class I PHWH	194	0.01	194	205	0.01	205	385	0.03	385	440	0.03	440	385	0.03	385	440	0.03	440	385	0.03	385	440	0.03	440	385	0.03	385	440	0.03	440
S4-381	Unnamed Trib. Clear Creek	Ephemeral	62.0	0.0	0.12	Class III PHWH	991	0.14	0	991	0.14	0	991	0.14	0	991	0.14	0	991	0.14	0	991	0.14	0	991	0.14	0	991	0.14	0	991	0.14	0	991	0.14	0
S4-383	Unnamed Trib. Clear Creek	Ephemeral	23.0	0.0	0.01	Class I PHWH	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0	124	0.01	0
S4-385	Unnamed Trib. Clear Creek	Ephemeral	24.0	0.0	0.02	Modified Class I PHWH	7	0.01	0	14	0.01	0	7	0.01	0	14	0.01	0	7	0.01	0	14	0.01	0	7	0.01	0	14	0.01	0	7	0.01	0	14	0.01	0

Table 5.19-7: Potential Stream Impacts and Potential Stream Relocation Length by Alternative

Stream ID#	Stream Name	USGS Stream Type	HHEI Score	QHEI Score	Drain. Area (mi ^{2})	Stream Habitat Classification	Alternative 1						Alternative 2						Alternative 3						Alternative 4						Refined Preferred Alternative 2					
							Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria			Low-Cost Design Criteria			Initial Design Criteria		
							LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.	LF In ROW	AC In ROW	LF Relo.
S4-386	Unnamed Trib. Clear Creek	Ephemeral	13.0	0.0	0.02	Class I PHWH	40	0.01	0	0	0.00	0	30	0.01	0	22	0.01	0	30	0.01	0	8	0.01	0	30	0.01	0	22	0.01	0	30	0.01	0	22	0.01	0
S4-389	Unnamed Trib. Indian Creek	Ephemeral	28.0	0.0	0.80	Class I PHWH	985	0.09	0	985	0.09	0	5	0.01	5	30	0.01	30	985	0.09	0	985	0.09	0	5	0.01	5	30	0.01	30	5	0.01	5	30	0.01	30
S4-391	Unnamed Trib. Indian Creek	Ephemeral	55.0	0.0	0.16	Class III PHWH	495	0.20	0	656	0.27	0	588	0.24	0	611	0.25	0	504	0.21	0	611	0.25	0	517	0.21	0	580	0.24	0	588	0.24	0	534	0.22	0
S4-393	Unnamed Trib. Black Ankle Creek	Ephemeral	11.0	0.0	0.09	Class I PHWH	67	0.01	0	271	0.01	0	67	0.01	0	271	0.01	0	67	0.01	0	271	0.01	0	67	0.01	0	271	0.01	0	67	0.01	0	272	0.01	0
S4-394	Unnamed Trib. Plummer Creek	Intermittent	57.0	0.0	0.24	Class III PHWH	147	0.04	0	208	0.05	0	147	0.04	0	208	0.05	0	147	0.04	0	208	0.05	0	147	0.04	0	208	0.05	0	147	0.04	0	208	0.05	0
S4-395	Unnamed Trib. Dry Branch Creek	Ephemeral	11.0	0.0	0.03	Class I PHWH	427	0.02	427	734	0.03	0	427	0.02	427	734	0.03	0	427	0.02	427	734	0.03	0	427	0.02	427	734	0.03	0	427	0.02	427	734	0.03	0
S4-396	Unnamed Trib. Plummer Creek	Ephemeral	45.0	0.0	0.40	Class II PHWH	0	0.00	0	466	0.07	466	0	0.00	0	466	0.07	466	0	0.00	0	466	0.07	466	0	0.00	0	466	0.07	466	0	0.00	0	466	0.07	466
S4-397	Unnamed Trib. Little Clifty Branch	Ephemeral	57.0	0.0	0.12	Class III PHWH	320	0.08	320	320	0.08	320	320	0.08	320	320	0.08	320	320	0.08	320	320	0.08	320	320	0.08	320	320	0.08	320	320	0.08	320	320	0.08	320
S4-398	Unnamed Trib. Little Clifty Branch	Ephemeral	77.0	0.0	0.11	Class III PHWH	271	0.05	271	255	0.05	255	271	0.05	271	255	0.05	255	271	0.05	271	255	0.05	255	271	0.05	271	255	0.05	255	271	0.05	271	255	0.05	255
S4-399	Unnamed Trib. Little Clifty Branch	Ephemeral	59.0	0.0	0.12	Class III PHWH	518	0.10	0	518	0.10	0	518	0.10	0	518	0.10	0	518	0.10	0	518	0.10	0	518	0.10	0	518	0.10	0	518	0.10	0	518	0.10	0
S4-400	Unnamed Trib. Mitchell Branch	Ephemeral	44.0	0.0	0.51	Class II PHWH	94	0.01	94	240	0.02	240	94	0.01	94	240	0.02	240	94	0.01	94	240	0.02	240	94	0.01	94	240	0.02	240	94	0.01	94	185	0.02	185
S4-401	Unnamed Trib. Mitchell Branch	Intermittent	80.0	0.0	0.48	Class III PHWH	484	0.20	0	442	0.18	0	484	0.20	0	442	0.18	0	484	0.20	0	442	0.18	0	484	0.20	0	442	0.18	0	484	0.20	0	442	0.18	0
S4-402	Unnamed Trib. Indian Creek	Intermittent	84.0	0.0	0.79	Class III PHWH	0	0.00	0	0	0.00	0	249	0.11	0	355	0.16	0	0	0.00	0	0	0.00	0	244	0.11	0	355	0.16	0	249	0.11	0	355	0.16	0
S4-403	Unnamed Trib. Indian Creek	Intermittent	55.0	0.0	0.17	Class III PHWH	583	0.40	0	573	0.39	0	462	0.32	0	512	0.35	0	458	0.32	0	496	0.34	0	558	0.38	0	684	0.47	0	464	0.32	0	536	0.37	0
S4-404	Unnamed Trib. Indian Creek	Ephemeral	60.0	0.0	0.40	Class III PHWH	0	0.00	0	28	0.01	0	0	0.00	0	28	0.01	0	0	0.00	0	28	0.01	0	0	0.00	0	28	0.01	0	0	0.00	0	0	0.00	0
S4-405	Unnamed Trib. Clear Creek	Ephemeral	36.0	0.0	0.10	Modified Class II PHWH	372	0.06	372	494	0.07	0	372	0.06	372	494	0.07	0	372	0.06	372	494	0.07	0	372	0.06	372	494	0.07	0	372	0.06	372	458	0.07	458
S4-406	Unnamed Trib. Clear Creek	Intermittent	62.0	0.0	0.30	Class III PHWH	301	0.17	301	877	0.50	877	301	0.17	301	877	0.50	877	301	0.17	301	877	0.50	877	301	0.17	301	877	0.50	877	301	0.17	301	851	0.48	851
S4-407	Unnamed Trib. Clear Creek	Intermittent	80.0	0.0	0.88	Class III PHWH	3	0.01	0	162	0.09	0	3	0.01	0	162	0.09	0	3	0.01	0	162	0.09	0	3	0.01	0	162	0.09	0	3	0.01	0	115	0.06	0
S4-408	Unnamed Trib. Clear Creek	Ephemeral	62.0	0.0	0.10	Class III PHWH	162	0.07	0	236	0.09	0	162	0.07	0	236	0.09	0	162	0.07	0	236	0.09	0	162	0.07	0	236	0.09	0	162	0.06	0	233	0.09	0
						Grand Total	**93,467**	**15.46**	**28,338**	**111,725**	**19.48**	**34,069**	**93,110**	**15.79**	**30,827**	**112,801**	**19.80**	**38,556**	**93,610**	**15.09**	**31,328**	**112,698**	**18.64**	**37,950**	**90,053**	**15.33**	**24,876**	**108,083**	**19.12**	**32,367**	**93,196**	**15.80**	**30,861**	**111,247**	**19.42**	**37,325**

ABBREVIATIONS:
LF = Linear feet, USGS = United States Geological Survey, HHEI = Headwater Habitat Evaluation Index ,QHEI = Qualitative Headwater Evaluation Index, Relo. = Relocation, Ripar. = Riparian, ROW = Right-of-way, UT = Unnamed Tributary
NOTE:**Width of the ordinary high water mark (OHWM) x linear feet of impact = acres of impact.

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Floodplains

According to Map No. 1804360005A for Greene County (effective date July 21, 1978), the project crosses the 100-year floodplains of Black Ankle Creek and Dry Branch Creek transversely, i.e., it crosses directly over the creek. All four alternatives and Refined Preferred Alternative 2 cross Black Ankle Creek and Dry Branch Creek in the same location resulting in the same floodplain impacts. According to Map No. 1804360006A for Greene County, the project crosses the 100-year floodplain of Plummer Creek transversely. All four alternatives and Refined Preferred Alternative 2 cross Plummer Creek in the same location resulting in the same floodplain impacts.

According to Map No. 1804360003A for Greene County, and Map No. 1804440005B for Monroe County (effective date April 1, 1988), the project crosses the 100-year floodplain of Indian Creek in the following locations, depending on the alternative:

- Alternatives 1 and 3 have similar impacts from a transverse crossing of the floodplain (south crossing) approximately one mile south of Carmichael Road (due west of the CR 100S/W. Rock East Rd Intersection).
- Alternatives 2, 4, and Refined Preferred Alternative 2 have similar impacts from a minor longitudinal encroachment approximately 3,200 feet south of Carmichael road.
- At Carmichael Road, Alternatives 2, 4, and Refined Preferred Alternative 2 have similar impacts from transverse crossings of the floodplain (south crossing). Alternative 1 and 3 both have minor longitudinal floodplain encroachments along Carmichael Road. Alternative 1 has slightly more floodplain impact than Alternative 3 in this location.
- Each alternative has a transverse crossing of the Indian Creek floodplain along the South Connector Road for the Greene/Monroe County Line interchange. Alternatives 2, 3, and Refined Preferred Alternative 2 cross in an area with a slightly wider floodplain than Alternatives 1 and 4.
- Each alternative has a transverse crossing of the floodplain (middle crossing) approximately three-quarters of a mile north of Carter Road. Alternatives 2, 3, and Refined Preferred Alternative 2 cross in an area with a slightly wider floodplain than Alternatives 1 and 4.
- All four alternatives and Refined Preferred Alternative 2 cross the Indian Creek floodplain (north crossing) just west of Breeden Road in the same location and have equal floodplain impacts.

According to Map No. 1804440005B for Monroe County, the project crosses the 100-year floodplain of Clear Creek as it extends northwesterly into the Section 4 corridor along an unnamed tributary to Clear Creek transversely. Alternatives 2, 3, 4 and Refined Preferred Alternative 2 cross the floodplain in the same location resulting in the same floodplain impacts. Alternative 1 crosses this unnamed tributary to Clear Creek upstream of the limits of the designated floodplain.

In all, the impacts to floodplains range from 31.01 acres (Alternative 1, using the low-cost design criteria) to 53.93 acres (Alternative 3, using the initial design criteria) and are shown on **Table 5.19-8.**

Table 5.19-8: Floodplain Impacts

	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Acres of Impact	31.01	43.73	36.26	53.07	38.45	53.93	32.25	45.20	36.26	50.97

Hydraulic analysis will be performed in the vicinity of stream crossings which require bridges to ensure that the proposed crossings will not result in significant increases in flooding. This includes crossings of Black Ankle Creek, Plummer Creek, Dry Branch, Indian Creek (four crossings), and Clear Creek Tributaries. The creek openings of the proposed bridges over these streams would be sized so that 100-year floodway elevations would not be substantially affected. There would be no significant change in flood risk due to I-69 and there would be no increase in potential for interruption or termination of emergency service or emergency evacuation routes. Flood easements[5] may be acquired if determined appropriate.

Surface Water Quality

In accordance with Section 305(b) of the Clean Water Act (CWA), IDEM publishes the annual *Integrated Water Quality Monitoring and Assessment Report*. This report includes the Section 303(d) (CWA) List of Impaired Waters for the State of Indiana (IDEM 2008).[6] These are water bodies that do not or are not expected to meet applicable water quality standards with federal technology based standards alone. A review of the 2008 list shows there are no impaired stream systems within the Section 4 corridor. Impaired waters downstream of the Section 4 corridor include White River (West Fork) (Impaired Biotic Communities and Fish Consumption Advisories for PCBs and Mercury), Lower East Fork White River (Fish Consumption Advisories for PCBs and Mercury), and Clear Creek (Fish Consumption Advisories for PCBs). **Figure 5.19-4** (p. 5-621) shows the location of impaired streams in the vicinity of Section 4.

The **Lower White River Watershed** and **Lower East Fork White River Watershed** are the two major watersheds traversed by the project corridor. These watersheds are briefly described in Chapter 4, Section 4.3.2, *Water Resources*. Information regarding water quality in the two major watersheds and their sub-watersheds within the project corridor is summarized below.

[5] Refer to Chapter 13 for further discussion of Flood Easements.
[6] IDEM has provided a draft list of impaired waters for 2010. This list has not yet been finalized, pending consideration of public comments. The FEIS for this project will include this updated data once it is finalized.

Lower White River Watershed. Numerous streams identified in the project corridor are within the Lower White River Watershed. These streams are tributaries to the White River, which drains to the Wabash River. Several streams in the watershed are included in the State of Indiana's 2008 Clean Water Act Section 303(d) list of impaired waterbodies (IDEM 2008), including the White River itself. Neither the Section 4 corridor nor any of the alternatives cross any of the listed impaired waterbodies. **Table 5.19-7** identifies the major streams and tributaries within the right-of-way of each alternative carried forward for detailed analysis.

In Northern Greene County, the Lower (West Fork) White River flows through areas of sand, silt and gravel (Schnoebelen et al, 1999). The White River is listed as impaired due to its impaired biotic communities, Fish Consumption Advisory (FCA) for Mercury, and FCA for PCBs. The Section 4 project corridor does not traverse the White River, but many of the identified streams are within its watershed.

Section 4 of the I-69 corridor crosses six sub-watersheds of the Lower White River Watershed. The six sub-watersheds are briefly described below (IGS GIS Atlas).

- Doans Creek-Headwaters Watershed: This sub-watershed encompasses approximately 10,639 acres, and it covers the southwestern end of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Doans Creek-Bogard Creek Watershed: This sub-watershed encompasses approximately 6,444 acres, and it also covers a portion of the southwestern end of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Beech Creek Watershed: This sub-watershed encompasses approximately 14,860 acres, and it is located west of SR 45 at the South Connector Road intersection of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Plummer Creek-Lower Watershed: This sub-watershed encompasses approximately 11,747 acres, and it covers the western third of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Plummer Creek-Black Ankle Creek Watershed: This sub-watershed encompasses approximately 15,036 acres, and it also covers a portion of the western third of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Clifty Branch Watershed: This sub-watershed encompasses approximately 11,184 acres, and it covers the center third of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

Lower East Fork White River Watershed. Numerous streams identified in the project corridor are within the Lower East Fork White River Watershed. These streams are tributaries to the Lower East Fork White River which originates from the confluence of the Upper East Fork White River and Muscatatuck River near Medora then flows southwest before joining the Lower White River near Petersburg and ultimately discharging into the Wabash River. Several streams in the watershed are in the State of Indiana's 2008 Clean Water Act Section 303(d) list of impaired waterbodies (IDEM 2008), including the Lower East Fork White River itself and Clear Creek. Neither the Lower East Fork White River or Clear Creek are within the Section 4 corridor; however, tributaries to the Lower East Fork White River and Clear Creek are in the Section 4 corridor. Neither the Section 4 corridor nor any of the alternatives cross any of the listed impaired waterbodies.

Section 4 of the I-69 corridor crosses five sub-watersheds of the Lower East Fork White River Watershed. The five sub-watersheds are briefly described below (IGS GIS Atlas).

- Indian Creek-Town Branch Watershed: This sub-watershed encompasses approximately 13,167.5 acres, and it covers the center third of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Indian Creek-Little Indian Creek Watershed: This sub-watershed encompasses approximately 13,464.7 acres, and it covers the east central portion of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Indian Creek-Headwaters (Monroe) Watershed: This sub-watershed encompasses approximately 15,636.4 acres, and it also covers the east central portion the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

- Clear Creek-May Creek Watershed: This sub-watershed encompasses approximately 19,181.9 acres, and it covers the east portion of the Section 4 corridor. There are two National Pollutant Discharge System (NPDES) discharge points in the watershed. One is for the Dillman Road Waste Water Treatment Plant that discharges into Clear Creek. This is located southeast and downstream of the corridor. The other is a stormwater discharge far north of the project area at ABB Power T&D Co. Inc. However, this facility actually discharges into Beanblossom Creek via tributary of Stout Creek.

- Clear Creek-Jackson Creek Watershed: This sub-watershed encompasses approximately 16,073.9 acres, and it covers the northeastern terminus of the Section 4 corridor. There is one National Pollutant Discharge System (NPDES) discharge point in the watershed located at Keil Brothers Oil service Station for groundwater treatment. This discharges into Jackson Creek that discharges into Clear Creek. Located east and downstream of the corridor.

5.19.2.4 Mitigation

Chapter 7 contains details on proposed measures to mitigate surface water resource impacts that may result from the project. The following paragraphs outline the proposed measures.

Wetlands

Within the Section 4 corridor there are 18 palustrine forested (PFO) wetlands totaling approximately 11.45 acres, 28 palustrine emergent (PEM) wetlands totaling approximately 27.01 acres, 8 palustrine shrub/scrub (PSS) wetlands totaling approximately 3.06 acres and 68 palustrine unconsolidated bottom (PUB) wetlands totaling approximately 25.02 acres. There are an additional 5 PUB wetlands located outside of the corridor in the vicinity of the County Line interchange with a total area of 1.29 acres. Of these 127 wetlands, 38 are within the right-of-way of one or more alternatives. For the purposes of the Section 4 INWRAP analysis, some of these wetlands were combined into complexes. 23 wetland complexes are within the right-of-way of one or more alternatives. One of these wetland complexes appears to be a "waters of the state" (isolated) and would be regulated solely by IDEM. Twenty two (22) of these wetland complexes appear to be "waters of the U.S." and, as such, would be under the jurisdiction of USACE and IDEM. Depending on the alternatives considered, the total impacts to emergent, scrub-shrub and forested wetlands range from approximately 5.26 acres to 13.09 acres. PUB wetland impacts are discussed with impacts to open water (See Section 5.19.2, *Surface Waters*). The following measures will be utilized to address impacts on wetlands:

- **Avoidance and Minimization—**Wetlands and wetland complexes will be avoided as much as possible. If unable to be avoided completely, wetland impacts will be minimized by shifts in the alignment in final design. A firm commitment was made that wetlands and other water resources will be actively avoided throughout the final design of the Section 4 roadway. All avoided water resource areas within the right-of-way will be identified on the design plans and these areas will have erosion control measures as approved by IDEM as part of the overall erosion control plan for the roadway project to prevent any filling or contamination of these areas during construction of the Section 4 project.

- ***Revised Tier 1 Conceptual Forest and Wetland Mitigation and Enhancement Plan—*** During Tier 1, INDOT and FHWA developed a Tier 1 *Forest and Wetland Mitigation and Enhancement Plan* ("Plan") for the proposed project in consultation with the USFWS and other review agencies. An updated version of that Plan has since been developed[7] and its stipulations regarding wetland mitigation are included in USFWS's revised Tier 1 Biological Opinion issued on August 24, 2006 (as amended May 25, 2011).[8] The revised Tier 1 Plan included a commitment to replace wetlands at a ratio of 3 to 1 for forested and scrub/shrub wetlands, and a ratio of 2 to 1 for emergent wetlands. The wetland mitigation sites will include an approximate 25% buffer area around them in appropriate areas. Based on these mitigation ratios, depending on the alternatives considered, mitigation for all wetland impacts ranges from approximately 15.56 acres (Alternative 3, using the low-cost design criteria) to

[7] Appendix D of the Tier 1 BA Addendum contains the revised Tier 1 Plan, which is also included in this FEIS as **Appendix P**. (A copy of the original *Tier 1 Conceptual Forest and Wetland Mitigation and Enhancement Plan* was included as Appendix NN in the Tier 1 FEIS, Volume II.)

[8] The revised Tier 1 BO was primarily based on the agency's review of two documents: the *Tier 1 Biological Assessment for Threatened and Endangered Species, Interstate 69, Indianapolis to Evansville*, dated July 18, 2003, revised October 27, 2003 (hereafter referred to as the Tier 1 BA); and the *Tier 1 Biological Assessment Addendum* dated March 7, 2006, (hereafter referred to as the Tier 1 BA Addendum).

39.41 acres (Alternative 1, using the initial design criteria). Mitigation for Refined Preferred Alternative 2 would range from approximately 15.79 acres to 29.14 acres for the low-cost and initial design criteria. **Table 5.19-11** identifies the potential mitigation for each alternative.

Table 5.19-9: Potential Acres of Wetland Mitigation

Acres Assuming 2 to 1 ratio for Emergent, 3 to 1 ratio for Scrub/Shrub, 3 to 1 ratio for Forested, and a 25% Buffer	Alternatives: Potential Acres of Wetland Mitigation									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
	21.83	**39.41**	**15.79**	**29.21**	**15.56**	**28.65**	**21.35**	**38.58**	**15.79**	**29.14**

The revised Plan also identifies the general location of 13 potential mitigation sites along the entire Tier 1 Preferred Alternative 3C corridor from Evansville to Indianapolis for the design and construction of wetlands and upland forest. In Section 4, three potential mitigation sites have been identified: Doans Creek, Plummer Creek, and Indian Creek. These sites are described in **Chapter 7,** *Mitigation and Commitments*. These sites have been identified for further consideration. Other areas may also be identified in the future.

- **Wetland Pooling—**If appropriate, wetland mitigation may include wetland pooling, meaning efforts will be made to group mitigation sites together to create a more substantial and effective mitigation site.
- **Wetland Mitigation and Monitoring Plans—**As determined during Section 404 permitting, Wetland Mitigation and Monitoring Plans will be prepared.
- **Spraying of Herbicides—**To prevent herbicides from entering wetland areas, "Do Not Spray" signs will be posted as appropriate in the right-of-way.

Given that wetlands may naturally increase, decrease, be eliminated, or be created naturally over the course of time, detailed mitigation plans will be developed before or during final design to meet the permitting requirements of the USACE when details exist to support such plans. At that time, additional measures to minimize impacts to specific wetland sites will be considered, including narrowing the right-of-way; installing drainage features such as swales to ensure that roadway runoff does not enter wetland areas; and designing culverts to maintain the flow of water to a wetland area otherwise cut off from its existing water source. A more detailed conceptual mitigation plan is included in the Tier 2 BA (**Appendix JJ1**).

Open Water

Fifteen (15) of the 68 palustrine unconsolidated bottom (PUB) wetlands located within the Section 4 corridor and the 5 PUB wetlands located outside of the corridor would be affected by the project. The total acres of impacts range from 1.71 acres to 4.56 acres, depending on the alternative considered. Mitigation will be accomplished using a 1 to 1 ratio. Borrow pit construction may be considered for mitigating these open water impacts. The total amount of mitigation for impacts to open water/PUBs, by alternative, is shown on **Table 5.19-10**.

Table 5.19-10: Potential Open Water Impacts

Open Water (1 to 1 Ratio)	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Acres for Mitigation	3.37	4.32	2.53	3.48	2.78	3.24	3.61	4.56	1.71	2.35

Rivers and Streams

Because the project is on new alignment through Section 4, the majority of proposed stream crossings are new crossings. Where the interstate encounters county roads at their stream crossings, some existing stream crossing structures could be modified or relocated to accommodate the new construction. The potential impacts to streams vary with the alternatives considered. The linear feet of all streams (perennial, intermittent, and ephemeral) within the right-of-way at the crossings range from approximately 90,053 linear feet with Alternative 4 (low-cost design criteria) to 112,801 linear feet with Alternative 2 (initial design criteria).

IDEM and USACE criteria call for mitigating stream impacts based on the length of impact. Prior to the new mitigation rule, the USACE based mitigation on *acres of impact below the ordinary high water mark.* A linear foot ratio as agreed upon by the regulatory agencies will be used to mitigate impacts to streams in Section 4. Stream impacts that require mitigation by IDEM and the USACE would range from approximately 90,053 linear feet to 112,801 linear feet. **Table 5.19-11** summarizes potential mitigation for stream impacts for each of the alternatives. The mitigation concept being proposed for stream mitigation for Section 4 includes stream restoration, riparian buffer plantings, and stream preservation by Conservation Easements being recorded as approved by the regulatory agencies. The cost estimate in Chapter 7 for stream mitigation was calculated on an acreage basis and not a linear feet basis due to the proposed stream mitigation concept identified above. Stream mitigation will be completed to adequately mitigate for linear feet of stream impacts in coordination with both the USACE and IDEM during the permitting process of the Section 4 project. Wherever possible, both banks of stream mitigation areas will be protected. If both banks cannot be protected, coordination with both IDEM and USACE will be completed to identify the amount of mitigation credits that INDOT may receive based on the proposed mitigation site. Per IDEM comments received on the

DEIS, consideration will be given in the design phase to planting trees and shrubs along relocated streams and outside right-of-way edge.

Coordination with IDEM and USACE has been initiated and will continue throughout the development of the proposed mitigation sites that will be offered for compensatory mitigation in Section 4. Natural channel stream designs for perennial and larger intermittent stream relocation located within the Indiana bat maternity colony areas and the Winter Action Area may include but will not be limited to stream designs that incorporate riffle/run/pool/glide or step/pool sequences and sinuosity to replicate natural channel geomorphology, in stream natural structures (log and rock vanes) to help prevent streambank erosion, and riparian buffer plantings outside the clear zone of the roadway. Off-site channel restoration for compensatory mitigation will also be completed including the same natural channel design features.

Table 5.19-11: Potential Mitigation for Stream and Riparian Impacts

Mitigation (1 to 1 Ratio)	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
For Stream Impacts										
Linear feet (based on LF of impacts)	93,467	111,725	93,110	112,801	93,610	112,698	90,053	108,083	93,196	111,247
Acres (based on acres of impacts)	15.46	19.48	15.79	19.80	15.09	18.64	15.33	19.12	15.80	19.42

Continued efforts will be made during final design to identify design features that would minimize impacts at stream crossings, including identifying measures to keep channel and bank modifications to a minimum and, where feasible, avoid channel alterations below the ordinary high water mark elevation. Mitigation of stream impacts could include installing three-sided culverts or oversized box culverts sunk into the streambed that would retain the natural channel bottom, thereby facilitating the migration of stream fauna through the culverts, and reducing impacts to the flow rate. The culverts should be of sufficient size to prevent upstream bed instability and erosion of downstream banks. The channels of Black Ankle, Dry Branch, Plummer, Mitchell Branch, Indian Creek and a portion of their overbanks will be bridged to minimize stream and riparian impacts.

Per IDEM written comments on the DEIS, a firm commitment was made to evaluate measures for bank stabilization, reinforcement and erosion control for final design of the South Connector Road bridge over Indian Creek to minimize natural channel migration.

Per IDNR written comments on the DEIS, a firm commitment was made that during the design phase, consideration will be given to using alternative armoring materials and including portions of dry land under the bridge opening that is not armored with riprap. The use of bio-engineering techniques to provide natural armoring of stream banks will be considered and implemented where practicable. Installation of riprap will be limited to areas necessary to protect the integrity of structures being installed. If riprap is required, it will be installed outside the thalweg and

between the toe of slope and the ordinary high water mark (OHWM) where possible. In some instances, such as culvert inlets and outlets, riprap may need to be placed within the thalweg to prevent scour. Riprap will be installed at the same elevation as the thalweg to avoid fish passage issues. Riprap may also be needed above the (OHWM) to protect bridge piers and abutments from scour where bio-engineering will not suffice.

Erosion control and other measures to avoid or minimize the temporary impacts to streams during construction will be employed. Implementing an approved soil erosion and sedimentation control plan will control erosion within the construction limits. All construction activities must comply with federal and state soil erosion and sedimentation regulations. This plan will be developed in conjunction with final construction plans. INDOT Standard Specifications and Special Provisions will govern construction activities to control erosion and subsequent water pollution.

For additional discussion of mitigation measures, see Chapter 7, *Mitigation and Commitments.*

Floodplain

INDOT will work closely with IDNR to adequately study the impacts to floodplains during further development of the I-69 project. A final hydraulic design study that addresses various structure size alternatives will be completed during future final design phase of I-69, and a summary of this will be included with the Field Check Plans and Design Summary. INDOT will submit a formal permit application to IDNR Division of Water during this phase of project development where a "Construction in a Floodway" permit is required.

Drainage Control

Roadway runoff can have significant impacts to the water quality by directly impacting streams as well as impacting water quality downstream. Numerous constituents may be found in roadway runoff from multiple sources. These constituents include: particulates, nitrogen, phosphorus, metals, salts, petroleum, pesticides, PCBs, rubber, pathogenic bacteria, and asbestos. These constituents are originated by many different sources, some of the primary sources include: deicing chemicals, tire wear, wear of engine parts and other moving parts, exhaust, motor lubricant leaks and blow-by, roadside fertilizing and spraying, and atmospheric deposition. These items are of special concern in karst areas and are discussed in Section 5.21, *Karst Impacts*.

Of the identified runoff constituents, a point of primary concern is the build-up of deicing chemicals in the atmosphere, due to the seasonally large volumes of this contaminant. Salting of a highway in winter with the drainage from the road could cause changes in the water quality of a number of streams, especially those with little volume or flow. Salting of any road may lead to adverse effects for aquatic and terrestrial organisms. A variety of environmental consequences have been associated with the use of deicing chemicals and their associated additives. Road salting affects water quality, soil properties, plants and animals. Salt inhibits plant growth by changing soil structure, changing the osmotic gradient and through chloride ion toxicity (NCHRP, 1976). Excess salinity causes moisture stress in plants, suppresses proper nutrient uptake, and leads to deficiencies in plant nutrition (NCHRP, 1978). In addition, additives can

contribute to eutrophication in wetlands and toxicity to its inhabitants. More detail related to INDOT's current de-icing practices is presented in INDOT Snow and Ice Control Instructions, **Appendix Q**.

Best Management Practices (BMPs) will be used to prevent non-source point pollution, to control storm water runoff, and to minimize sediment damage to water quality and aquatic habitats. INDOT *Standard Specifications and Special Provisions* will govern construction activities to control erosion and subsequent water pollution.

Hazardous Material Spill Response

The release of hazardous and potentially harmful materials into adjacent surface and subsurface waters from spills along highways is a concern both during and subsequent to construction. These items are of special concern in karst areas, as noted in Section 5.21, *Karst Impacts*. This is especially true when the highway is anticipated to be used by large volumes of semi-trucks transporting a wide variety of such substances. Since each of the alternatives for Section 4 would cross a number of streams, the potential for such impacts exists for all of the study alternatives.

During construction of I-69, contractors will be required to provide an acceptable spill response plan. This response plan will include telephone numbers for emergency response personnel and copies of agreements with any agencies which are part of the spill-response effort. An emergency contact telephone number also is required.

Following construction of I-69, emergency spill response for hazardous materials transported on the highway will be handled by local fire departments and regional hazardous materials units coordinated through the deputy state fire marshals in Bloomington and Terre Haute. Currently, law enforcement and nearly all fire departments within the Study Area possess either awareness level or operations level capabilities for responding to hazardous material spills or releases. Awareness includes the recognition of hazardous material placards and the means to cordon off an incident site. Operations level includes booms for diking spills, personal protection equipment to work within contaminated sites, and other basic containment equipment. If called upon, INDOT state highway equipment and resources can also be deployed to assist in containment anywhere along the proposed interstate facility.

Indiana's State Emergency Commission has established eleven Regional Response Teams throughout the state, each of which will have full Level A hazardous materials response capabilities. Currently, the hazardous materials units of Bloomington Township and Crane NSWC are the closest regional unit with Level A capabilities to the Section 4 Study Area. Evansville, Vincennes, Terre Haute, and Marion County/Indianapolis area are the other regional units with Level A capabilities. The I-69 project will help accelerate emergency response to incidents on routes served by these units.

5.19.2.5 Summary

As **Table 5.19-12** indicates, water quality impacts to surface waters anticipated in Section 4 vary depending on the alternatives considered. In the case of impacts to wetlands, the differences among the alternatives' impacts are relatively small. For example, there is only a 2.30 acre

difference between the greatest and least impact to non-open water wetlands for the low-cost design criteria and a 3.66 difference between the greatest and least impact to non-open water wetlands for the initial design criteria. The total range of impacts, including open water, is from 7.03 acres (Refined Preferred Alternative 2, using the low-cost design criteria) to 17.42 acres (Alternative 4, using the initial design criteria). The INWRAP evaluations rated the majority of the wetlands as fair quality in their regard to animal habitat; poor to fair in botanical quality; and good quality in their hydrology measure. The range of impacts to streams is also relatively small. The linear feet of streams within the right-of-way of the alternatives (low-cost design criteria) ranges from 90,053 linear feet (Alternative 4) to 93,610 linear feet (Alternative 3). The linear feet of streams within the right-of-way of the alternatives (initial design criteria) ranges from 108,083 linear feet (Alternative 4) to 112,801 linear feet (Alternative 2). Potential stream relocations (low-cost design criteria) range from 24,876 linear feet (Alternative 4) to 31,328 linear feet (Alternative 3). Potential stream relocations (initial design criteria) range from 32,367 linear feet (Alternative 4) to 38,556 linear feet (Alternative 2). The total *acres* of impact (linear feet *x* width of stream's ordinary high water mark) range from 15.09 acres to 15.80 acres (low-cost design criteria), with only 0.71 acre separating the alternatives with the greatest and least impact. The total acres of impact range from 18.64 acres to 19.80 acres (initial design criteria), with only 1.16 acres separating the alternatives with the greatest and least impact. The QHEI/HHEI evaluations determined that the majority of streams in the project corridor are of at least moderate quality. A comparison of the alternatives' stream impacts, weighted by stream quality, found the alternatives to be similar in overall quality of streams impacted (the alternatives were within 8% of each other).

Table 5.19-12: Summary of Potential Impacts to Surface Waters, by Alternative

Water Quality Impacts	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Wetlands (acres):										
Emergent	5.22	7.74	3.33	5.37	3.33	5.37	5.21	7.72	3.33	5.34
Scrub/Shrub	0.22	0.52	0.18	0.45	0.00	0.07	0.22	0.52	0.18	0.45
Forested	2.12	4.83	1.81	3.76	1.93	3.99	2.00	4.62	1.81	3.76
Total	**7.56**	**13.09**	**5.32**	**9.58**	**5.26**	**9.43**	**7.43**	**12.86**	**5.32**	**9.55**
Streams:										
Linear feet in right-of-way	93,467	111,725	93,110	112,801	93,610	112,698	90,053	108,083	93,196	111,247
Acres in right-of-way	15.46	19.48	15.79	19.80	15.09	18.64	15.33	19.12	15.80	19.42
Linear feet stream relocation	28,338	34,069	30,827	38,556	31,328	37,950	24,876	32,367	30,861	37,325
Riparian Corridor:										
Acres	327.56	400.08	323.79	397.74	323.08	398.83	315.72	385.03	323.59	391.81
Open Water (acres): (PUBs)	3.37	4.32	2.53	3.48	2.78	3.24	3.61	4.56	1.71	2.35
Floodplain (acres)	31.01	43.73	36.26	53.07	38.45	53.93	32.25	45.20	36.26	50.97

Early coordination has occurred and consultation is ongoing with the regulatory agencies. It is anticipated that a USACE 404 Permit, an IDEM 401 Water Quality Certification, an IDEM Isolated Wetlands Permit, an IDEM Rule 5 Permit, and an IDNR Construction in a Floodway

Permit would be needed to construct any of the proposed alternatives. Detailed permit coordination would occur before or during the final design phase of the project. The permits will include a detailed mitigation and monitoring plan for wetland, forest and stream impacts, as appropriate. **Table 5.19-12** provides a summary of potential surface water resource impacts by alternative. Section 5.23, *Permits,* provides more detailed information about permits that may be required. Chapter 7, *Mitigation and Commitments*, provides detailed discussion of measures to mitigate surface water resource impacts.

5.19.3 Groundwater

5.19.3.1 Introduction

This section evaluates the project's impact on groundwater quality. The analysis of ground water impacts includes an assessment of the existing groundwater conditions in the Study Area; as well as the project's potential impact on groundwater resources. If there is a potential impact to groundwater resources due to project construction, proposed mitigation measures are discussed. These items are of special concern in karst areas and are discussed in Section 5.21, *Karst Impacts*.

Wellhead protection areas were authorized by the 1986 Amendments to the Safe Drinking Water Act. When a proposed project encroaches upon a wellhead protection area (WHPA), the delineated area is identified and coordinated with the community's wellhead protection program is documented.

Early coordination with USEPA is necessary if a proposed project potentially affects an area designated as the principal or sole source aquifer under Section 1414(e) of the Safe Drinking Water Act. Currently, only the St. Joseph Aquifer (near South Bend) is designated as a sole source aquifer in Indiana, and it is not located within the project limits.

USEPA Class V injection well permits may be required for various types of projects. For example such a permit could be required by EPA Region 5 if a Class V injection well is located within the karst region of the state, a sole source aquifer area, a state designated source water protection area for a public water supply, or anywhere untreated fluids discharged through a Class V well may otherwise endanger an underground source of drinking water. If there are measures in place to prevent contamination of groundwater, a Class V well could be authorized by rule rather than by a permit. A Class V Well Inventory Form would need to be provided to EPA Region 5 prior to construction of a Class V injection well so that EPA could determine if a Class V injection well permit will be required for any Class V wells. For the I-69 project, if the inventory information provided indicates that any injection well would likely contaminate any underground source of drinking water, a permit would be required. Any permit would need to be applied for and obtained prior to construction of the Class V well.

5.19.3.2 Methodology

The IDNR 'Water Well Record Database' was used to locate ground water wells within a 1000-foot vicinity of all alternatives carried forward for detailed analysis (http://www.in.gov/dnr/water/ground_water/well_database/). The 1000-foot search criterion for

the water well database was established using the U.S. Environmental Protection Agency (USEPA) Calculated Fixed Radius (CFR) method that determines a zone of concern around a well. Some well records listed more detailed location descriptions, but each record provided the township, range, section and quadrant of the water well. If the quadrant was within 1000 feet of an alternative, the well was listed as a potential impact. Additional groundwater information was obtained from various publications from the IDNR, Division of Water, including "Ground-Water Resources In The White And West Fork White River Basin, Indiana (Beaty, 2002), Bedrock Aquifer Systems of Monroe County, Indiana (Maier, 2003), Unconsolidated Aquifer Systems of Monroe County, Indiana (Maier, 2003), and Hydrogeology and Principle Aquifers in Sullivan and Greene Counties (L.W. Cable and T.M. Robison, 1973).

5.19.3.3 Analysis

Private/Public Wells

In the project area, public drinking water is supplied by private wells and by municipally-owned systems. In the Section 4 corridor, most of the unconsolidated wells appear to be developed in sand and gravel and some fine-grained silt and clay.

Three public water utilities service the Section 4 area. They are Eastern Heights Utilities, Van Buren Water, Inc., and Southern Monroe Water Company.

Eastern Heights Utilities is located in Bloomfield, Indiana and covers the Greene County portions of the Section 4 corridor and extends partially into western Monroe County. It obtains water from groundwater wells. Eastern Heights Utilities, Inc. has provided information indicating that its closest well to the Section 4 corridor is located 4.84 miles away. This well is located along the White River near Newberry, Indiana, which is west of the Section 3/Section 4 terminus. Eastern Heights Utilities, Inc. stated this well is developed in the White River Aquifer. No impact to this well is anticipated as a result of construction within the Section 4 corridor.

Van Buren Water Inc. serves portions of Richland, Van Buren and Clear Creek Townships in Monroe County. Its service area includes the portion of western Monroe County in the Section 4 corridor. Southern Monroe Water Company serves much of the lower portion of Perry Township, Clear Creek Township, and continues into a small northern portion of Lawrence County. Southern Monroe Water Company service area extends into the Section 4 corridor along Bolin Lane. Both Van Buren Water Inc. and Southern Monroe Water Company obtain water from the City of Bloomington. The source for this water is Lake Monroe. The Section 4 corridor is closest to Lake Monroe at its north terminus. At this location the closest drainage to Lake Monroe is 2.5 miles away, and is separated by Clear Creek. No impacts to Lake Monroe, Van Buren Water, Inc., or Southern Monroe Water Company water supplies are anticipated to result from construction within the Section 4 corridor.

The Division of Water also registers significant water withdrawal facilities in the State of Indiana (Water Resource Management Act, 1982 (IC 14-25-7). Significant withdrawal facilities are defined as "the water withdrawal facilities of a person that, in the aggregate from all sources and by all methods, has the capability of withdrawing more than 100,000 gallons of ground water, surface water, or ground and surface water combined in one (1) day." Significant withdrawal

facilities records include the original registration form, location map, and annual water use report for each facility (Division of Water, 2004). None were found in the Section 4 corridor.

Wellhead Protection Zones

Coordination with IDEM indicated that there are no Wellhead Protection Areas in or adjacent to the Section 4 corridor.

Bedrock Aquifer Systems — The bedrock (consolidated) aquifers in the Section 4 study area are highly variable. On average, wells yield less than 10 gallons per minute (gpm). However, wells that intersect fracture zones and karst conduits can have greater yields. See Section 5.21, *Karst Impacts* for further information. Groundwater is available from consolidated aquifers over the majority of the Section 4 Corridor, beginning at Taylor Ridge in Greene County and extending northeast to the north terminus of the Section 4 corridor. From Taylor Ridge to SR 54 in Greene County, the major hydrogeologic units are limestones of the West Baden and Stephensport groups with Beech Creek Limestone being the major hydrogeologic unit. Haney Limestone, Beaver Bend Limestone, and Big Clifty Sandstone serve as minor hydrogeologic units. From SR 54 to Harmony Road in Monroe County, the major hydrogeologic units are limestones of the Upper Blue River, West Baden, and Lower Stephensport groups, which include the Paoli, Beaver Bend, and Beech Creek limestones. From Harmony Road to the north terminus at SR 37, the major hydrogeologic units are limestones of the Sanders and Blue River groups, which include the Harrodsburg, Salem, St. Louis, and Ste. Genevieve limestones.

Unconsolidated Aquifer Systems — The single unconsolidated aquifer in the Section 4 study area consists of medium to fine glacial sands of the Jessup Formation. The aquifer lies in Greene County between US 231 and Taylor Ridge. The aquifer thickness typically ranges from 5 to 150 feet with yield rates of 100 to 2,000 gpm.

The number of private groundwater wells within 1,000 feet of the right-of-way limits of each of the alternatives ranges from 42 to 46. **Table 5.19-13** shows the number of groundwater wells within 1,000 feet in the right-of-way of each of the alternatives.

Table 5.19-13: Private Groundwater Wells in Right-of-Way of Alternatives

	Alternative									
	1		2		3		4		Refined Preferred Alternative 2	
Number of wells within 1,000 feet of the right-of-way	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
	45	44	46	46	43	42	45	46	46	46

Groundwater Quality

Water is available from both consolidated and unconsolidated aquifers in the Study Area. The principle bedrock aquifers in the region are composed of Beech Creek, Haney, Beaver Bend, Paoli, Harrodsburg, Salem, St. Louis, and Ste. Genevieve Limestones and Big Clifty Sandstone.

The unconsolidated aquifer consists of medium to fine glacial sands. Section 4.3.2, *Water Resources*, describes the aquifers in Section 4 in more detail.

The Section 4 Study Area is within a karst area. Water resources in karst areas are especially sensitive to impairment. Karst flowpaths (the distance and direction water travels while in the karst system) are interconnected and can cross groundwater aquifers used as private and public water supplies. Groundwater wells are commonly used throughout the Section 4 study area and springs are also used by some individual landowners as a potable water supply and for livestock. Very little water purification occurs in karst areas because the water flows directly through cracks and fissures in rocks rather than percolating slowly through soil as in other types of terrain. Therefore, surface and groundwater quality is an important concern in karst areas, since karst flowpaths can convey pollutants to these water sources.

Consequences of road construction can include excess sedimentation of surface water, increased surface runoff, and mounding of surface water, all of which may disrupt the natural groundwater cycle. Such disturbances can lead to decreased infiltration and a locally lowered groundwater table resulting in interruption of shallow rural water supplies. Where ground water from private, individual wells is the principal source of potable water, there is the potential that road surface stormwater runoff or surface spills to karst features (e.g., gasoline tankers, chemical transports, etc.) from the new roadway could enter the groundwater system and affect drinking water in the area. Grassy swales would help to facilitate infiltration and associated recharge of groundwater supplies. **Appendix AA** (*Final Karst Report/Addendum to Karst Report (Redacted)*) identifies Best Management Practices (BMPs) that will be considered for implementation for the project and includes additional information pertaining to mitigation of highway runoff to karst features. Under the Karst Memorandum of Understanding (MOU), a monitoring and maintenance plan will be developed for affected karst features.

No currently designated Sole Source Aquifers exist within the project limits. The only Sole Source Aquifer in Indiana is the St. Joseph Aquifer in South Bend.

There are no public water supply impoundments within or adjacent to the Section 4 corridor and no impacts to local public water supplies are anticipated. Where groundwater from private, individual wells is the principal source of potable water, there is the potential that road surface stormwater runoff from the new roadway could affect drinking water in the area.

Per USEPA written comments on the DEIS, a firm commitment has been made that if active groundwater flow paths are discovered, measures will be taken to perpetuate the flow and protect water quality.

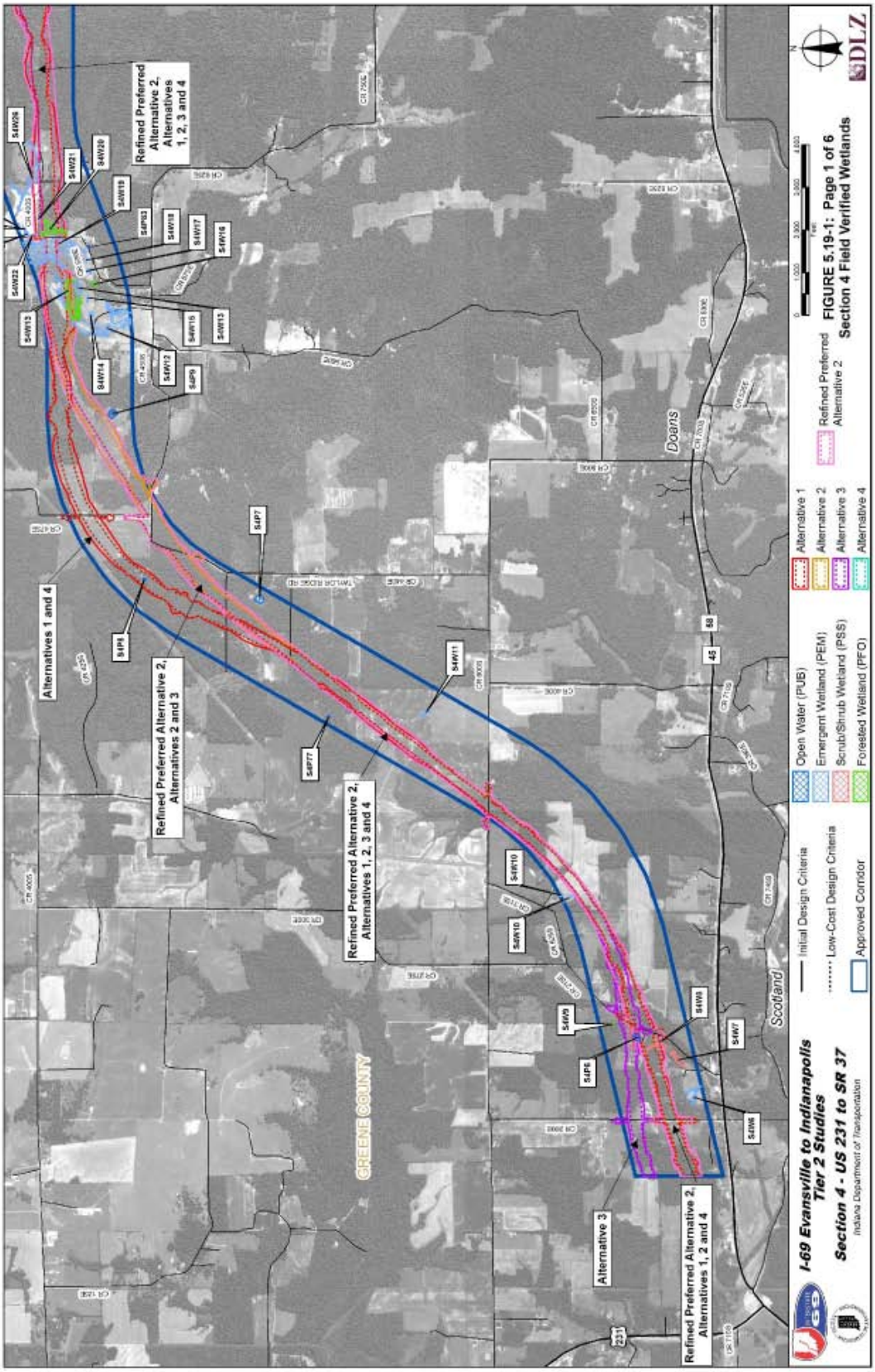
5.19.3.4 Mitigation

Grassy swales to facilitate infiltration and associated recharge of groundwater supplies, and construction methods to reduce erosion, sedimentation, and turbidity that road construction could temporarily cause would be among the measures employed to protect groundwater resources. BMPs will be used during construction of this project to reduce groundwater impacts. Under the Karst MOU, a monitoring and maintenance plan will be developed for karst features that receive highway drainage.

See Chapter 7, *Mitigation and Commitments*, for additional discussion of mitigation for water quality impacts.

5.19.3.5 Summary

There are no wellhead protection zones, water supply impoundments, or sole source aquifers in or adjacent to the project corridor. There are between 42 to 46 private groundwater wells within 1000 feet of the right-of-way limits each of the alternatives. There are no public water supply wells in or adjacent to the project corridor. INDOT's Standard Specifications and BMPs will be used during construction to minimize the temporary impacts that roadway construction can cause to groundwater.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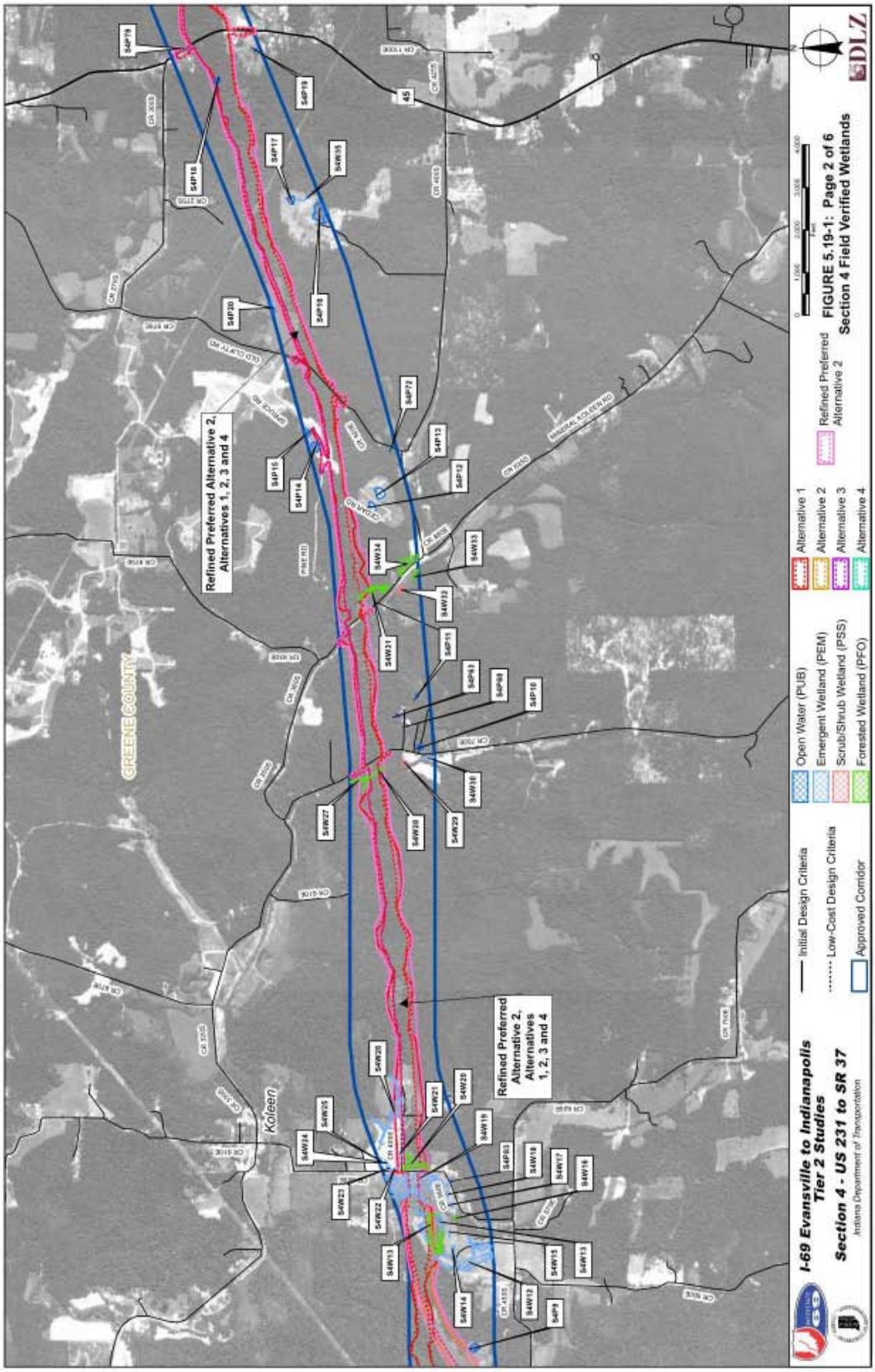
Alternative 3
GREENE COUNTY
Scotland
Dogans
Open Water (PUB)
Emergent Wetland (PEM)
Scrub/Shrub Wetland (PSS)
Forested Wetland (PFO)
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-1: Page 1 of 6
Section 4 Field Verified Wetlands
DLZ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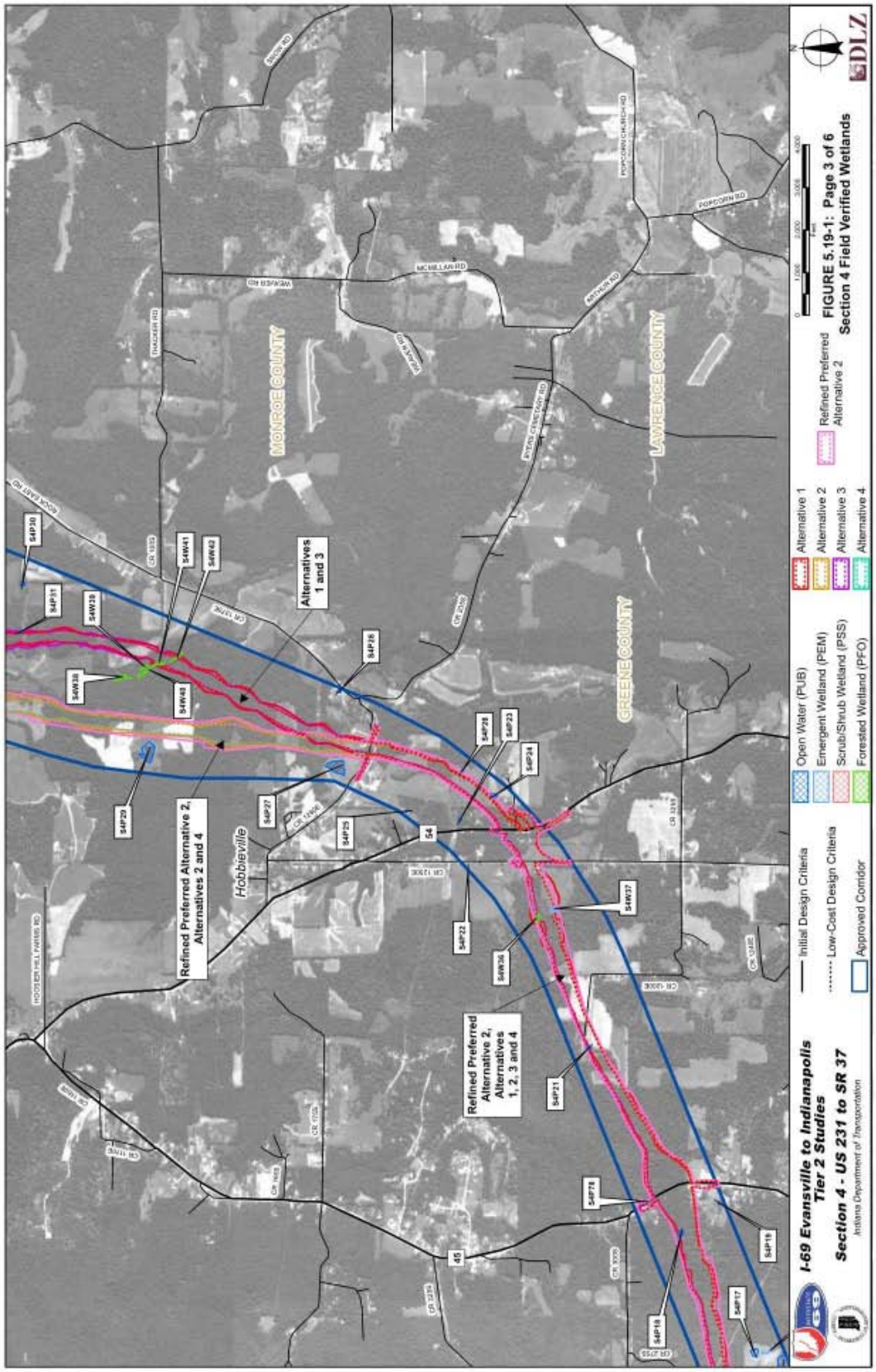
GREENE COUNTY
Koleen
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Open Water (PUB)
Emergent Wetland (PEM)
Scrub/Shrub Wetland (PSS)
Forested Wetland (PFO)
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-1: Page 2 of 6
Section 4 Field Verified Wetlands
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ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GREENE COUNTY
LAWRENCE COUNTY
Hobbieville
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S4W38
S4W41
S4W42
S4W43
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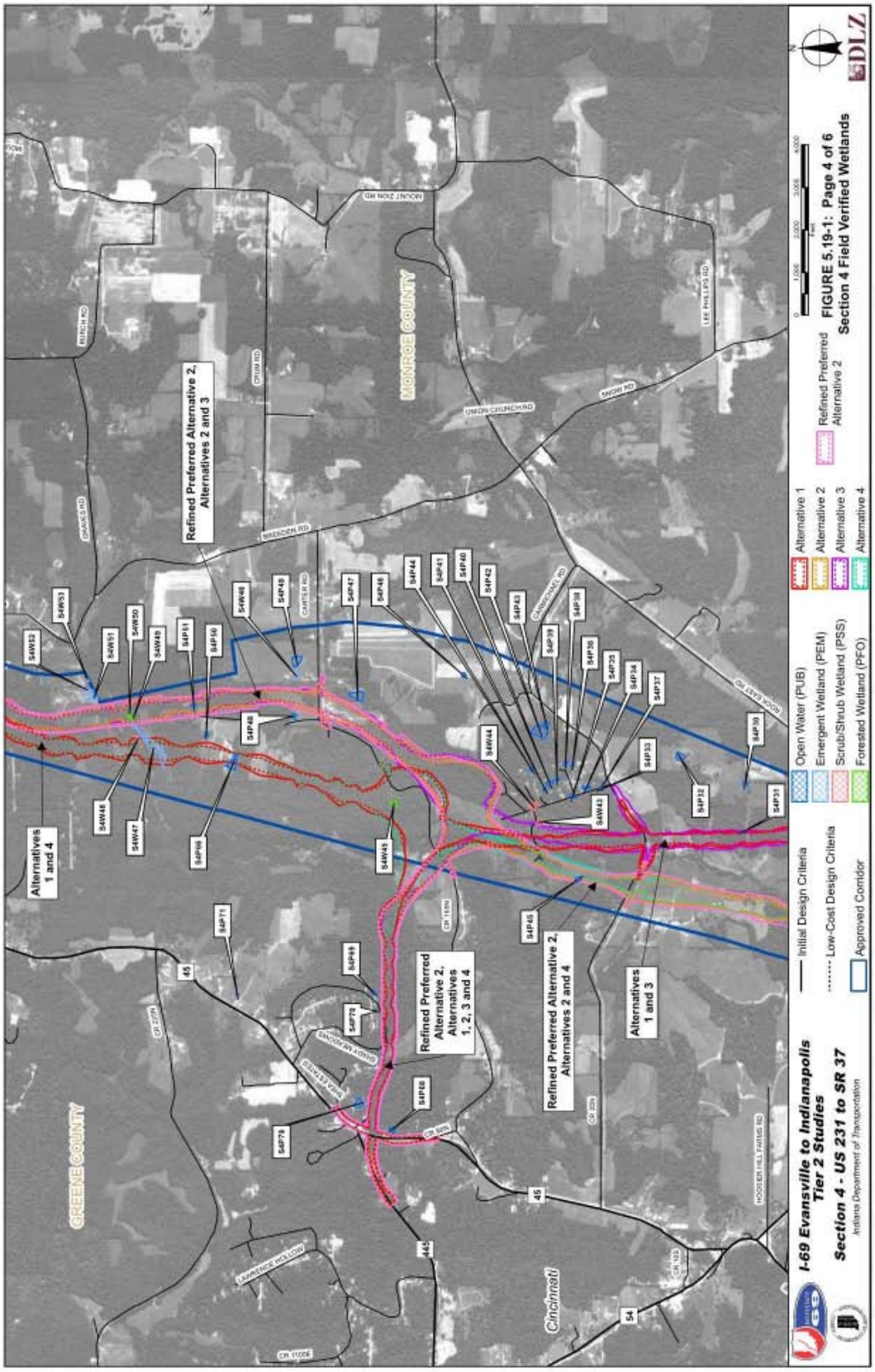
S4P27
S4P25
S4P23
S4P24
S4P22
S4W36
S4W37
S4P21
S4P11
S4P18
S4P17
54
45
Open Water (PUB)
Emergent Wetland (PEM)
Scrub/Shrub Wetland (PSS)
Forested Wetland (PFO)
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-1: Page 3 of 6
Section 4 Field Verified Wetlands
DLZ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Cincinnati
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Alternatives 1 and 3
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S4W50
S4W49
S4W48
S4W47
S4W46
S4W45
S4W44
S4W43
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S4P38
S4P36
S4P35
S4P34
S4P33
S4P32
S4P31
S4P30
S4P78
S4P76
S4P75
S4P68
S4P66
S4P65
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Open Water (PUB)
Emergent Wetland (PEM)
Scrub/Shrub Wetland (PSS)
Forested Wetland (PFO)
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-1: Page 4 of 6
Section 4 Field Verified Wetlands
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
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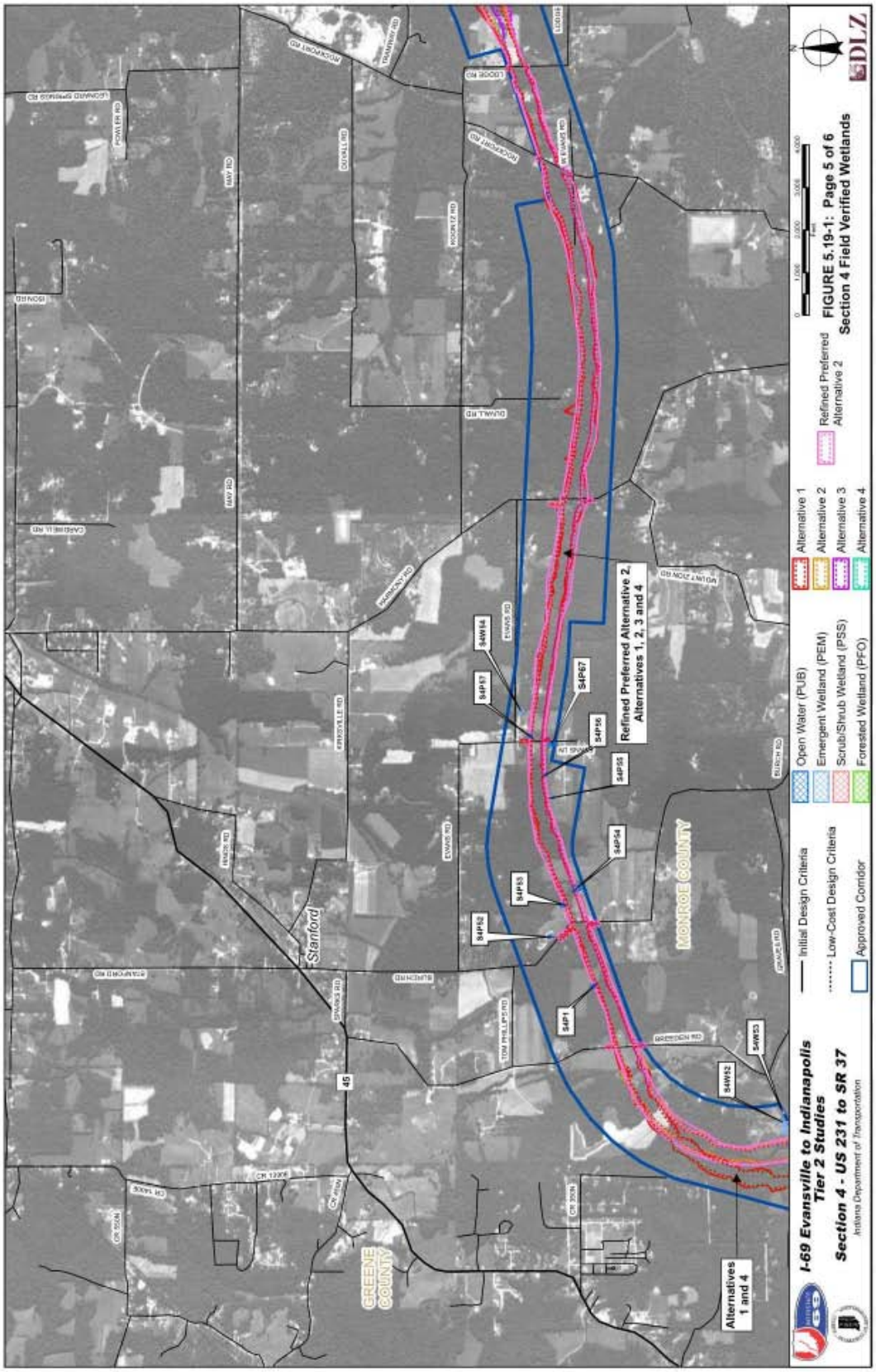
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Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
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Low-Cost Design Criteria
Approved Corridor
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Emergent Wetland (PEM)
Scrub/Shrub Wetland (PSS)
Forested Wetland (PFO)
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-1: Page 5 of 6
Section 4 Field Verified Wetlands
DLZ
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Alternatives 1 and 4
GREENE COUNTY
MONROE COUNTY
Stanford
S4P1
S4P53
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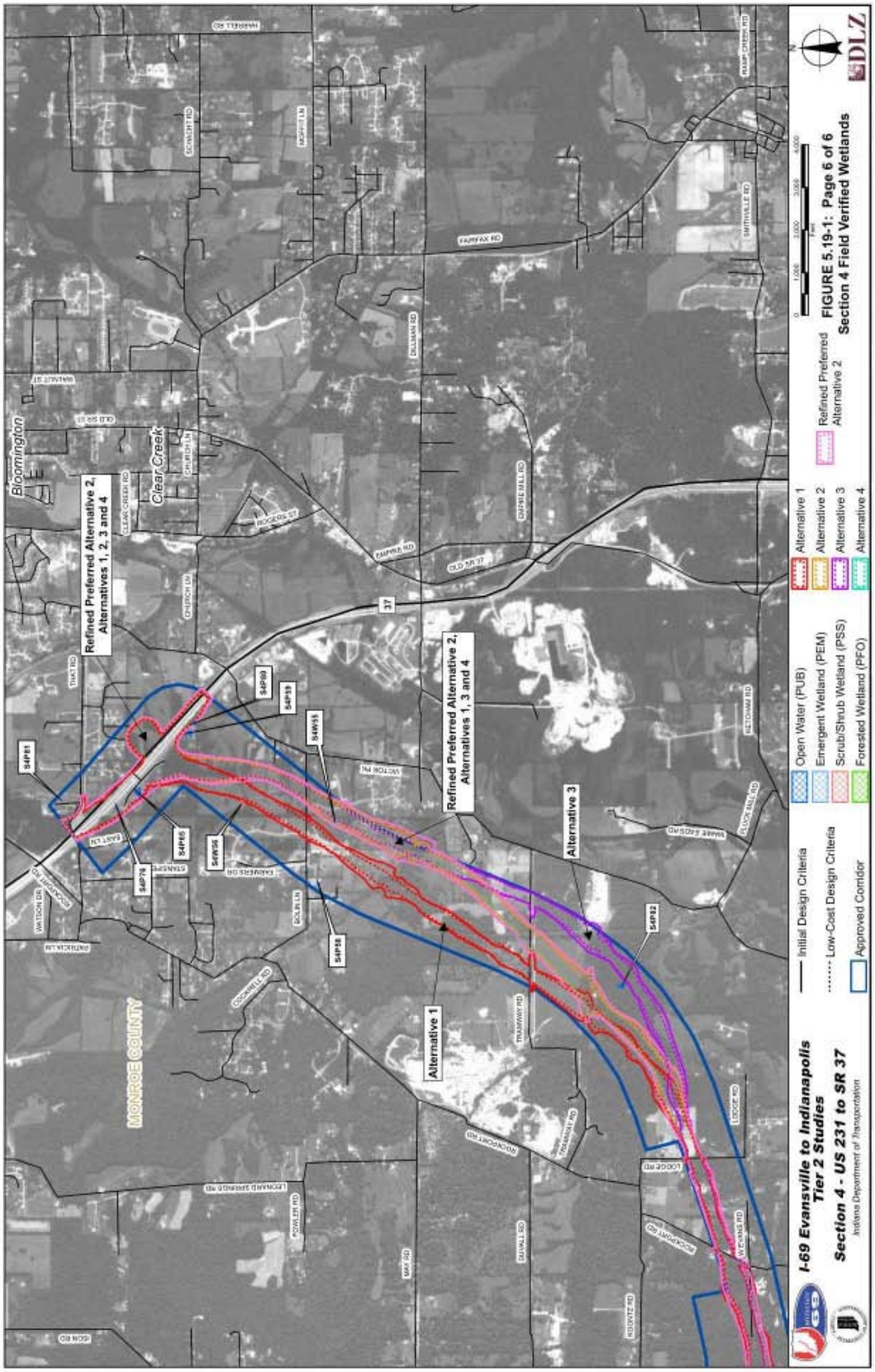
S4W54
45


Bloomington
Clear Creek
MONROE COUNTY
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Alternative 1
Alternative 3
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Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Open Water (PUB)
Emergent Wetland (PEM)
Scrub/Shrub Wetland (PSS)
Forested Wetland (PFO)
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-1: Page 6 of 6
Section 4 Field Verified Wetlands
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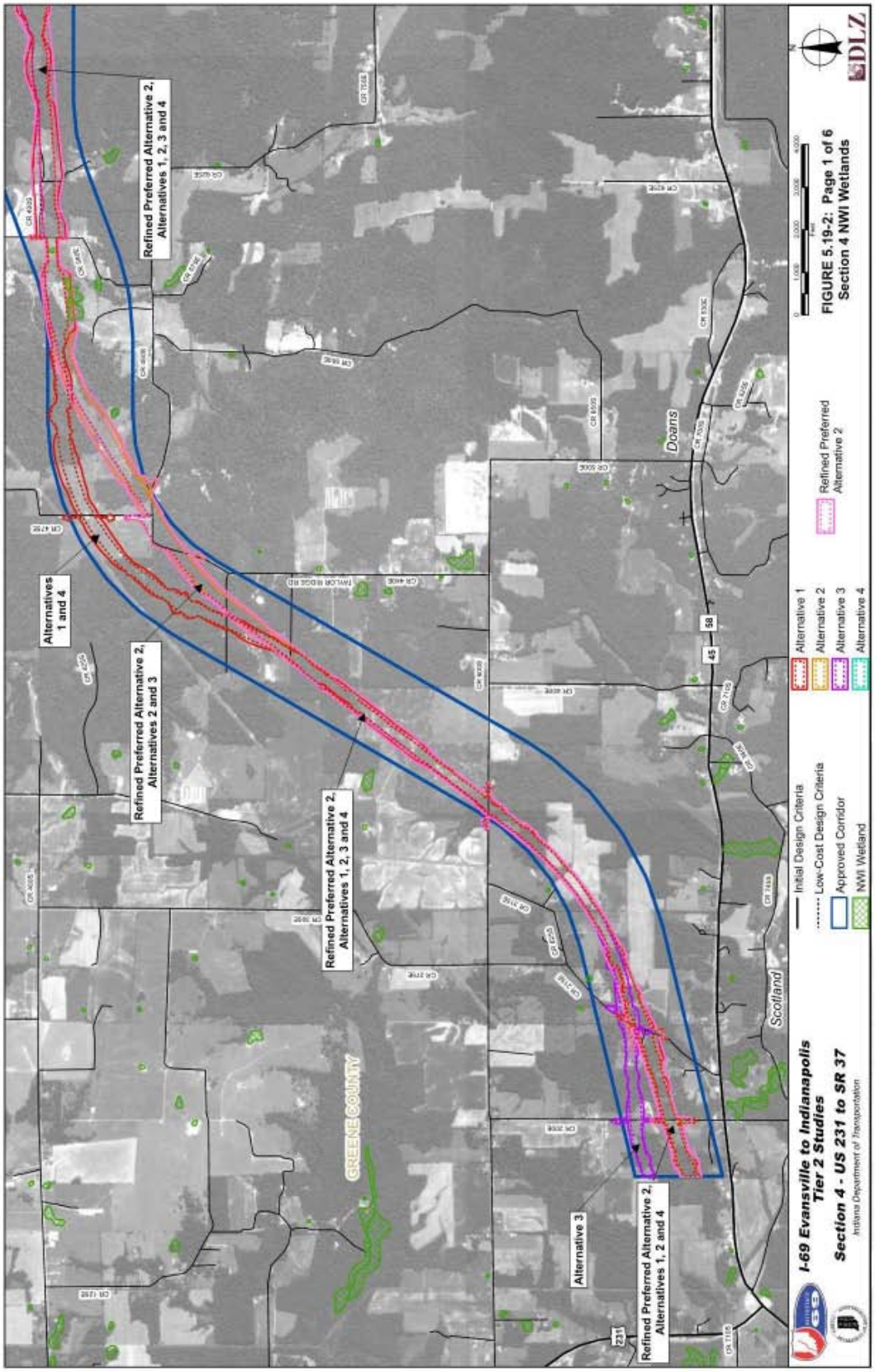
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Alternative 3
GREENE COUNTY
Scotland
Doans
TAYLOR RIDGE RD
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Alternative 1
Alternative 2
Alternative 3
Alternative 4
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
NWI Wetland
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I-69 Evansville to Indianapolis Tier 2 Studies
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Indiana Department of Transportation
FIGURE 5.19-2: Page 1 of 6
Section 4 NWI Wetlands
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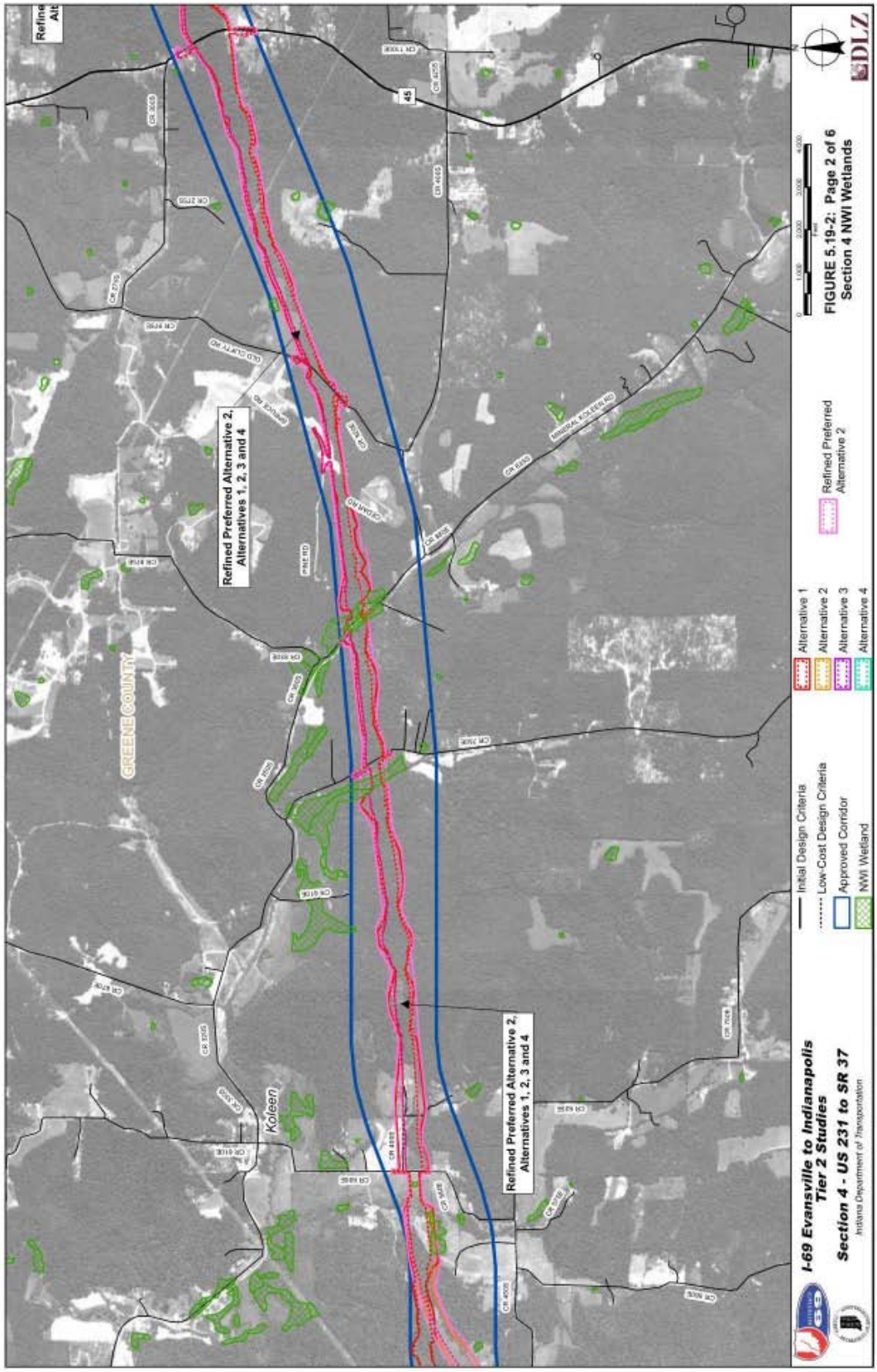
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GREENE COUNTY
Koleen
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Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
NWI Wetland
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-2: Page 2 of 6
Section 4 NWI Wetlands
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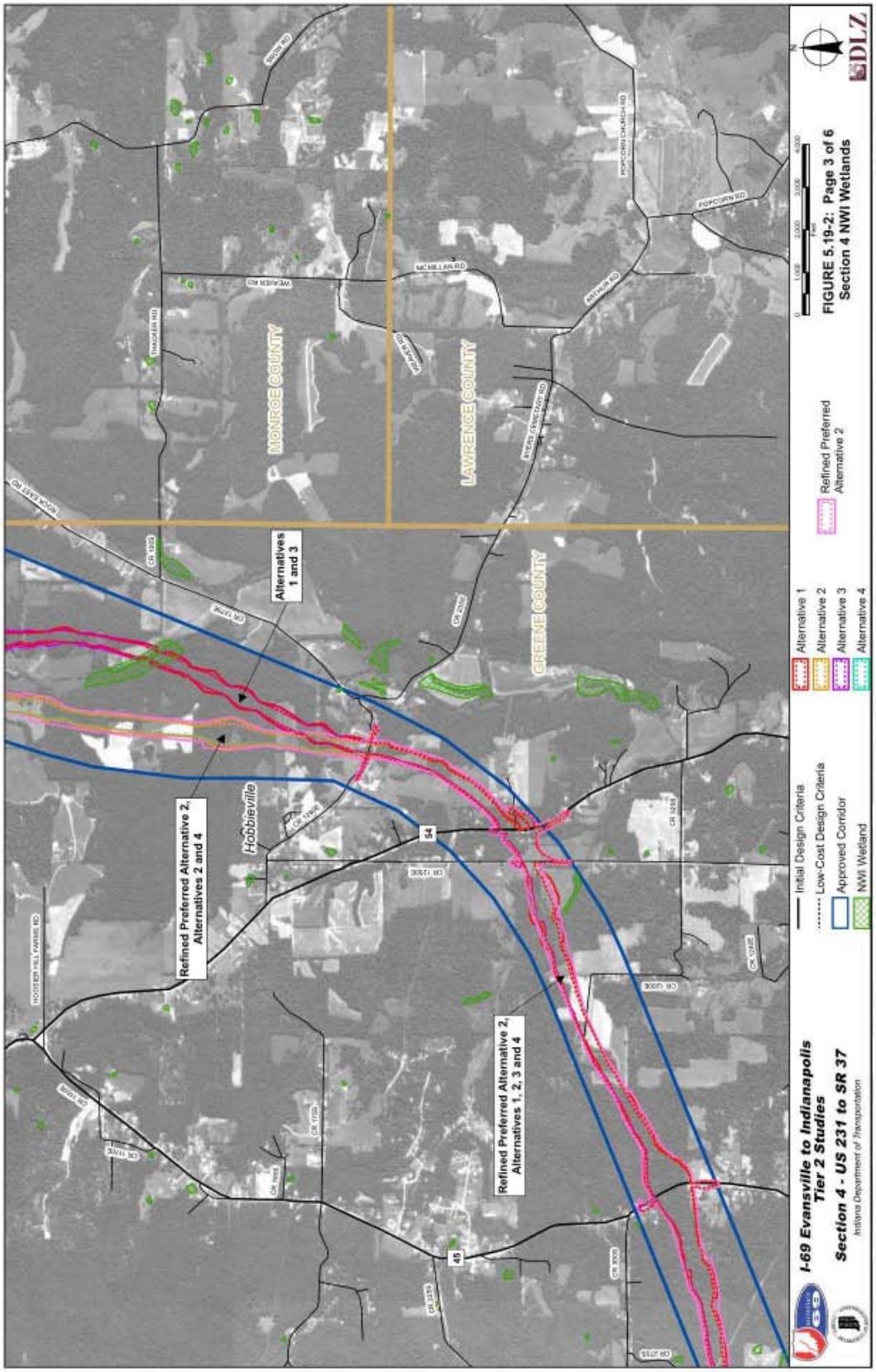
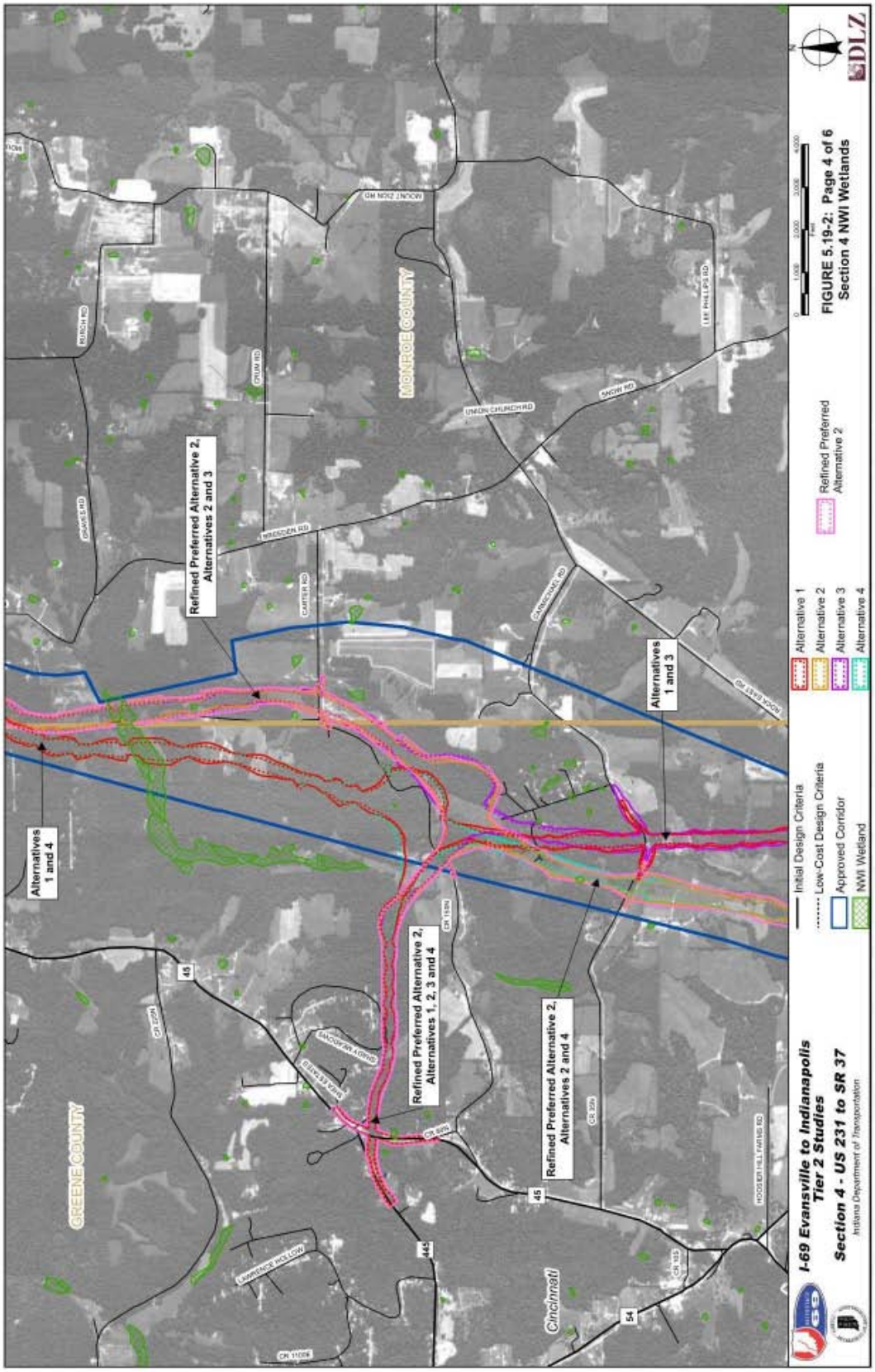


FIGURE 5.19-2: Page 3 of 6
Section 4 NWI Wetlands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MONROE COUNTY
Cincinnati
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
NWI Wetland
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-2: Page 4 of 6
Section 4 NWI Wetlands
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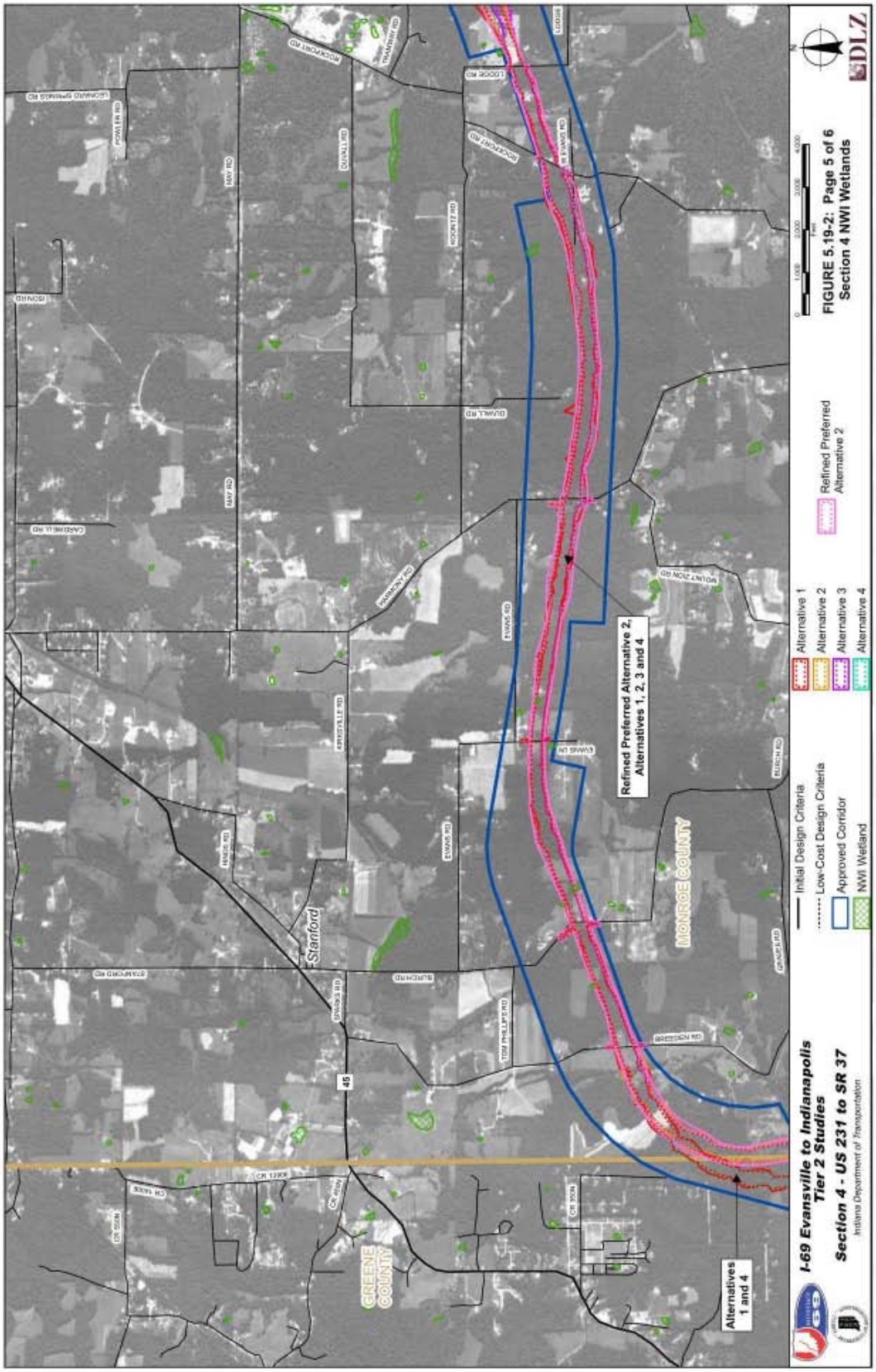
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
NWI Wetland
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-2: Page 5 of 6
Section 4 NWI Wetlands
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Stanford
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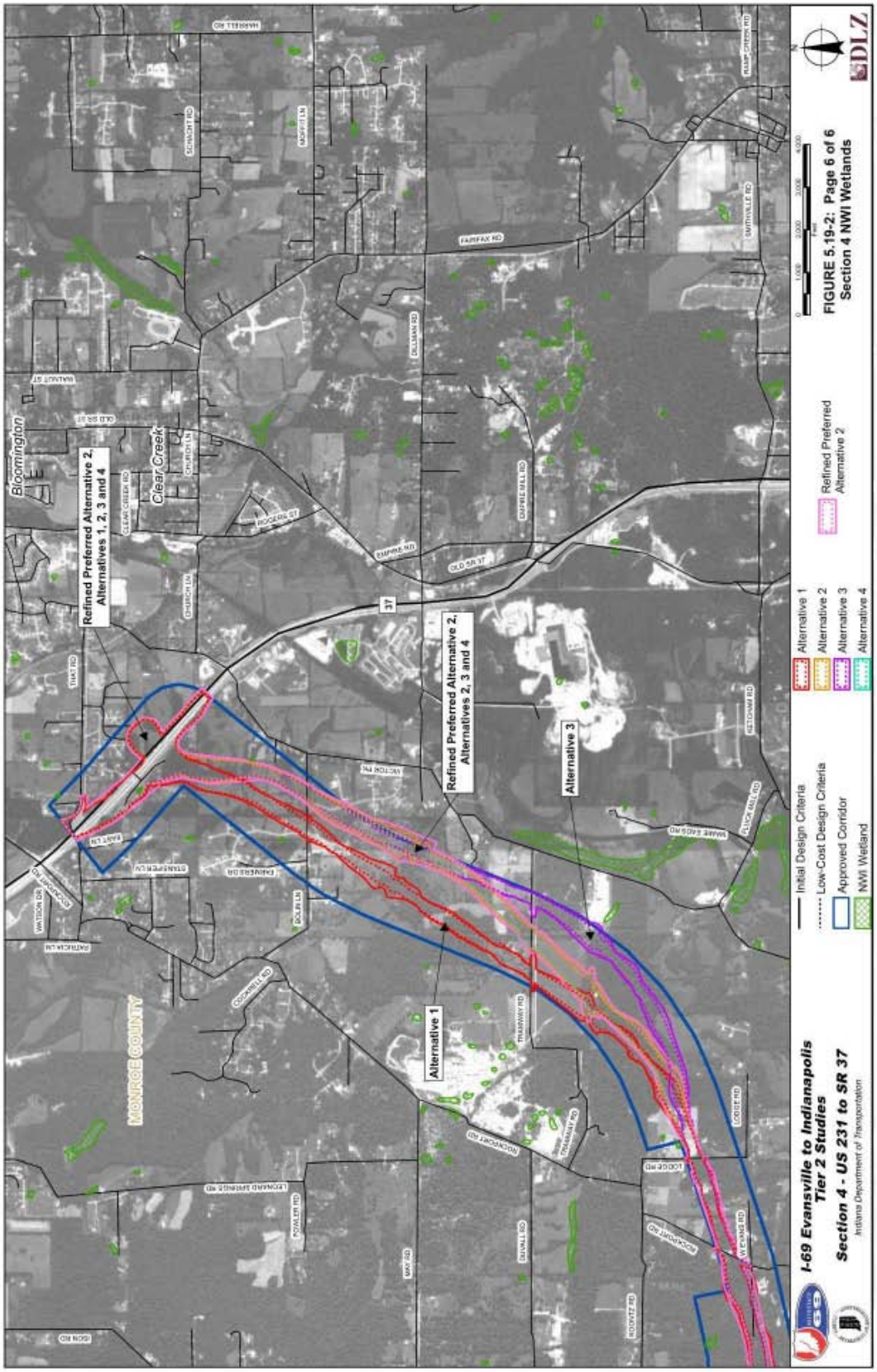
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Alternative 1
Alternative 3
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
NWI Wetland
Alternative 1
Alternative 2
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Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-2: Page 6 of 6
Section 4 NWI Wetlands
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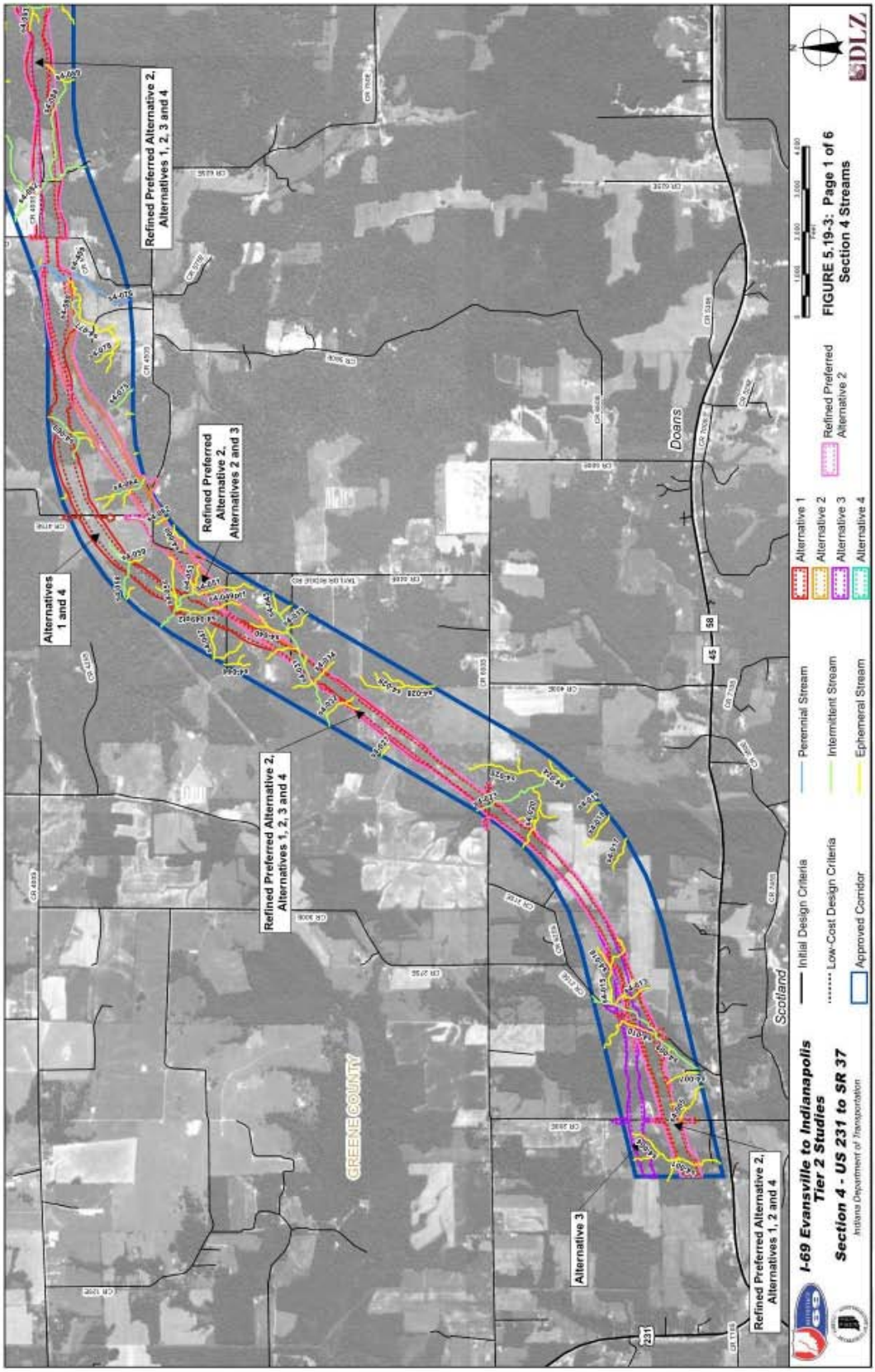
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Alternative 3
GREENE COUNTY
Scotland
Doans
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Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Perennial Stream
Intermittent Stream
Ephemeral Stream
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-3: Page 1 of 6
Section 4 Streams
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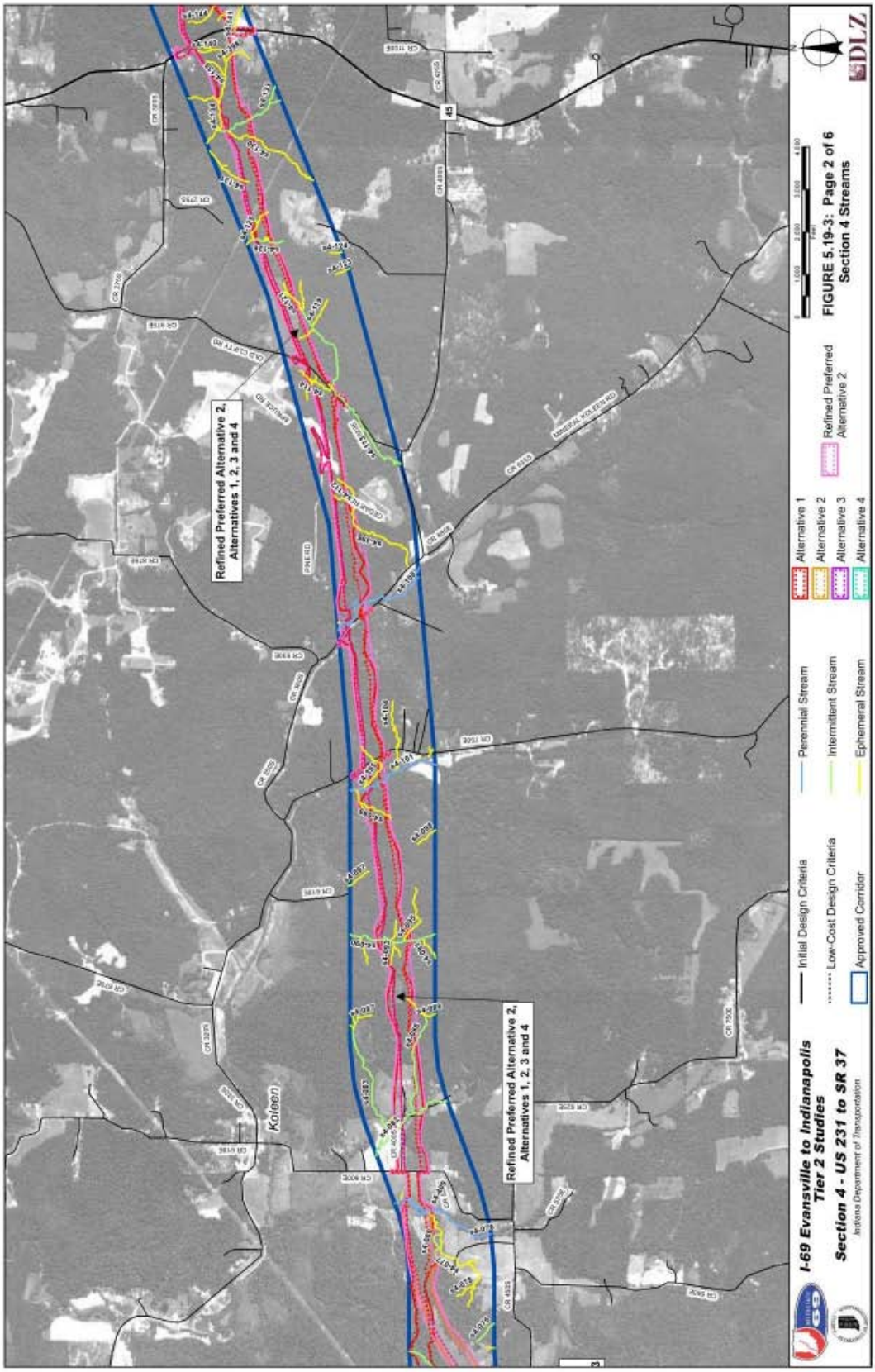
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Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Perennial Stream
Intermittent Stream
Ephemeral Stream
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.19-3: Page 2 of 6
Section 4 Streams
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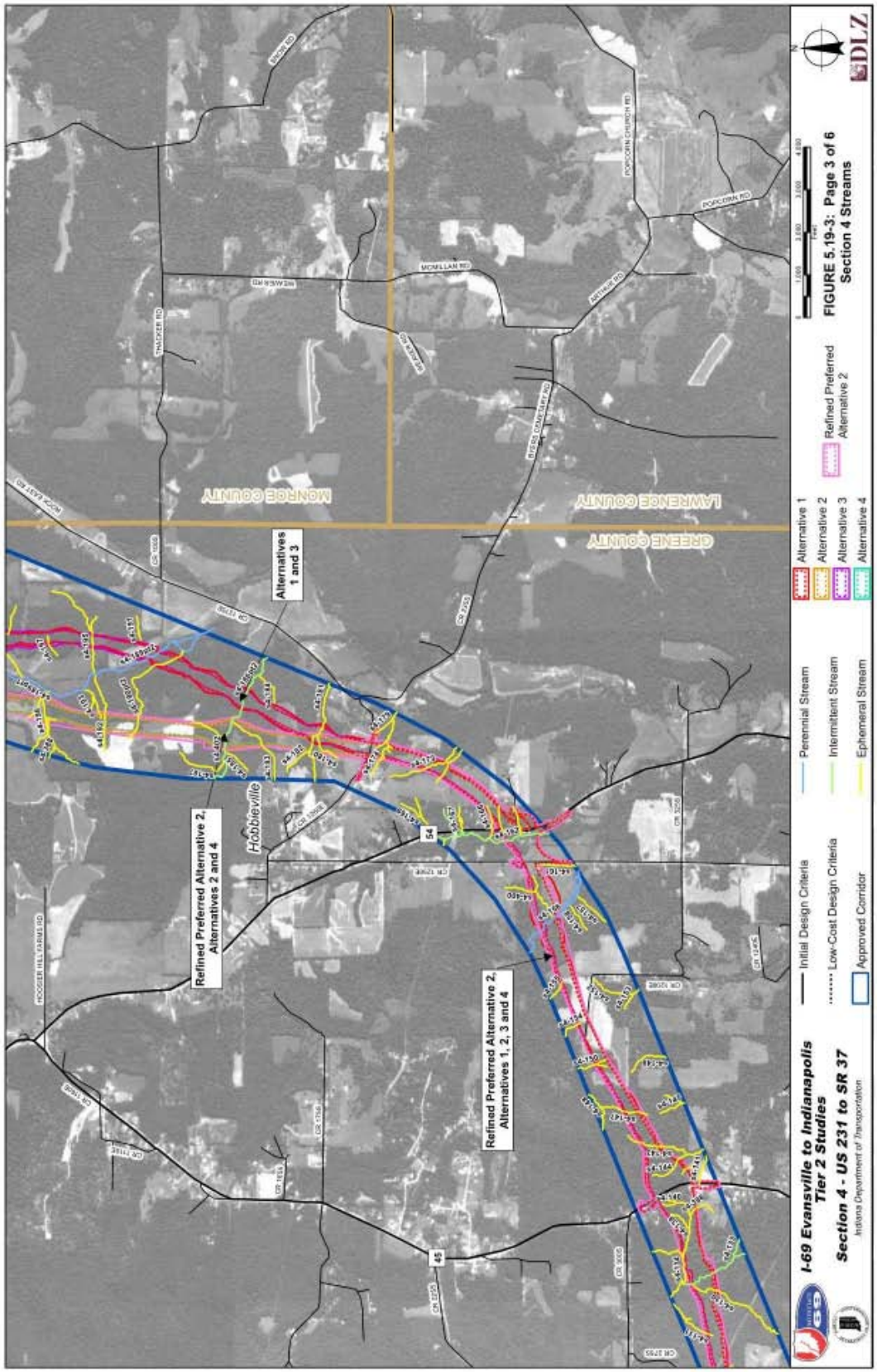
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Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Perennial Stream
Intermittent Stream
Ephemeral Stream
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-3: Page 3 of 6
Section 4 Streams
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MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Hobbieville
Alternatives 1 and 3
Refined Preferred Alternative 2, Alternatives 2 and 4
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
54
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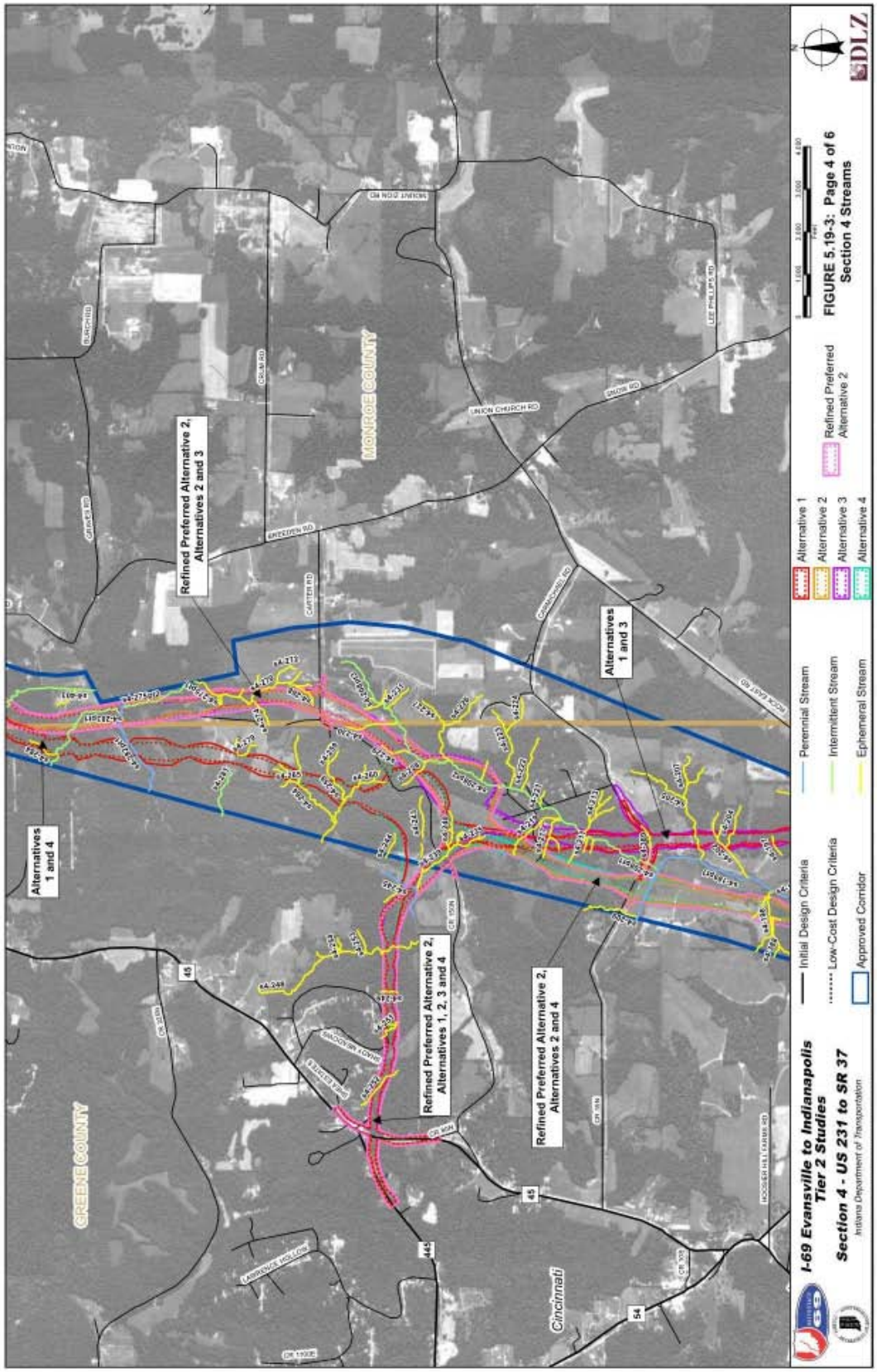
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Cincinnati
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Alternatives 1 and 3
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Perennial Stream
Intermittent Stream
Ephemeral Stream
Alternative 1
Alternative 2
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Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
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FIGURE 5.19-3: Page 4 of 6
Section 4 Streams
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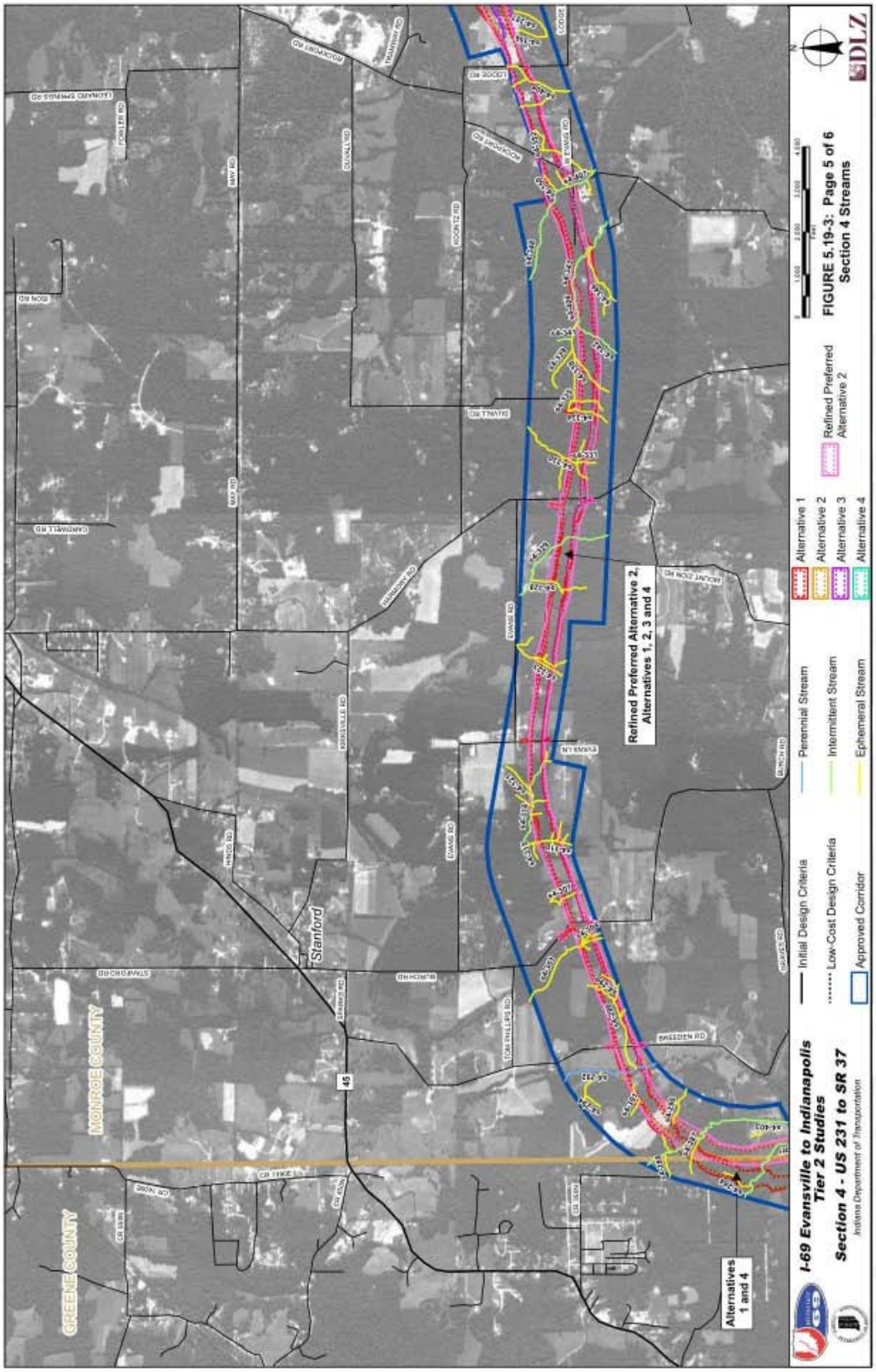
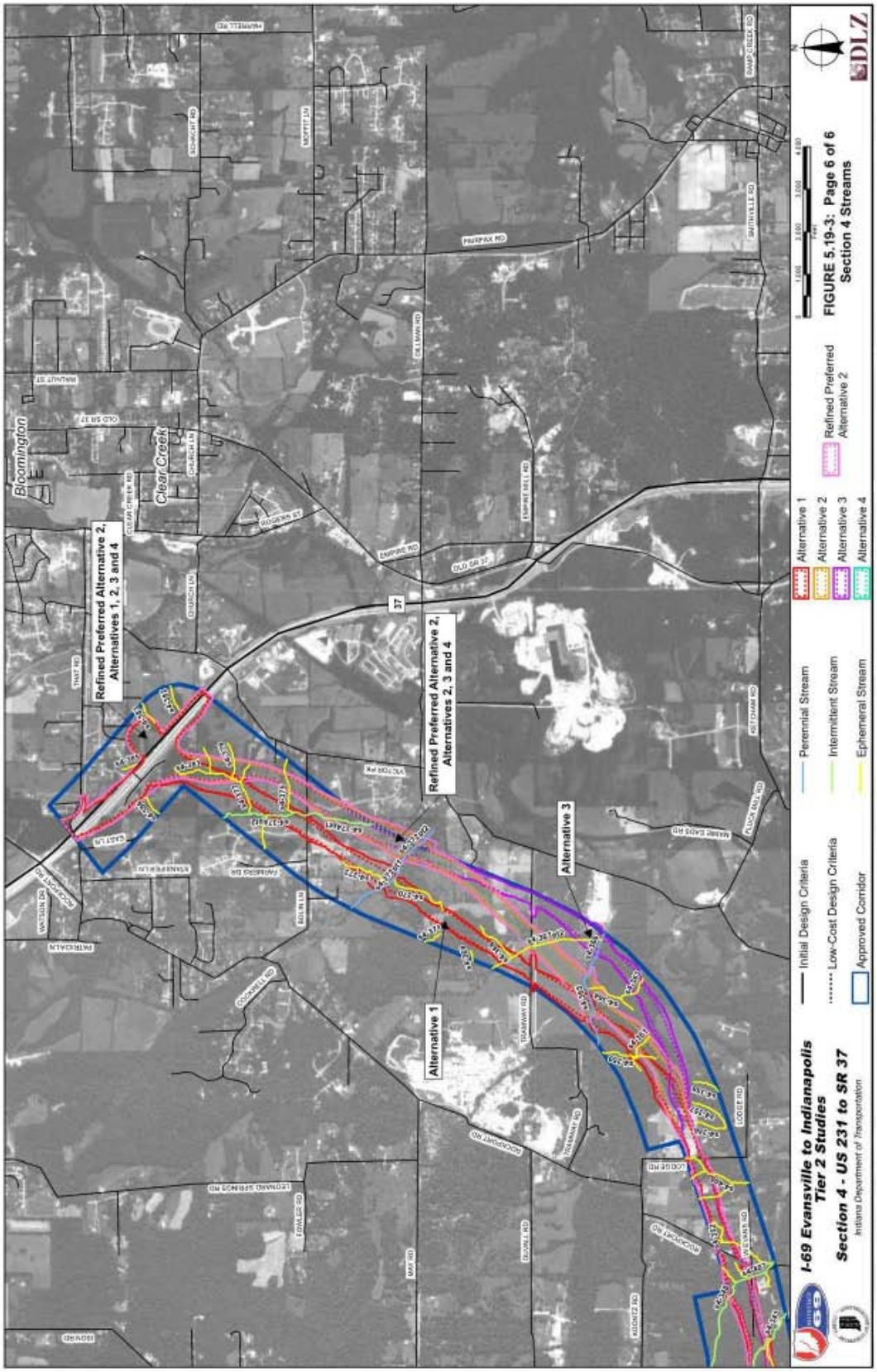
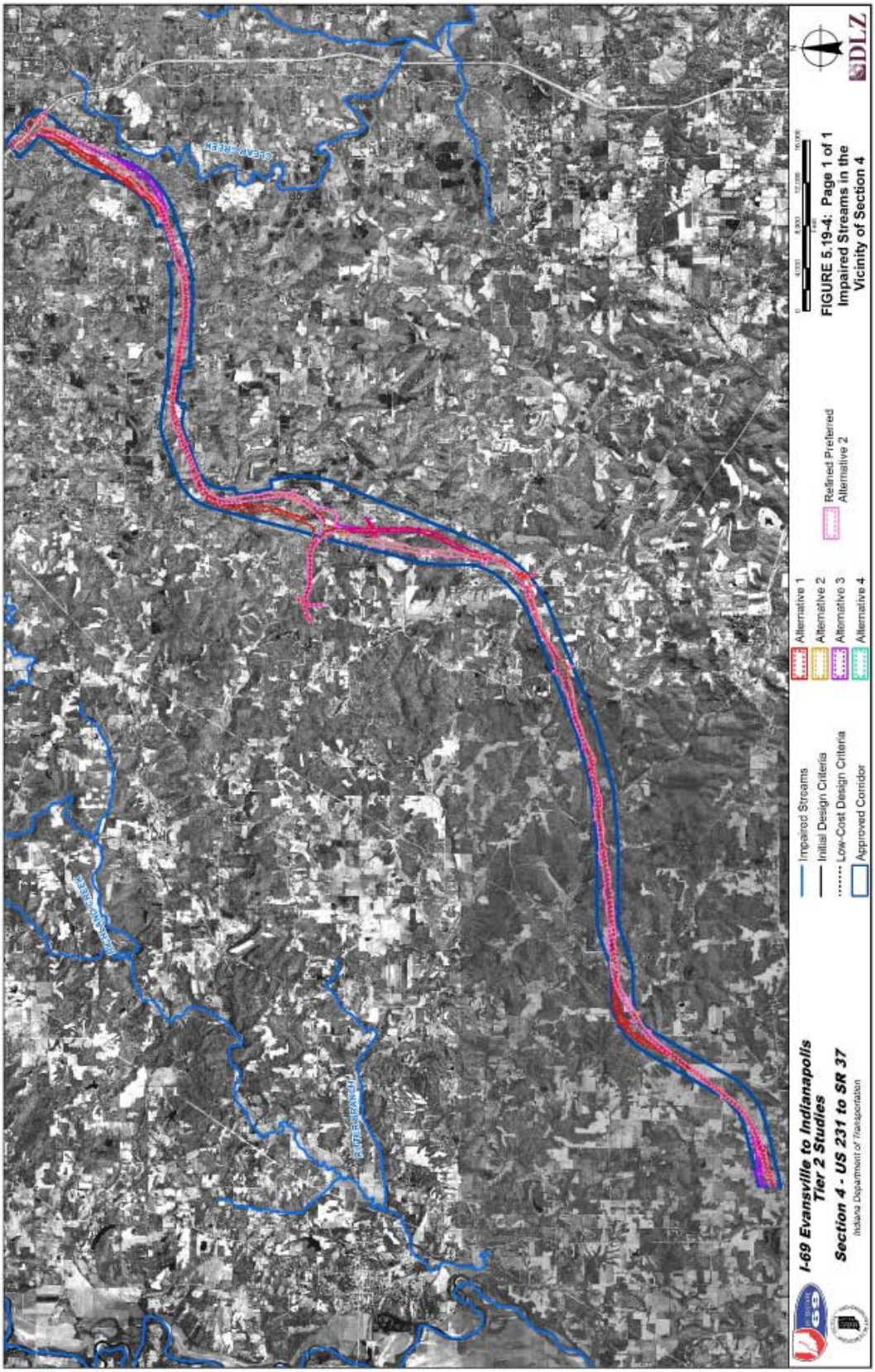

GREENE COUNTY
MONROE COUNTY
Stanford
45
Alternatives 1 and 4
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Perennial Stream
Intermittent Stream
Ephemeral Stream
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-3: Page 5 of 6
Section 4 Streams
DLZ


Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 2, 3 and 4
Alternative 1
Alternative 3
Bloomington
Clear Creek
37
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Perennial Stream
Intermittent Stream
Ephemeral Stream
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-3: Page 6 of 6
Section 4 Streams
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Impaired Streams
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.19-4: Page 1 of 1
Impaired Streams in the Vicinity of Section 4
DLZ

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5.20 Forest Impacts

Since the DEIS, the following substantive changes have been made to this section:

- Sections 5.20.3, 5.20.4, and 5.20.5 were updated for Refined Preferred Alternative 2.
- Tables 5.20-2, 5.20-3, 5.20-4, and 5.20-6 were updated for Refined Preferred Alternative 2.
- Section 5.20.4 – updated text to clarify that areas converted to mitigation land will no longer be available for timbering activities.
- Section 5.20.4 – updated text to include information from the Section 4 Biological Opinion (BO) and additional information on mitigation sites.

5.20.1 Introduction

Forests are a large and important resource in Indiana. Indiana's forests make significant environmental and economic contributions, including: timber, employment, outdoor recreation, protection of soil and water resources, and habitat for many plant and animal species. Approximately 4.5 million acres, or 20%, of Indiana is forested. Most forests are located in the southern half of the state (Tormoehlen et al., 2000). The majority of Indiana's forests are composed of hardwood species. The primary hardwood forest types in Indiana are oak-hickory and maple-beech (Schmidt et al, 2000).

In addition to impacts from the direct taking of forested land, ecosystems such as forests, prairies, wetlands, and others may be affected adversely by habitat fragmentation. It can be defined as the steady transformation of once large and continuous tracts of natural landscape into smaller and more isolated patches or fragments surrounded by disturbed areas (Temple and Wilcox, 1984). **Figure 5.20–1** (p. 5-624) shows a forest before and after fragmentation occurs. Fragmentation can increase the likelihood of invasive species entering an area's remaining habitat. Invasive plant species can cause ecological damage by displacing native plant species, eliminating food and cover for wildlife, and threatening rare plant and animal species. The Invasive Plant Species Assessment Working Group (IPSAWG) was formed to combat invasive species in Indiana. A number of agencies and organizations, including INDOT, participate in this group.[48]

[48] Partners in IPSAWG include USFWS, National Parks Service, U.S. Forest Service, The Nature Conservancy, The Wildlife Society Indiana Chapter, Purdue Cooperative Extension Service, IDNR, IDEM, Indiana Chapter of the American Society of Landscape Architects, Indiana Forage Council, Indiana Wildlife Federation, Indiana Seed Trade Association, Indiana State Beekeepers Association, Indiana Native Plant and Wildflower Society, Indiana Farm Bureau, Indiana State Chemist, White River Gardens, Grazing Lands Conservation Initiative, Green Industry Alliance, Indiana Academy of Science, Indianapolis Landscapers Association, and the Indianapolis Zoo.

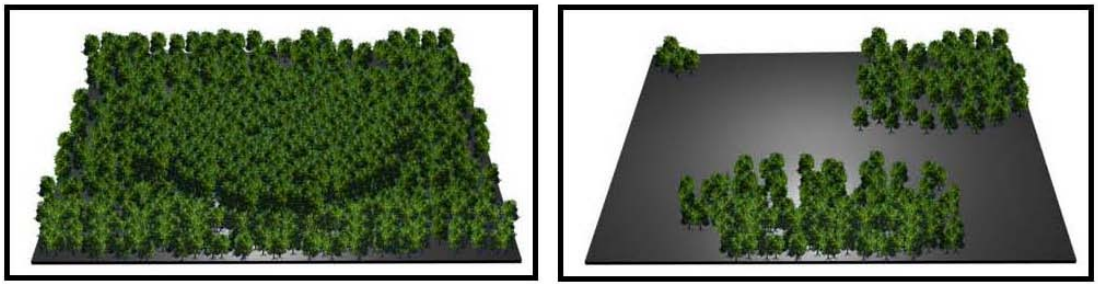

Figure 5.20-1: Left: Forest Prior to Fragmentation. Right: Forest After Fragmentation

Core habitat is the interior portion of any particular habitat. Core habitat can be associated with different ecosystem types, such as forest and prairies. However, in Southern Indiana most core habitat is generally associated with forests because no large tracts of prairie remain. Core forest is generally accepted to be the portion of the forest that is 100 meters (328 feet) from the edge (Temple, 1986). The outer portion of forest is considered the edge habitat. **Figure 5.20–2** (p. 5-624) shows core forest habitat. Core forest can be affected directly by impacting the core area or indirectly by impacting the edge of the forest, which in turn redefines the core area. Fragmentation of core forest habitat can affect migratory birds in a number of ways. Some birds require large blocks of forest to successfully nest and fledge their young. Nests deep in a forest tract are also often less susceptible to cowbird parasitism and predation by edge species such as raccoons. Fragmentation also can affect bird use by separating habitat blocks so they no longer function as one habitat unit.

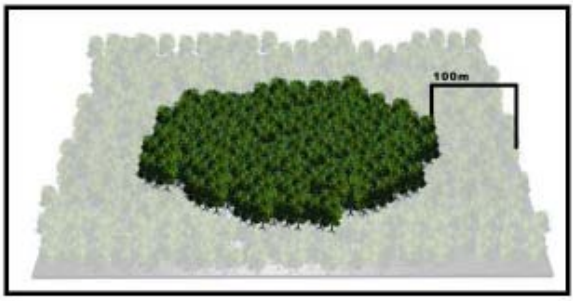

Figure 5.20-2: Diagram of Core Forest Habitat

5.20.2 Methodology

During the Tier 1 study, identifying the estimated impacts to forests was accomplished using the Geographic Information System (GIS) developed for Southwest Indiana. Alternative alignments were placed on top of the 1992 USGS Land Cover data layer (published in 1998) in the GIS, as described in The Tier 1 FEIS Section 5.21, *Forest Impacts*. The total acreage included the right-of-way needs for the mainline of the Interstate from US 231 (the US 231 interchange is included in Section 3) near Crane NSWC to SR 37 south of Bloomington, as well as the potential interchanges with SR 45 and SR 54.

In the Tier 2 study in Section 4, potential impacts to forested areas due to the project were identified using Year 2008 aerial photography supported by field surveys to verify or revise the mapped data. The field reconnaissance enabled the identification of small woodlots and narrow wooded areas along fencerows and streams that were not shown on the USGS data and, therefore, not included in the Tier 1 acreage estimates. Total acreages included the right-of-way needs for the mainline and interchanges in addition to county road overpasses and proposed road relocations and access roads.

All forests identified in the field and through aerial photography were digitized with current aerial photographs as a backdrop. The United States Department of Agriculture (USDA) definition of forest was used in this study. The USDA definition of forest states that the "minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land." All forests within the corridor and extending another 100 meters beyond the corridor edge were included to determine whether core forests would be impacted by the project. Forests were also digitized for any areas where alternatives extended outside the project corridor.

The information obtained from the aerials and field reconnaissance was used to map the forest types within the project corridor. The forest areas within the corridor were outlined and color-coded by forest type, and the acres of each type within the corridor were calculated. The proposed right-of-way of each end-to-end alternative was placed over the aerial mapping showing the outlined forest types, and the impacted forest areas were calculated by alternative.

As is explained in greater detail in Section 5.1.2, a range of impacts are calculated for each Alternative, corresponding to the footprints of the "low-cost" and "initial" design criteria. Unlike Sections 1 – 3 of the I-69 project, the terrain in Section 4 is such that application of different design criteria can materially affect the impacts of an alternative. The tables in this chapter provide two estimates for impacts of a specific alternative.

Information on potential indirect and cumulative effects of the project on forest land was obtained from many sources, including coordination with local county offices and staff in the project area, (several of whom served on Section 4's expert land use panel) as well as private industry development experts in the area. The analyses used the Regional Economic Models, Inc. (REMI) to calculate projected population and employment changes in each of five economic zones within the 26-county Tier 1 I-69 Study Area for the year 2030. Growth for each region was delegated into Traffic Analysis Zones (TAZs) based on input from the expert land use panels. The indirect impacts to forests are summarized in Section 5.20.3. The indirect and cumulative impact to forests and other key resources in Section 4 are described in detail in Section 5.24, Indirect and Cumulative Impacts.

5.20.3 Analysis

Field investigations and review of aerial photography resulted in the identification of four USDA forest classification types in the corridor for Section 4. **Table 5.20-1** lists the four types and describes the species associated with each. **Table 5.20-2** lists the forest types, the acres of each within the project corridor and within the proposed rights-of-way of the four end-to-end

alternatives in Section 4, and the degree of impact anticipated (i.e., Edge, Fragment, or Total). The occurrence of all forest areas within the project corridor is depicted on **Figure 5.20-3** (p. 5-655).

Table 5.20-1: Forest Types and Associated Plant Species in the Section 4 Corridor

USDA Forest Classifications	Representative Plant Species
Elm-ash-cottonwood	Forests in which lowland elm, ash, red maple, silver maple, and cottonwood, singly or in combination, comprise a plurality of the stocking. Species commonly associated with the elm-ash-cottonwood forest type in Indiana include sycamore, yellow-poplar, red oak, and black walnut.
Maple-beech	Forests in which hard maple, beech, American elm, and red maple, singly or in combination, comprise a plurality of the stocking. Species commonly associated with the maple-beech forest type in Indiana include white oaks, red oaks, hickories, yellow-poplar, and ash.
Eastern red cedar-hardwood	Forests in which hardwoods comprise a plurality of the stocking but in which eastern redcedar comprises between 25 and 50 percent of the stocking. Hardwood species commonly associated with the hardwood portion of this forest type in Indiana include ash, hickories, hard maple, white oaks, red oaks, and yellow-poplar.
Oak-hickory	Forests in which upland oaks and hickories, singly or in combination, comprise a plurality of the stocking. Species commonly associated with the oak-hickory forest type in Indiana include yellow-poplar, ash, black cherry, cottonwood, and black walnut.

A survey of Indiana's forests, 1999-2003, published by the USDA Forest Service identified a total of 256,800 acres of forest in the two counties in the Section 4 Study Area, as follows:

- Greene County—114, 200 acres
- Monroe County –142,600 acres

The selected corridor for I-69 in Section 4 has approximately 4,420 acres of forest (including upland and wetland forest) on 140 separate tracts. The entire Section 4 corridor includes approximately 7,498 acres of land, most of which is forested (59%). **Figure 5.20-3** (p. 5-655) shows an overview of the forest areas within the Section 4 corridor. The forest areas range in size from approximately 0.1 acre to 275 acres within the corridor with 25 of the tracts having greater than 50 acres. Many of the forest areas are large tracts that occupy the entire width of the corridor. The largest tract (275 acres) within the corridor is located in west of the Greene/Monroe County line north of Carter Road. The predominant forest type within the corridor is oak-hickory, totaling approximately 2,087 acres, or 47% of the total forested acres. Maple-beech accounts for 46%, elm-ash-cottonwood accounts for 6% and eastern redcedar-hardwood accounts for 1% of the total forested acres. The Alternatives also impact 6 additional forest tracts that lie entirely outside the corridor for development of proposed interchanges.

The potential impacts to forests due to Section 4 of the proposed I-69 project for the alternatives using the low-cost design criteria and initial design criteria range from 874 acres to 1,091 acres (Refined Preferred Alternative 2), which is 20%-25% of the total forest area in the corridor, to 936 acres to 1,173 acres (Alternative 1), which is 21%-27% of the total forest acreage in the corridor. The impact of Refined Preferred Alternative 2 using the low-cost design criteria and initial design criteria ranges from approximately 16 acres less, to 201 acres more, than the 890

acre impact in the Tier 1 study, but approximately 258 to 41 acres less than the 1,132 acres estimated in the revised Tier 1 BO.

The difference in impacts from the original Tier 1 study is largely the result of the more detailed analysis performed in Tier 2—analysis that involved different data sources for forest and field identification of wooded areas not included in the Tier 1 estimation of forest acres impacted (See Section 5.20.2, *Methodology*). The difference from the forest impact estimate in the revised BO is due to the use of a "representative alternative" during those calculations. The representative alternative was the alternative that had the highest impact to Tier 2 forest, from among the alignments being considered at that time in the Tier 2 studies as of November 14, 2005. **Figure 5.20-3** (p. 5-655) depicts the impacts to forest areas by alternative.

There are eight forests (F38, F40, F49, F53, F67, F82, F100, and F101) being impacted that include wetland areas within their boundaries. The numbers in **Table 5.20-2** include impacts to those wetlands.

The Indiana Wetland Rapid Assessment Protocol (INWRAP) was used to assess the wetlands within the construction limits of the Section 4 alternatives. Section 5.19, *Water Resources*, provides a detailed description of wetlands in the Section 4 corridor, the results of the INWRAP assessment, and potential impacts to wetlands as a result of each alternative. For mitigation purposes, forested wetlands are treated as wetlands. See Section 5.19, *Water Resources*, and in Chapter 7, *Mitigation and Commitments*, for a discussion of mitigation of impacts to forested wetlands. For impacts to forested wetlands, see **Table 5.20-3**.

Impacts to all forests within the Section 4 corridor, including the forested wetlands tabulated above, are shown in **Table 5.20-2**. Note that some of the forest areas affected extend beyond the corridor boundary, while others are located entirely outside the corridor. These forest areas are impacted by portions of the project, such as interchanges or local service roads, which extend beyond the limits of the Section 4 corridor. Those forest areas with portions outside the Section 4 corridor boundary are indicated with an "†" in the "Forest ID" column.

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Table 5.20-2: Section 4 - Potential Direct Impacts to Forested Areas, by Alternative

Total Acres of Forest in Corridor	Forest Type	Forest ID	Total Acres in Corridor	ALTERNATIVE 1				ALTERNATIVE 2				ALTERNATIVE 3				ALTERNATIVE 4				REFINED PREFERRED ALTERNATIVE 2			
				Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria	
				Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact
0-4.9 acres	Maple-beech	F147†	0.01	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F9†	0.29	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F151†	0.33	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F12†	0.34	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F126†	0.41	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F96	0.46	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F138†	0.57	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F97	0.63	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F94	0.67	0.00		0.09	Edge	0.00		0.00		0.00		0.22	Edge	0.00		0.00		0.00		0.00	
	Oak-hickory	F93	0.85	0.00		0.09	Edge	0.00		0.00		0.00		0.08	Edge	0.00		0.00		0.00		0.00	
	Oak-hickory	F71	1.06	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F26†	1.09	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F161†	1.35	0.63	Edge	0.63	Edge	0.63	Edge	0.63	Edge	0.63	Edge	0.63	Edge	0.63	Edge	0.63	Edge	0.63	Edge	0.63	Edge
	Elm-ash-cottonwood	F14	1.52	0.79	Fragment	0.92	Fragment	0.79	Fragment	0.92	Fragment	0.87	Fragment	0.88	Fragment	0.79	Fragment	0.92	Fragment	0.80	Fragment	0.92	Fragment
	Oak-hickory	F68†**	1.57	1.67	Edge	1.61	Edge	1.67	Edge	1.61	Edge	1.67	Edge	1.61	Edge	1.67	Edge	1.61	Edge	1.67	Edge	1.61	Edge
	Oak-hickory	F72†	1.71	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F57	1.78	0.69	Edge	0.87	Edge	0.69	Edge	0.87	Edge	0.69	Edge	0.87	Edge	0.69	Edge	0.87	Edge	0.69	Edge	0.87	Edge
	Maple-beech	F89†	1.81	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F6†	1.92	0.41	Edge	0.55	Edge	0.41	Edge	0.55	Edge	0.11	Edge	0.11	Edge	0.41	Edge	0.55	Edge	0.39	Edge	0.55	Edge
	Maple-beech	F102**	2.19	0.00		0.00		0.00		0.02	Edge	0.00		0.10	Edge	0.00		0.00		0.00		0.02	Edge
	Maple-beech	F157	2.35	1.73	Edge	1.74	Edge	1.74	Edge	1.74	Edge	1.74	Edge	1.74	Edge	1.74	Edge	1.74	Edge	1.74	Edge	1.74	Edge
	Maple-beech	F76†	2.40	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F155	2.56	0.00		0.01	Edge	0.00		0.01	Edge	0.00		0.01	Edge	0.00		0.01	Edge	0.00		0.01	Edge
	Maple-beech	F13†**	2.67	0.40	Edge	0.49	Edge	0.40	Edge	0.49	Edge	0.45	Edge	0.42	Edge	0.40	Edge	0.49	Edge	0.40	Edge	0.49	Edge
	Maple-beech	F85†	2.72	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F78	2.81	0.00		0.01	Edge	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F83†	2.81	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F150**	2.81	1.43	Edge	2.40	Total	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F32†**	3.01	0.65	Edge	1.34	Edge	0.00		0.00		0.00		0.00		0.65	Edge	1.34	Edge	0.00		0.00	
	Oak-hickory	F77†	3.07	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F153†	3.07	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F156	3.17	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge

Table 5.20-2: Section 4 - Potential Direct Impacts to Forested Areas, by Alternative

Total Acres of Forest in Corridor	Forest Type	Forest ID	Total Acres in Corridor	ALTERNATIVE 1				ALTERNATIVE 2				ALTERNATIVE 3				ALTERNATIVE 4				REFINED PREFERRED ALTERNATIVE 2			
				Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria	
				Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact
	Oak-hickory	F152†	3.54	0.00		0.00		0.82	Edge	0.93	Edge	0.78	Edge	0.93	Edge	0.82	Edge	0.93	Edge	0.73	Edge	0.93	Edge
	Oak-hickory	F95	3.68	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F135†	3.77	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F28	3.98	1.38	Edge	1.79	Edge	0.00		0.00		0.00		0.00		1.38	Edge	1.79	Edge	0.00		0.00	
	Maple-beech	F160†	4.12	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F134†	4.15	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F39	4.30	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F104	4.33	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.01	Edge	0.00		0.00	
	Maple-beech	F158	4.39	2.52	Edge	2.52	Edge	2.52	Edge	2.52	Edge	2.52	Edge	2.52	Edge	2.52	Edge	2.52	Edge	2.52	Edge	2.52	Edge
	Maple-beech	F27	4.52	2.07	Edge	2.45	Edge	0.00		0.00		0.00		0.00		2.07	Edge	2.45	Edge	0.00		0.00	
	Elm-ash-cottonwood	F106†	4.80	2.40	Fragment	3.09	Fragment	0.00		0.00		0.00		0.00		2.28	Fragment	3.04	Fragment	0.00		0.00	
	Maple-beech	F149†	5.24	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F4	5.43	2.00	Edge	2.26	Edge	2.00	Edge	2.26	Edge	2.01	Edge	2.12	Edge	2.00	Edge	2.26	Edge	2.00	Edge	2.26	Edge
	Elm-ash-cottonwood	F40	5.64	4.51	Edge	5.52	Total	4.46	Edge	5.52	Total	4.46	Edge	5.52	Total	4.51	Edge	5.52	Total	4.46	Edge	5.52	Total
	Maple-beech	F34†	6.17	0.00		0.00		3.17	Fragment	3.53	Fragment	3.17	Fragment	3.53	Fragment	0.00		0.00		3.17	Fragment	3.53	Fragment
	Oak-hickory	F159	6.26	1.85	Edge	2.07	Edge	1.93	Edge	2.07	Edge	1.93	Edge	2.07	Edge	1.93	Edge	2.07	Edge	1.93	Edge	2.07	Edge
	Maple-beech	F109†	6.40	1.64	Fragment	1.66	Fragment	1.58	Fragment	2.06	Fragment	1.60	Fragment	2.00	Fragment	1.60	Fragment	1.95	Fragment	1.59	Fragment	2.14	Fragment
	Maple-beech	F133†	6.47	4.03	Fragment	4.94	Fragment	4.03	Fragment	4.94	Fragment	4.03	Fragment	4.94	Fragment	4.03	Fragment	4.94	Fragment	4.03	Fragment	4.70	Fragment
5-9.9 acres	Eastern redcedar-hardwood	F142	6.53	0.00		0.00		4.34	Total	5.05	Total	0.01	Edge	0.01	Edge	4.34	Total	5.05	Total	4.34	Total	5.05	Total
	Oak-hickory	F75	6.60	3.74	Fragment	4.48	Fragment	2.13	Edge	2.77	Edge	3.74	Edge	4.20	Edge	2.58	Edge	2.75	Edge	2.13	Edge	2.76	Edge
	Elm-ash-cottonwood	F38	7.26	1.08	Edge	4.56	Edge	1.10	Edge	4.11	Edge	1.10	Edge	4.11	Edge	1.08	Edge	4.56	Edge	1.10	Edge	4.11	Edge
	Maple-beech	F87†	7.70	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F23	8.14	0.61	Fragment	0.78	Fragment	2.85	Fragment	3.48	Fragment	2.85	Fragment	3.48	Fragment	0.61	Fragment	0.78	Fragment	2.85	Fragment	3.48	Fragment
	Maple-beech	F11†	8.63	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F124†	8.69	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F5†	9.22	0.14	Edge	0.14	Edge	0.14	Edge	0.14	Edge	0.96	Edge	1.29	Edge	0.14	Edge	0.14	Edge	0.09	Edge	0.09	Edge
	Oak-hickory	F16†	10.47	5.54	Fragment	6.32	Fragment	5.54	Fragment	6.32	Fragment	5.62	Fragment	6.16	Fragment	5.54	Fragment	6.32	Fragment	5.56	Fragment	6.34	Fragment
	Oak-hickory	F59**	10.59	7.31	Fragment	8.15	Fragment	7.31	Fragment	8.15	Fragment	7.31	Fragment	8.15	Fragment	7.31	Fragment	8.15	Fragment	7.31	Fragment	8.15	Fragment
	Maple-beech	F2†**	10.62	2.97	Edge	3.02	Edge	2.97	Edge	3.02	Edge	0.02	Edge	0.00	Edge	2.97	Edge	3.02	Edge	2.95	Edge	3.21	Edge
10-24.9 acres	Maple-beech	F60	11.34	1.95	Edge	2.88	Edge	1.95	Edge	2.88	Edge	1.95	Edge	2.88	Edge	1.95	Edge	2.88	Edge	1.95	Edge	2.88	Edge
	Oak-hickory	F22†	11.40	1.22	Edge	1.31	Edge	1.13	Edge	1.27	Edge	1.13	Edge	1.27	Edge	1.22	Edge	1.31	Edge	1.13	Edge	1.27	Edge
	Maple-beech	F145	12.04	5.17	Fragment	5.96	Fragment	0.00		0.01	Edge	0.00		0.00		0.00	Edge	0.01	Edge	0.00		0.01	Edge
	Oak-hickory	F73†	12.66	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	

Table 5.20-2: Section 4 - Potential Direct Impacts to Forested Areas, by Alternative

Total Acres of Forest in Corridor	Forest Type	Forest ID	Total Acres in Corridor	ALTERNATIVE 1				ALTERNATIVE 2				ALTERNATIVE 3				ALTERNATIVE 4				REFINED PREFERRED ALTERNATIVE 2			
				Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria	
				Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact
	Oak-hickory	F103**	12.74	0.69	Edge	1.11	Edge	0.00		0.00		0.00		0.00		0.72	Edge	1.04	Edge	0.00		0.00	
	Maple-beech	F7**	13.07	4.27	Edge	5.03	Edge	4.27	Edge	5.03	Edge	0.60	Edge	1.14	Edge	4.27	Edge	5.03	Edge	3.79	Edge	4.53	Edge
	Eastern redcedar-hardwood	F144†	13.48	2.12	Edge	3.38	Edge	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F69†**	14.02	10.70	Fragment	10.55	Fragment	10.70	Fragment	10.55	Fragment	10.70	Fragment	10.55	Fragment	10.70	Fragment	10.55	Fragment	10.71	Fragment	11.01	Fragment
	Eastern redcedar-hardwood	F141†**	14.54	0.00		0.00		0.04	Edge	0.06	Edge	9.53	Fragment	10.61	Fragment	0.04	Edge	0.06	Edge	0.04	Edge	0.06	Edge
	Maple-beech	F29†**	14.73	0.00		0.00		10.12	Edge	10.21	Edge	10.12	Edge	10.21	Edge	0.00		0.00		10.12	Edge	10.33	Edge
	Maple-beech	F24†	14.83	4.89	Fragment	5.92	Fragment	0.32	Edge	1.06	Edge	0.32	Edge	1.06	Edge	4.89	Fragment	5.92	Fragment	0.32	Edge	1.06	Edge
	Oak-hickory	F35†	14.94	5.52	Fragment	9.89	Fragment	0.01	Edge	0.57	Edge	0.01	Edge	0.57	Edge	5.52	Fragment	9.89	Fragment	0.01	Edge	0.57	Edge
	Elm-ash-cottonwood	F18†	16.33	1.73	Fragment	2.00	Fragment	1.73	Fragment	2.00	Fragment	1.73	Fragment	2.00	Fragment	1.73	Fragment	2.00	Fragment	1.73	Fragment	2.00	Fragment
	Maple-beech	F110†	16.93	2.49	Edge	3.84	Edge	2.36	Edge	3.84	Edge	2.53	Edge	3.88	Edge	2.38	Edge	3.81	Edge	2.36	Edge	3.08	Edge
	Oak-hickory	F15†	17.29	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F131†**	17.30	0.94	Edge	2.61	Edge	0.94	Edge	2.61	Edge	0.94	Edge	2.61	Edge	0.94	Edge	2.61	Edge	0.94	Edge	1.51	Edge
	Maple-beech	F36†	18.29	12.73	Fragment	14.45	Fragment	0.00		0.09	Edge	0.00	Edge	0.09	Edge	12.73	Fragment	14.45	Fragment	0.00		0.11	Edge
	Oak-hickory	F70**	18.91	3.07	Edge	3.82	Edge	3.07	Edge	3.82	Edge	3.07	Edge	3.82	Edge	3.07	Edge	3.82	Edge	3.07	Edge	3.64	Edge
	Maple-beech	F58†	18.92	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F10	19.37	9.16	Fragment	11.14	Fragment	9.16	Fragment	11.14	Fragment	9.46	Fragment	11.37	Fragment	9.16	Fragment	11.14	Fragment	9.18	Fragment	11.16	Fragment
	Maple-beech	F21†	19.95	4.60	Fragment	4.25	Fragment	4.80	Fragment	4.54	Fragment	4.80	Fragment	4.54	Fragment	4.60	Fragment	4.25	Fragment	4.80	Fragment	4.54	Fragment
	Maple-beech	F99†**	20.92	0.00		0.00		1.16	Edge	2.12	Edge	0.00		0.00		0.89	Edge	1.51	Edge	1.16	Edge	2.12	Edge
	Elm-ash-cottonwood	F46†	21.27	7.13	Fragment	9.09	Fragment	7.13	Fragment	9.09	Fragment	7.13	Fragment	9.09	Fragment	7.13	Fragment	9.09	Fragment	7.13	Fragment	9.09	Fragment
	Maple-beech	F136†**	21.90	6.69	Fragment	7.70	Fragment	6.69	Fragment	7.80	Fragment	6.72	Fragment	7.90	Fragment	6.69	Fragment	7.80	Fragment	6.69	Fragment	7.50	Fragment
	Maple-beech	F19†**	22.11	2.64	Fragment	2.66	Fragment	2.64	Fragment	2.66	Fragment	2.64	Fragment	2.66	Fragment	2.64	Fragment	2.66	Fragment	2.64	Fragment	2.66	Fragment
	Elm-ash-cottonwood	F53†**	22.46	5.79	Fragment	8.98	Fragment	5.79	Fragment	8.98	Fragment	5.79	Fragment	8.98	Fragment	5.79	Fragment	8.98	Fragment	5.84	Fragment	8.98	Fragment
	Maple-beech	F63†	23.01	10.63	Fragment	11.54	Fragment	10.63	Fragment	11.54	Fragment	10.63	Fragment	11.54	Fragment	10.63	Fragment	11.54	Fragment	10.63	Fragment	11.54	Fragment
	Maple-beech	F43†	23.23	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Oak-hickory	F107†	23.28	7.49	Fragment	9.07	Fragment	0.00		0.00		0.00		0.00		6.84	Fragment	8.21	Fragment	0.00		0.00	
	Oak-hickory	F139†	24.44	3.29	Fragment	5.16	Fragment	3.03	Fragment	6.13	Fragment	7.71	Fragment	11.54	Fragment	3.03	Fragment	6.13	Fragment	3.03	Fragment	6.13	Fragment
	Maple-beech	F86†	25.48	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00			
	Oak-hickory	F105**	26.76	0.00		0.00		5.63	Fragment	7.04	Fragment	4.93	Fragment	7.65	Fragment	0.00		0.00		5.65	Fragment	8.05	Fragment
	Maple-beech	F125†**	27.43	4.84	Fragment	4.67	Fragment	4.84	Fragment	4.67	Fragment	4.84	Fragment	4.67	Fragment	4.84	Fragment	4.67	Fragment	4.84	Fragment	5.42	Fragment
25-49.9 acres	Oak-hickory	F3†	28.98	7.64	Fragment	9.57	Fragment	7.64	Fragment	9.57	Fragment	5.33	Fragment	6.52	Fragment	7.64	Fragment	9.57	Fragment	7.64	Fragment	9.57	Fragment
	Elm-ash-cottonwood	F56†**	29.36	6.26	Fragment	6.09	Fragment	6.26	Fragment	6.09	Fragment	6.26	Fragment	6.09	Fragment	6.26	Fragment	6.09	Fragment	6.26	Fragment	6.10	Fragment
	Maple-beech	F50†	29.81	6.86	Fragment	7.86	Fragment	6.86	Fragment	7.86	Fragment	6.86	Fragment	7.86	Fragment	6.86	Fragment	7.86	Fragment	7.05	Fragment	7.86	Fragment
	Oak-hickory	F137†	30.21	1.59	Edge	2.32	Edge	2.30	Edge	3.46	Edge	3.75	Edge	4.89	Edge	2.30	Edge	3.46	Edge	2.30	Edge	3.46	Edge
	Maple-beech	F154†**	30.52	16.42	Fragment	17.23	Fragment	17.32	Fragment	18.98	Fragment	17.35	Fragment	19.04	Fragment	17.32	Fragment	18.98	Fragment	17.33	Fragment	18.98	Fragment

Table 5.20-2: Section 4 - Potential Direct Impacts to Forested Areas, by Alternative

Total Acres of Forest in Corridor	Forest Type	Forest ID	Total Acres in Corridor	ALTERNATIVE 1				ALTERNATIVE 2				ALTERNATIVE 3				ALTERNATIVE 4				REFINED PREFERRED ALTERNATIVE 2			
				Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria	
				Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact
	Maple-beech	F1†	30.82	7.32	Fragment	8.44	Fragment	7.32	Fragment	8.44	Fragment	5.75	Fragment	6.04	Fragment	7.32	Fragment	8.44	Fragment	7.32	Fragment	8.44	Fragment
	Elm-ash-cottonwood	F49†**	31.91	7.53	Fragment	11.22	Fragment	7.53	Fragment	11.22	Fragment	7.53	Fragment	11.22	Fragment	7.53	Fragment	11.22	Fragment	7.62	Fragment	11.23	Fragment
	Elm-ash-cottonwood	F80†	32.35	4.57	Fragment	5.68	Fragment	3.38	Fragment	5.62	Fragment	4.54	Fragment	5.34	Fragment	3.39	Fragment	5.49	Fragment	3.38	Fragment	5.62	Fragment
	Maple-beech	F45†	33.59	7.84	Fragment	9.66	Fragment	7.84	Fragment	9.66	Fragment	7.84	Fragment	9.66	Fragment	7.84	Fragment	9.66	Fragment	7.84	Fragment	9.66	Fragment
	Maple-beech	F146†	33.71	10.62	Fragment	14.75	Fragment	2.53	Fragment	4.38	Fragment	2.17	Fragment	4.36	Fragment	2.53	Fragment	4.38	Fragment	2.53	Fragment	4.38	Fragment
	Maple-beech	F74†**	34.49	8.94	Fragment	9.90	Fragment	8.80	Fragment	10.00	Fragment	8.94	Fragment	10.11	Fragment	9.11	Fragment	9.88	Fragment	8.80	Fragment	10.00	Fragment
	Maple-beech	F17†**	34.72	4.40	Fragment	4.82	Fragment	4.40	Fragment	4.82	Fragment	4.40	Fragment	4.82	Fragment	4.40	Fragment	4.82	Fragment	4.40	Fragment	4.82	Fragment
	Maple-beech	F132	35.59	15.74	Fragment	24.76	Fragment	15.74	Fragment	24.76	Fragment	15.74	Fragment	24.76	Fragment	15.74	Fragment	24.76	Fragment	15.74	Fragment	20.95	Fragment
	Oak-hickory	F33†**	36.26	2.29	Fragment	3.61	Fragment	10.57	Fragment	15.14	Fragment	10.57	Fragment	15.14	Fragment	2.29	Fragment	3.61	Fragment	10.60	Fragment	15.15	Fragment
	Oak-hickory	F129†**	36.36	4.44	Fragment	7.10	Fragment	4.44	Fragment	7.10	Fragment	4.44	Fragment	7.10	Fragment	4.44	Fragment	7.10	Fragment	4.44	Fragment	6.92	Fragment
	Maple-beech	F42†	37.46	9.01	Fragment	15.34	Fragment	9.01	Fragment	15.34	Fragment	9.01	Fragment	15.34	Fragment	9.01	Fragment	15.34	Fragment	9.02	Fragment	15.34	Fragment
	Maple-beech	F52†**	39.83	9.31	Fragment	11.40	Fragment	9.31	Fragment	11.40	Fragment	9.31	Fragment	11.40	Fragment	9.31	Fragment	11.40	Fragment	9.49	Fragment	11.40	Fragment
	Maple-beech	F67†	41.51	9.49	Fragment	15.83	Fragment	9.49	Fragment	15.83	Fragment	9.49	Fragment	15.83	Fragment	9.49	Fragment	15.83	Fragment	9.49	Fragment	12.80	Fragment
	Oak-hickory	F41†	42.75	5.82	Edge	8.18	Edge	5.79	Edge	8.17	Edge	5.79	Edge	8.17	Edge	5.82	Edge	8.18	Edge	5.79	Edge	8.17	Edge
	Maple-beech	F65†	43.77	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
	Maple-beech	F37†	44.80	10.74	Fragment	15.59	Fragment	12.25	Fragment	16.09	Fragment	12.25	Fragment	16.09	Fragment	10.74	Fragment	15.59	Fragment	12.26	Fragment	16.16	Fragment
	Oak-hickory	F44†	53.53	10.31	Fragment	14.63	Fragment	10.31	Fragment	14.63	Fragment	10.31	Fragment	14.63	Fragment	10.31	Fragment	14.63	Fragment	10.34	Fragment	14.63	Fragment
	Maple-beech	F55†**	57.83	14.27	Fragment	14.86	Fragment	14.27	Fragment	14.86	Fragment	14.27	Fragment	14.86	Fragment	14.27	Fragment	14.86	Fragment	14.28	Fragment	14.86	Fragment
	Maple-beech	F47†**	61.92	11.42	Fragment	16.18	Fragment	11.42	Fragment	16.18	Fragment	11.42	Fragment	16.18	Fragment	11.42	Fragment	16.18	Fragment	11.42	Fragment	16.18	Fragment
	Oak-hickory	F98**	63.18	16.23	Fragment	19.66	Fragment	14.16	Fragment	15.95	Fragment	16.61	Fragment	21.48	Fragment	11.10	Fragment	14.47	Fragment	14.16	Fragment	15.95	Fragment
	Maple-beech	F79†**	64.42	9.39	Fragment	11.94	Fragment	10.98	Fragment	13.84	Fragment	9.39	Fragment	12.61	Fragment	11.07	Fragment	13.60	Fragment	10.98	Fragment	13.88	Fragment
	Maple-beech	F91**	64.86	6.29	Edge	7.60	Edge	0.00		0.00		6.21	Edge	9.18	Edge	0.00		0.00		0.00		0.00	
50-99.9 acres	Oak-hickory	F51†	65.73	12.53	Fragment	18.60	Fragment	12.53	Fragment	18.60	Fragment	12.53	Fragment	18.60	Fragment	12.53	Fragment	18.60	Fragment	12.53	Fragment	18.60	Fragment
	Maple-beech	F84†**	70.82	13.45	Fragment	14.87	Fragment	0.00		0.00		13.35	Fragment	17.19	Fragment	0.00		0.00		0.00		0.00	
	Elm-ash-cottonwood	F82†	71.58	7.38	Fragment	10.08	Fragment	2.83	Fragment	5.04	Fragment	7.34	Fragment	10.84	Fragment	2.82	Fragment	4.71	Fragment	2.83	Fragment	5.04	Fragment
	Oak-hickory	F123†**	79.57	18.69	Fragment	20.57	Fragment	18.69	Fragment	20.57	Fragment	18.69	Fragment	20.57	Fragment	18.69	Fragment	20.57	Fragment	18.71	Fragment	20.88	Fragment
	Oak-hickory	F54†	90.01	24.73	Fragment	37.32	Fragment	24.73	Fragment	37.32	Fragment	24.73	Fragment	37.32	Fragment	24.73	Fragment	37.32	Fragment	24.72	Fragment	37.32	Fragment
	Maple-beech	F122†**	91.01	18.07	Fragment	21.72	Fragment	17.90	Fragment	21.87	Fragment	17.68	Fragment	21.83	Fragment	18.05	Fragment	21.89	Fragment	17.90	Fragment	21.63	Fragment
	Oak-hickory	F48†	96.30	21.23	Fragment	29.49	Fragment	21.23	Fragment	29.49	Fragment	21.23	Fragment	29.49	Fragment	21.23	Fragment	29.49	Fragment	21.23	Fragment	29.49	Fragment
	Maple-beech	F140†	100.47	20.15	Fragment	25.84	Fragment	19.12	Fragment	25.12	Fragment	16.45	Fragment	21.54	Fragment	19.12	Fragment	25.12	Fragment	19.12	Fragment	25.13	Fragment
	Oak-hickory	F108†	112.90	24.46	Fragment	30.96	Fragment	23.74	Fragment	27.95	Fragment	23.29	Fragment	27.67	Fragment	23.69	Fragment	30.42	Fragment	23.93	Fragment	29.70	Fragment
>100 acres	Oak-hickory	F62†**	116.25	35.45	Fragment	40.99	Fragment	35.45	Fragment	40.99	Fragment	35.45	Fragment	40.99	Fragment	35.45	Fragment	40.99	Fragment	35.46	Fragment	41.01	Fragment
	Maple-beech	F128†	117.66	32.52	Fragment	35.92	Fragment	32.52	Fragment	35.92	Fragment	32.52	Fragment	35.92	Fragment	32.52	Fragment	35.92	Fragment	32.52	Fragment	39.06	Fragment
	Oak-hickory	F101**	120.74	43.84	Fragment	49.29	Fragment	17.00	Fragment	20.22	Fragment	17.67	Fragment	25.65	Fragment	42.89	Fragment	47.27	Fragment	16.74	Fragment	20.22	Fragment

Table 5.20-2: Section 4 - Potential Direct Impacts to Forested Areas, by Alternative

Total Acres of Forest in Corridor	Forest Type	Forest ID	Total Acres in Corridor	ALTERNATIVE 1				ALTERNATIVE 2				ALTERNATIVE 3				ALTERNATIVE 4				REFINED PREFERRED ALTERNATIVE 2			
				Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria		Low-Cost Design Criteria		Initial Design Criteria	
				Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact	Acres Impact	Type Impact
	Oak-hickory	F61†	136.22	15.09	Fragment	19.54	Fragment	15.09	Fragment	19.54	Fragment	15.09	Fragment	19.54	Fragment	15.09	Fragment	19.54	Fragment	15.09	Fragment	19.55	Fragment
	Oak-hickory	F81†**	141.67	10.35	Fragment	14.48	Fragment	19.56	Fragment	26.50	Fragment	10.05	Fragment	14.40	Fragment	19.04	Fragment	25.75	Fragment	19.43	Fragment	26.51	Fragment
	Oak-hickory	F64†**	161.34	44.25	Fragment	52.42	Fragment	44.25	Fragment	52.42	Fragment	44.25	Fragment	52.42	Fragment	44.25	Fragment	52.42	Fragment	44.34	Fragment	51.47	Fragment
	Oak-hickory	F20†	183.72	30.06	Fragment	35.10	Fragment	30.15	Fragment	35.22	Fragment	30.15	Fragment	35.22	Fragment	30.06	Fragment	35.10	Fragment	30.17	Fragment	35.18	Fragment
	Maple-beech	F92**	196.92	10.63	Fragment	14.34	Fragment	30.08	Fragment	35.17	Fragment	44.98	Fragment	49.95	Fragment	0.08	Fragment	0.08	Fragment	30.09	Fragment	35.17	Fragment
	Oak-hickory	F130†	247.00	45.93	Fragment	70.29	Fragment	45.93	Fragment	70.29	Fragment	45.93	Fragment	70.29	Fragment	45.93	Fragment	70.29	Fragment	45.95	Fragment	66.97	Fragment
	Maple-beech	F100†**	274.72	63.42	Fragment	73.22	Fragment	44.32	Fragment	52.61	Fragment	40.24	Fragment	51.35	Fragment	65.55	Fragment	72.00	Fragment	44.42	Fragment	52.03	Fragment
Total in Corridor			**4420.19**	**889.05**		**1120.91**		**826.54**		**1047.79**		**852.84**		**1087.97**		**846.46**		**1068.79**		**826.64**		**1040.56**	
Forests Completely Outside Corridor	Maple-beech	F111†**	0.00	38.21	Fragment	42.31	Fragment	38.87	Fragment	41.53	Fragment	39.47	Fragment	40.89	Fragment	38.41	Fragment	42.06	Fragment	38.88	Fragment	41.53	Fragment
	Oak-hickory	F112†	0.00	0.93	Edge	0.99	Edge	0.46	Edge	0.53	Edge	0.31	Edge	0.41	Edge	0.22	Edge	0.98	Edge	0.46	Edge	0.53	Edge
	Oak-hickory	F113†	0.00	3.11	Edge	3.42	Edge	3.12	Edge	3.34	Edge	3.12	Edge	3.34	Edge	3.12	Edge	3.34	Edge	3.12	Edge	3.34	Edge
	Maple-beech	F119†**	0.00	0.88	Edge	0.92	Edge	0.88	Edge	0.92	Edge	0.88	Edge	0.93	Edge	0.88	Edge	0.92	Edge	0.88	Edge	0.93	Edge
	Maple-beech	F120†**	0.00	3.80	Edge	4.51	Edge	3.80	Edge	4.09	Edge	3.80	Edge	4.45	Edge	3.80	Edge	4.09	Edge	3.80	Edge	4.09	Edge
	Maple-beech	F121†	0.00	0.15	Edge	0.17	Edge	0.15	Edge	0.15	Edge	0.15	Edge	0.15	Edge	0.15	Edge	0.15	Edge	0.15	Edge	0.15	Edge
Total Outside Corridor			**0.00**	**47.08**		**52.32**		**47.28**		**50.56**		**47.73**		**50.17**		**46.58**		**51.54**		**47.29**		**50.57**	
Total, All Forest*			**4420.19**	**936.13**		**1173.23**		**873.82**		**1098.35**		**900.57**		**1138.14**		**893.04**		**1120.33**		**873.93**		**1091.13**	
Total Forested Wetlands in Construction Limits			**11.45**	**2.12**		**4.83**		**1.81**		**3.76**		**1.93**		**3.99**		**2.00**		**4.62**		**1.81**		**3.76**	
Total, All Upland Forests*			**4408.74**	**934.01**		**1168.40**		**872.01**		**1094.59**		**898.64**		**1134.15**		**891.04**		**1115.71**		**872.12**		**1087.37**	

† Indicates forest tract with some portion of the tract located outside the Section 4 corridor boundary.
**Includes forested wetland acreage that will be preserved within the right-of-way.*
***Includes multiple encroachments upon forests.*
****An "Edge" impact means the alternative impacts one side of the forest leaving the remaining forest on one side of the right-of-way. "Fragment" means the alternative splits the forest such that one or more forest areas remain on each side of the right-of-way. "Total" means the entire forest will be impacted by the alternative or less than 1 acre, which is the USDA size criterion for forest, will remain.*
*****Each range corresponds to "low-cost" and "initial" design criteria – in that order.*
Note: There are no forests named F90, F127, or F143.

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Table 5.20-3: Wetland Impacts in Forested Areas (Forested Wetlands)

Impacts (Acres)	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Total Forest	936.13	1173.23	873.82	1098.35	900.57	1138.14	893.04	1120.33	873.93	1091.13
F038 wetland impact acres	0.00	2.17	0.01	1.51	0.01	1.51	0.00	2.17	0.01	1.51
F040 wetland impact acres	1.44	1.64	1.42	1.62	1.42	1.62	1.44	1.64	1.42	1.62
F049 wetland impact acres	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
F053 wetland impact acres	0.09	0.25	0.09	0.25	0.09	0.25	0.09	0.25	0.09	0.25
F067 wetland impact acres	0.06	0.15	0.06	0.15	0.06	0.15	0.06	0.15	0.06	0.15
F082 wetland impact acres	0.12	0.21	0.00	0.00	0.12	0.23	0.00	0.00	0.00	0.00
F100 wetland impact acres	0.00	0.00	0.15	0.15	0.15	0.15	0.00	0.00	0.15	0.15
F101 wetland impact acres	0.33	0.33	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00
Total forested wetland impact acres	2.12	4.83	1.81	3.76	1.93	3.99	2.00	4.62	1.81	3.76
Non-wetland Forest Acres impacted	934.01	1168.40	872.01	1094.59	898.64	1134.15	891.04	1115.71	872.12	1087.37

Note: These wetland impacts are within the construction limits. See page 5.1.2 for an explanation of using construction limits for calculating wetlands impacts.

Each range corresponds to "low-cost" and "initial" design criteria – in that order.

The potential impacts to non-wetland forests due to Section 4 of the proposed I-69 project for alternatives using the low-cost design criteria and initial design criteria vary from approximately 872 acres to 1,087 acres (Refined Preferred Alternative 2) to 934 acres to 1,168 acres (Alternative 1).

Core Forest Impacts

Twenty-five (25) forests containing core forest areas habitat were identified as being impacted by Section 4 Alternatives. The impacts are summarized in **Table 5.20-4**. The figures referenced below (**Figure 5.20-4** through **Figure 5.20-82** (p. 5-667 through p. 5-695) provide a "before and

after" picture of the amount of core forest. In order to determine potential impacts to core forest, all forests within the corridor and extending at least another 100 meters beyond either the corridor edge or the right-of-way of each of the alternatives where core forest impacts would extend beyond the corridor were included in this analysis. In some cases, the total acreages and acreages of core forest remaining will be larger than what is reported as the existing forests extend beyond 100 meters from the corridor.

For analysis of core forest impacts, the forests below (in most cases) are combinations of two or more contiguous forests, as described earlier in this section. The forests described earlier designate as different "forests" each different forest type (e.g., maple-beech, oak-hickory, elm-ash-cottonwood, etc.). In many cases, these different forest types form larger, contiguous stands of forest. These adjacent tracts of different forest types must be considered as a unit for analysis of core forest impacts.

Forest A (F1): This forest is a maple-beech stand with approximately 3.09 acres of core forest habitat located west of Greene CR 200E. Approximately 30.82 acres of the forest are within the project corridor. The core forest area is located in the center of the project corridor. Alternative 3 (low-cost design criteria and initial design criteria) impacts from 5.75 acres to 6.04 acres from the northern end of Forest A and redefines the core forest area. The size of the core forest habitat is reduced to 3.09 acres to 2.96 acres, a difference of 0.00 acres to 0.13 acres. Alternatives 1, 2, 4, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impact from 7.32 acres to 8.44 acres of Forest A and eliminate the entire core forest area. The impacts are shown in **Figure 5.20-4** through **Figure 5.20-6** (p. 5-667). The forest is located at the very western end of the Section 4 project corridor. The core forest acreage that is beyond 100 meters of the Section 4 Alternatives will be impacted by Section 3 Alternatives.

Forest B (F3, F4, F5, F6, F7): This forest is a maple-beech/oak-hickory/elm-ash-cottonwood stand with approximately 4.31 acres of core forest habitat located east of Greene CR 200E. Approximately 58.62 acres of the forest are within the project corridor. Alternatives 1, 2, and 4 (low-cost design criteria and initial design criteria) impact 14.46 to 17.55 acres from Forest B. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 13.91 to 17.00 acres from Forest B. Alternatives 1, 2, 4, and Refined Preferred Alternative 2 redefine the core forest area to the same extent. The size of the core forest habitat is reduced to 4.01 acres to 3.90 acres, a difference of 0.30 acres to 0.41 acres. Alternative 3 (low-cost design criteria and initial design criteria) impacts 9.01 to 11.18 acres of Forest B. The size of the core forest habitat is reduced to 0.50 acres to 0.43 acres, a difference of 3.81 to 3.88 acres. The impacts are shown in **Figure 5.20-7** through **Figure 5.20-9** (p. 5-668).

Forest C (F15, F16, F17, F18, F19): This forest is an oak-hickory/maple-beech/elm-ash-cottonwood stand with approximately 23.43 acres of core forest habitat located south of Greene CR 600S. Approximately 100.92 acres of the forest are within the project corridor. Alternatives 1, 2, and 4 (low-cost design criteria and initial design criteria) impact 14.31 acres to 15.80 acres from the north end of Forest C. Alternative 3 (low-cost design criteria and initial design criteria) impacts 14.39 acres to 15.64 acres from the north end of Forest C. Refined Preferred Alternative 2 impacts 14.33 acres to 15.82 acres from the north end of Forest C. Each of the alternatives redefine the core forest area. The size of the core forest habitat is reduced to 20.90 to 20.48

acres, a difference of 2.53 to 2.95 acres. The impacts are shown in **Figure 5.20-10** through **Figure 5.20-11** (p. 5-669).

Forest D (F20, F21, F22, F23, F24, F27, F28, F29): This forest is an oak-hickory and maple-beech stand with approximately 115.17 acres of core forest habitat located west of Taylor Ridge Road. Approximately 261.27 acres of the forest are within the project corridor. Alternatives 1 and 4 (low-cost design criteria and initial design criteria) impact 44.83 acres to 51.60 acres of Forest D and redefine the core forest area. The size of the core forest habitat is reduced to 52.02 acres to 49.94 acres, a difference of 63.15 acres to 65.23 acres. Alternative 2 and 3 (low-cost design criteria and initial design criteria) impact 49.37 acres to 55.78 acres of Forest D and redefine the core forest area. The size of the core forest habitat is reduced to 53.10 acres to 51.85 acres, a difference of 62.07 acres to 63.32 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 49.39 acres to 55.86 acres of Forest D and redefines the core forest area. The size of the core forest habitat is reduced to 53.10 acres to 51.72 acres, a difference of 62.07 acres to 63.45 acres. The impacts are shown in **Figure 5.20-12** through **Figure 5.20-14** (p. 5-670).

Forest E (F33, F34, F35, F36, F37 and F38): This forest is an oak-hickory/maple-beech/elm-ash-cottonwood stand with approximately 54.41 acres of core forest habitat located east of Taylor Ridge Road. Approximately 127.72 acres of the forest are within the project corridor. Alternatives 1 and 4 (low-cost design criteria and initial design criteria) impact 32.36 to 48.10 acres of Forest E and redefine the core forest area. The size of the core forest habitat is reduced to 25.54 to 21.32 acres, a difference of 28.87 to 33.09 acres. Alternatives 2 and 3 (low-cost design criteria and initial design criteria) impact 27.10 to 39.53 acres of Forest E and redefine the core forest area. The size of the core forest habitat is reduced to 41.84 acres to 38.74 acres, a difference of 12.57 acres to 15.67 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 27.14 acres to 39.63 acres of Forest E and redefines the core forest area. The size of the core forest habitat is reduced to 41.82 acres to 38.67 acres, a difference of 12.59 acres to 15.74 acres. The impacts are shown in **Figure 5.20-15** through **Figure 5.20-17** (p. 5-671).

Forest F (F40, F41): This forest is an oak-hickory/elm-ash-cottonwood stand with approximately 5.98 acres of core forest habitat located east of Greene CR 600E. Approximately 48.39 acres of the forest are within the project corridor. Alternatives 1 and 4 (low-cost design criteria and initial design criteria) impact 10.33 acres to 13.70 acres from the northern end of Forest F. Alternatives 2, 3, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impact 10.25 acres to 13.69 acres from the northern end of Forest F. Each alternative (low-cost design criteria and initial design criteria) redefines the core forest area. The size of the core forest habitat is reduced to 4.68 acres to 4.44 acres, a difference of 1.30 acres to 1.54 acres. The impacts are shown in **Figure 5.20-18** through **Figure 5.20-19** (p. 5-672).

Forest G (F42, F43, F44, F44, F45, F46, F47, F48, F49, F50, F51, F52, F53, F54, F55, F56, F57, F58, F59, F60, and F61): This forest is an oak-hickory/maple-beech/elm-ash-cottonwood stand with approximately 636.26 acres of core forest habitat located east of Greene CR 600E. Approximately 873.09 acres of the forest are within the project corridor. Alternatives 1, 2, 3, and 4 (low-cost design criteria and initial design criteria) will impact 179.26 acres to 242.16

acres from Forest G and redefine the core forest area. The size of the core forest habitat is reduced to 288.72 acres to 245.11 acres, a difference of 347.54 acres to 391.15 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 179.81 acres to 242.19 acres of Forest G and redefines the core forest area. The size of the core forest habitat is reduced to 288.68 acres to 245.11 acres, a difference of 347.58 acres to 391.15 acres. The impacts are shown in **Figure 5.20-20** through **Figure 5.20-21** (p. 5-673).

Forest H (F62, F63): This forest is an oak-hickory/maple-beech stand with approximately 83.02 acres of core forest habitat located west of SR 45. Approximately 139.26 acres of the forest are within the project corridor. Alternatives 1, 2, 3, and 4 (low-cost design criteria and initial design criteria) impact 46.08 acres to 52.53 acres of Forest H and redefines the core forest area. The size of the core forest habitat is reduced to 28.14 acres to 23.51 acres, a difference of 54.88 acres to 59.51 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 46.09 acres to 52.55 acres of Forest H and redefines the core forest area. The size of the core forest habitat is reduced to 28.13 acres to 23.51 acres, a difference of 54.89 acres to 59.51 acres. The impacts are shown in **Figure 5.20-22** through **Figure 5.20-23** (p. 5-674).

Forest I (F64, F65, F67): This forest is an oak-hickory/maple-beech stand with approximately 96.09 acres of core forest habitat located east of SR 45. Approximately 246.62 acres of the forest are within the project corridor. Alternatives 1, 2, 3, and 4 (low-cost design criteria and initial design criteria) impact 53.74 acres to 68.25 acres of Forest I and redefines the core forest area. The size of the core forest habitat is reduced to 34.56 acres to 28.17 acres, a difference of 61.53 acres to 67.92 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 53.83 acres to 64.27 acres of Forest I and redefines the core forest area. The size of the core forest habitat is reduced to 34.56 acres to 29.83 acres, a difference of 61.53 acres to 66.26 acres. The impacts are shown in **Figure 5.20-24** through **Figure 5.20-25** (p. 5-674).

Forest J (F77, F78, F79, F80, F81, F82): This forest is an oak-hickory/maple-beech/elm-ash-cottonwood stand with approximately 120.32 acres of core forest habitat located north of Hobbieville Road. Approximately 315.90 acres of the forest are within the project corridor. Alternative 1 (low-cost design criteria and initial design criteria) impacts 31.69 acres to 42.19 acres of Forest J and redefines the core forest area. The size of the core forest habitat is reduced to 77.52 acres to 72.51 acres, a difference of 42.80 acres to 47.81 acres. Alternative 2 (low-cost design criteria and initial design criteria) impacts 36.75 acres to 51.00 acres of Forest J and redefines the core forest area. The size of the core forest habitat is reduced to 97.86 acres to 90.92 acres, a difference of 22.46 to 29.40 acres. Alternative 3 (low-cost design criteria and initial design criteria) impacts 31.32 acres to 43.19 acres of Forest J and redefines the core forest area. The size of the core forest habitat is reduced to 78.03 acres to 72.18 acres, a difference of 42.29 acres to 48.14 acres. Alternative 4 (low-cost design criteria and initial design criteria) impacts 36.32 acres to 49.55 acres of Forest J and redefines the core forest area. The size of the core forest habitat is reduced to 97.86 acres to 91.30 acres, a difference of 22.46 acres to 29.02 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 36.62 acres to 51.05 acres of Forest J and redefines the core forest area. The size of the core forest habitat is reduced to 98.25 acres to 90.92 acres, a difference of 22.07 acres to 29.40 acres. The impacts are shown in **Figure 5.20-26** (p. 5-676) through **Figure 5.20-30** (p. 5-677).

Forest K (F84): This forest is a maple-beech stand with approximately 13.09 acres of core forest habitat located west of Rock East Road. Approximately 70.82 acres of the forest are within the project corridor. Alternatives 2, 4, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) do not impact the forest or redefine the core forest. Alternative 1 (low-cost design criteria and initial design criteria) impacts 13.45 to 14.87 acres from Forest K and redefines the core forest area. The size of the core forest habitat is reduced to 6.60 to 5.94 acres, a difference of 6.49 to 7.15 acres. Alternative 3 (low-cost design criteria and initial design criteria) impacts 13.35 to 17.19 acres from Forest K and redefines the core forest area. The size of the core forest habitat is reduced to 6.62 to 5.69 acres, a difference of 6.47 to 7.40 acres. The impacts are shown in **Figure 5.20-31** through **Figure 5.20-34** (p. 5-678).

Forest L (F91): This forest is a maple-beech stand with approximately 4.04 acres of core forest habitat located south of Carmichael Road. Approximately 64.86 acres of the forest are within the project corridor. Alternative 1 (low-cost design criteria and initial design criteria) impacts 6.29 acres to 7.60 acres of Forest L and redefines the core forest area. The size of the core forest habitat is reduced to 3.11 acres to 2.99 acres, a difference of 0.93 to 1.05 acres. Alternative 3 (low-cost design criteria and initial design criteria) impacts 6.21 acres to 9.18 acres of Forest L and redefines the core forest area. The size of the core forest habitat is reduced to 3.14 acres to 2.93 acres, a difference of 0.90 acres to 1.11 acres. Alternatives 2, 4, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) do not impact the forest or redefine the core forest. The impacts are shown in **Figure 5.20-35** through **Figure 5.20-38** (p. 5-679).

Forest M (F86): This forest is a maple-beech stand with approximately 4.40 acres of core forest habitat located south of Carmichael Road. Approximately 25.48 acres of the forest are within the project corridor. None of the alternatives impact this forest or redefine the core forest area. This forest is shown in **Figure 5.20-39** through **Figure 5.20-40** (p. 5-680).

Forest N (F92, F93, F94, F95, F96, F97, F98, F99, F100, F101, F103, F104, F105, F106, F107, F108, F109, F110): This forest is an oak-hickory/maple-beech/elm-ash-cottonwood stand with approximately 312.63 acres of core forest habitat located north of Carmichael Road. Approximately 890.91 acres of the forest are within the project corridor. Alternative 1 (low-cost design criteria and initial design criteria) impacts 173.29 acres to 206.42 acres of Forest N and redefines the core forest area. The size of the core forest habitat is reduced to 137.67 acres to 127.20 acres, a difference of 174.96 acres to 185.43 acres. Alternative 2 (low-cost design criteria and initial design criteria) impacts 140.03 acres to 166.96 acres of Forest N and redefines the core forest area. The size of the core forest habitat is reduced to 211.94 acres to 205.98 acres, a difference of 100.69 acres to 106.65 acres. Alternative 3 (low-cost design criteria and initial design criteria) impacts 151.85 acres to 189.93 acres of Forest N and redefines the core forest area. The size of the core forest habitat is reduced to 187.83 acres to 175.47 acres, a difference of 124.80 acres to 137.16 acres. Alternative 4 (low-cost design criteria and initial design criteria) impacts 158.02 acres to 183.81 acres of Forest N and redefines the core forest area. The size of the core forest habitat is reduced to 164.40 acres to 155.56 acres, a difference of 148.23 acres to 157.07 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 140.10 acres to 168.46 acres of Forest N and redefines the core forest area. The size of the core forest habitat is reduced to 212.68 acres to 206.13 acres, a difference of 99.95 acres to

106.50 acres. The impacts are shown in **Figure 5.20-41** (p. 5-681) through **Figure 5.20-50** (p. 5-685).

Forest O (F111, F112, F113, and F114): This forest is an oak-hickory/maple-beech stand with approximately 73.92 acres of core forest habitat located along the county line connector road. This forest is located completely outside of the corridor. Alternative 1 (low-cost design criteria and initial design criteria) impacts 42.25 acres to 46.72 acres of Forest O and redefines the core forest area. The size of the core forest habitat is reduced to 26.87 acres to 25.95 acres, a difference of 47.05 acres to 47.97 acres. Alternative 2 (low-cost design criteria and initial design criteria) impacts 42.45 acres to 45.40 acres of Forest O and redefines the core forest area. The size of the core forest habitat is reduced to 28.22 acres to 27.78 acres, a difference of 45.70 acres to 46.14 acres. Alternative 3 (low-cost design criteria and initial design criteria) impacts 42.90 acres to 44.64 acres of Forest O and redefines the core forest area. The size of the core forest habitat is reduced to 28.64 acres to 28.15 acres, a difference of 45.28 acres to 45.77 acres. Alternative 4 (low-cost design criteria and initial design criteria) impacts 41.75 acres to 46.38 acres of Forest O and redefines the core forest area. The size of the core forest habitat is reduced to 28.60 acres to 26.47 acres, a difference of 45.32 acres to 47.45 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 42.46 acres to 45.40 acres of Forest O and redefines the core forest area. The size of the core forest habitat is reduced to 28.22 acres to 27.77 acres, a difference of 45.70 acres to 46.15 acres. The impacts are shown in **Figure 5.20-51** (p. 5-686) through **Figure 5.20-55** (p. 5-687).

Forest P (F122, F123, F124, and F125): This forest is an oak-hickory/maple-beech stand with approximately 41.17 acres of core forest habitat located east of Breeden Road. Approximately 206.70 acres of the forest are within the project corridor. Alternative 1 (low-cost design criteria and initial design criteria) impacts 41.60 acres to 46.96 acres of Forest P. Alternative 2 (low-cost design criteria and initial design criteria) impacts 41.43 acres to 47.11 acres of Forest P. Alternative 3 (low-cost design criteria and initial design criteria) impacts 41.21 acres to 47.07 acres of Forest P. Alternative 4 (low-cost design criteria and initial design criteria) impacts 41.58 acres to 47.13 acres of Forest P. For Alternatives 1, 2, 3, and 4 (low-cost design criteria and initial design criteria) the size of the core forest habitat is reduced to 16.56 acres to 16.22 acres, a difference of 24.61 acres to 24.95 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 41.45 acres to 47.93 acres of Forest P and redefines the core forest area. The size of the core forest habitat is reduced to 16.56 acres to 15.91 acres, a difference of 24.61 acres to 25.26 acres. The impacts are shown in **Figure 5.20-56** through **Figure 5.20-57** (p. 5-687).

Forest Q (F128, F129): This forest is an oak-hickory/maple-beech stand with approximately 72.90 acres of core forest habitat located south of Evans Road. Approximately 154.02 acres of the forest are within the project corridor. Alternatives 1, 2, 3, and 4 using low-cost design criteria and initial design criteria impact 36.96 acres to 43.02 acres of Forest Q and redefine the core forest area. The size of the core forest habitat is reduced to 35.71 acres to 31.88 acres, a difference of 37.19 acres to 41.02 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 36.96 acres to 45.98 acres of Forest Q and redefines the core forest area. The size of the core forest habitat is reduced to 35.71 acres to 31.99 acres, a

difference of 37.19 acres to 40.91 acres. The impacts are shown in **Figure 5.20-58** through **Figure 5.20-59** (p. 5-688).

Forest R (F130, F131, F132): This forest is an oak-hickory/maple-beech stand with approximately 197.48 acres of core forest habitat located west of Rockport Road. Approximately 299.89 acres of the forest are within the project corridor. Alternatives 1, 2, 3, and 4 using low-cost design criteria and initial design criteria impacts 62.61 acres to 97.66 acres of Forest R and redefines the core forest area. The size of the core forest habitat is reduced to 100.33 acres to 80.64 acres, a difference of 97.15 acres to 116.84 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 62.63 acres to 89.43 acres of Forest R and redefines the core forest area. The size of the core forest habitat is reduced to 100.32 acres to 86.31 acres, a difference of 97.16 acres to 111.17 acres. The impacts are shown in **Figure 5.20-60** through **Figure 5.20-61** (p. 5-688).

Forest S (137): This forest is an oak-hickory stand with approximately 3.14 acres of core forest habitat located east of Lodge Road. Approximately 30.21 acres of the forest are within the project corridor. Alternatives 2, 4, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impact 2.30 acres to 3.46 acres from Forest S but do not redefine the core forest. Alternative 1 impacts (low-cost design criteria and initial design criteria) 1.59 acres to 2.32 acres from Forest S but do not redefine the core forest. Alternative 3 (low-cost design criteria and initial design criteria) impacts 3.75 acres to 4.89 acres from Forest S and redefines the core forest area. The size of the core forest habitat is reduced to 3.13 acres to 3.06 acres, a difference of 0.01 acres to 0.08 acres. The impacts are shown in **Figure 5.20-62** through **Figure 5.20-64** (p. 5-689).

Forest T (F139, F140): This forest is an oak-hickory/maple beech stand with approximately 52.12 acres of core forest habitat located east of Lodge Road. Approximately 124.91 acres of the forest are within the project corridor. Alternative 1 (low-cost design criteria and initial design criteria) impacts 23.44 acres to 31.00 acres of Forest T and redefines the core forest area. The size of the core forest habitat is reduced to 26.93 acres to 25.08 acres, a difference of 25.19 acres to 27.04 acres. Alternatives 2 and 4 (low-cost design criteria and initial design criteria) impact 22.15 acres to 31.25 acres of Forest T and redefine the core forest area. The size of the core forest habitat is reduced to 30.09 acres to 28.38 acres, a difference of 22.03 acres to 23.74 acres. Alternative 3 (low-cost design criteria and initial design criteria) impacts 24.16 acres to 33.08 acres of Forest T and redefines the core forest area. The size of the core forest habitat is reduced to 26.43 acres to 23.92 acres, a difference of 25.69 acres to 28.20 acres. Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impacts 22.15 acres to 31.26 acres of Forest T and redefines the core forest area. The size of the core forest habitat is reduced to 30.09 acres to 28.38 acres, a difference of 22.03 acres to 23.74 acres. The impacts are shown in **Figure 5.20-65** through **Figure 5.20-68** (p. 5-690).

Forest U (F141): This forest is an eastern red cedar-hardwood stand with approximately 9.27 acres of core forest habitat located south of Tramway Road. Approximately 14.54 acres of the forest are within the project corridor. Alternative 1 (low-cost design criteria and initial design criteria) does not impact Forest U. Alternatives 2, 4, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) impact 0.04 acres to 0.06 acres of Forest U.

Alternative 3 (low-cost design criteria and initial design criteria) impacts 9.53 acres to 10.61 acres of Forest U and redefines the core forest area. The size of the core forest habitat is reduced to 2.38 acres to 2.46 acres, a difference of 6.89 acres to 6.81 acres. Alternatives 1, 2, 4, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) do not redefine the core forest area for Forest U. The impacts are shown in **Figure 5.20-69** through **Figure 5.20-71** (p. 5-691).

Forest V (F11): This forest is a maple-beech stand with approximately 0.07 acres of core forest habitat located east of Greene CR 215E. Approximately 8.63 acres of the forest are within the project corridor. None of the Alternatives impact this forest or redefine the core forest area. This forest is shown in **Figure 5.20-72** through **Figure 5.20-74** (p. 5-692).

Forest W (F31): This forest is an oak-hickory stand with approximately 0.14 acres of core forest habitat located along Taylor Ridge Road. None of this forest is within the project corridor. None of the alternatives impact this forest or redefine the core forest area. This forest is shown in **Figure 5.20-75** through **Figure 5.20-77** (p. 5-693).

Forest X (F144): This forest is an eastern red cedar-hardwood stand with approximately 0.60 acres of core forest habitat located north of Tramway Road. Approximately 13.48 acres of the forest are within the project corridor. Alternative 1 (low-cost design criteria and initial design criteria) impacts 2.12 acres to 3.38 acres of Forest X and redefines the core forest area. The size of the core forest habitat is reduced to 0.60 acres to 0.25 acres, a difference of 0.00 acres to 0.35 acres. Alternatives 2, 3, 4, and Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) do not impact the forest or redefine the core forest area. The impacts are shown in **Figure 5.20-78** through **Figure 5.20-80** (p. 5-694).

Forest Y (F74): This forest is a maple-beech stand with approximately 0.54 acres of core forest habitat located south of Hobbieville Road. Approximately 34.49 acres of the forest are within the project corridor. Alternative 1 impacts (low-cost design criteria and initial design criteria) 8.94 acres to 9.90 acres from Forest Y. Alternative 2 and Refined Preferred Alternative 2 impact (low-cost design criteria and initial design criteria) 8.80 acres 10.00 acres from Forest Y. Alternative 3 impacts (low-cost design criteria and initial design criteria) 8.84 acres 10.11 acres from Forest Y. Alternative 4 impacts (low-cost design criteria and initial design criteria) 9.11 acres 9.88 acres from Forest Y. None of the alternatives redefine the core forest area. This forest is shown in **Figure 5.20-81** through **Figure 5.20-82** (p. 5-695).

Table 5.20-4: Summary of Impacts to Core Forest Habitat

Impact (Acres)	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Forest A (F1-30.82 acres)										
Forest Acres Impacted	7.32	8.44	7.32	8.44	5.75	6.04	7.32	8.44	7.32	8.44
Total Core Forest Area	3.09	3.09	3.09	3.09	3.09	3.09	3.09	3.09	3.09	3.09
Remaining Core Forest Area	0.00	0.00	0.00	0.00	3.09	2.96	0.00	0.00	0.00	0.00
Impact on Core Forest	3.09	3.09	3.09	3.09	0.00	0.13	3.09	3.09	3.09	3.09
Forest B (F3, F4, F5, F6, F7 - 58.62 acres)										
Forest Acres Impacted	14.46	17.55	14.46	17.55	9.01	11.18	14.46	17.55	13.91	17.00
Total Core Forest Area	4.31	4.31	4.31	4.31	4.31	4.31	4.31	4.31	4.31	4.31
Remaining Core Forest Area	4.01	3.90	4.01	3.90	0.50	0.43	4.01	3.90	4.01	3.90
Impact on Core Forest	0.3	0.41	0.3	0.41	3.81	3.88	0.3	0.41	0.3	0.41
Forest C (F15, F16, F17, F18, F19 - 100.92 acres)										
Forest Acres Impacted	14.31	15.80	14.31	15.80	14.39	15.64	14.31	15.80	14.33	15.82
Total Core Forest Area	23.43	23.43	23.43	23.43	23.43	23.43	23.43	23.43	23.43	23.43
Remaining Core Forest Area	20.90	20.48	20.90	20.48	20.90	20.48	20.90	20.48	20.90	20.48
Impact on Core Forest	2.53	2.95	2.53	2.95	2.53	2.95	2.53	2.95	2.53	2.95
Forest D (F20, F21, F22, F23, F24, F27, F28, F29 - 261.27 acres)										
Forest Acres Impacted	44.83	51.60	49.37	55.78	49.37	55.78	44.83	51.60	49.39	55.86
Total Core Forest Area	115.17	115.17	115.17	115.17	115.17	115.17	115.17	115.17	115.17	115.17
Remaining Core Forest Area	52.02	49.94	53.10	51.85	53.10	51.85	52.02	49.94	53.10	51.72
Impact on Core Forest	63.15	65.23	62.07	63.32	62.07	63.32	63.15	65.23	62.07	63.45
Forest E (F33, F34, F35, F36, F37, F38 - 127.72 acres)										
Forest Acres Impacted	32.36	48.10	27.10	39.53	27.10	39.53	32.36	48.10	27.14	39.63
Total Core Forest Area	54.41	54.41	54.41	54.41	54.41	54.41	54.41	54.41	54.41	54.41
Remaining Core Forest Area	25.54	21.32	41.84	38.74	41.84	38.74	25.54	21.32	41.82	38.67
Impact on Core Forest	28.87	33.09	12.57	15.67	12.57	15.67	28.87	33.09	12.59	15.74
Forest F (F40, F41 - 48.39 acres)										
Forest Acres Impacted	10.33	13.70	10.25	13.69	10.25	13.69	10.33	13.70	10.25	13.69
Total Core Forest Area	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98
Remaining Core Forest Area	4.68	4.44	4.68	4.44	4.68	4.44	4.68	4.44	4.68	4.44
Impact on Core Forest	1.30	1.54	1.30	1.54	1.30	1.54	1.30	1.54	1.3	1.54
Forest G (F42, F43, F44, F45, F46, F47, F48, F49, F50, F51, F52, F53, F54, F55, F56, F57, F58, F59, F60, F61 – 873.09 acres)										
Forest Acres Impacted	179.26	242.16	179.26	242.16	179.26	242.16	179.26	242.16	179.81	242.19
Total Core Forest Area	636.26	636.26	636.26	636.26	636.26	636.26	636.26	636.26	636.26	636.26
Remaining Core Forest Area	288.72	245.11	288.72	245.11	288.72	245.11	288.72	245.11	288.68	245.11

Table 5.20-4: Summary of Impacts to Core Forest Habitat

Impact (Acres)	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Impact on Core Forest	347.54	391.15	347.54	391.15	347.54	391.15	347.54	391.15	347.58	391.15
Forest H (F62, F63 - 139.26 acres)										
Forest Acres Impacted	46.08	52.53	46.08	52.53	46.08	52.53	46.08	52.53	46.09	52.55
Total Core Forest Area	83.02	83.02	83.02	83.02	83.02	83.02	83.02	83.02	83.02	83.02
Remaining Core Forest Area	28.14	23.51	28.14	23.51	28.14	23.51	28.14	23.51	28.13	23.51
Impact on Core Forest	54.88	59.51	54.88	59.51	54.88	59.51	54.88	59.51	54.89	59.51
Forest I (F64, F65, F67 - 246.62 acres)										
Forest Acres Impacted	53.74	68.25	53.74	68.25	53.74	68.25	53.74	68.25	53.83	64.27
Total Core Forest Area	96.09	96.09	96.09	96.09	96.09	96.09	96.09	96.09	96.09	96.09
Remaining Core Forest Area	34.56	28.17	34.56	28.17	34.56	28.17	34.56	28.17	34.56	29.83
Impact on Core Forest	61.53	67.92	61.53	67.92	61.53	67.92	61.53	67.92	61.53	66.26
Forest J (F77, F78, F79, F80, F81, F82 - 315.90 acres)										
Forest Acres Impacted	31.69	42.19	36.75	51.00	31.32	43.19	36.32	49.55	36.62	51.05
Total Core Forest Area	120.32	120.32	120.32	120.32	120.32	120.32	120.32	120.32	120.32	120.32
Remaining Core Forest Area	77.52	72.51	97.86	90.92	78.03	72.18	97.86	91.30	98.25	90.92
Impact on Core Forest	42.80	47.81	22.46	29.40	42.29	48.14	22.46	29.02	22.07	29.4
Forest K (F84 - 70.82 acres)										
Forest Acres Impacted	13.45	14.87	0.00	0.00	13.35	17.19	0.00	0.00	0.00	0.00
Total Core Forest Area	13.09	13.09	13.09	13.09	13.09	13.09	13.09	13.09	13.09	13.09
Remaining Core Forest Area	6.60	5.94	13.09	13.09	6.62	5.69	13.09	13.09	13.09	13.09
Impact on Core Forest	6.49	7.15	0.00	0.00	6.47	7.40	0.00	0.00	0.00	0.00
Forest L (F91 - 64.86 acres)										
Forest Acres Impacted	6.29	7.60	0.00	0.00	6.21	9.18	0.00	0.00	0.00	0.00
Total Core Forest Area	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04
Remaining Core Forest Area	3.11	2.99	4.04	4.04	3.14	2.93	4.04	4.04	4.04	4.04
Impact on Core Forest	0.93	1.05	0.00	0.00	0.90	1.11	0.00	0.00	0.00	0.00
Forest M (F86 - 25.48 acres)										
Forest Acres Impacted	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Core Forest Area	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
Remaining Core Forest Area	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
Impact on Core Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest N (F92, F93, F94, F95, F96, F97, F98, F99, F100, F101, F103, F104, F105, F106, F107, F108, F109, F110 – 890.91 acres)										
Forest Acres Impacted	173.29	206.42	140.03	166.96	151.85	189.93	158.02	183.81	140.10	168.46

Table 5.20-4: Summary of Impacts to Core Forest Habitat

Impact (Acres)	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Total Core Forest Area	312.63	312.63	312.63	312.63	312.63	312.63	312.63	312.63	312.63	312.63
Remaining Core Forest Area	137.67	127.20	211.94	205.98	187.83	175.47	164.40	155.56	212.68	206.13
Impact on Core Forest	174.96	185.43	100.69	106.65	124.80	137.16	148.23	157.07	99.95	106.5
Forest O (F111, F112, F113, F114 - 0 acres)										
Forest Acres Impacted	42.25	46.72	42.45	45.40	42.90	44.64	41.75	46.38	42.46	45.40
Total Core Forest Area	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92	73.92
Remaining Core Forest Area	26.87	25.95	28.22	27.78	28.64	28.15	28.60	26.47	28.22	27.77
Impact on Core Forest	47.05	47.97	45.70	46.14	45.28	45.77	45.32	47.45	45.7	46.15
Forest P (F122, F123, F124, F125 - 206.70 acres)										
Forest Acres Impacted	41.60	46.96	41.43	47.11	41.21	47.07	41.58	47.13	41.45	47.93
Total Core Forest Area	41.17	41.17	41.17	41.17	41.17	41.17	41.17	41.17	41.17	41.17
Remaining Core Forest Area	16.56	16.22	16.56	16.22	16.56	16.22	16.56	16.22	16.56	15.91
Impact on Core Forest	24.61	24.95	24.61	24.95	24.61	24.95	24.61	24.95	24.61	25.26
Forest Q (F128, F129 - 154.02 acres)										
Forest Acres Impacted	36.96	43.02	36.96	43.02	36.96	43.02	36.96	43.02	36.96	45.98
Total Core Forest Area	72.90	72.90	72.90	72.90	72.90	72.90	72.90	72.90	72.90	72.90
Remaining Core Forest Area	35.71	31.88	35.71	31.88	35.71	31.88	35.71	31.88	35.71	31.99
Impact on Core Forest	37.19	41.02	37.19	41.02	37.19	41.02	37.19	41.02	37.19	40.91
Forest R (F130, F131, F132 - 299.89 acres)										
Forest Acres Impacted	62.61	97.66	62.61	97.66	62.61	97.66	62.61	97.66	62.63	89.43
Total Core Forest Area	197.48	197.48	197.48	197.48	197.48	197.48	197.48	197.48	197.48	197.48
Remaining Core Forest Area	100.33	80.64	100.33	80.64	100.33	80.64	100.33	80.64	100.32	86.31
Impact on Core Forest	97.15	116.84	97.15	116.84	97.15	116.84	97.15	116.84	97.16	111.17
Forest S (F137 -30.21 acres)										
Forest Acres Impacted	1.59	2.32	2.30	3.46	3.75	4.89	2.30	3.46	2.30	3.46
Total Core Forest Area	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14
Remaining Core Forest Area	3.14	3.14	3.14	3.14	3.13	3.06	3.14	3.14	3.14	3.14
Impact on Core Forest	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.00	0.00	0.00
Forest T (F139, F140 - 124.91 acres)										
Forest Acres Impacted	23.44	31.00	22.15	31.25	24.16	33.08	22.15	31.25	22.15	31.26
Total Core Forest Area	52.12	52.12	52.12	52.12	52.12	52.12	52.12	52.12	52.12	52.12
Remaining Core Forest Area	26.93	25.08	30.09	28.38	26.43	23.92	30.09	28.38	30.09	28.38
Impact on Core Forest	25.19	27.04	22.03	23.74	25.69	28.20	22.03	23.74	22.03	23.74
Forest U (F141 - 14.54 acres)										

Table 5.20-4: Summary of Impacts to Core Forest Habitat

Impact (Acres)	Alternatives									
	1		2		3		4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Forest Acres Impacted	0.00	0.00	0.04	0.06	9.53	10.61	0.04	0.06	0.04	0.06
Total Core Forest Area	9.27	9.27	9.27	9.27	9.27	9.27	9.27	9.27	9.27	9.27
Remaining Core Forest Area	9.27	9.27	9.27	9.27	2.38	2.46	9.27	9.27	9.27	9.27
Impact on Core Forest	0.00	0.00	0.00	0.00	6.89	6.81	0.00	0.00	0.00	0.00
Forest V (F11 - 8.63 acres)										
Forest Acres Impacted	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Core Forest Area	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Remaining Core Forest Area	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Impact on Core Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest W (F31 - 0 acres)										
Forest Acres Impacted	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Core Forest Area	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Remaining Core Forest Area	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Impact on Core Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest X (F144 - 13.48 acres)										
Forest Acres Impacted	2.12	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Core Forest Area	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Remaining Core Forest Area	0.60	0.25	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Impact on Core Forest	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest Y (F74 - 34.49 acres)										
Forest Acres Impacted	8.94	9.90	8.80	10.00	8.94	10.11	9.11	9.88	8.80	10.00
Total Core Forest Area	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Remaining Core Forest Area	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Impact on Core Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Impact on Core Forest Habitat Acres	**1019.56**	**1124.50**	**895.64**	**994.30**	**957.51**	**1063.55**	**960.18**	**1064.98**	**894.59**	**987.23**
Total Remaining Core Forest Habitat Acres	**908.03**	**803.09**	**1031.95**	**933.29**	**970.08**	**864.04**	**967.41**	**862.61**	**1033.00**	**940.36**

Note: "Remaining Core Forest" was obtained by subtracting the "Total Core Forest Area" from the "Impact on Core Forest."

Each range corresponds to "Low-Cost" and "Initial" Design Criteria – in that order.

Multiple Encroachments

Forty-five (45) out of the 146 forests impacted by the Section 4 Alternatives will have multiple encroachments. These multiple encroachments are the result of the mainline alternatives impacting the forest in more than one location, or are the combination of the mainline alternatives and side road improvements impacting the forest in more than one location. Forests with multiple encroachments are identified in **Table 5.20-2** and are shown on **Figure 5.20-3** (p. 5-655).

Indirect Impacts

Indirect impacts to forests could occur if forested land is used for commercial or residential development that is induced as a result of the construction of I-69. A total of 160 acres of induced growth is forecasted for each of the alternatives in Section 4. This consists of 106 acres of induced growth in Greene County and 54 acres of induced growth in Monroe County. The primary induced land use changes are anticipated to occur in TAZs located near proposed interchanges.

The 2001 USGS National Land Cover Database was used to identify the amount and types of land cover in the induced growth traffic analysis zones (TAZs).[49] Of the total 73,822 acres comprising the 55 TAZ that were studied for induced growth in Section 4, 52,328 acres (71%) were identified as "Forest" and 18,914 acres (26%) were identified as "Agricultural/Other" (See **Table 5.20.5**). Indirect impacts are addressed in detail in Section 5.24, *Indirect and Cumulative Impacts.*

As it is in the majority of the induced growth TAZs, forest is the predominant (59%) land use in the Section 4 corridor. The expert panel has identified 160 acres of induced development. Within the areas identified for potential future development, some agricultural land is available to accommodate the future land use changes, both induced by I-69 and other activities due to growth in population and economic activity. It is considered likely that such development would occur both on forest land and on land that has already been cleared (i.e., farmland).

Analysis of these resources in the induced growth TAZs indicated that all of the induced growth near the US 231 interchange (25 acres) is likely to occur on agricultural land. In the other TAZs studied in Greene and Monroe County approximately 60% of the induced growth (81 acres) is estimated to occur on agricultural land and approximately 40% (54 acres) is estimated to occur on forest land. These estimates are based upon an analysis of development patterns between 1998 and 2008 in Greene and Monroe counties. **Appendix CC**, *Indirect Impact Analysis*, documents the induced growth forecasts both in the areas near the US 231 interchange as well as

[49] A traffic analysis zone (TAZ) is one of many small areas within a larger geographical study area that has been subdivided for purposes of obtaining socioeconomic and traffic data in a manageable fashion. The geographical scope of the Section 4 was identified as Monroe and Greene Counties. Growth induced by the I-69 Section 4 project (indirect impact) was predicted to occur in a total of 55 TAZs distributed within these two counties.

elsewhere in the project. The total predicted induced growth for Section 4 is composed of 106 acres of agricultural land and 54 acres of forest land.

Table 5.20-5: USGS National Land Cover Database: Amount of Land Cover Types in Induced Growth TAZs

County (# TAZs represented)	Developed (acres)	Unusable (acres)	Ag/Other in Floodplain (acres)	Available Ag / Other (acres)	Forest in Floodplain (acres)	Available Forest (acres)	Total Acres In TAZs (Forest as % of total)
US 231 Vicinity (12)	668	1	147	6,237	146	5,613	12,812 (45%)
Greene (39)	1,766	18	460	11,756	1,407	44,825	60,232 (77%)
Monroe (4)	127	0	32	282	35	302	778 (43%)
Totals	2,561 (3%)	19 (< 0.1%)	18,914 (26% of total TAZ acres)		52,328 (71% of total TAZ acres)		73,822 (71%)

Source USGS 2001 National Land Cover Dataset for Zone 49.

Cover types

Developed Open Water; Developed, Open Space; Developed, Low Intensity; Developed, Medium Intensity; and Developed, High Intensity.

Unusable Woody Wetlands; and Emergent Herbaceous Wetlands.

Agriculture Land/Other Barren Land (Rock/Sand/Clay); Shrub/Scrub; Grassland/Herbaceous; Pasture/Hay; and Cultivated Crops.

Forest Land Deciduous Forest; Evergreen Forest; and Mixed Forest.

5.20.4 Mitigation

Although not required by law or regulation, upland forests impacted by the I-69 Evansville to Indianapolis project will be mitigated at a 3 to 1 ratio. This commitment, made in the Tier 1 FEIS and reaffirmed in the Tier 1 ROD, considers upland forests as all those not classified as wetlands. INDOT and FHWA offered this level of mitigation as environmental stewardship to assure adequate habitat for the Indiana bat as well as other species. The implementation of this effort is now required under the Terms and Conditions of the I-69 Revised Tier 1 Biological Opinion issued by FWS under the authority of Section 7 of the ESA. Mitigation may be in the form of planting unforested areas with a goal of 1 to 1 replacement or protecting existing forests by fee simple purchase, permanent protective easement, or a combination of actions with a goal of 2 to 1 protective measures. The 3 to 1 ratio will be achieved for the overall I-69 Evansville to Indianapolis project; the ratio for an individual Tier 2 section could be higher or lower than 3 to 1. Areas converted to mitigation land will no longer be available for timbering activities. Therefore, these lands will be taken out of production of forest products. Per federal law, all land for the project will be purchased at fair market value. In the case of mitigation land, the land must be purchased from willing sellers in accordance with FHWA policy. Mitigation of forest impacts is discussed in further detail in Chapter 7, *Mitigation and Commitments*.

Based on the 3 to 1 ratio, Refined Preferred Alternative 2 (low-cost design criteria and initial design criteria) would impact approximately between 872.12 acres to 1,087.37 acres of upland forest and therefore would require from 2,616 acres to 3,262 acres for mitigation.

Some forested areas also are classified as wetlands. Wetlands will be replaced in accordance with the MOU between INDOT, USFWS, and IDNR as dated January 28, 1991, or any successor agreement entered into by these agencies. Wetlands will be mitigated at appropriate ratios. Under the 1991 MOU, emergent and scrub/shrub wetlands would be mitigated at a ratio of 2 to 1 or 3 to 1 and forested wetlands would be mitigated at a ratio of 3 to 1 or 4 to 1. Ratios used to determine mitigation will depend upon the quality of the resource. In the case of any forested wetlands in this Section, it is anticipated a 3 to 1 ratio would apply. If the forests are identified as non-wetland forests in a floodway, a 2 to 1 replacement or 10 to 1 preservation ratio would apply, as applicable by the IDNR Construction in a Floodway permit. If needed, the necessary permit would be secured before or during the design phase of the project. All non-wetland forest replacement (including floodway forest) will be included as part of the 3 to 1 upland forest mitigation.

During the Tier 1 studies potential mitigation sites were identified because they offer opportunities for habitat restoration and/or preservation. Large, existing forest and wetland complexes may be used as potential mitigation sites with the goal of increasing core forest and reducing fragmentation. The *Revised Tier 1 Conceptual Forest and Wetlands Mitigation Plan & Comparison of Tier 1 Plans* (**Appendix S**) identifies the general location of potential mitigation sites for the design and construction of upland forest. In the vicinity of Section 4, Doans Creek, Plummer Creek, and Indian Creek were identified as potential mitigation sites. Mitigation in these areas would increase the amount of core forest and provide habitat for the Indiana bat and other species. Additional mitigation sites may be identified during the remaining stages of project development.

In November 2010, INDOT submitted a Tier 2 Section 4 Biological Assessment (BA) which provided additional details on the mitigation plans in Section 4. The Tier 2 BA can be found in **Appendix JJ1**. On July 6, 2011, FWS issued its Biological Opinion for Section 4. The Tier 2 Section 4 BA includes mitigation information for Section 4. The BA identifies 36 possible mitigation sites for Section 4. Seven (7) focus areas were targeted for the Section 4 mitigation: SR 57, Doan's Creek Maternity Colony, Plummer Creek Maternity Colony, Little Clifty Branch Maternity Colony, Indian Creek Maternity Colony Area, Cave[50], and Garrison Chapel Valley. INDOT has purchased or is in the process of purchasing mitigation sites. The current status of the mitigation sites is discussed below.

Veale Creek Maternity Colony Area (Section 2[51])

- Approximately 32.5 acres of forest preservation, 87.5 acres of reforestation, 4.2 acres of emergent wetlands, 7.4 acres of forested wetlands and 1.6 acres of scrub/shrub wetlands are contained in two sites that have been purchased for mitigation.

SR 57 Focus Area

[50] This cave is an important Indiana bat hibernaculum.

[51] USFWS agreed in their Section 2 Biological Opinion (BO) (February 2010) that this mitigation could be applied to Section 4.

- Approximately 193 acres of forest preservation, 298 acres reforestation and 3 acres of forested wetlands are currently being pursued from three mitigation sites.

Doan's Creek Maternity Colony Area

- Approximately 334 acres of forest preservation and 160 acres of reforestation are currently being pursued from four mitigation sites.

Plummer Creek Maternity Colony Area

- Approximately 169 acres of forest preservation, 48.6 acres of reforestation, 3 acres of forested wetlands and 0.4 acre of scrub/shrub wetlands have been purchased from three mitigation sites. Approximately 577.3 acres of forest preservation, 218.7 acres of reforestation and 8.2 acres of emergent wetlands are currently being pursued from six additional mitigation sites.

Little Clifty Branch Maternity Colony Area

- Approximately 167 acres of forest preservation are currently being pursued from one mitigation site.

Indian Creek Maternity Colony Area

- Approximately 40 acres of forest preservation have been purchased from one mitigation site. Approximately 484 acres of forest preservation and 239 acres of reforestation are currently being pursued from eight additional mitigation sites.

Cave[52] Focus Area

- Approximately 106 acres of forest preservation and 37 acres of reforestation have been purchased from two mitigation sites.

Garrison Chapel Valley Focus Area

- Approximately 212 acres of forest preservation, 79.5 acres of reforestation and 0.5 acre of emergent wetland have been purchased from three mitigation sites. Approximately 322 acres of forest preservation are currently being pursued from four additional mitigation sites.

The proposed combined mitigation features will create a mosaic of wetland, riparian, and bottomland woods habitat within areas where much of the land is currently being farmed in row crop production providing very little natural habitat value. The proposed mitigation sites will include the development of the following:

[52] This cave is an important Indiana bat hibernaculum.

- 2,636.8 acres of forest preservation
- 1,168.3 acres of reforestation
- 12.9 acres of emergent wetlands
- 13.4 acres of forested wetlands
- 2 acres of scrub/shrub wetlands

INDOT will be responsible for monitoring and maintaining the mitigation areas while they are being established, as well as monitoring periodically. As noted in the Tier 2 BA, the mitigation sites will be restricted from other uses to ensure that they remain in a natural condition in perpetuity. Areas set aside for mitigation plantings will protect those areas from development in the short term, and in the long term will provide quality roosting and foraging habitat. These areas will also help to decrease habitat fragmentation, and to improve the potential for colonies of Indiana bats currently using the action area to expand into other areas of suitable habitat. Successful implementation of the mitigation plans and conservation measures are expected to result in sustainable, and in some cases improved, long-term habitat conditions for Indiana bat maternity colonies, individual, and hibernating populations within the action areas.

In its Section 4 Tier 2 BO summary of anticipated effects of the project, USFWS stated the following (pp. 48-50):

- *Direct habitat modification/loss will occur, but will be minimal with a loss of tree cover ranging from approximately 1% to 4% within the four maternity colony areas. Therefore, the total amount of forest loss is relatively insignificant. It is also unlikely that these maternity areas would experience a significant long-term decrease in quality of roosting or foraging habitat as a direct result of I-69, based on the amount and quality of remaining forest habitat.*
- *Seasonal tree-cutting restrictions*[53] *will ensure no direct impacts/take occurs from the construction of I-69 during the maternity colony season. INDOT has also extended this restriction to include all borrow areas used by construction contractors.*
- *Indirect loss of forest or wetland habitat from residential and commercial development is anticipated to be fairly small and minimal impacts are expected.*

[53] Tree cutting can only occur within the Winter Action Area between November 16 and March 31. No tree cutting within the Winter Action Area will occur between April 1 and November 15. Tree cutting can only occur within the Summer Action area between October 1 and March 31. No tree cutting within the Summer Action Area will occur between April 1 and September 30.

- *One primary roost tree was recently discovered within the project right-of-way. Although this tree is no longer standing, to be conservative, the FWS assumes that upon return to the summer maternity area, the displaced bats will relocate to a new roost in the general vicinity, and potentially within the right-of-way. Loss of a primary roost tree during the winter could result in stress (and take) to pregnant females in the spring as they search for a new roost and try to meet thermoregulatory needs. A few individuals may have delayed parturition or abort their pups. Although no primary roosts were identified for the other colonies, alternate roost trees were located for all maternity colonies within Section 4. None of the known alternate roosts are anticipated to be lost. Loss of other unidentified alternate roost trees may occur.*
- *Due to the significant amount of forest and stream crossings in Section 4, numerous travel corridors may be disrupted by the proposed interstate alignment. Considering the amount of available foraging habitat, we anticipate that this potential adverse effect would impinge on a relatively small proportion of colony members and not be a significant source of take. Indian Creek is expected to be disrupted the most within Section 4 due to the configuration of the alignment through the colony area. (There will be ten separate bridge crossing locations in Section 4 that will have bridges with 25 feet or greater clearance. These bridge locations would include but are not limited to I-69 over CR 600 E and Black Ankle Creek, I-69 over CR 360 S and Plummer Creek, I-69 over Mitchell Branch, I-69 over SR 54 and Tributary of Mitchell Branch, I-69 over all three crossings of Indian Creek, the county line connector road over Indian Creek, and I-69 over Branch of Clear Creek in two separate locations. The bridge structures should provide areas for bats to connect to existing habitat and safely cross under the interstate.)*
- *Death/kill from collision with vehicles once road is operational is anticipated on I-69 and other local roadways with increased traffic volume. One bat per colony is projected to be taken every two years through 2030. In addition up to 21 males during the summer and 244 bats in the fall swarming and spring staging periods may be taken through the year 2030. Some roadkill may be offset as traffic on local roads decreases and shifts to the new interstate.*
- *The maternity colonies and individual adult males have access to ample additional habitat nearby in the unlikely case that some individual bats should become displaced from their traditional foraging/roosting areas.*
- *I-69 may induce some amount of residential/commercial development in currently forested areas and may also speed up the rate of development that otherwise would have occurred within the action area at a slower rate, particularly in the immediate vicinity of and within easy commuting distance of Section 4 interchanges (e.g., SR 45). We anticipate approximately 10 Indiana bats will be taken due to indirect development.*
- *Some harassment of bats roosting near construction areas may occur as a result of exposure to novel noises/vibrations/disturbance causing roost-site abandonment and atypical exposure to day-time predators while fleeing and seeking new shelter during the day-time. This will most likely have only short term impacts, if any.*

- *Proposed forest, wetland, and stream mitigation within and near the maternity and hibernacula areas will ensure that at least 2,878 acres, and up to 3,583 acres of suitable roosting and foraging habitat persists in perpetuity. In addition, several Indiana bat hibernacula, including two Priority 1A caves, will be protected in perpetuity.*
- *A potential for increased disturbance/vandalism of bats in vulnerable hibernacula due to more accessibility to that part of the state*
- *Long term reproduction and viability are not expected to be impacted by the project and all maternity colonies and hibernacula are likely to persist in the area.*

The Section 4 BA (including mitigation information) and the Section 4 Tier 2 BO are provided in **Appendix JJ1** and **Appendix JJ2**, respectively, of this FEIS. The *Revised Tier 1 Conceptual Forest and Wetland Mitigation Plan & Comparison of Tier 1 Plans* (2006) is in **Appendix S**, together with a summary of the differences between the original Tier 1 plan (2003) and the revised plan.

An overall I-69 mitigation tracking method has been developed in consultation with permitting agencies and the United States Environmental Protection Agency (USEPA). The tracking is accomplished using a database with a GIS component. INDOT has coordinated with agencies to identify agency-specific information to be included in the database for tracking. Information on purchased, constructed, and potential mitigation sites, as well as the anticipated natural resource mitigation required and available credits of I-69 are continually being updated within the tracking system, including for the sites currently secured and being pursued for Section 4.

5.20.5 Summary

Indiana's forests are an important resource for timber, wildlife habitat, protection of soil and water, and outdoor recreation. Impacts from the alternatives using the low-cost design criteria and initial design criteria vary from approximately 872 acres to 1,087 acres (Refined Preferred Alternative 2) to 934 acres to 1,168 acres (Alternative 1) of upland forest. Upland forest impacted by the I-69 Evansville to Indianapolis project will be mitigated at a 3 to 1 ratio (with the goal of 1 to 1 replacement and 2 to 1 preservation). Therefore, the range of impacts using the low-cost design criteria and initial design criteria would require mitigation of 2,616 acres to 3,505 acres, depending on the alternative selected. Refined Preferred Alternative 2 would impact approximately between 872 acres to 1,087 acres, thereby requiring mitigation of from 2,616 acres to 3,262 acres. The Section 4 BA identifies the general location of 36 possible mitigation sites for the design and construction of wetlands and upland forest. For Section 4, the primary focus areas are SR 57, Doan's Creek Maternity Colony, Plummer Creek Maternity Colony, Little Clifty Branch Maternity Colony, Indian Creek Maternity Colony Area, Cave[54], and Garrison Chapel Valley. Other areas may also be identified.

Twenty-one (21) forests containing core forest habitat were identified as being impacted by Section 4 Alternatives. Impacts to core forest habitat for alternatives using the low-cost design

[54] This cave is an important Indiana bat hibernaculum.

criteria and initial design criteria range from 894.59 acres to 1,124.50 acres. Refined Preferred Alternative 2 has the lowest core forest impact of the alternatives.

Table 5.20-6 summarizes the potential direct impacts to forest areas for each alternative, and provides the approximate acres of forest mitigation associated with the impacts of each alternative.

Table 5.20-6: Summary of Forest Impacts and Potential Mitigation, by Alternatives

USDA Forest Classification	Acres of Forest in Corridor	Acres in Rights-of-Way of Alternatives									
		1		2		3		4		Refined Preferred Alternative 2	
		Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Eastern red cedar-hardwood	34.55	2.12	3.38	4.38	5.11	9.54	10.62	4.38	5.11	4.38	5.11
Elm-ash-cottonwood	265.44	53.01	72.44	43.41	61.40	48.87	66.3	45.72	64.43	43.54	61.42
Maple-beech	2,033.68	404.87	494.11	372.22	456.92	389.97	482.14	365.90	444.55	372.22	450.75
Oak-hickory	2,086.52	429.05	550.98	406.53	524.36	404.46	528.91	430.46	554.70	406.50	523.28
Total Forest Acres in Corridor*	4,420.19	889.05	1,120.91	826.54	1,047.79	852.84	1,087.97	846.46	1,068.79	826.64	1,040.56
Percent of Forest Acres in Corridor	100%	20%	25%	19%	24%	19%	25%	19%	24%	19%	24%
Forest Outside Corridor**	0	47.08	52.32	47.28	50.56	47.73	50.17	46.58	51.54	47.29	50.57
Total Forest within the Right-of-Way***		936.13	1,173.23	873.82	1,098.35	900.57	1,138.14	893.04	1,120.33	873.93	1,091.13
Construction Limit Forested Wetland Impacts**** (Included in Total Forest Impacts)	11.45	2.12	4.83	1.81	3.76	1.93	3.99	2.00	4.62	1.81	3.76
Upland Forest Impacts (included in Total Forest Impacts)	4408.74	934.01	1,168.40	872.01	1,094.59	898.64	1,134.15	891.04	1,115.71	872.12	1,087.37
Approximate Upland Forest Mitigation (acres)- 3 to 1 ratio		2,802	3,505	2,616	3,284	2,696	3,402	2,673	3,347	2,616	3,262
Core Forest: Acres of Reduction		1019.56	1124.50	895.64	994.30	957.51	1063.55	960.18	1064.98	894.59	987.23

Note: Some totals may not add due to rounding.

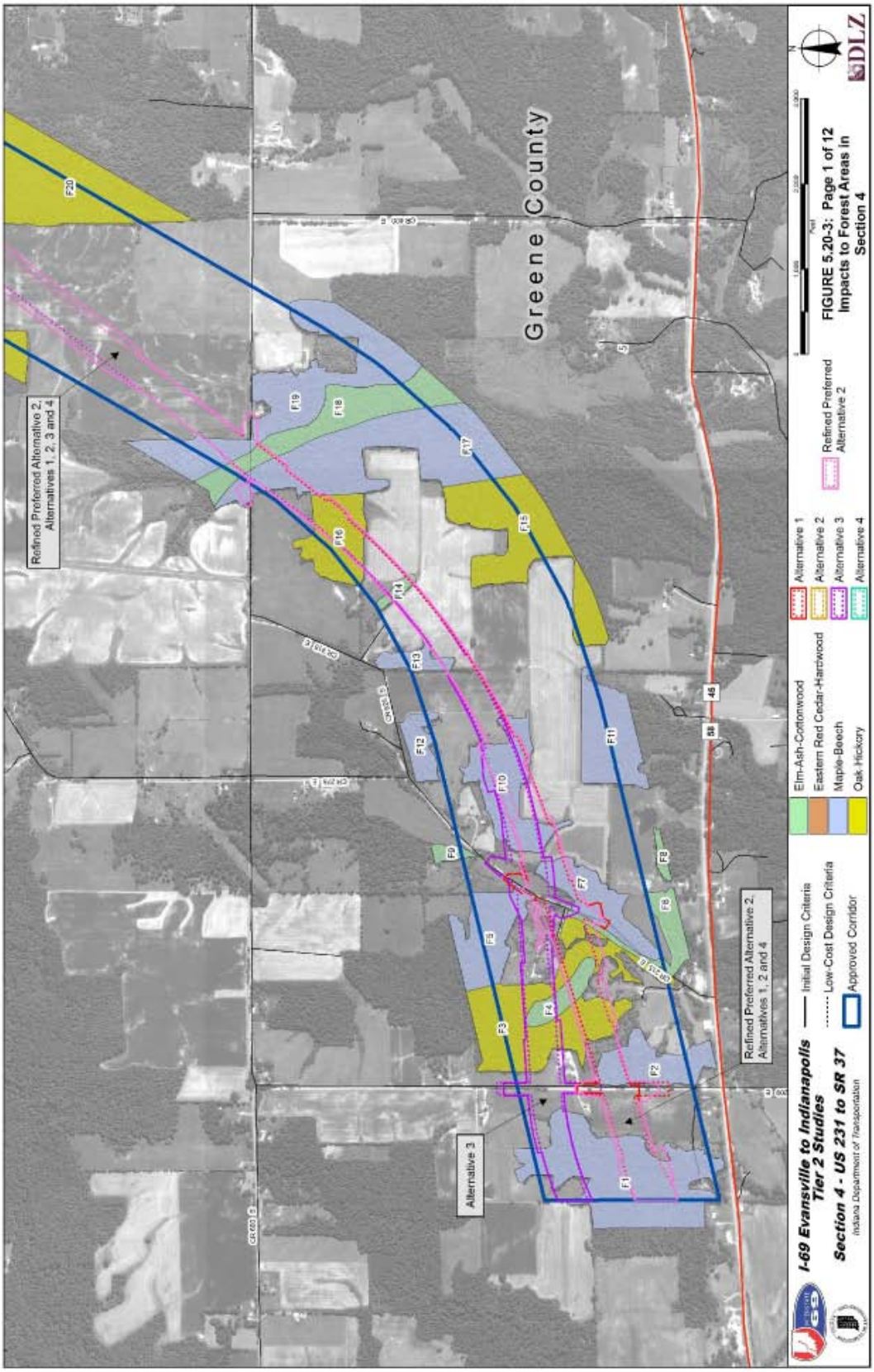
**Total acres of forest in corridor include wetland forests.*

***In some areas, the alternatives impact forests outside the corridor boundary, due to access roads or interchanges.*

****Includes forested wetland acreage that will be preserved within the right-of-way.*

*****Forested wetland impacts will be mitigated per the Wetlands MOU, and are discussed in Section 5.19, Water Resources.*

Each range corresponds to "Low-Cost" and "Initial" Design Criteria – in that order.


Greene County
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 1, 2 and 4
Alternative 3
F1
F2
F3
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F5
F6
F7
F8
F9
F10
F11
F12
F13
F14
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F16
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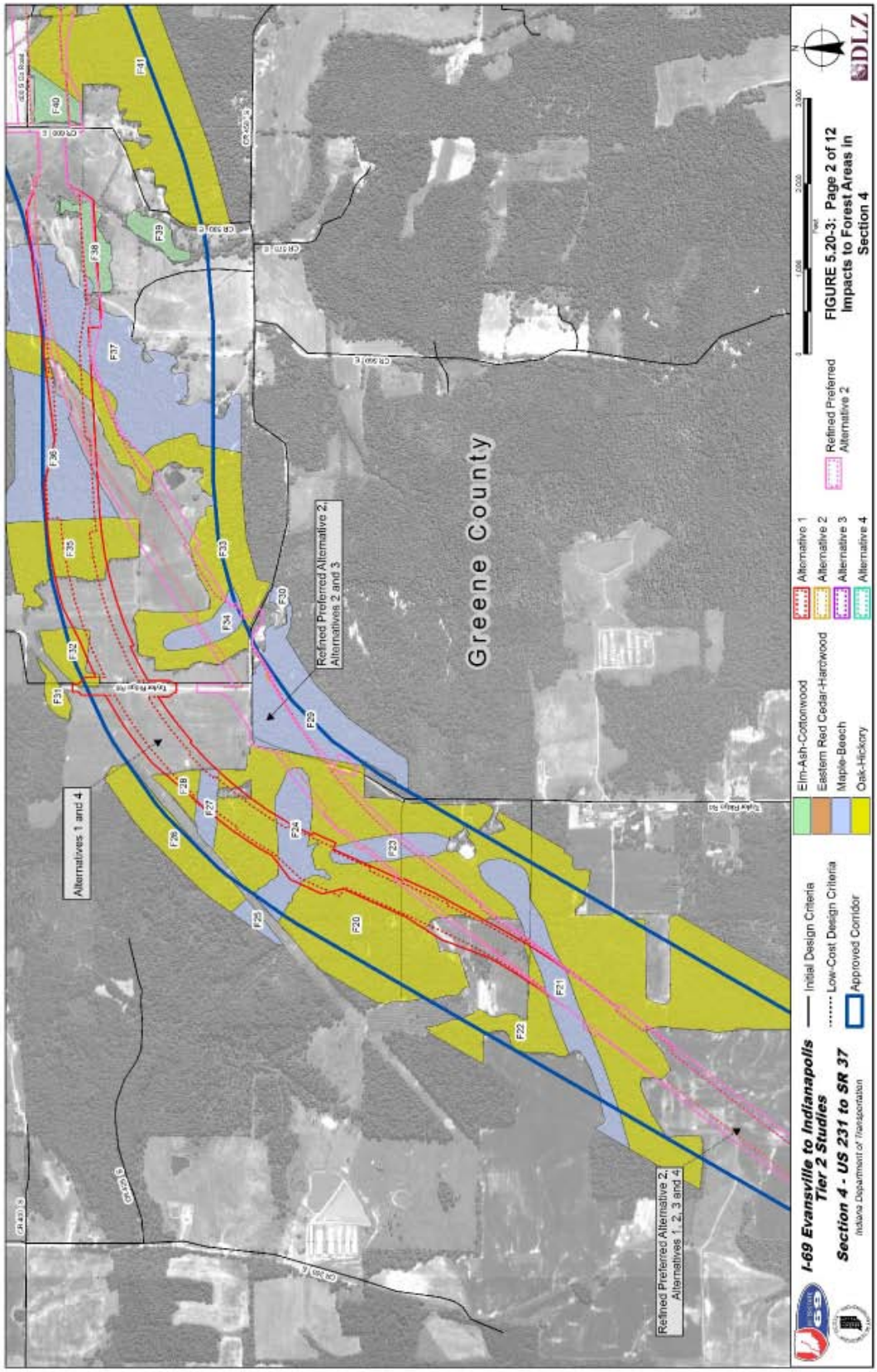
F18
F19
F20
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.20-3: Page 1 of 12
Impacts to Forest Areas in Section 4
DLZ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Alternatives 1 and 4
Refined Preferred Alternative 2, Alternatives 2 and 3
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
F17
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F19
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F22
F23
F24
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F27
F28
F29
F30
F31
F32
F33
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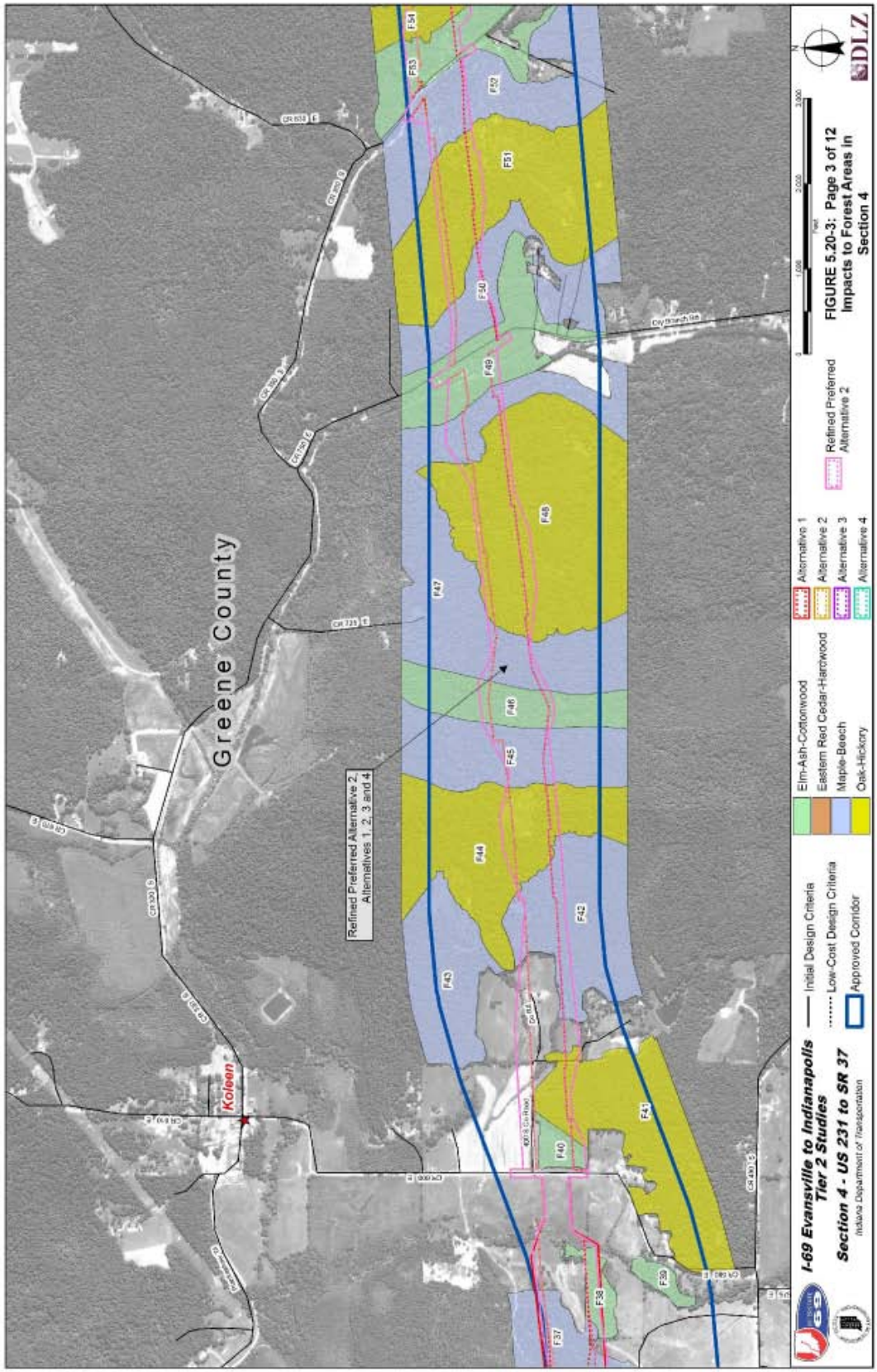
F39
F40
F41
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.20-3: Page 2 of 12
Impacts to Forest Areas in Section 4
DLZ


Greene County
Koleen
Refined Preferred Alternative 2
Alternatives 1, 2, 3 and 4
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F33
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F46
F45
F44
F43
F42
F41
F40
F39
F38
F37
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
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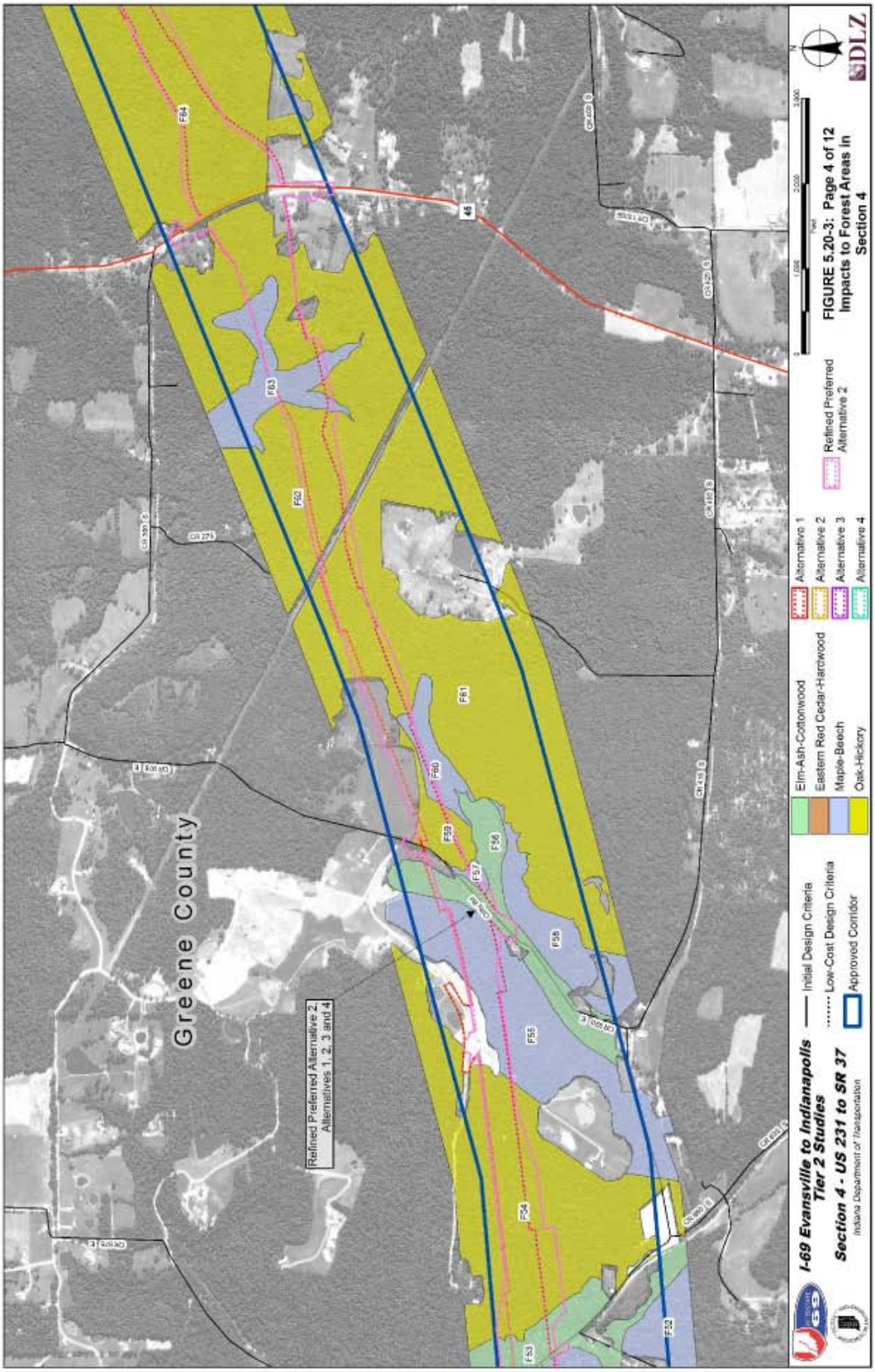
FIGURE 5.20-3: Page 3 of 12
Impacts to Forest Areas in Section 4
DLZ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Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
F52
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F59
F60
F61
F62
F63
F64
45
CR 275
CR 400 S
CR 450 S
CR 475 S
CR 500 S
CR 525 S
CR 600 S
CR 625 S
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
I-69 Evansville to Indianapolis Tier 2 Studies
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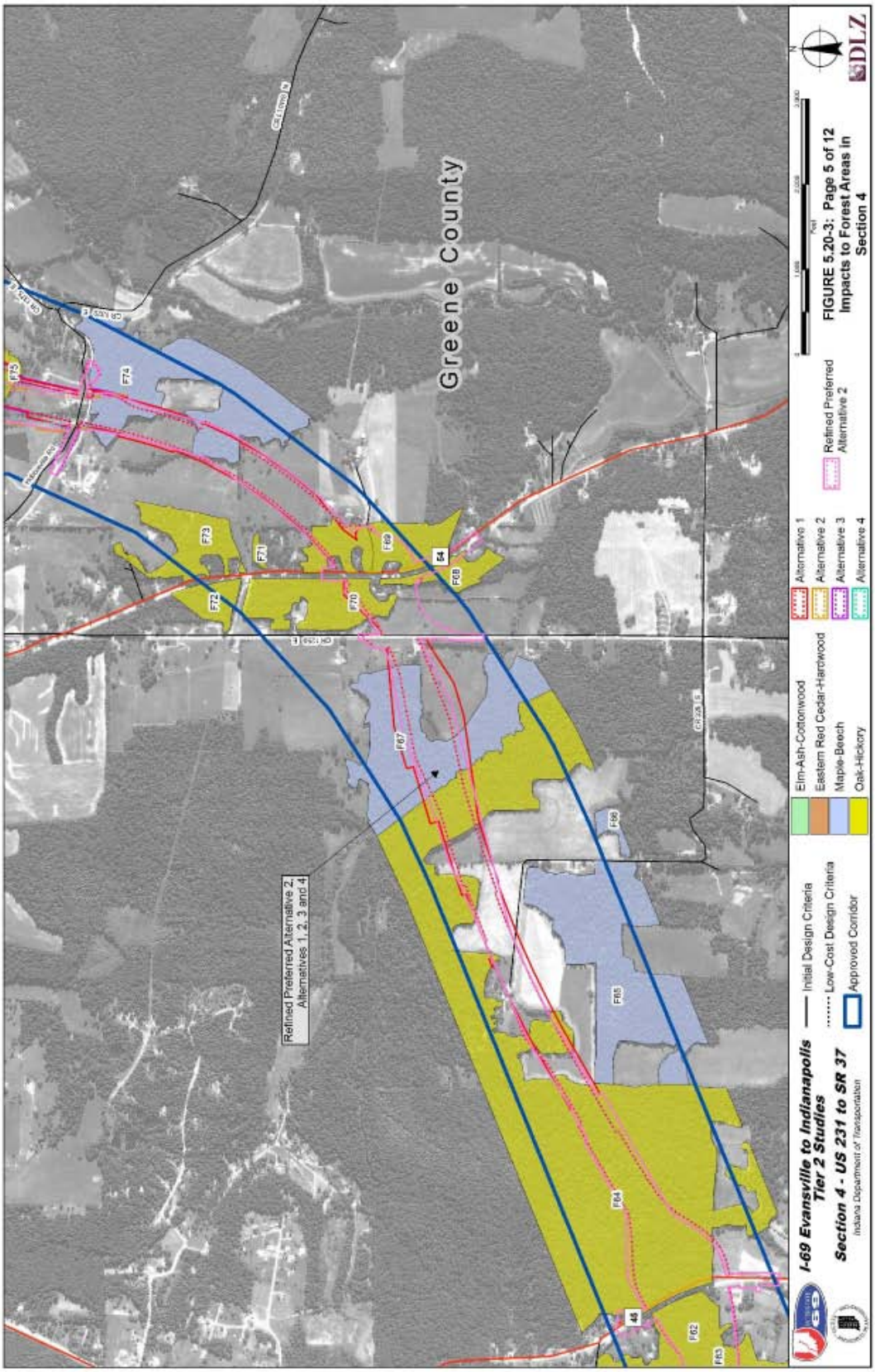
FIGURE 5.20-3: Page 4 of 12
Impacts to Forest Areas in Section 4
DLZ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F64
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F69
F70
F71
F72
F73
F74
F75
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beach
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
I-69 Evansville to Indianapolis Tier 2 Studies
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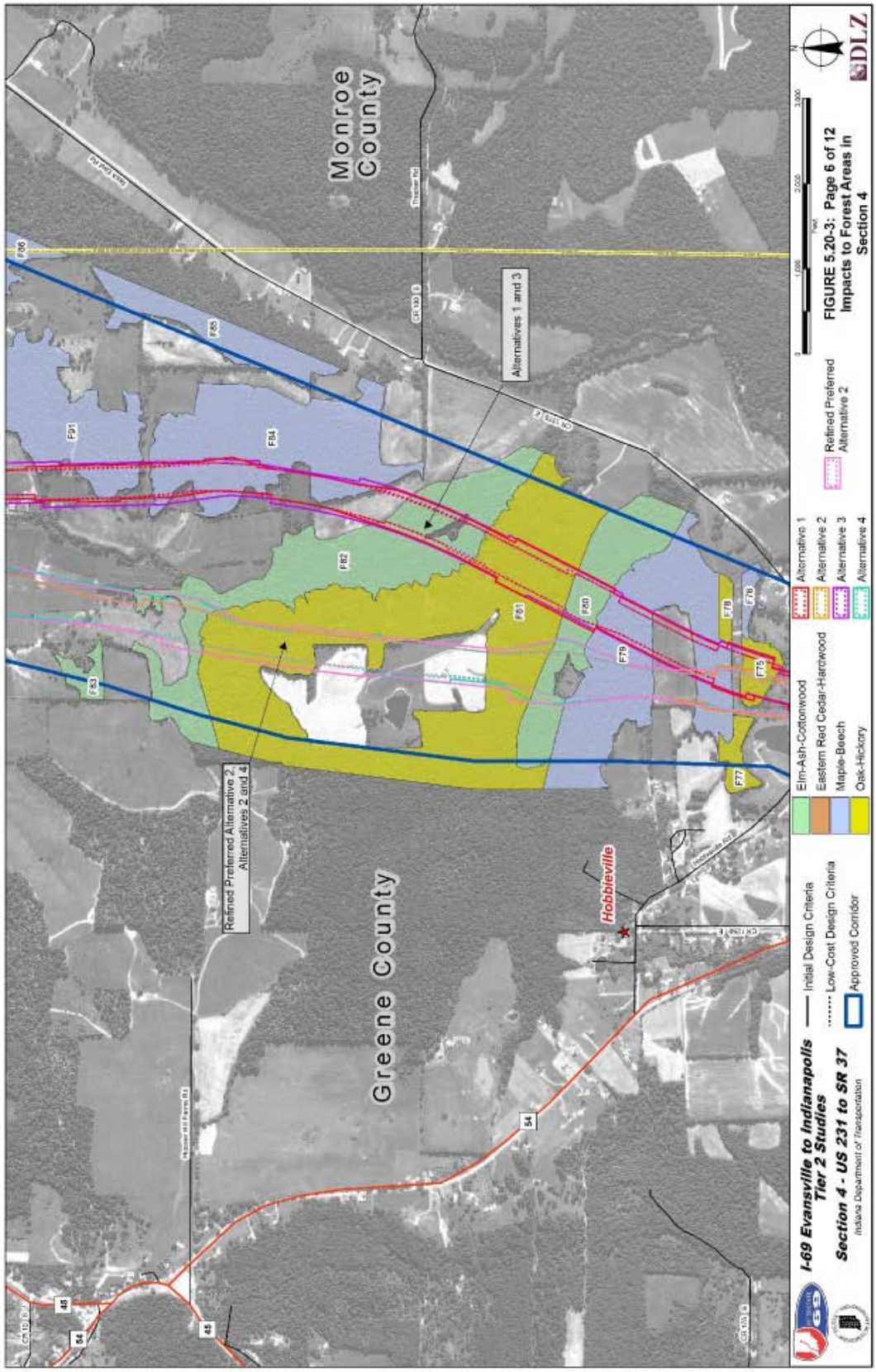
FIGURE 5.20-3: Page 5 of 12 Impacts to Forest Areas in Section 4
DLZ


Monroe County
Greene County
Hobbieville
Alternatives 1 and 3
Refined Preferred Alternative 2; Alternatives 2 and 4
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F84
F85
F86
F82
F81
F80
F79
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F75
F77
F83
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Initial Design Criteria
Low-Cost Design Criteria
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I-69 Evansville to Indianapolis Tier 2 Studies
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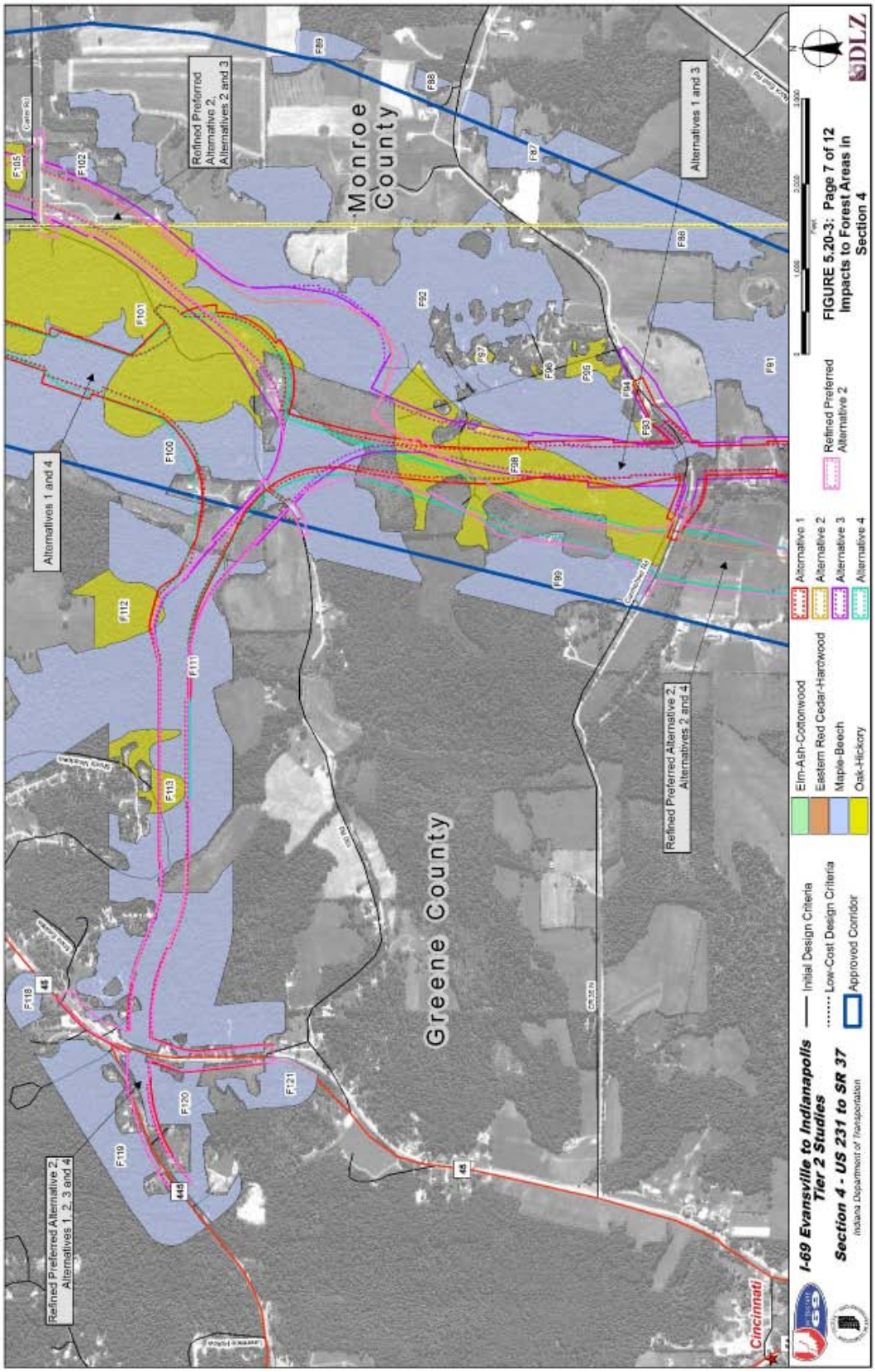
FIGURE 5.20-3: Page 6 of 12
Impacts to Forest Areas in Section 4
DLZ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Greene County
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Alternatives 1 and 3
Alternatives 1 and 4
Refined Preferred Alternative 2, Alternatives 2 and 4
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Cincinnati
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Initial Design Criteria
Low-Cost Design Criteria
Approved Corridor
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
I-69 Evansville to Indianapolis Tier 2 Studies
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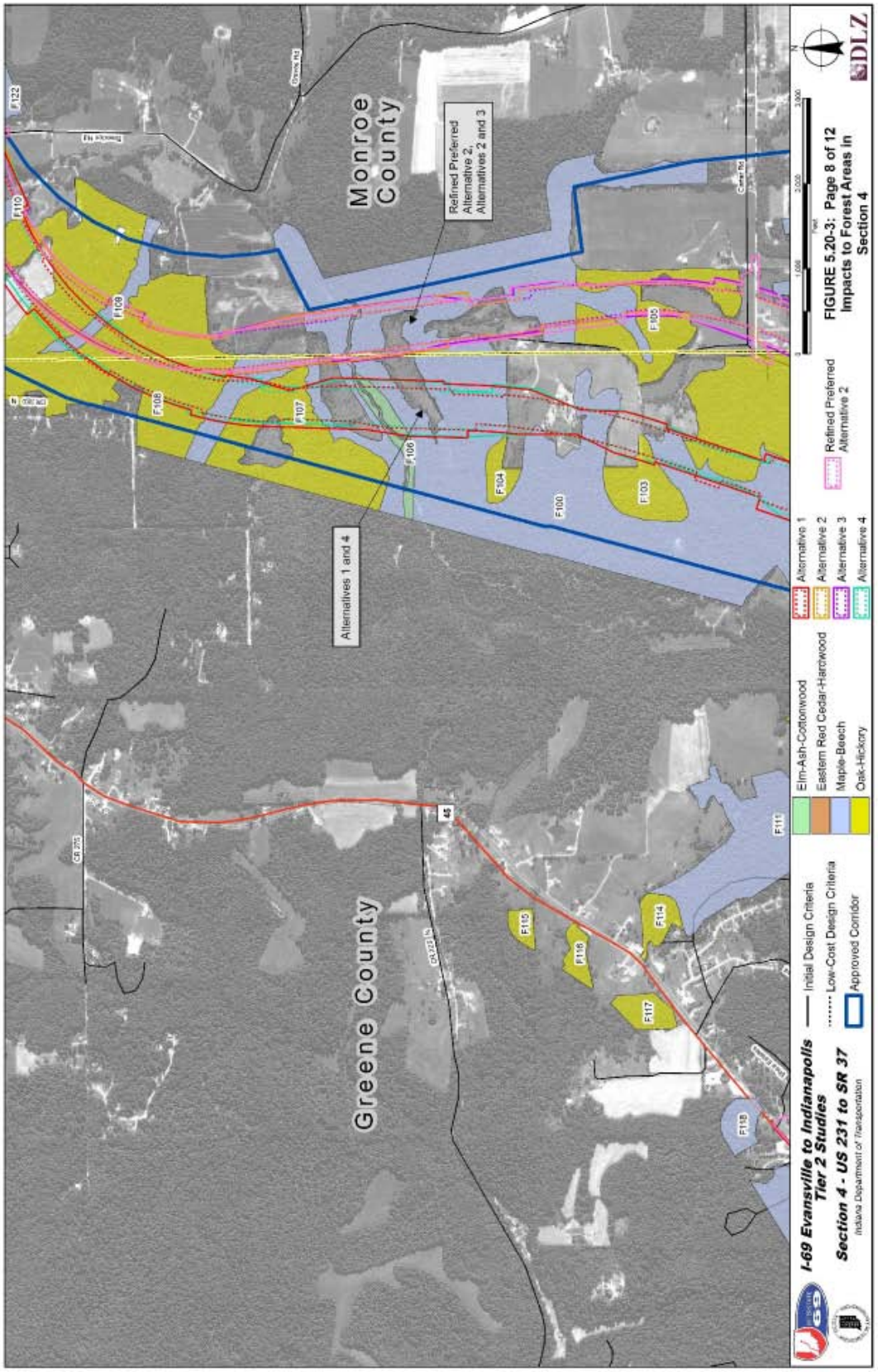
FIGURE 5.20-3: Page 7 of 12 Impacts to Forest Areas in Section 4
DLZ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Greene County
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Alternatives 1 and 4
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Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
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Low-Cost Design Criteria
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I-69 Evansville to Indianapolis Tier 2 Studies
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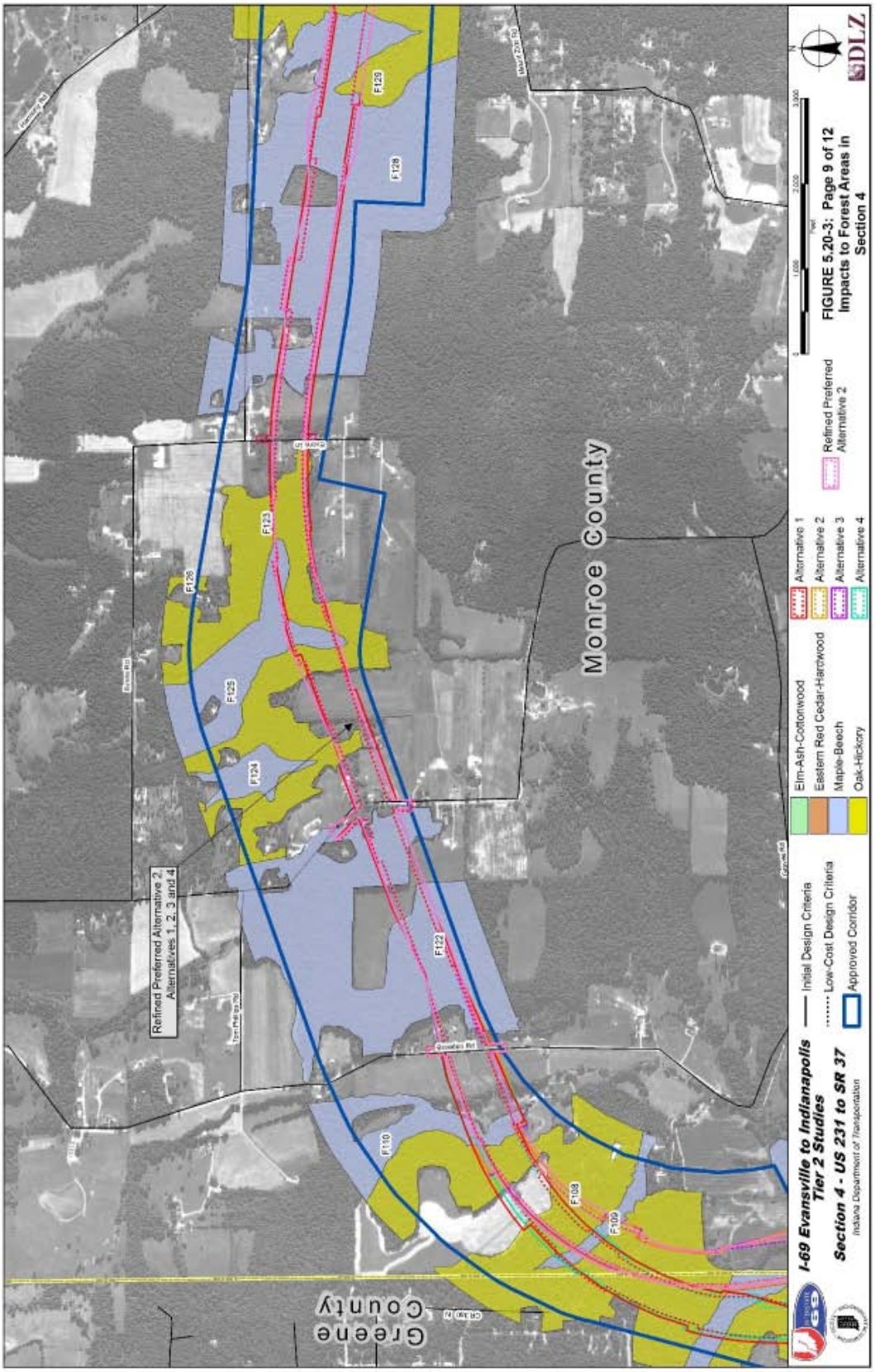
FIGURE 5.20-3: Page 8 of 12 Impacts to Forest Areas in Section 4
DLZ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F125
F126
F128
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Monroe County
Greene County
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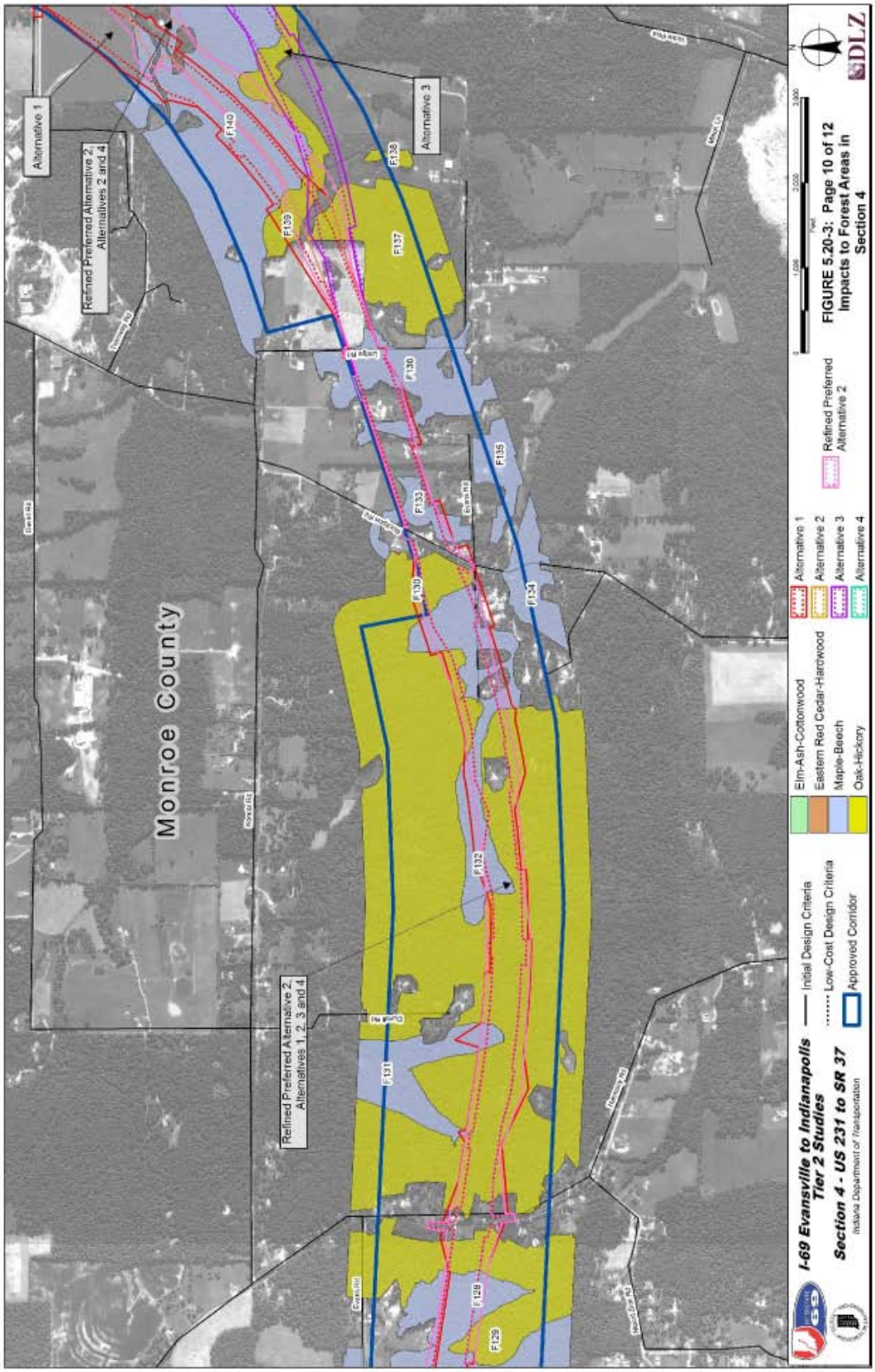
Low-Cost Design Criteria
Approved Corridor
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
FIGURE 5.20-3: Page 9 of 12
Impacts to Forest Areas in Section 4
DLZ


Monroe County
Alternative 1
Refined Preferred Alternative 2, Alternatives 2 and 4
Alternative 3
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
F128
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Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
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Low-Cost Design Criteria
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FIGURE 5.20-3: Page 10 of 12
Impacts to Forest Areas in Section 4
DLZ

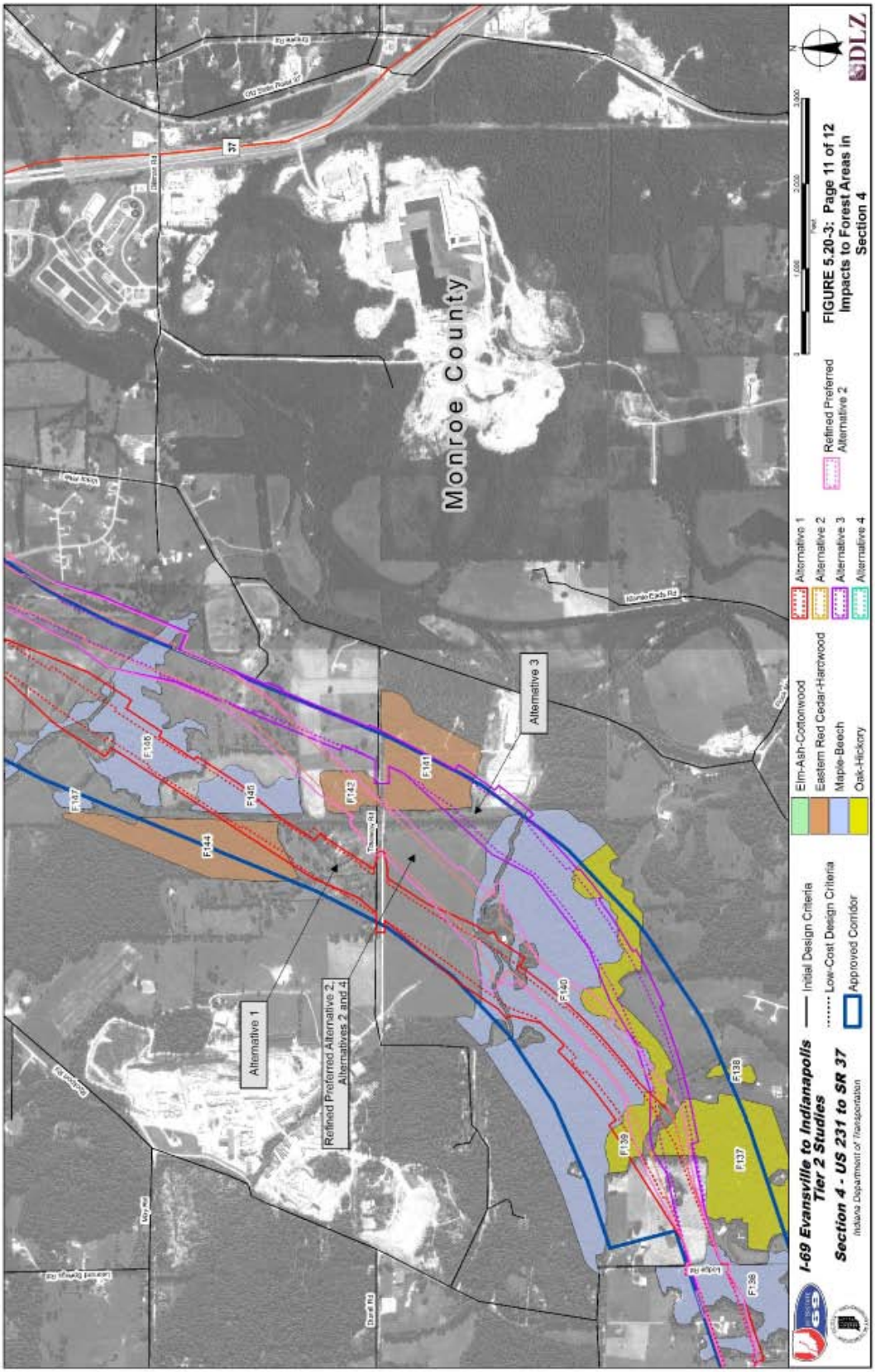
Monroe County
Alternative 1
Refined Preferred Alternative 2, Alternatives 2 and 4
Alternative 3
F137
F138
F139
F140
F141
F142
F143
F144
F145
F146
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple-Beech
Oak-Hickory
Alternative 1
Alternative 2
Alternative 3
Alternative 4
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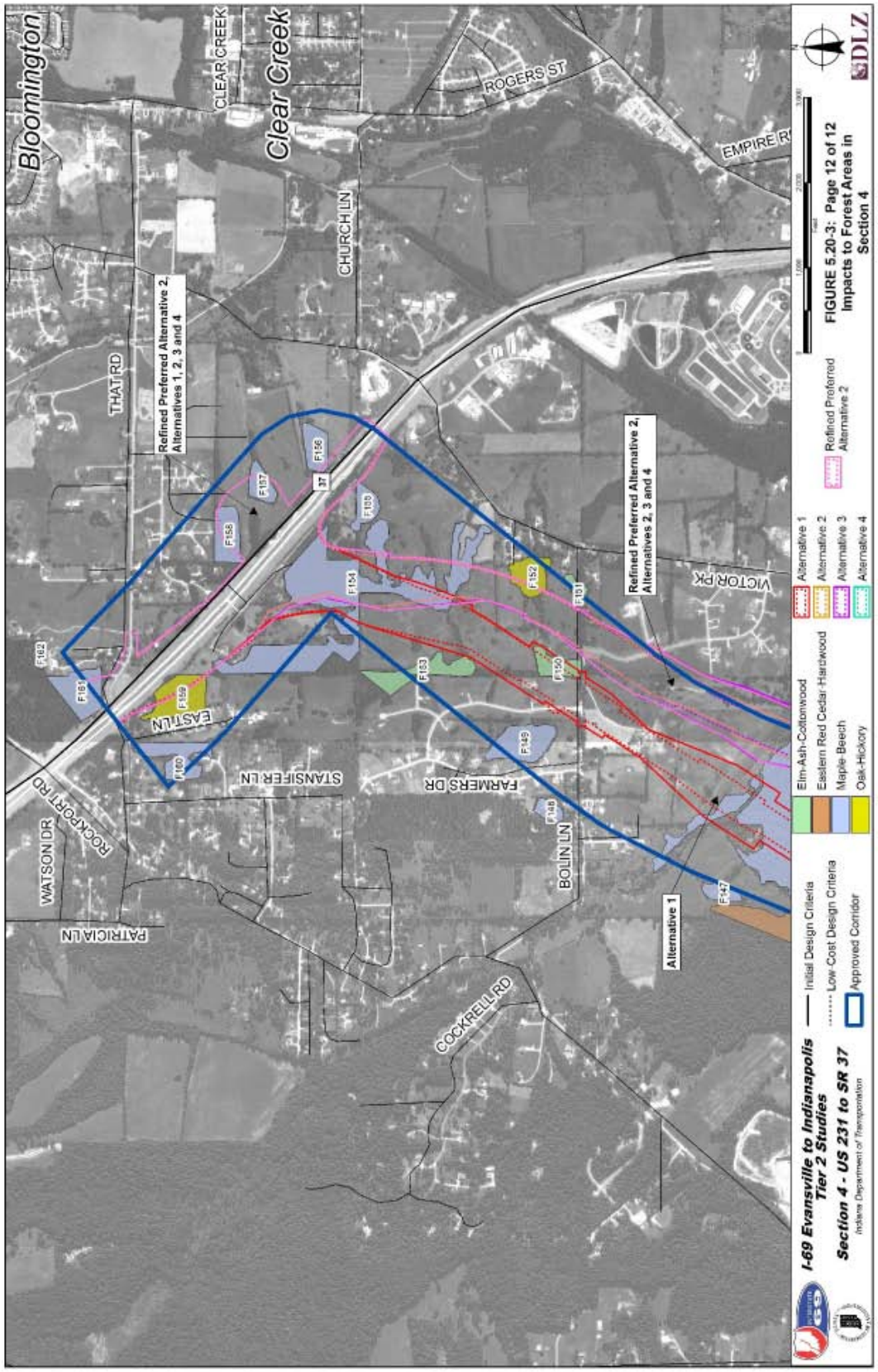
FIGURE 5.20-3: Page 11 of 12
Impacts to Forest Areas in Section 4
DLZ


Bloomington
Clear Creek
CLEAR CREEK
ROGERS ST
EMPIRE R
CHURCH LN
THAT RD
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 2, 3 and 4
VICTOR PK
EAST LN
STANSIFER LN
FARMERS DR
BOLIN LN
ROCKPORT RD
WATSON DR
PATRICIA LN
COCKRELL RD
Alternative 1
F161
F162
F160
F159
F157
F158
F156
F155
F154
F153
F152
F151
F150
F149
F148
F147
Elm-Ash-Cottonwood
Eastern Red Cedar-Hardwood
Maple Beech
Oak-Hickory
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Alternative 2
Alternative 3
Alternative 4
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FIGURE 5.20-3: Page 12 of 12 Impacts to Forest Areas in Section 4
DLZ

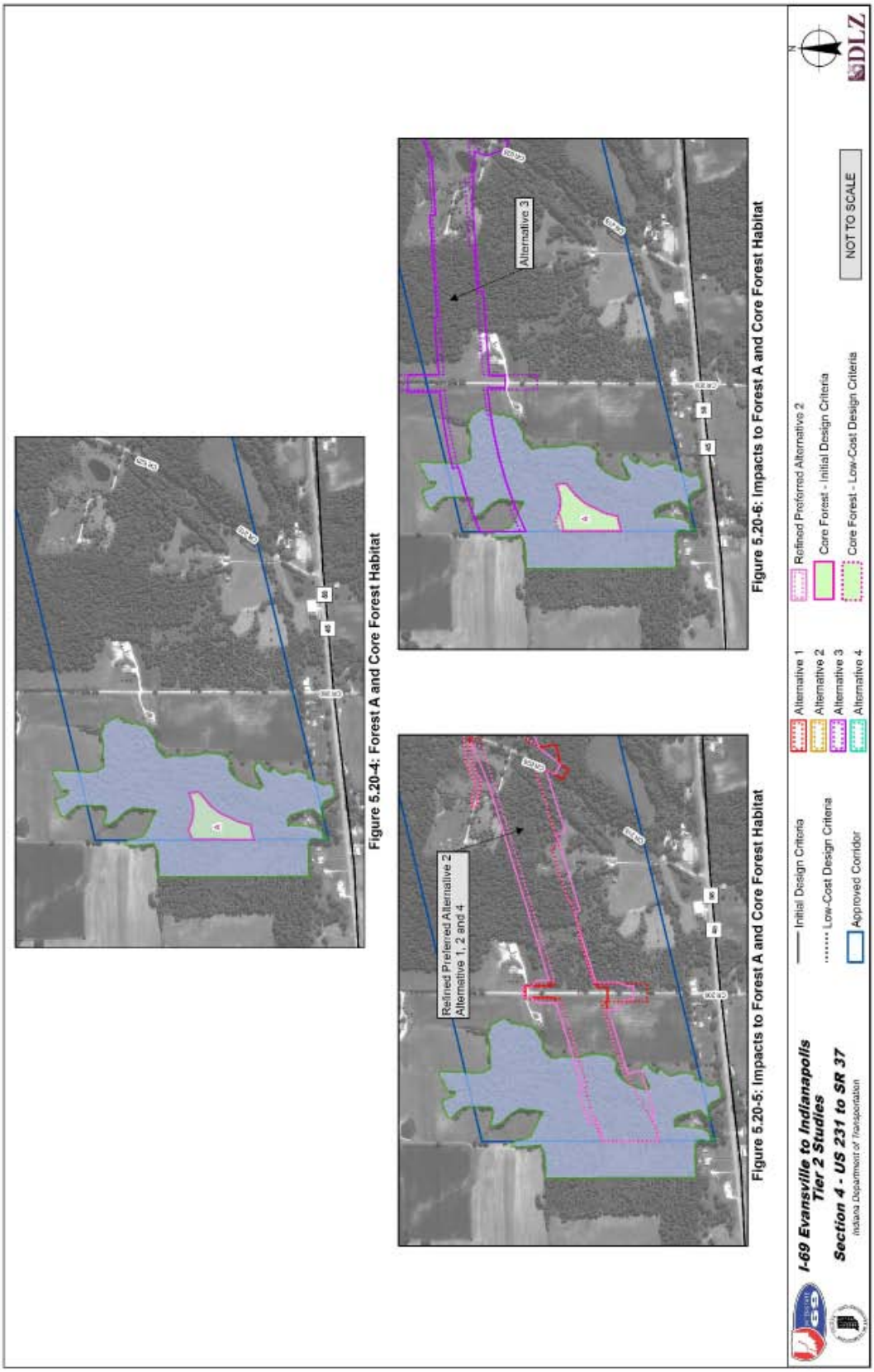

Figure 5.20-4: Forest A and Core Forest Habitat

Figure 5.20-5: Impacts to Forest A and Core Forest Habitat

Figure 5.20-6: Impacts to Forest A and Core Forest Habitat

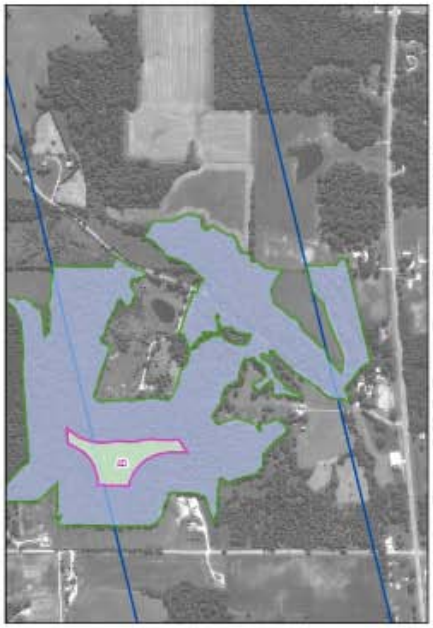

Figure 5.20-7: Forest B and Core Forest Habitat

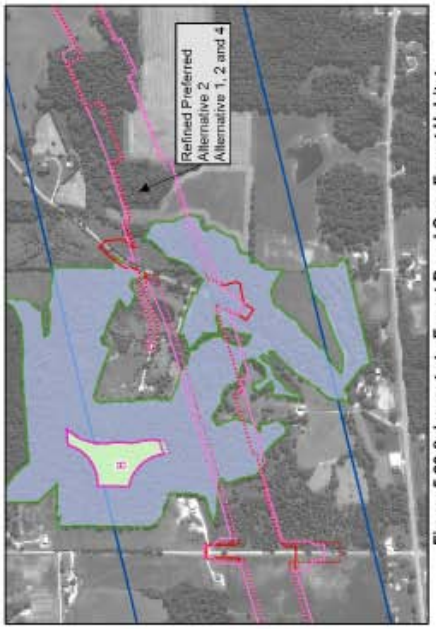

Figure 5.20-8: Impacts to Forest B and Core Forest Habitat

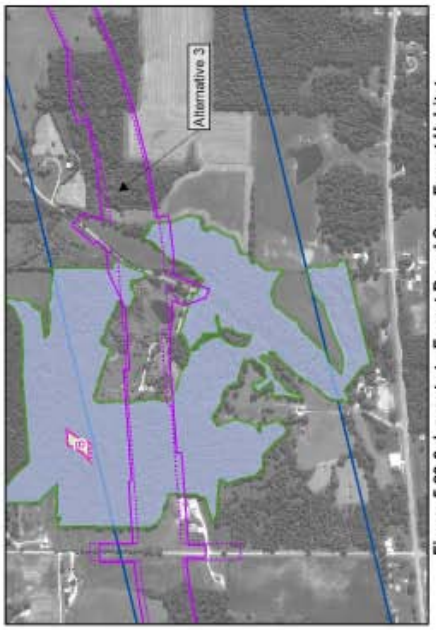

Figure 5.20-9: Impacts to Forest B and Core Forest Habitat

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Initial Design Criteria
Low-Cost Design Criteria
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Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Core Forest - Initial Design Criteria
Core Forest - Low-Cost Design Criteria

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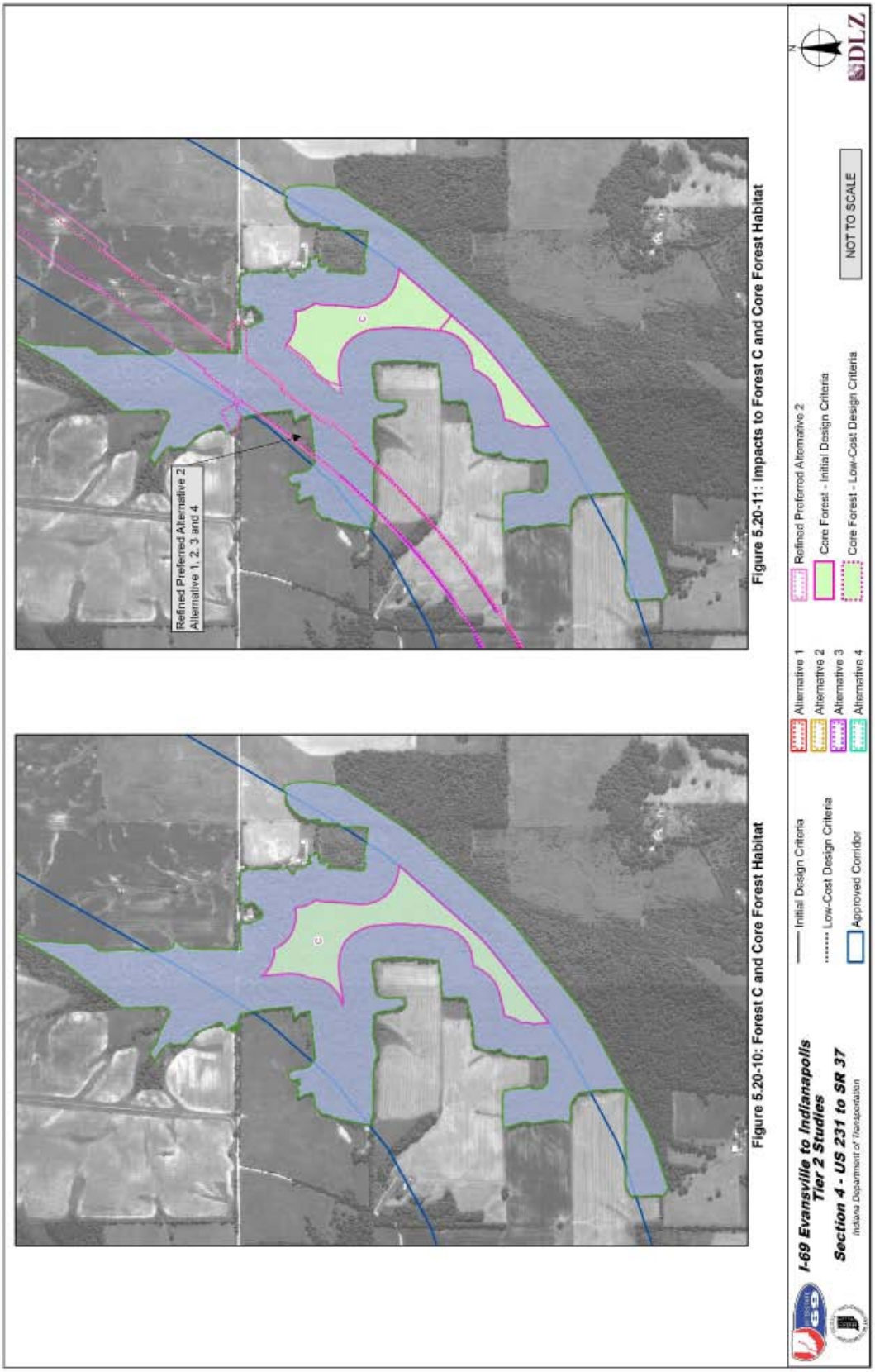

Figure 5.20-10: Forest C and Core Forest Habitat

Figure 5.20-11: Impacts to Forest C and Core Forest Habitat

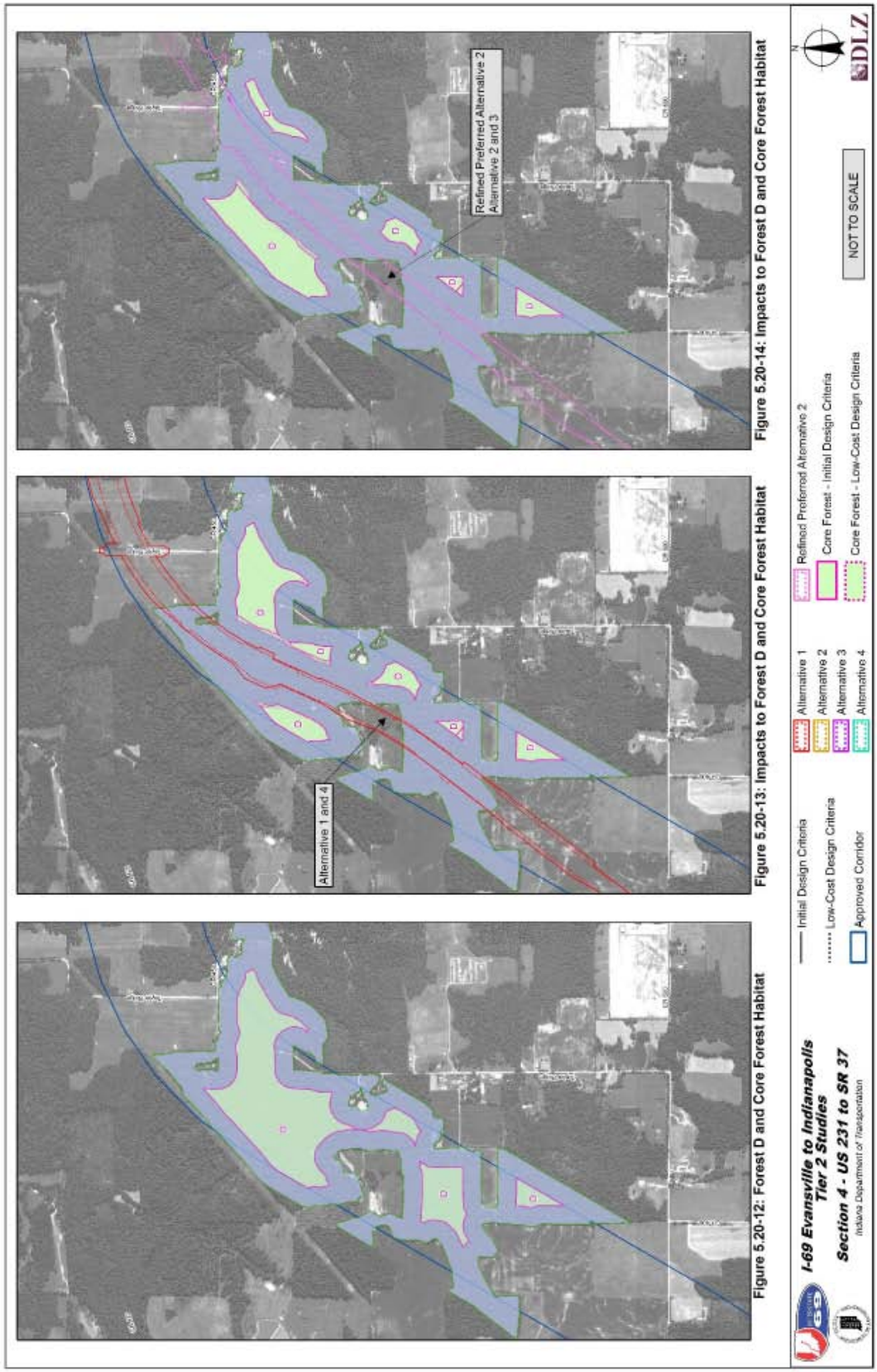

Figure 5.20-12: Forest D and Core Forest Habitat

Figure 5.20-13: Impacts to Forest D and Core Forest Habitat

Figure 5.20-14: Impacts to Forest D and Core Forest Habitat

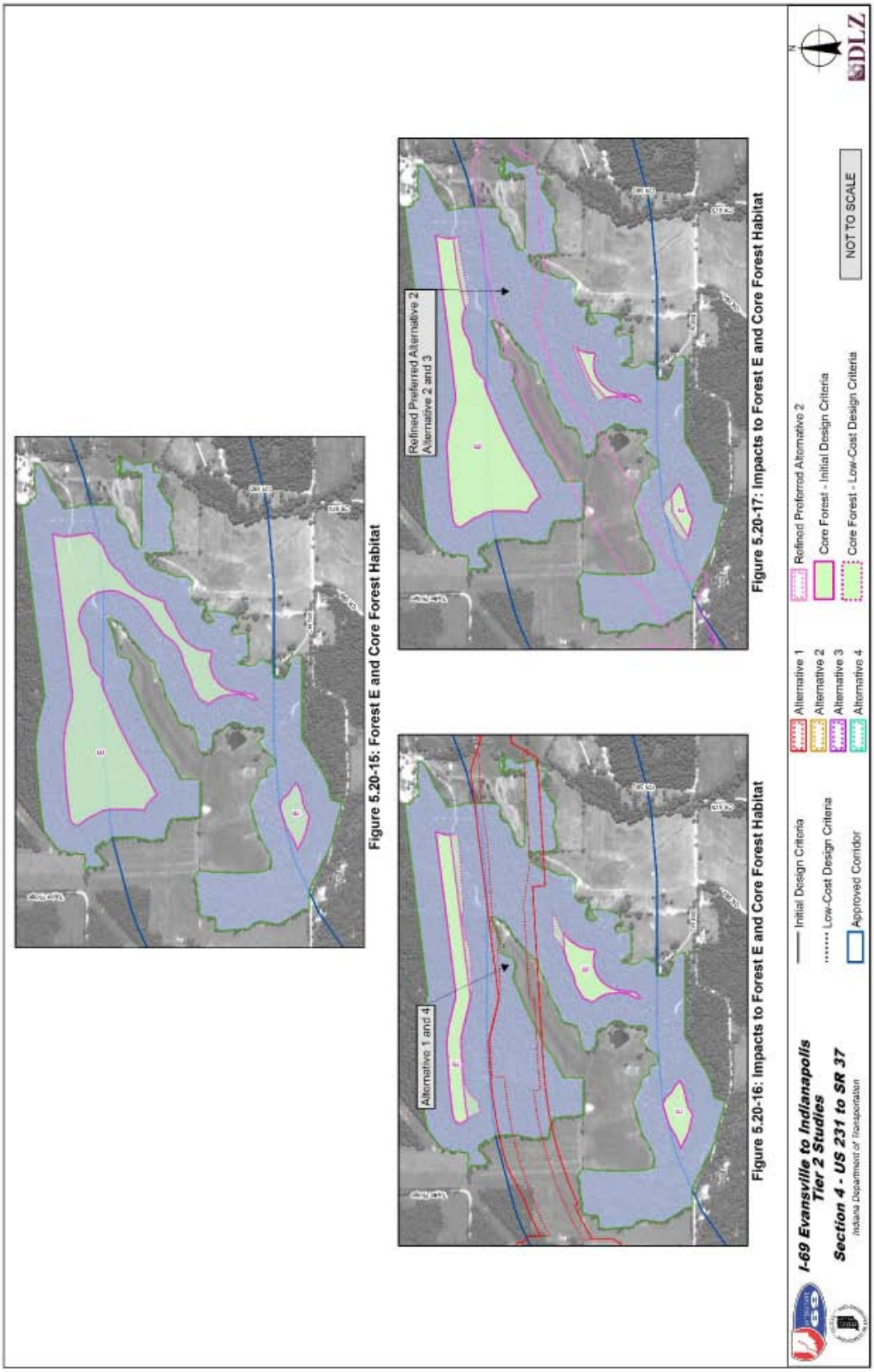

Figure 5.20-15: Forest E and Core Forest Habitat

Figure 5.20-16: Impacts to Forest E and Core Forest Habitat

Figure 5.20-17: Impacts to Forest E and Core Forest Habitat

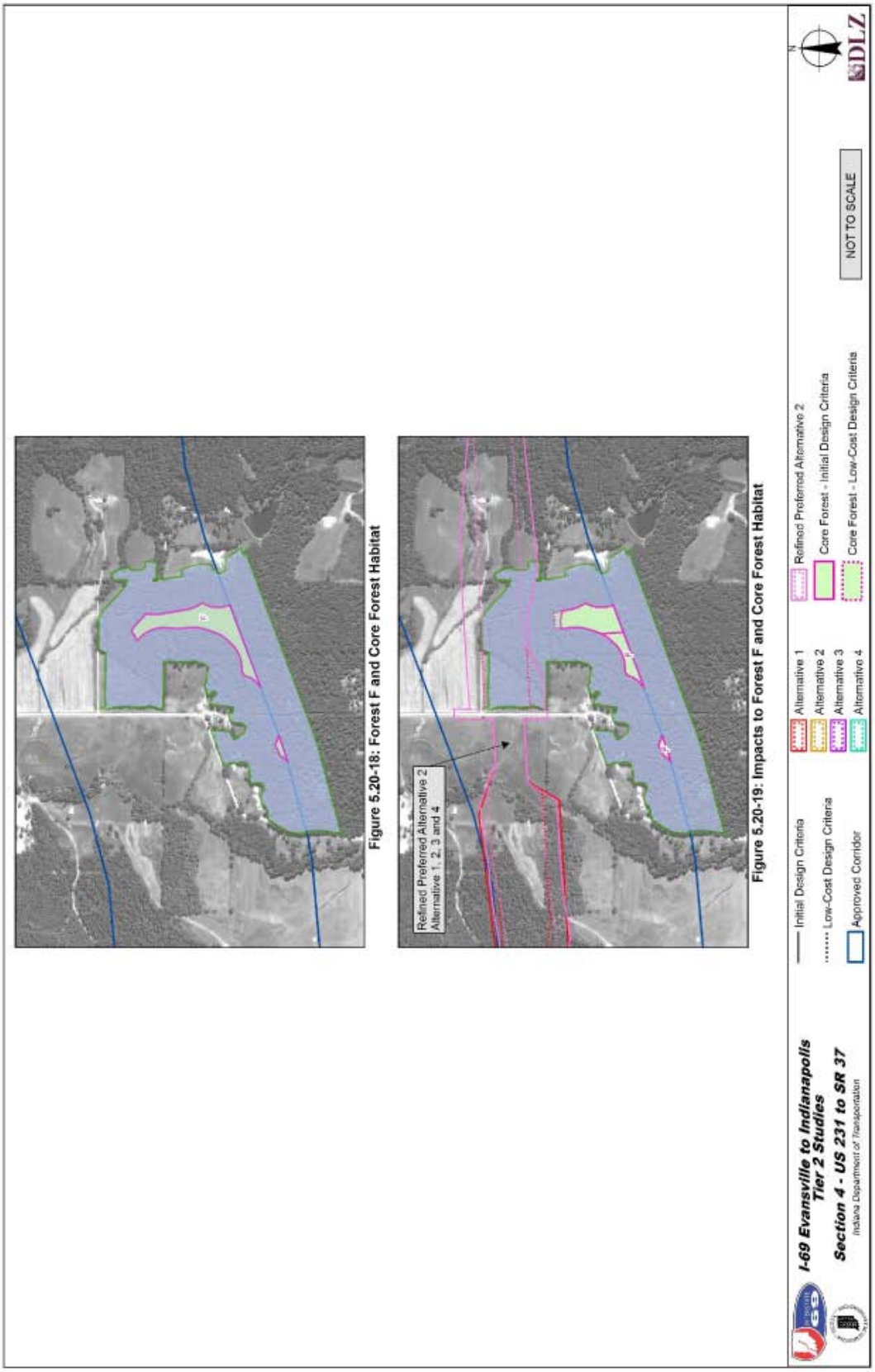

Figure 5.20-18: Forest F and Core Forest Habitat

Figure 5.20-19: Impacts to Forest F and Core Forest Habitat

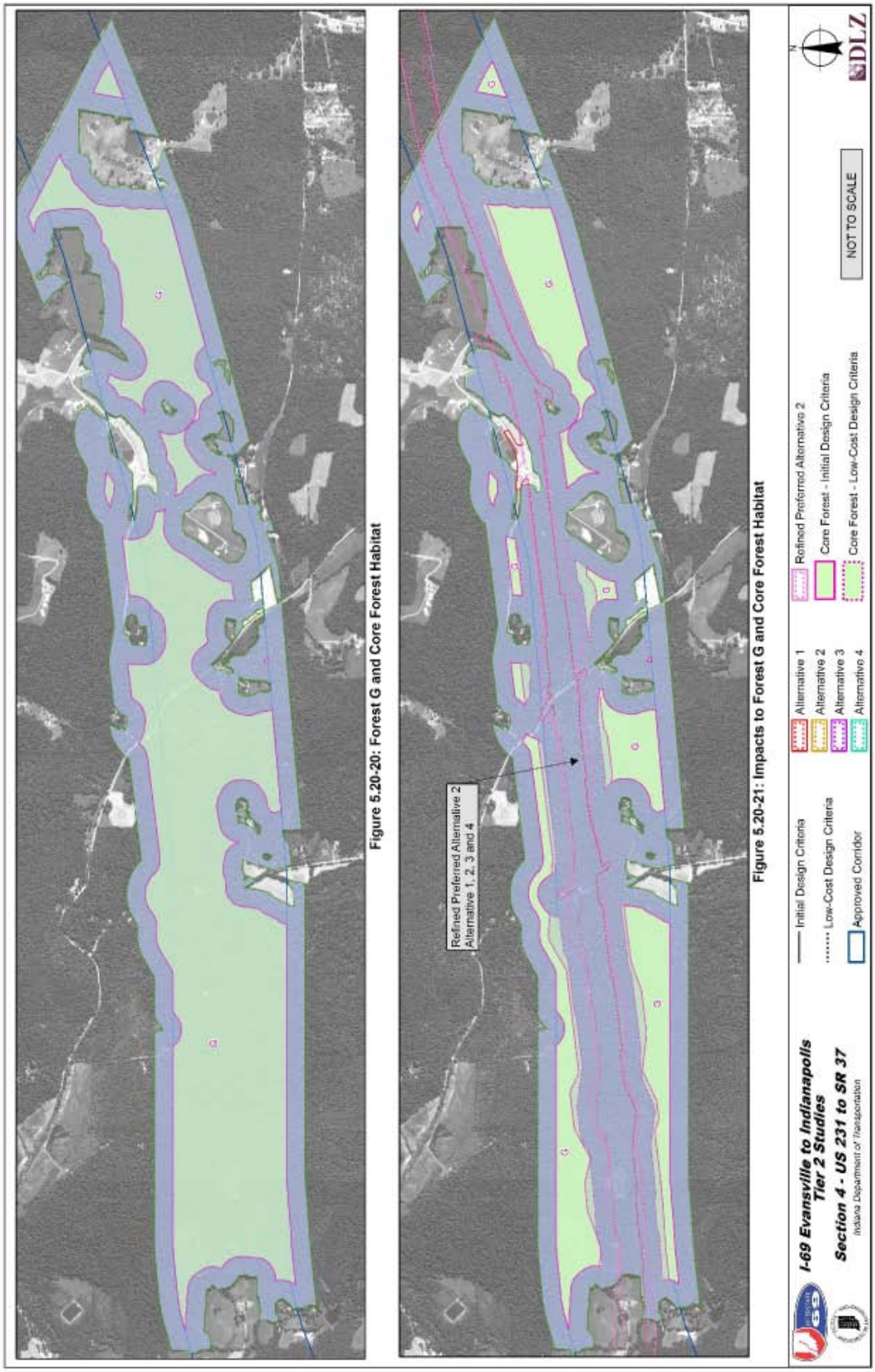

Figure 5.20-20: Forest G and Core Forest Habitat

Figure 5.20-21: Impacts to Forest G and Core Forest Habitat

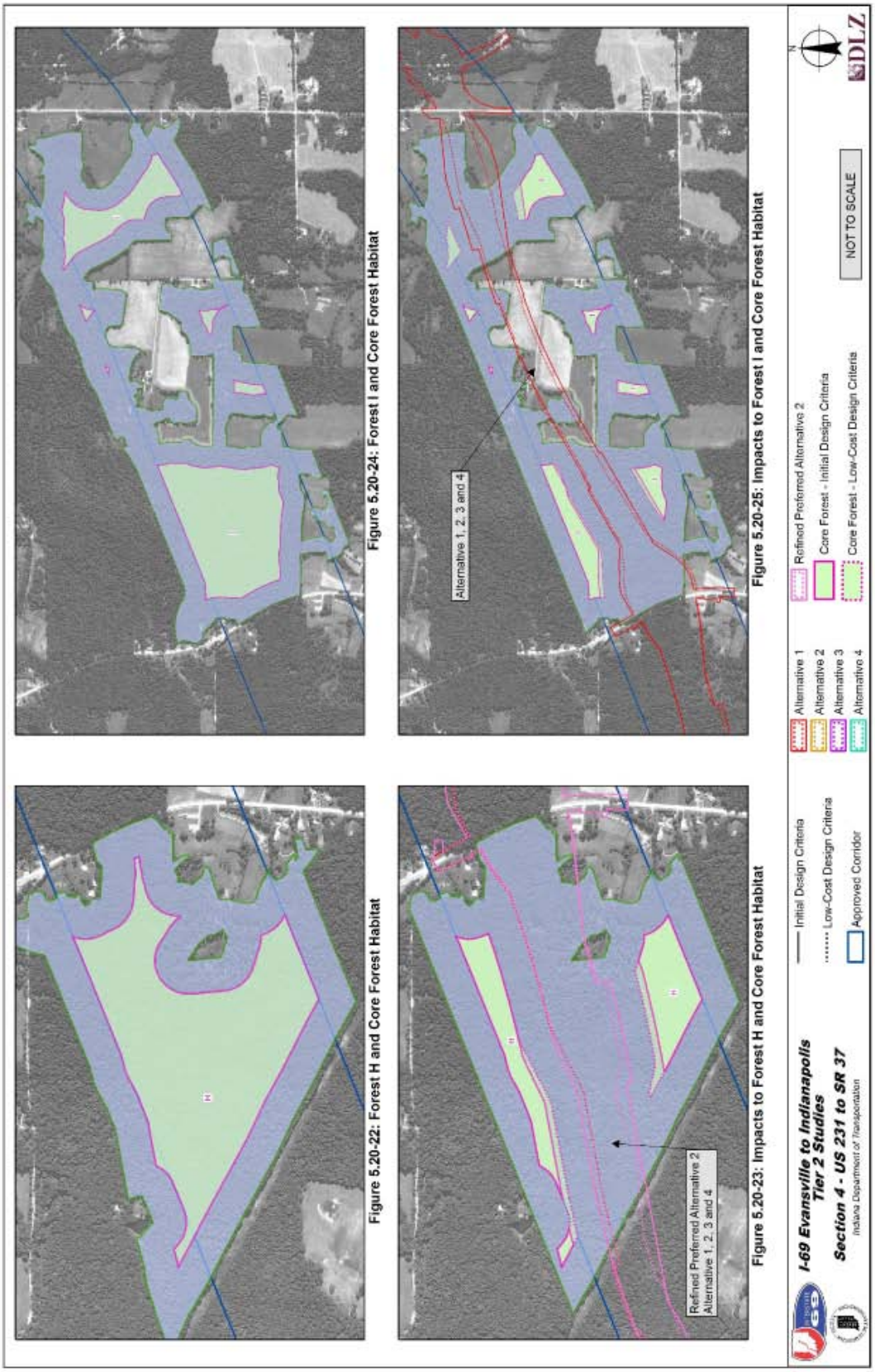
Figure 5.20-22: Forest H and Core Forest Habitat
Figure 5.20-23: Impacts to Forest H and Core Forest Habitat
Refined Preferred Alternative 2
Alternative 1, 2, 3 and 4
Figure 5.20-24: Forest I and Core Forest Habitat
Figure 5.20-25: Impacts to Forest I and Core Forest Habitat
Alternative 1, 2, 3 and 4
Initial Design Criteria
Low-Cost Design Criteria
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Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
Core Forest - Initial Design Criteria
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Figure 5.20-25a: Impacts to Forest I and Core Forest Habitat

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Alternative 2
Alternative 3
Alternative 4
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Core Forest - Initial Design Criteria
Core Forest - Low-Cost Design Criteria

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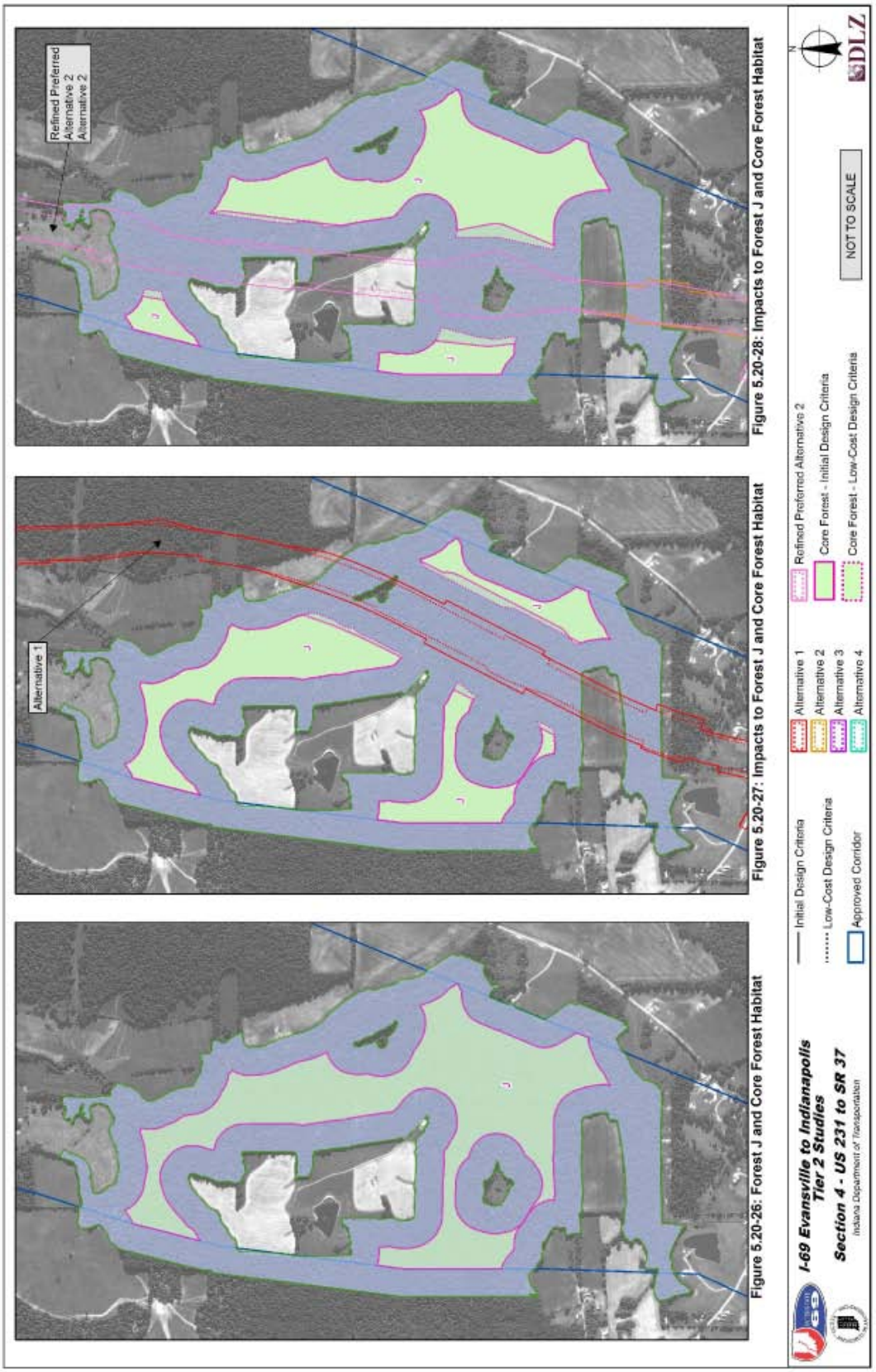

Figure 5.20-26: Forest J and Core Forest Habitat

Figure 5.20-27: Impacts to Forest J and Core Forest Habitat

Figure 5.20-28: Impacts to Forest J and Core Forest Habitat

Figure 5.20-29: Impacts to Forest J and Core Forest Habitat

Figure 5.20-30: Impacts to Forest J and Core Forest Habitat

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Alternative 3
Alternative 4

Refined Preferred Alternative 2
Core Forest - Initial Design Criteria
Core Forest - Low-Cost Design Criteria

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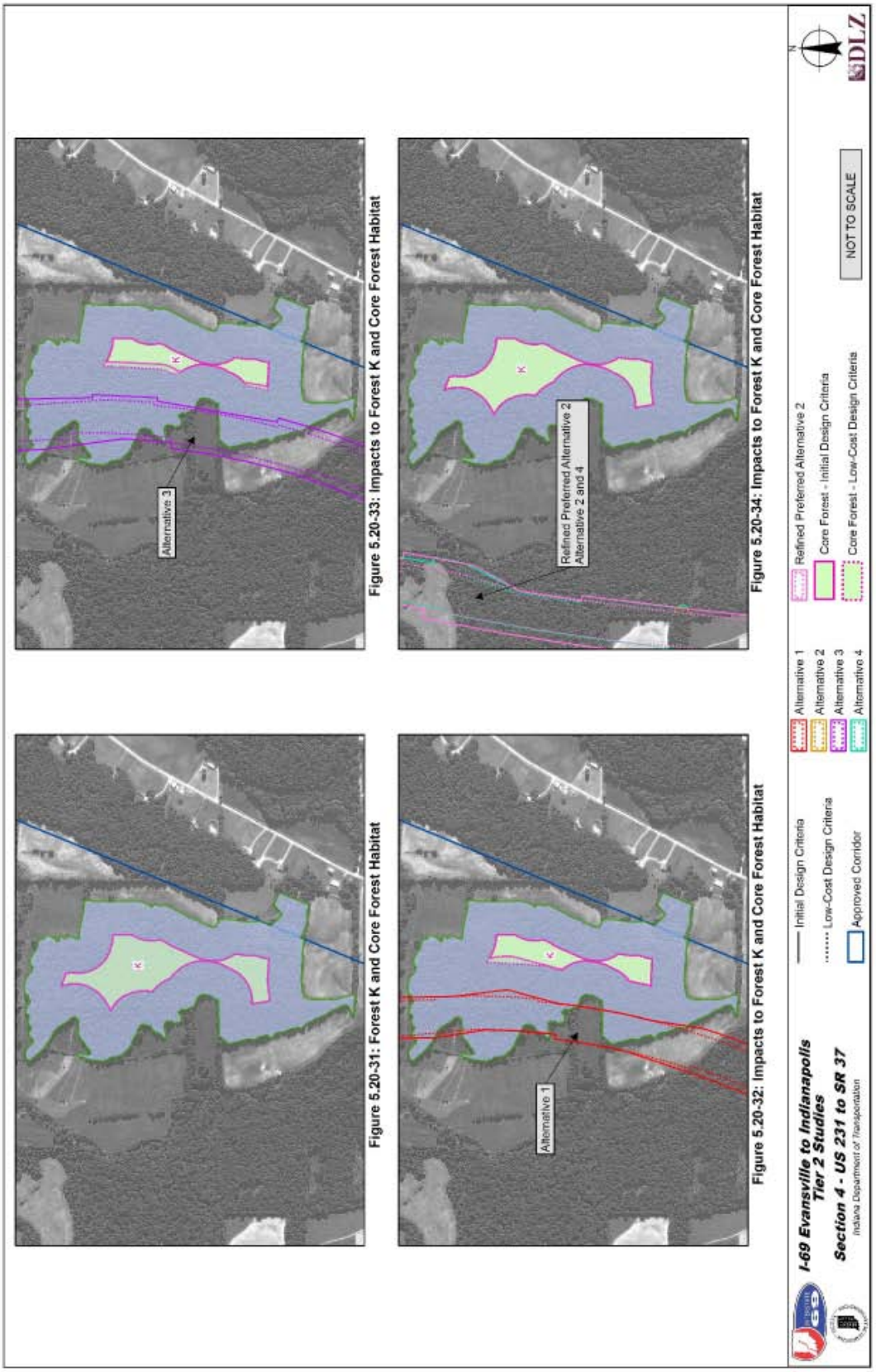

Figure 5.20-31: Forest K and Core Forest Habitat

Figure 5.20-32: Impacts to Forest K and Core Forest Habitat

Figure 5.20-33: Impacts to Forest K and Core Forest Habitat

Figure 5.20-34: Impacts to Forest K and Core Forest Habitat

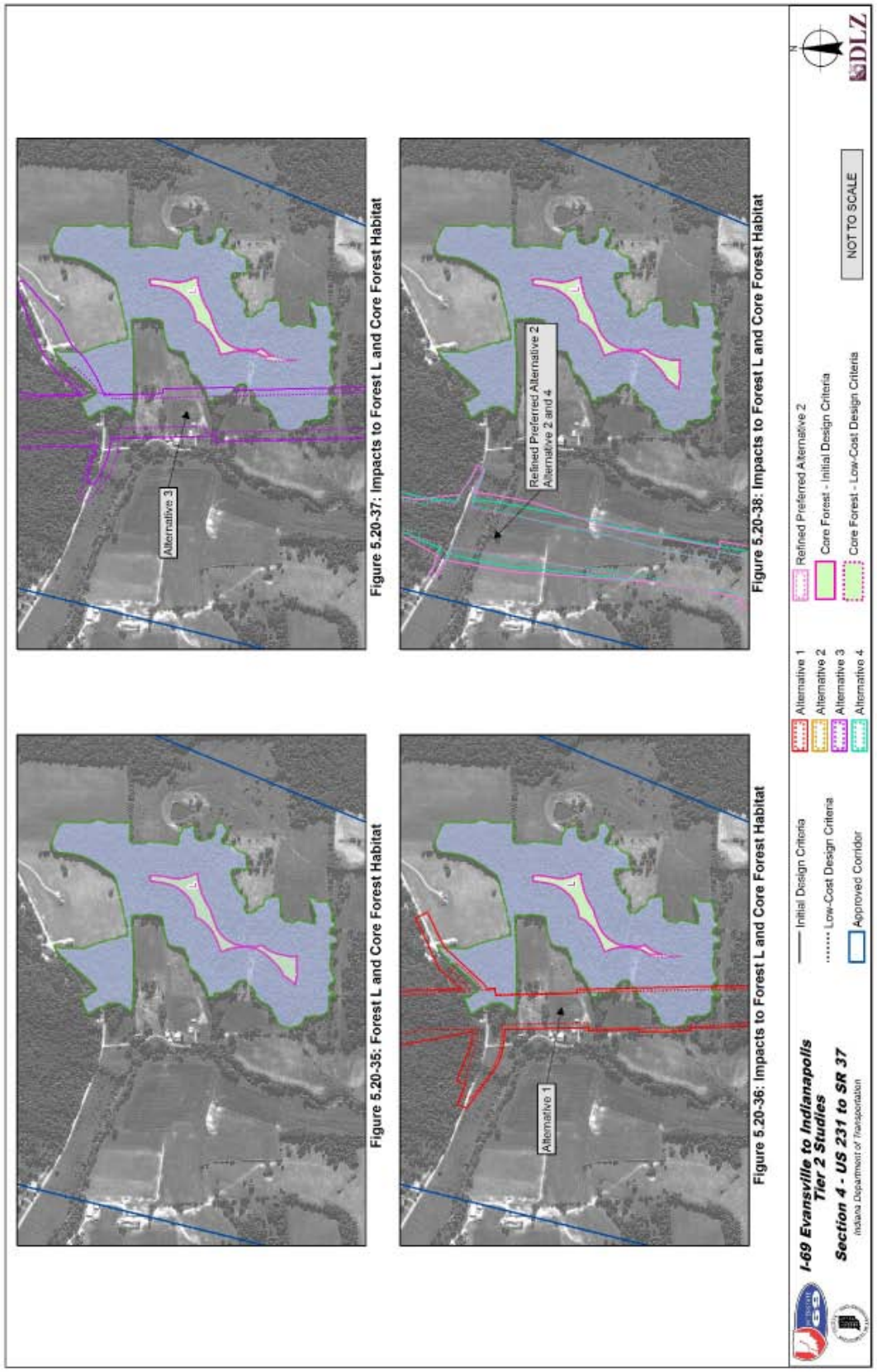

Figure 5.20-35: Forest L and Core Forest Habitat

Figure 5.20-36: Impacts to Forest L and Core Forest Habitat

Figure 5.20-37: Impacts to Forest L and Core Forest Habitat

Figure 5.20-38: Impacts to Forest L and Core Forest Habitat

Figure 5.20-39: Forest M and Core Forest Habitat

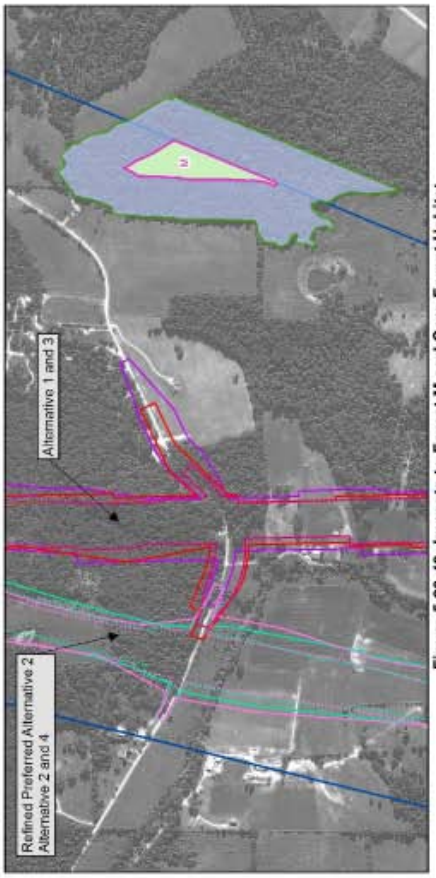

Figure 5.20-40: Impacts to Forest M and Core Forest Habitat

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Refined Preferred Alternative 2
Core Forest - Initial Design Criteria
Core Forest - Low-Cost Design Criteria

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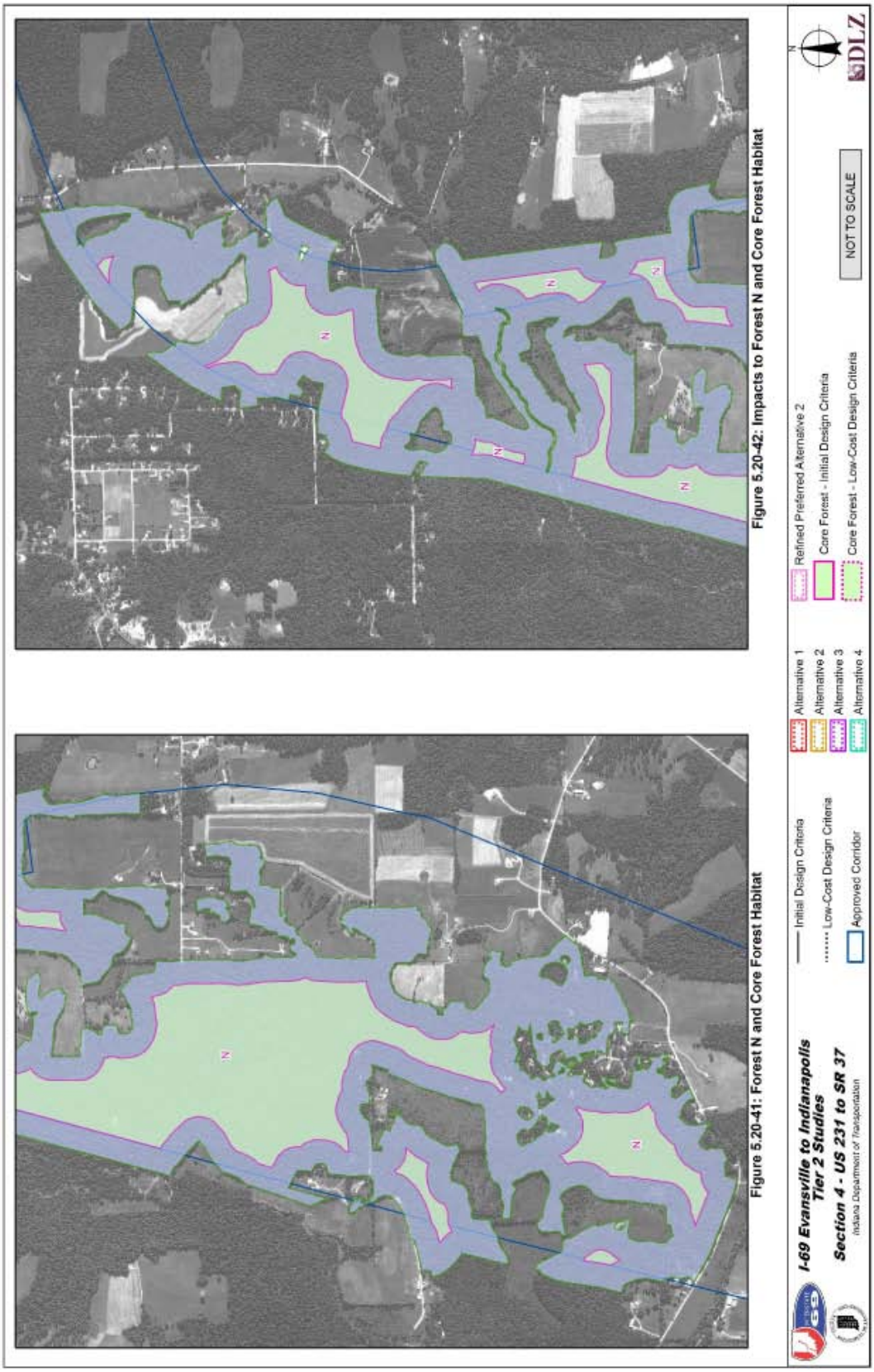

Figure 5.20-41: Forest N and Core Forest Habitat

Figure 5.20-42: Impacts to Forest N and Core Forest Habitat

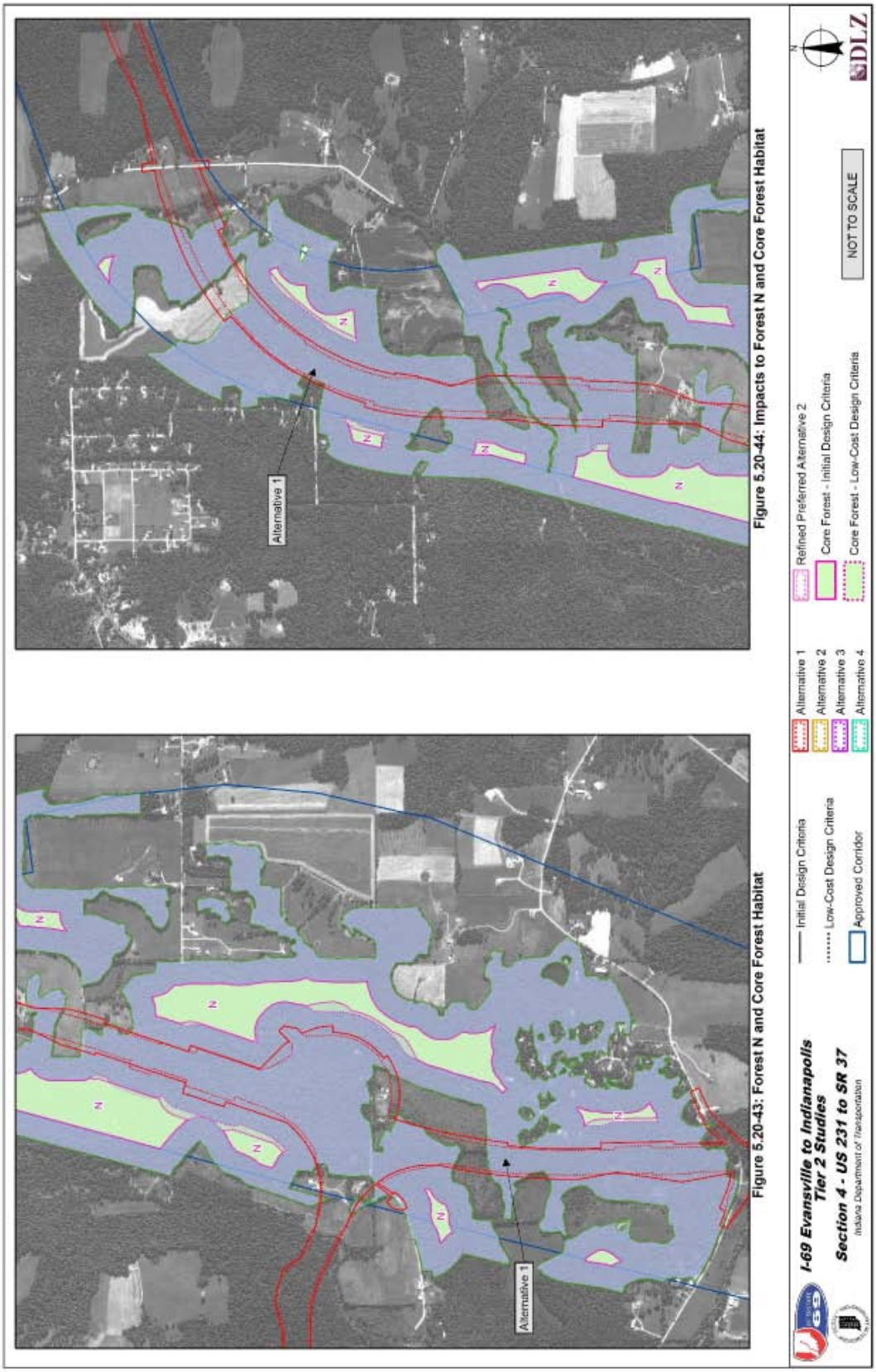

Figure 5.20-43: Forest N and Core Forest Habitat

Figure 5.20-44: Impacts to Forest N and Core Forest Habitat

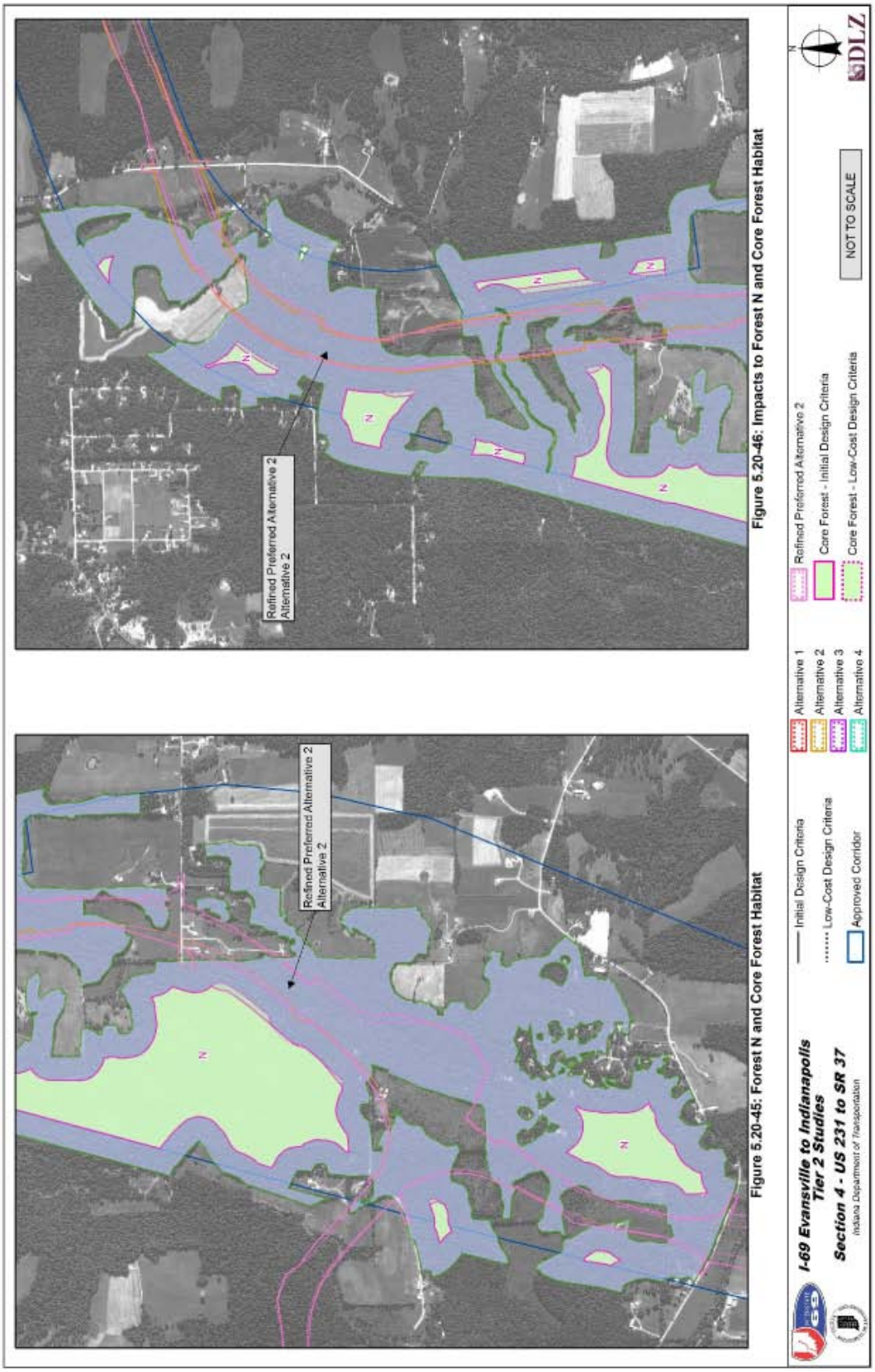

Figure 5.20-45: Forest N and Core Forest Habitat

Figure 5.20-46: Impacts to Forest N and Core Forest Habitat

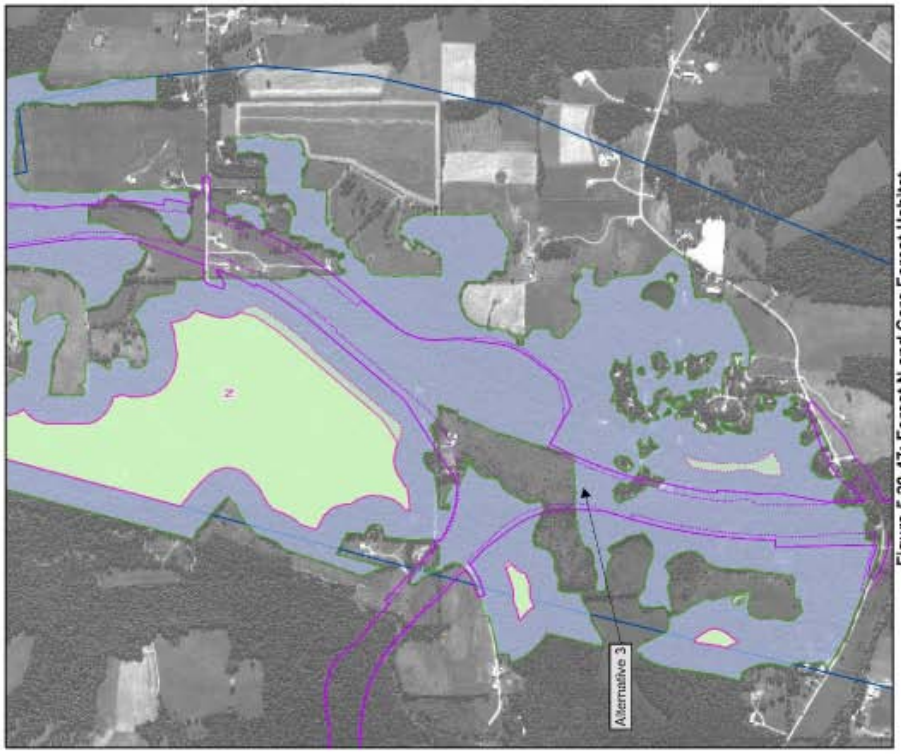

Figure 5.20-47: Forest N and Core Forest Habitat

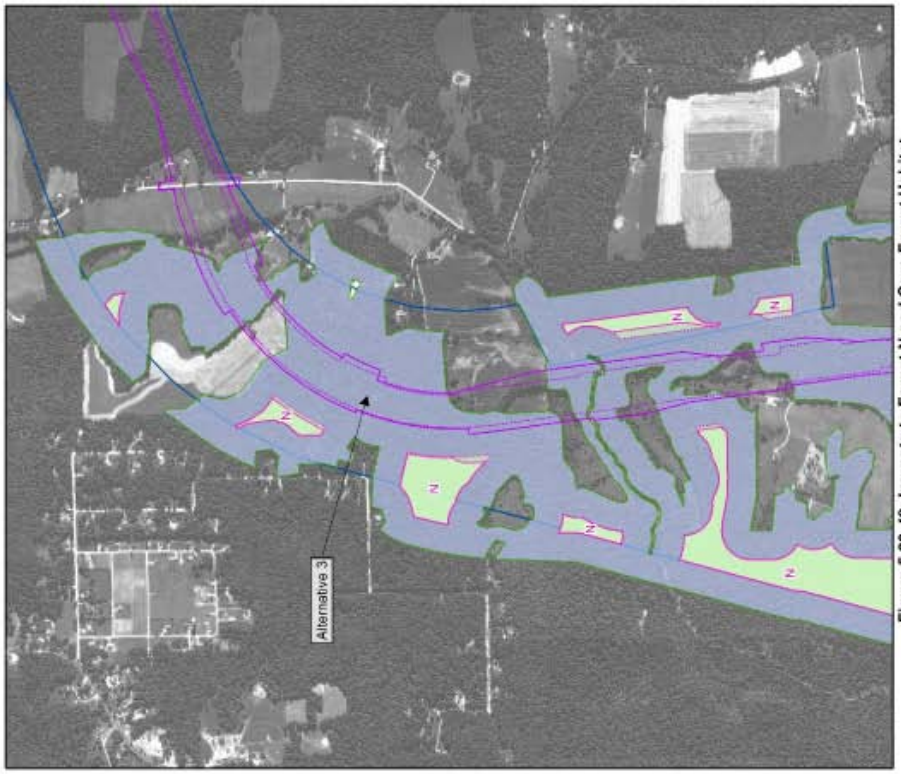

Figure 5.20-48: Impacts to Forest N and Core Forest Habitat

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Refined Preferred Alternative 2
Core Forest - Initial Design Criteria
Core Forest - Low-Cost Design Criteria

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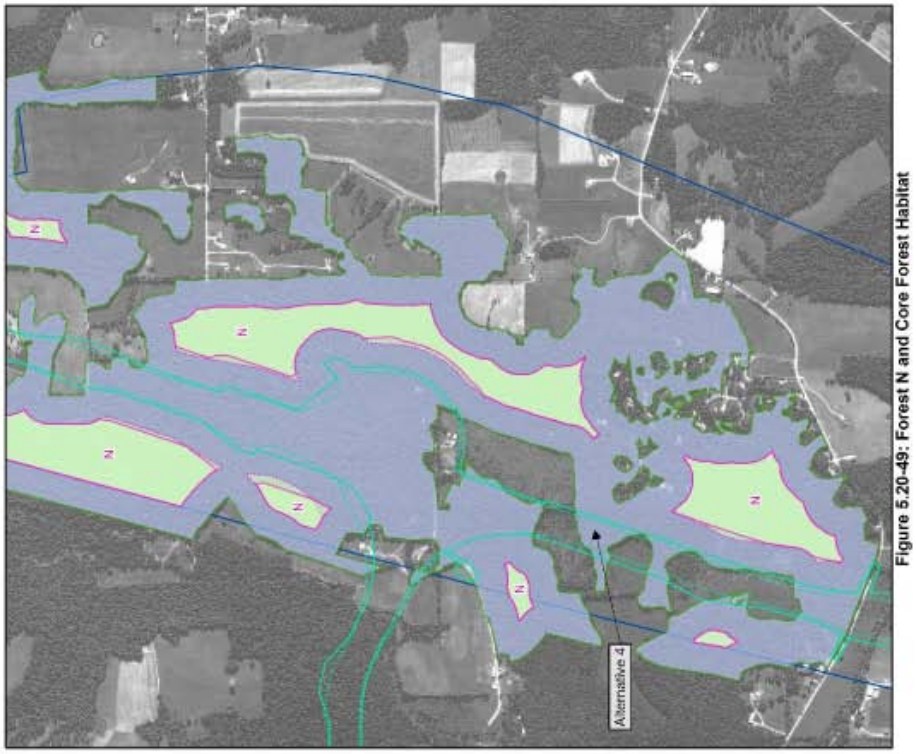

Figure 5.20-49: Forest N and Core Forest Habitat

Figure 5.20-50: Impacts to Forest N and Core Forest Habitat

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Alternative 4
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Core Forest - Initial Design Criteria
Core Forest - Low-Cost Design Criteria

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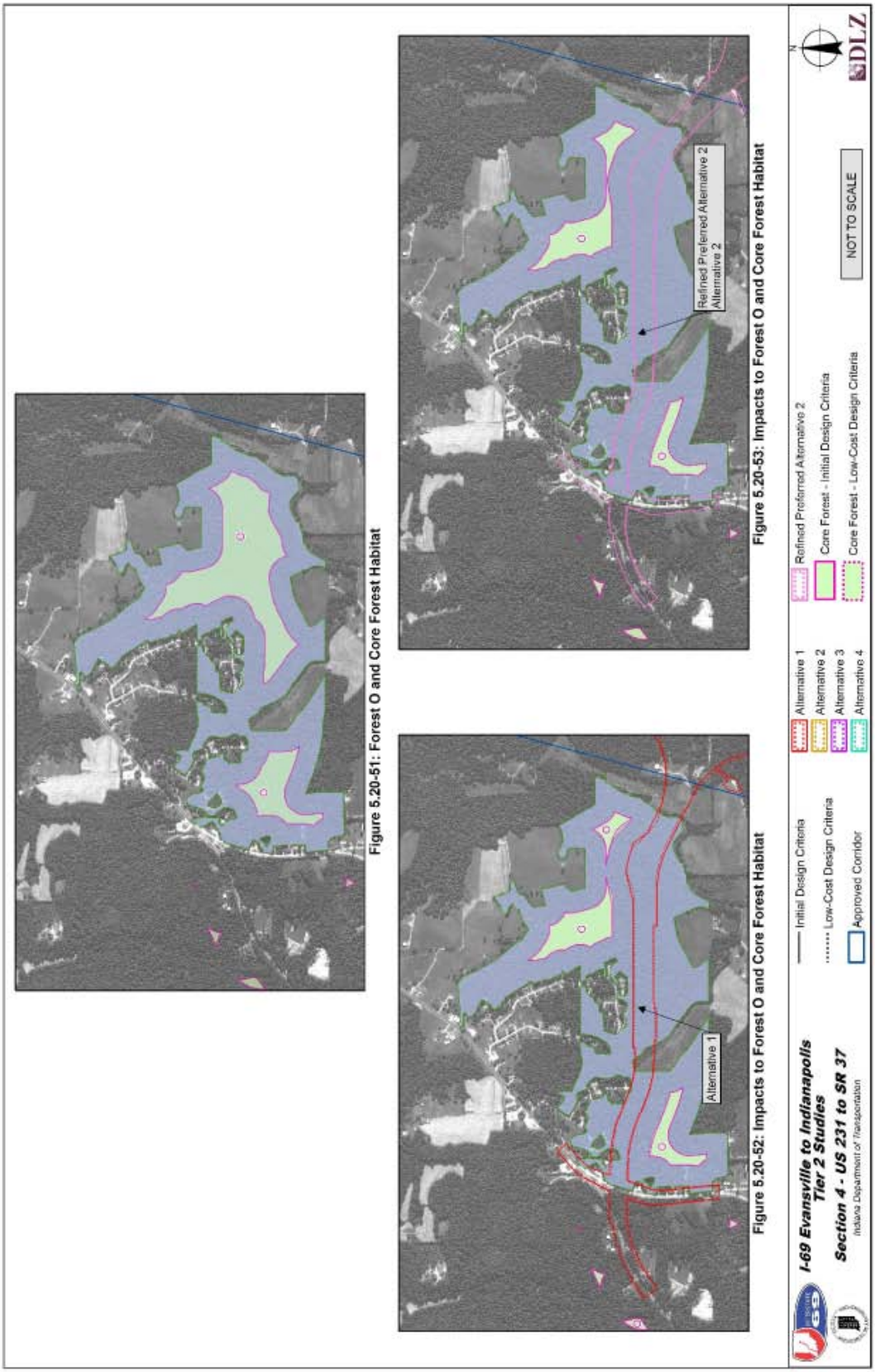

Figure 5.20-51: Forest O and Core Forest Habitat

Figure 5.20-52: Impacts to Forest O and Core Forest Habitat

Figure 5.20-53: Impacts to Forest O and Core Forest Habitat

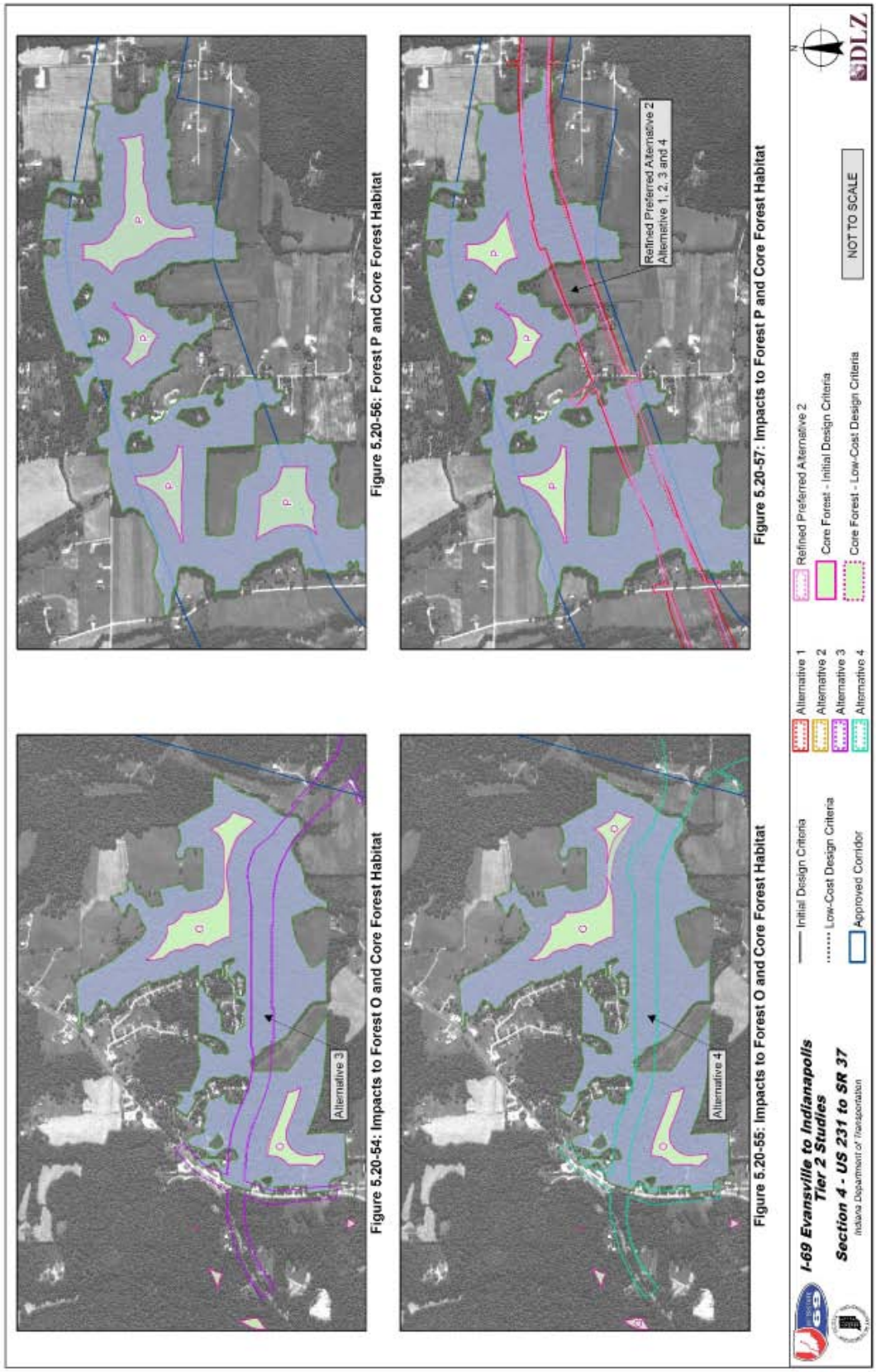

Figure 5.20-54: Impacts to Forest O and Core Forest Habitat

Figure 5.20-55: Impacts to Forest O and Core Forest Habitat

Figure 5.20-56: Forest P and Core Forest Habitat

Figure 5.20-57: Impacts to Forest P and Core Forest Habitat

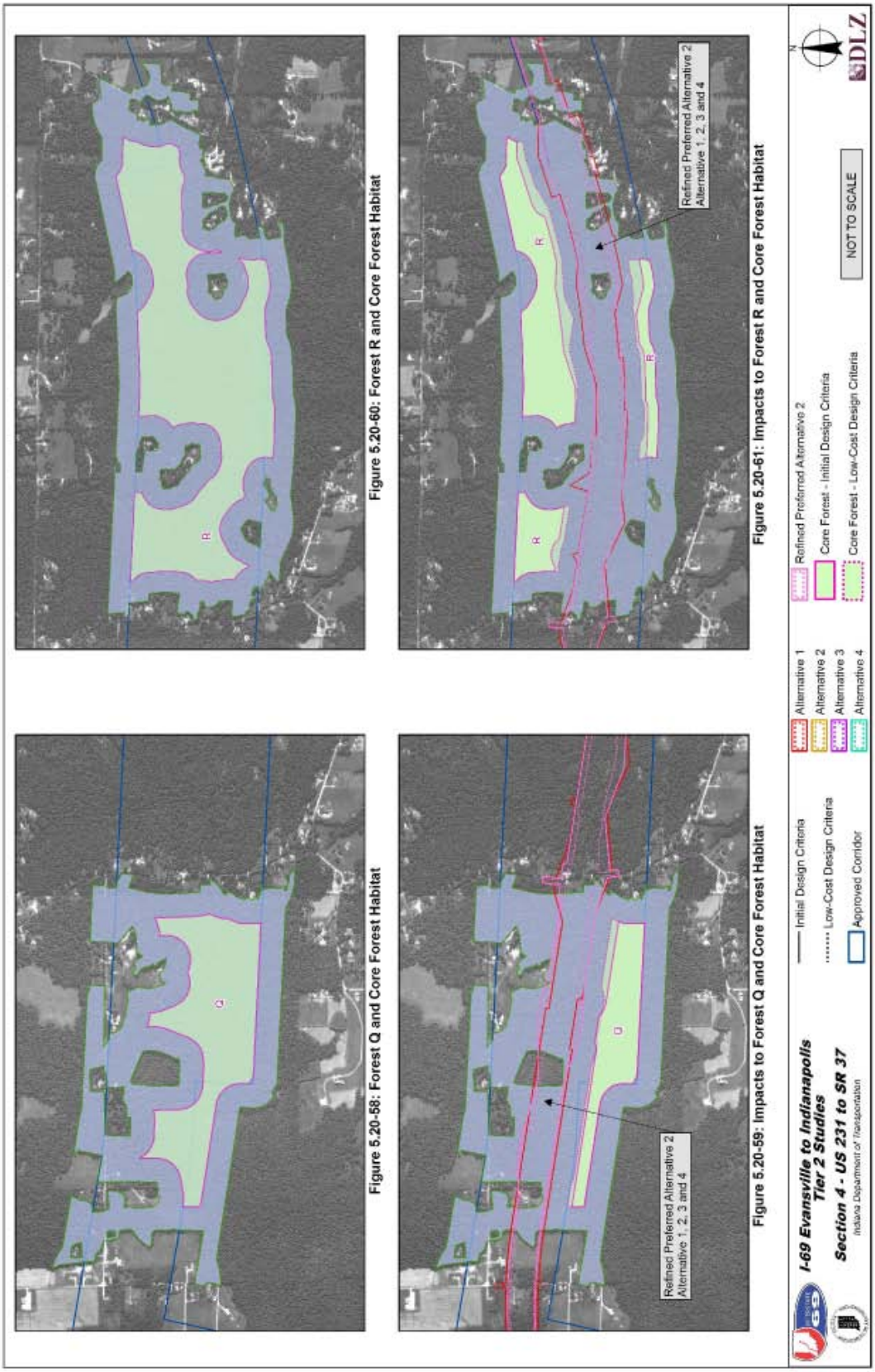

Figure 5.20-58: Forest Q and Core Forest Habitat

Figure 5.20-59: Impacts to Forest Q and Core Forest Habitat

Figure 5.20-60: Forest R and Core Forest Habitat

Figure 5.20-61: Impacts to Forest R and Core Forest Habitat

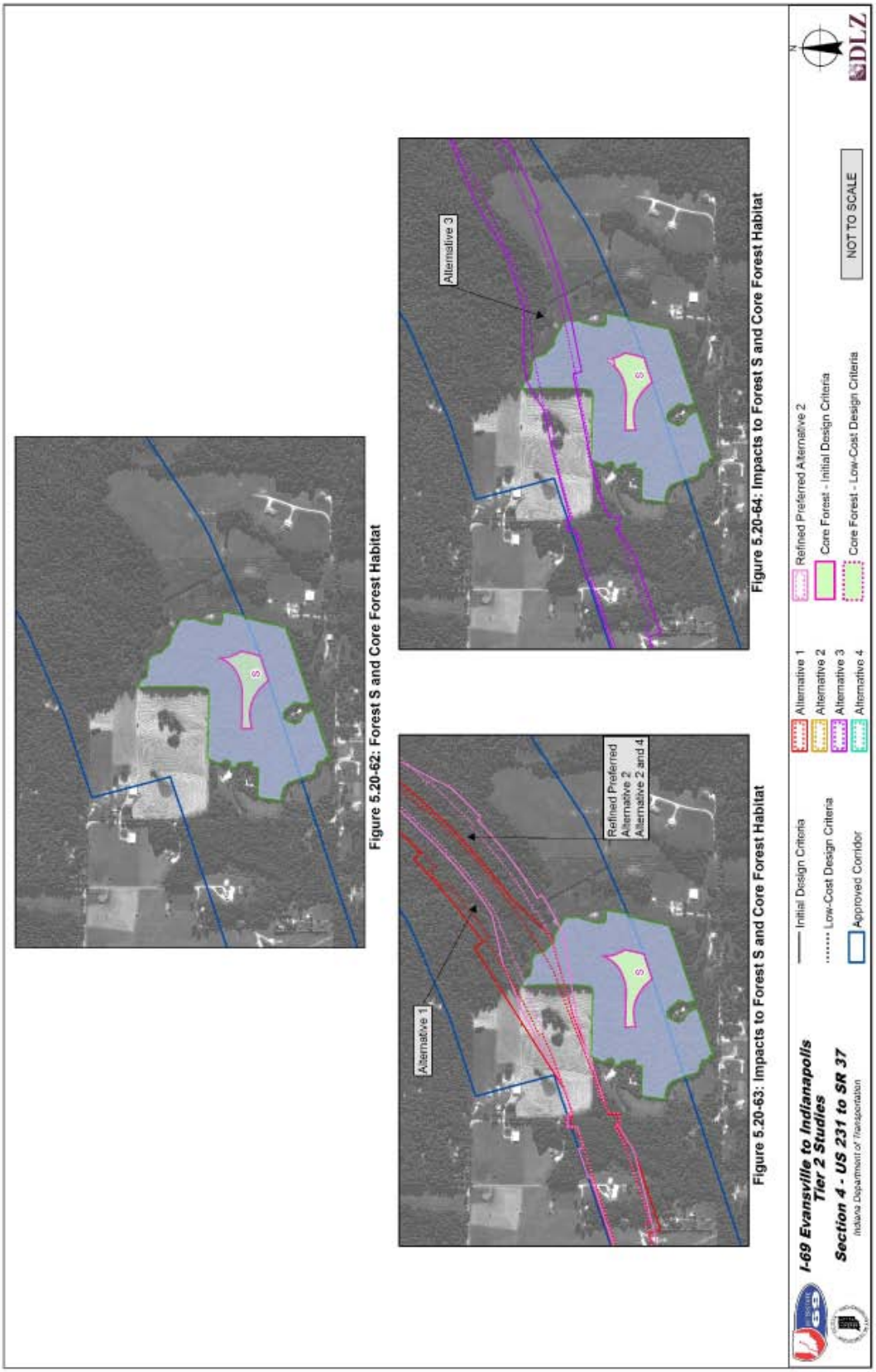

Figure 5.20-62: Forest S and Core Forest Habitat

Figure 5.20-63: Impacts to Forest S and Core Forest Habitat

Figure 5.20-64: Impacts to Forest S and Core Forest Habitat

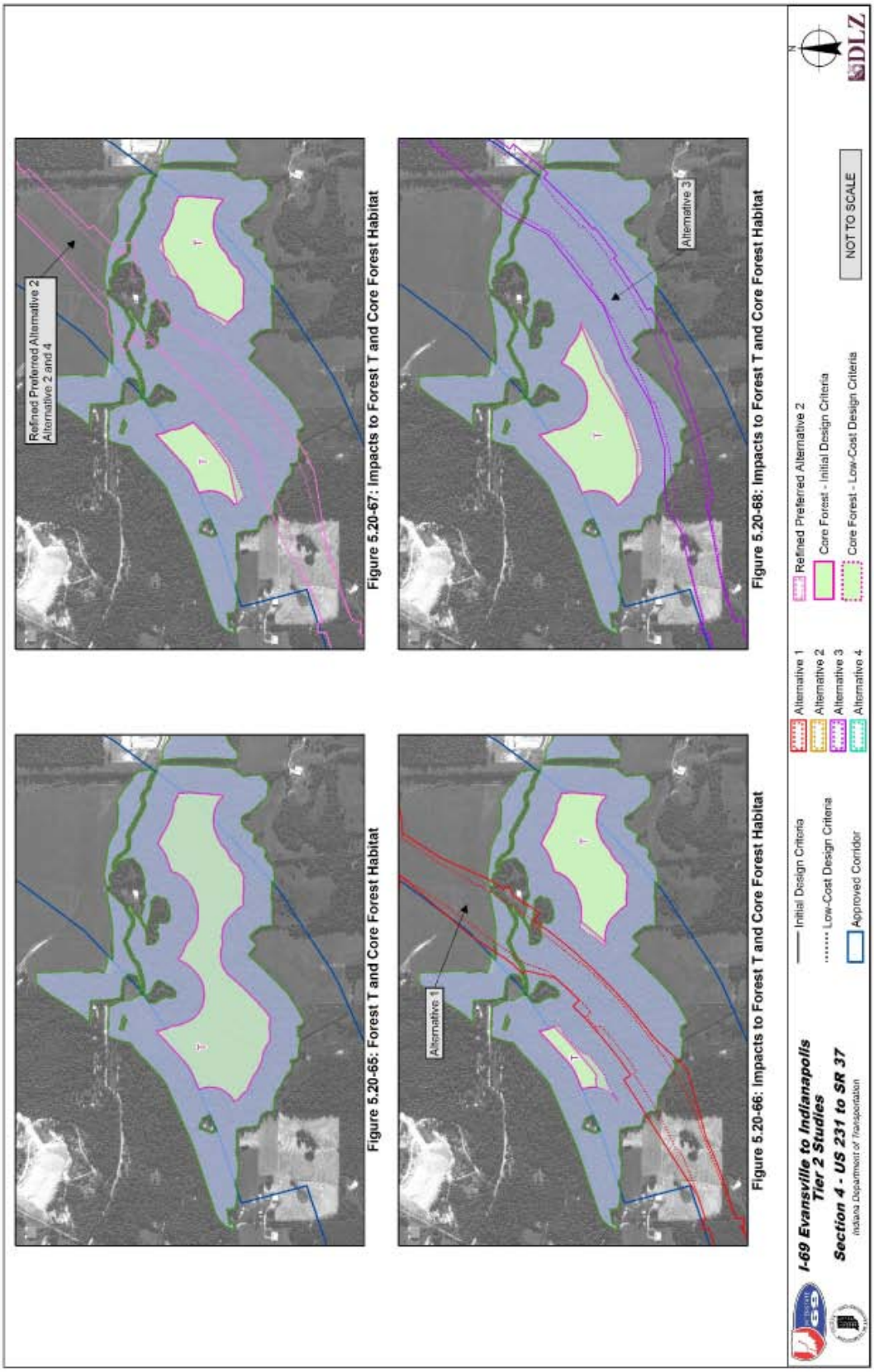

Figure 5.20-65: Forest T and Core Forest Habitat

Figure 5.20-66: Impacts to Forest T and Core Forest Habitat

Figure 5.20-67: Impacts to Forest T and Core Forest Habitat

Figure 5.20-68: Impacts to Forest T and Core Forest Habitat

Figure 5.20-69: Forest U and Core Forest Habitat

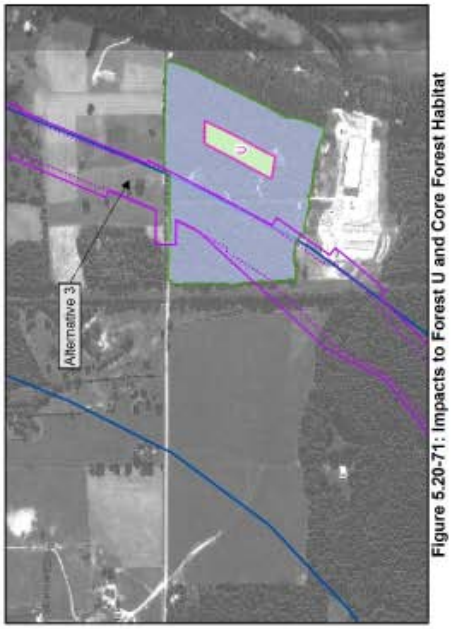

Figure 5.20-71: Impacts to Forest U and Core Forest Habitat

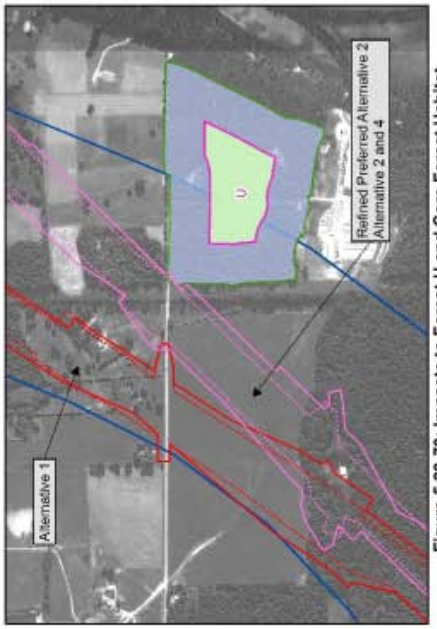

Figure 5.20-70: Impacts to Forest U and Core Forest Habitat

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Alternative 4
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Core Forest - Initial Design Criteria
Core Forest - Low-Cost Design Criteria

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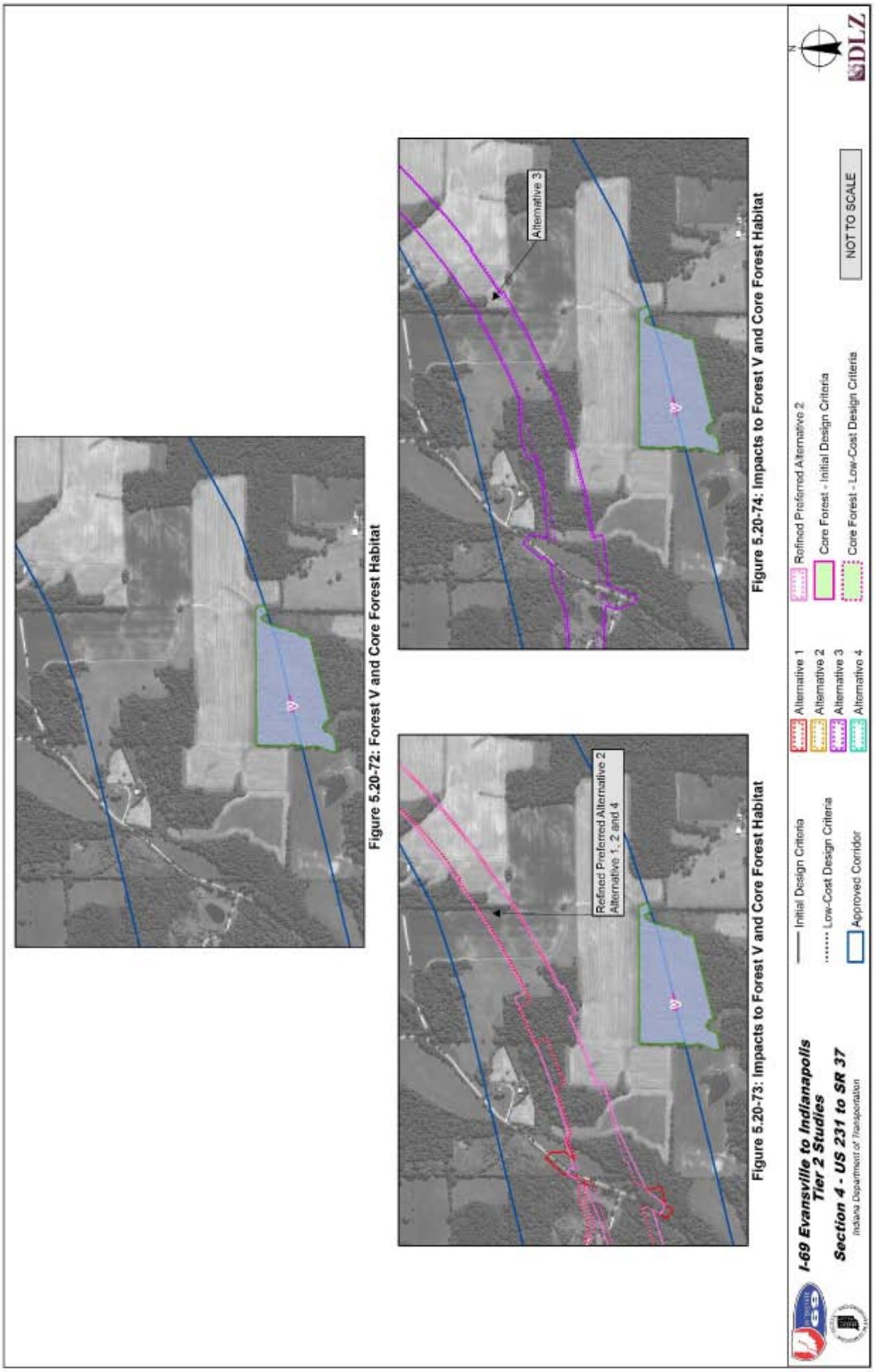

Figure 5.20-72: Forest V and Core Forest Habitat

Figure 5.20-73: Impacts to Forest V and Core Forest Habitat

Figure 5.20-74: Impacts to Forest V and Core Forest Habitat

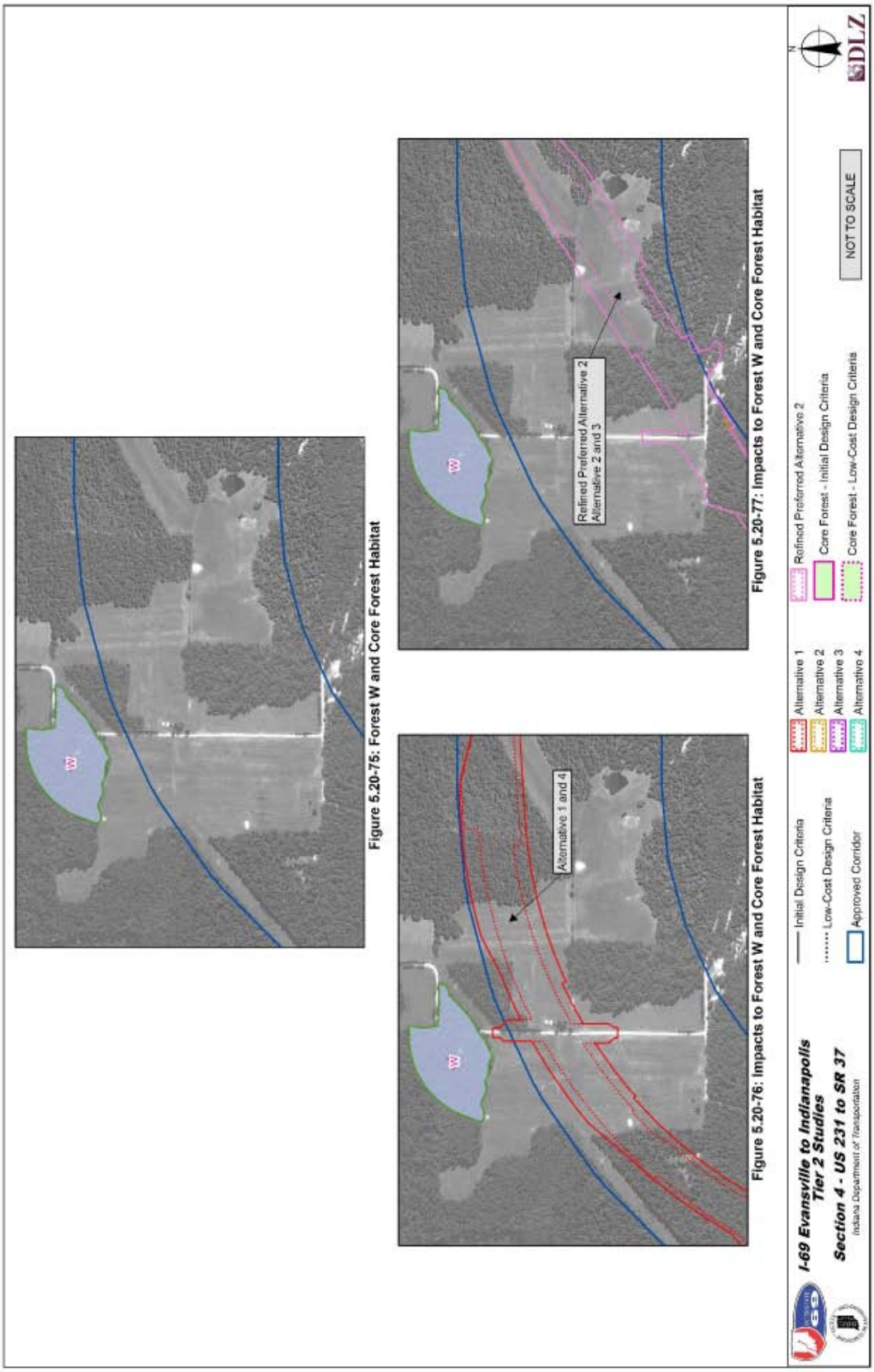

Figure 5.20-75: Forest W and Core Forest Habitat

Figure 5.20-76: Impacts to Forest W and Core Forest Habitat

Figure 5.20-77: Impacts to Forest W and Core Forest Habitat

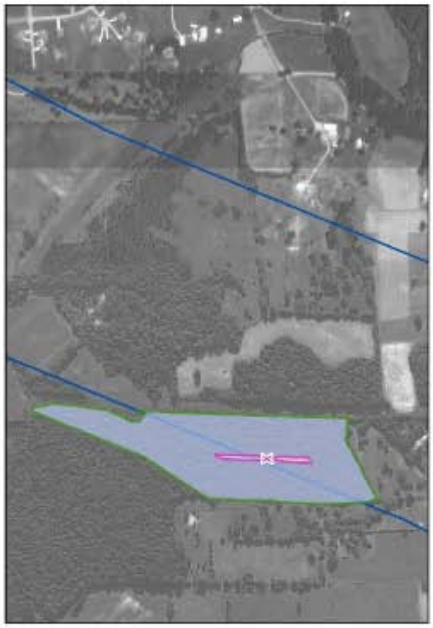

Figure 5.20-78: Forest X and Core Forest Habitat

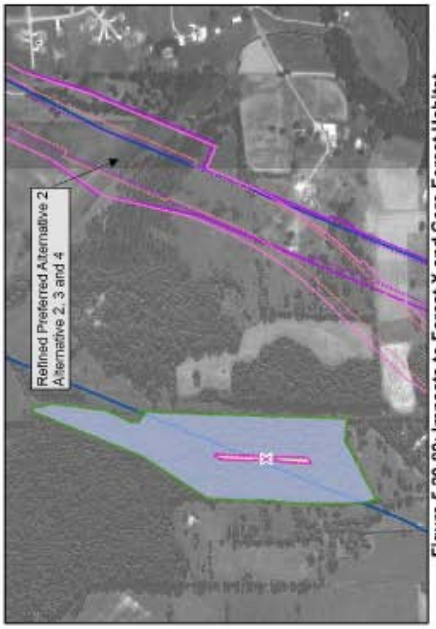

Figure 5.20-80: Impacts to Forest X and Core Forest Habitat

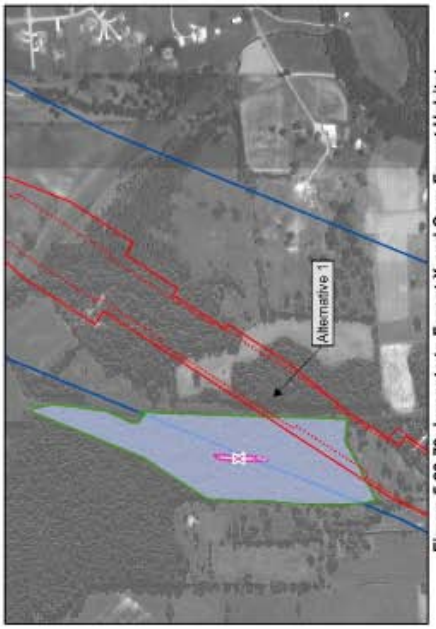

Figure 5.20-79: Impacts to Forest X and Core Forest Habitat

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Alternative 3
Alternative 4
Refined Preferred Alternative 2
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Core Forest - Low-Cost Design Criteria

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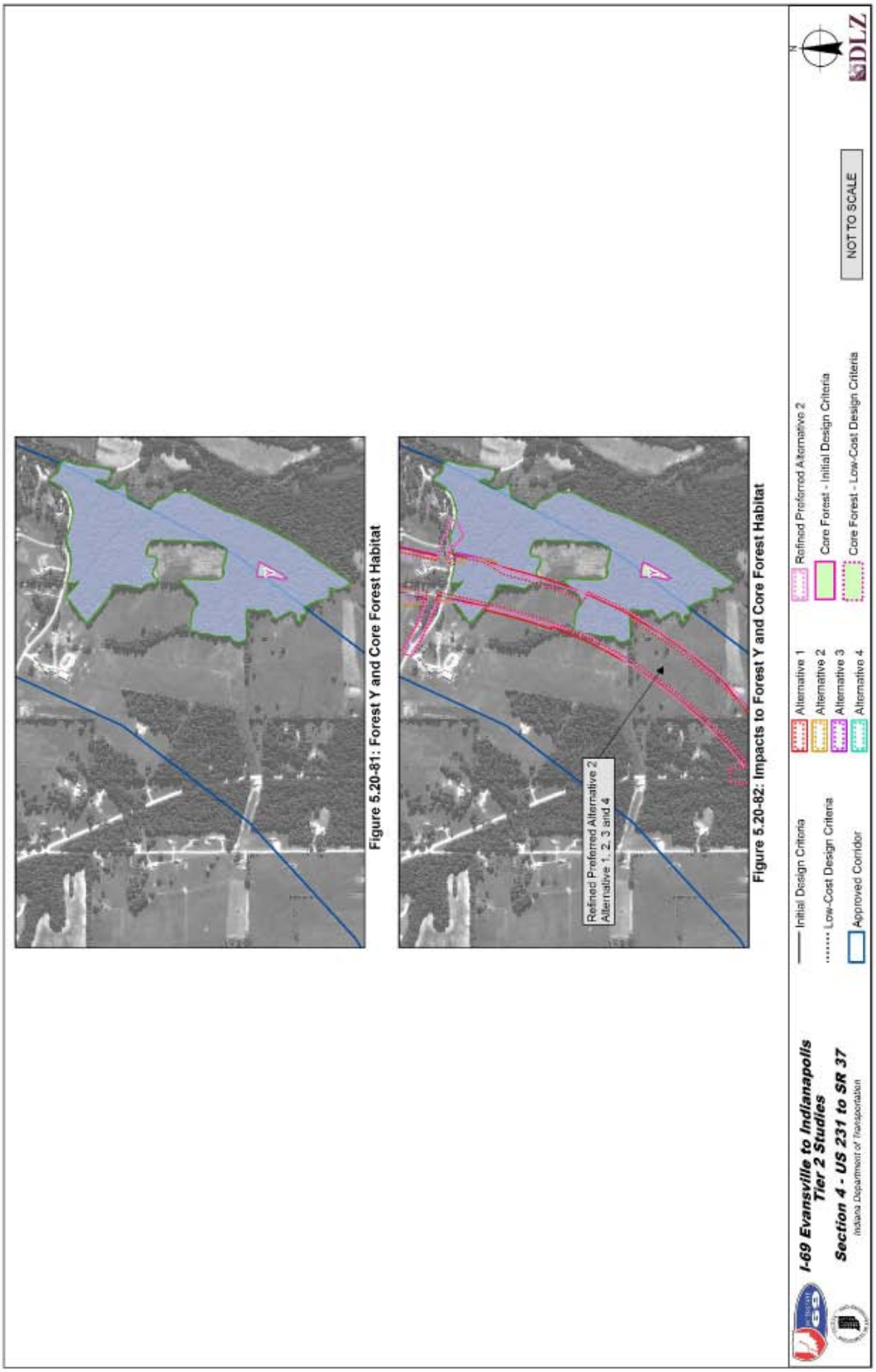

Figure 5.20-81: Forest Y and Core Forest Habitat

Figure 5.20-82: Impacts to Forest Y and Core Forest Habitat

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5.21 Karst Impacts

Since the DEIS, the following substantive changes have been made to this section:

- Section 5.21.1 – Clarified information on 1994 Karst Study.
- Section 5.21.2 – Updated to reference preparation of the Survey of Karst Features Report Addendum No. 1 and to include additional description of the Karst MOU.
- Section 5.21.3.3 – Added additional information on factors relating to the importance of karst features and the evaluation for avoidance and minimization, added information on recently discovered cave.
- **Table 5.21-1** – Updated numbers to include recently discovered cave.
- Section 5.21.3.4 – Updated to include impacts associated with Refined Preferred Alternative 2 and recently discovered cave.
- **Tables 5.21-2** and **5.21-3** – Updated to include impacts associated with Refined Preferred Alternative 2 and recently discovered cave.
- Section 5.21.3.7 - Updated to further explain how caves were selected for fauna survey and added information on recently discovered cave.
- Section 5.21.3.8 – Updated to reference the updated estimated pollutant loading calculations presented in Karst Features Report Addendum No. 1.
- Section 5.21.3.10 – Added this section discussing a recently discovered cave.
- Section 5.21.4 – Added information on recently discovered cave, discussion of applicability of IDEM Rule 5 Permit and potential erosion control measures, added commitment for establishment of low salt zones, added commitment to develop protocols for runoff treatment and monitoring, provided additional detail regarding inspection for soil piping, revised discussion of Class V Injection Well Permit, and updated to provide additional description of Best Management Practices (BMPs) that will be considered for implementation.
- **Table 5.21-2a** – Added to provide a list of BMPs for consideration in Karst Terrain.
- Section 5.21.5 - Updated to include impacts associated with Refined Preferred Alternative 2 and recently discovered cave.
- **Table 5.21-3** - Updated to include impacts associated with Refined Preferred Alternative 2 and recently discovered cave.

5.21.1 Introduction

Karst ecosystems are an important feature of Southern Indiana. The term karst refers to "landscapes characterized by caves, sinkholes, underground streams, and other features formed by the slow dissolving, rather than the mechanical eroding of bedrock" (AGI, 2001). Karst features form as water dissolves and flows through bedrock via solutionally enlarged subsurface passageways. A generalized cross section of karst terrain in Southern Indiana is presented as **Figure 5.21-1** (p. 5-698). Karst features may be apparent (visible) within the landscape or underground and not readily apparent from the surface.

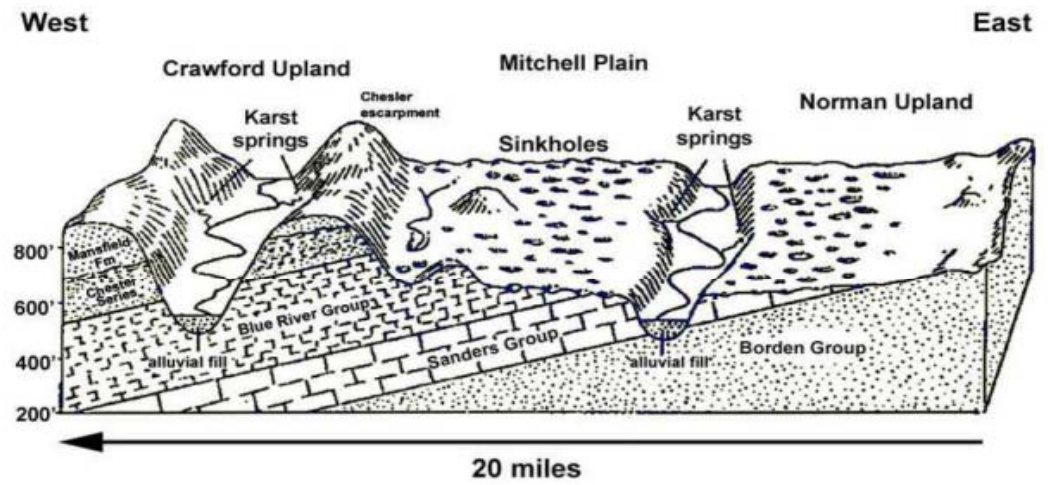

Figure 5.21-1 Generalized physiographic cross section of southern Indiana (from Palmer,1969)

Water resources in karst areas are especially sensitive to impairment. Karst flowpaths (the distance and direction water travels while in the karst system) are interconnected and can cross groundwater aquifers used as private and public water supplies. Groundwater wells are commonly used throughout the Section 4 study area and springs are also used by some individual landowners as a potable water supply and for livestock. Very little water purification occurs in karst areas because the water flows directly through cracks and fissures in rocks rather than percolating slowly through soil as in other types of terrain. Therefore, surface and groundwater quality is an important concern in karst areas, since karst flowpaths can convey pollutants to these water sources. Karst areas are also important because they provide cave and other subterranean habitat for a number of rare, threatened, and endangered species. Many species of bats including the federally-endangered Indiana bat (*Myotis sodalis*) use caves which form in karst areas.

Karst features can be classified as recharge features or discharge features. A recharge feature channels surface water to underground karst systems. Sinkholes, swallets, and sinking streams are types of recharge features. Recharge features have an associated surface drainage area (recharge area) from which the surface water is collected and directed to the subsurface. Recharge features can be further classified based on their relative capacity to convey surface water to the subsurface (high, medium and low infiltration rates). Infiltration rates vary with

feature size, filling by sedimentation and other factors. If flowpath lengths are equal, features with high infiltration rates have the potential to convey pollutants toward discharge locations more quickly than those with lower infiltration features. Highway construction or operational impacts upon high infiltration recharge features can be more problematic than impacts to lower infiltration recharge features, due to the limited time for water quality protection measures or emergency spill response to be effective. Definitions of these features are provided below, in 5.21.3, *Analysis*.

Discharge features are openings in the bedrock and/or soil that allow water to flow from the subsurface onto the land surface. Springs are types of discharge features. Caves may be recharge or discharge features depending upon their flowpath dynamics. Discharge features vary greatly in size and were further classified based on field-estimated flow rate (ranges of gallons per minute) within the Section 4 corridor. Definitions of these features are provided below, in 5.21.3, *Analysis*.

Potential highway related impacts to karst features can occur at the recharge feature, the discharge feature, or in between if a collapse occurs in the cave or conduit system. In general, highway construction and operational impacts upon recharge features are a broader concern because of the potential for changes in water quality throughout the involved karst system, changes in flow volumes within the karst system if karst flowpaths are plugged or severed, and, the potential for associated effects upon karst (primarily cave) biota. Concerns relating to discharge feature impacts are generally limited to the immediate location of the feature itself.

The avoidance and minimization of impacts to karst features has been an environmental concern for INDOT and FHWA since studies in the early 1990s. INDOT developed a karst report as part of the Southwest Indiana Highway Study entitled "Karst Features in the Bloomington to Evansville Highway" as early as 1994. This study was published as Appendix G in the March 1996 DEIS for the Southwest Indiana Highway. The study area for this report extended from SR 37 south of Bloomington in Monroe County to SR 57 near the town of Newberry in Greene County, Indiana, a distance of approximately 32 miles. This study can be found in **Appendix HH**, *Karst Features in the Southwest Indiana Highway Corridor (Redacted)*, of this FEIS.

As part of the 1994 Study, a field inventory was conducted and karst features were mapped on U.S. Geological Survey (USGS) topographic quadrangles. Prior to fieldwork, discussion with members of the Indiana Geological Survey (IGS) aided in selection of a study area. This study area was identified to minimize and avoid karst through a band where features were abundant. In addition, prior to the field inventory, the Indiana Cave Survey made available its list of known caves for the study area with certain confidentiality restrictions regarding locations of caves. This information was field checked during the field inventory. A database of 288 features was developed based on the field survey and evaluated. Features were classified as significant, possibly significant, and not significant. At that time, a potential alignment running along a segment of Koontz Road was under consideration. The 1994 Study had identified some 90 sinkhole and swallet features along Koontz Road in this area. The result was a relocation of the potential alignment to the south to avoid and minimize karst impacts. The 1994 Study only mapped several short segments that are inside of the Tier 1 Alternative 3C corridor, but it

provided direction for the location of this corridor and served as guidance in developing the Tier 2 fieldwork.

5.21.2 Methodology

Section 4 is located within a karst region. To define guidelines for the development of transportation projects in karst areas and minimize the impact of construction projects, INDOT, Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources (IDNR), and the U.S. Fish and Wildlife Service (USFWS) entered into the Karst Memorandum of Understanding (Karst MOU) in 1993. It should be noted that for I-69 Tier 2 studies in Sections 4 and 5, FHWA has invited the United States Environmental Protection Agency (USEPA) to participate in the karst study and assessment. This grew out of USEPA's participation in the I-69 Tier 1 study, in particular its interest in water resource impacts in karst areas.

The Karst MOU documents that the signatory agencies have agreed to the implementation of a seventeen step process for development of highway projects in karst terrain. The Karst MOU document is presented in **Appendix AA**, *Final Karst Report/Addendum to Karst Report (Redacted)*. Steps 1 through 4 of the Karst MOU are completed as part of the NEPA study phase of project development.

Steps 1 and 2 are karst survey efforts for the identification and documentation of karst feature locations, determination of subsurface flows and surface water drainage patterns, and calculations of estimated annual pollutant loads from the highway and drainage within the right of way, including prior to, during and after construction. These steps culminated in the preparation of the Draft Karst Report.

Step 3 includes the review of the karst survey findings by the MOU signatory agencies. The Draft Karst Report was provided to the Karst MOU signatory agencies and the USEPA for review and comment, and comments received were incorporated into the Karst Report prior to publication of the DEIS. The Karst Report was included in the DEIS, and is included in this FEIS, in **Appendix AA**. Comments received on the DEIS that pertained to karst were addressed in **Appendix AA**. Karst Report Addendum No. 1 also provides information regarding the impacts associated with Refined Preferred Alternative 2 and an updated annual pollutant loading analysis.

Step 4 includes the formulation of appropriate measures to offset unavoidable impacts to the identified karst features. The MOU recognizes that methods proposed during the NEPA phase may be generic as they may relate to an overall project, or specific if they relate to a particular karst feature, and that some approaches may require additional investigations later in project development to determine if they are feasible or an appropriate mitigation measure for a particular feature. A list of Best Management Practices (BMPs) that will be considered for implementation in Section 4 is provided in Section 5.21.4.

The remaining steps of the Karst MOU are post-NEPA efforts, and are summarized as follows:

- Step 5 specifies that drainage entering the project area will be treated in the same manner as highway generated runoff;
- Step 6 states MOU signatory agencies will be invited to field checks and other meetings where karst issues are discussed;
- Step 7 states that hazardous materials traps will be implemented to protect karst features against hazardous materials spills;
- Step 8 states that a monitoring and maintenance plan pertaining to affected karst features will be developed for review by signatory agencies;
- Step 9 requires development of low salt and no spray, and related signage strategies;
- Step 10 requires that signatory agencies agree in writing, prior to acceptance of final design plans, to appropriate and practicable karst mitigation measures to be implemented. This mitigation agreement document will become part of the contract documents;
- Step 11 states that INDOT will assure that the terms of the above-referenced agreement will be adhered to, and references that special provisions may be included as part of the contract documents. Step 11 also requires that strategies developed for dealing with karst features are discussed with construction and project administration personnel, that Rule 5 is adhered to, that an erosion control plan is available at the project administrator's office, and that an emergency response plan is made part of the project documents;
- Step 12 states that the location and nature of sinkholes and drainage schematic will be provided to IDEM so they can provide it to local authorities and hazardous materials teams, and an emergency response plan will be followed;
- Step 13 states that the signatory agencies may monitor construction and maintenance;
- Step 14 allows for alteration of the above-referenced mitigation agreement document during construction, a two working day response time is needed from the resource agencies;
- Step 15 requires visual inspection of treatment/mitigation measures on a weekly basis or after every rain, and that corrective actions are taken;
- Step 16 states that if state/federal endangered/threatened species are found, construction in the area will be halted and IDNR and USFWS will be notified to determine the appropriate action to be taken;
- Step 17 states that the Karst MOU will be reviewed annually by the signatory agencies, or more frequently by request.

As stated above, the first step in Karst MOU implementation for transportation projects located in karst regions is the identification of karst features within the project area. A survey of karst features was conducted by Hydrogeology Incorporated of Bloomington, Indiana (karst survey documents are presented in **Appendix AA**). This survey identified karst features that could be visually observed from the surface of the ground. Unidentified underground karst features are likely to be present within the project area. Dye tracing was conducted in order to determine groundwater flow patterns in the area. However, identifying the exact location of the subsurface features associated with this flow cannot be accomplished without invasive ground disturbance (e.g., excavation). Accordingly, otherwise unidentified subsurface karst features associated with observed surface features and underground flow paths were not identified in the karst survey methodology. The Karst MOU was developed with the understanding that it is possible that previously unknown subsurface karst features may be unearthed during construction. The Karst

MOU includes a procedure to address this potential; Step 14 states that if during construction it is found that the mitigation agreement must be altered, the MOU signatory agencies will be contacted and an agreement reached prior to work continuing in the specific area of the project requiring alteration of the agreement.

The karst survey documents the following:

- Reviews of karst information relevant to the Section 4 corridor
- Field checks of previously recorded karst features
- Field investigations to identify previously unrecorded karst features
- Water chemistry analysis
- Dye tracing of karst features, and
- Recommendations for karst feature avoidance, impact minimization, and mitigation of unavoidable impacts.

Existing information on karst features was compiled from a number of sources. These sources included: the Indiana Geological Survey, Indiana Cave Survey, Indiana Karst Conservancy, National Speleological Society, and karst experts knowledgeable about the area. Specific karst studies and mapping for the Section 4 Corridor examined and field checked for this study included I-69 Tier I and Tier II public comments, cave maps and other karst feature data and mapping, as well as all previous I-69 related karst study data. This included the 1994 Karst Features in the Bloomington to Evansville Highway Report and associated data. Additional resources included high resolution aerial photography, planimetric and topographic mapping in the corridor as well as USGS topographic maps and additional aerial photography.

During the study, a field reconnaissance was conducted by the karst consultant within and outside of the corridor to locate and map previously unrecorded karst features. Field checks were also conducted to verify and map previously recorded karst features along the length of the Section 4 corridor. In addition, other field crews (those conducting wetland and stream assessments, archaeological reconnaissance, biological surveys, etc.) communicated the locations of observed karst features to field crews conducting karst feature identification for verification and mapping. Features were mapped outside the corridor to identify karst features which may receive surface runoff water from within the corridor as well as to identify features to be evaluated as part of the dye tracing program to identify groundwater flow paths for features within the corridor. Drainage areas, drainage patterns, and land uses associated with karst features were determined and documented (land uses associated with the identified karst features are listed in the Karst Report. Dye tracing tests were conducted to determine the subsurface flow from recharge features to discharge features and establish groundwater flow patterns within the study area.

The study methodology was developed in coordination with the Karst MOU signatory agencies and the USEPA to ensure the project is consistent with the objectives of the Karst MOU. The karst survey methodology and updates on survey results were discussed with resource agencies during the following meetings (see **Appendix C**, *Agency Coordination Correspondence*, for meeting minutes):

- I-69 Tier 2 Interagency Water Resources Coordination Team Meeting – December 14, 2004

- I-69 Overall Agency Coordination Team Meeting: Karst Breakout Session – February 23, 2005
- I-69 Overall Agency Coordination Team Meeting – August 1, 2006
- I-69 Overall Agency Coordination Team Meeting – March 1, 2007
- I-69 USEPA Karst Review – June 26-27, 2007

A Draft Karst Report was sent to Karst MOU signatory agencies and the USEPA in July 2006. As a result of agency comments on this report, additional dye trace studies and water chemistry studies of select springs were subsequently conducted.

Coordination with the Karst MOU signatory agencies and the USEPA has been ongoing and appropriate measures to offset unavoidable karst impacts will be recommended through continued coordination with the signatory agencies and the USEPA. Refer to **Appendix AA,** Karst Report, for a comprehensive description of the karst survey and dye tracing efforts, methodology and results. This Appendix has been redacted to prevent disclosure of sensitive information, such as the specific location of karst features.

5.21.3 Analysis

The general locations of the identified karst features relative to the Section 4 corridor are depicted in **Figure 5.21-2** (p. 5-731). Karst feature density is shown due to the sensitivity of the data. Densities outside the area studied for the Section 4 karst surveys are not included on the maps.

5.21.3.1 Karst Feature Terminology

For the purposes of the Tier 2 Studies, karst features encountered within the Section 4 corridor were defined as described below.

Cave – A natural underground opening in rock, large enough for human entry and exploration of an appreciable distance.

Dip - The direction of the slope of geologic formations.

Gaining Stream – A stream which increases in water volume as it progresses downstream, as it gains water from the local aquifer.

Sinking Stream – The bed of this type of stream is positioned above the water table. Due to this vertical gradient, stream flow seeps through the stream bottom and enters the groundwater. This term can be used interchangeably with “influent stream” or “losing stream.”

Sinkhole - A naturally occurring bowl shaped recharge feature that collects water from nearby areas. Water can infiltrate to the subsurface through openings at the bottom and/or through the soil if openings are not present. Collapse of sinkholes is common and can result in steeper, irregular depressions.

Spring - An area where karst groundwater discharges to the surface.

Strike - The line perpendicular to the dip of geologic formations.

Swallet – The area where a stream sinks into the subsurface or the opening in the bottom of a sinkhole. This term can be used interchangeably with "swallowhole."

5.21.3.2 Karst Terrain Within and Adjacent to the Section 4 Corridor

The soil depth to bedrock is relatively shallow in the Section 4 corridor, with thin soil sections on the ridges and thicker soils in the valleys. Older to younger bedrock is exposed, from the northeast to the southwest. Mississippian age carbonate bedrock units are the source of visible karst development in the corridor.

Karst terrain within the Section 4 corridor begins approximately at Taylor Ridge (shown on **Figure 5.21-2** (p. 5-731) southwest of Koleen and extends north and east throughout the remainder of the corridor. No karst forming rocks are exposed in the portion of the corridor south and west of Taylor Ridge. The water chemistry of several springs south and west of Taylor Ridge was tested, and it was concluded that springs in this area are not karst features.

Three distinct areas (hydrogeologic units) of karst geology were identified within the study area and are described below:

Taylor Ridge to SR 54, **Figure 5.21-2** (p. 5-731)
In this area, Upper Mississippian bedrock, containing interbedded limestone, sandstone and shale, is predominant. Ridges are mostly sandstone and the valleys are limestone. The sandstone cap rock limits sinkhole development on the ridges. Some recharge occurs along fractures in the sandstone ridges but most of the recharge occurs in swallets and joints in the dry run valleys where limestone units outcrop. In most of this area the Big Clifty sandstone is found on the ridges and springs are developed in the underlying Beech Creek limestone. This area is typical of the Crawford Upland Physiographic Region.

Dye traces of features in this hydrogeologic unit indicate groundwater travel distances up to four miles, with travel times ranging from four days to three weeks. Generally water moves along the hydraulic gradient vertically downward through permeable bedrock in the direction of the bedrock dip. Within the karst study area this is downward to the southwest. This water also can flow along the bedrock strike, locally southeast or northwest. When the descending water encounters an impermeable bedrock unit, it moves horizontally out to a spring or gaining stream.

SR 54 to Harmony Road, **Figure 5.21-2** (p. 5-731)
In this area, Upper Mississippian bedrock, containing interbedded limestone, sandstone and shale, is predominant. Karst features are visible in this area, primarily in the eastern portion near Harmony Road. Karst-developing limestone beds dip regionally to the southwest. Surface expression (visual evidence) of karst features decreases as their depth increases. Sinkhole development occurs on the ridges in limestones of the Blue River and Sanders Group. Swallets

and sinking streams provide the majority of recharge to springs. This area is part of the Crawford Upland Physiographic Region.

Dye traces of features in this hydrogeologic unit indicate groundwater travels up to three miles, with travel times ranging from one to six weeks. Generally water moves along the hydraulic gradient vertically downward through permeable bedrock in the direction of the bedrock dip. Locally this is downward to the southwest. This water also can flow along the bedrock strike, locally southeast or northwest. When the descending water encounters an impermeable bedrock unit it moves horizontally out to a spring or gaining stream.

Harmony Road to SR 37, **Figure 5.21-2** (p. 5-731)
Lower Mississippian bedrock, containing interbedded limestone and shale, is predominant in this portion of the Section 4 corridor. Visible karst in this area is exemplified by ridges and valleys comprised of limestone in the Blue River and Sanders groups. Sinkhole and swallet development occurs in the limestone cap rock on the ridges and in drainages. These features act as recharge areas during rain events, providing water for the springs located in the valleys. The northern limit of this area, from Bolin Lane to SR 37, transitions to the Bloomington Karst with features in the lower St. Louis Limestone. This area is typical of the Mitchell Plain physiography.

Dye traces of features in this hydrogeologic unit indicate groundwater travels up to 3,000 feet, with relatively short travel times (generally less than three days). Generally, water moves along a localized hydraulic gradient which mimics the surface topography.

Hydrogeologic No-Flow Boundaries
A hydrogeologic no-flow boundary is a landscape feature, such as a ridge, which imposes a barrier to groundwater flowpaths. Dye tracing identified two no-flow boundaries in the area: the ridge along which SR 45 runs as it crosses the Section 4 corridor south of Cincinnati in Greene County; and Kirksville Ridge, which Harmony Road runs along as it crosses the corridor southeast of Stanford in Monroe County. Dye traces showed no groundwater flowpaths crossing these ridges.

5.21.3.3 Karst Features Within and Adjacent to the Section 4 Corridor

The Section 4 karst study area includes the 27-mile long Section 4 corridor and appropriate areas outside of the corridor to encompass karst features that may be associated with the corridor via karst groundwater flowpaths or surface run-off. This study area was determined by the professional judgment of karst geologists based on surface water flow, known or inferred groundwater connections, and knowledge of geology in the area. The Section 4 survey of karst features for the corridor and adjacent areas known and/or inferred to be linked through groundwater flowpaths or surface flow areas identified the following karst features (see **Table 5.21-1**). As noted above, the general locations of the identified karst features relative to the Section 4 corridor are depicted in **Figure 5.21-2** (p. 5-731).

Table 5.21-1: Karst Features Identified Within Karst Study Area*

Karst Feature Type	Within Section 4 Corridor	Outside Corridor - Hydrologically Associated to Section 4 Corridor	Total
Caves	15	49	64
Swallets	19	43	62
Sinking Streams	6	9	15
Springs	103	228	331
Sinkholes	305	688	993
Totals	**448**	**1,017**	**1,465**

***The Karst Study Area consists of the Section 4 corridor as well as area outside the corridor that is hydrologically linked to the corridor**

Once karst features were identified and mapped, this resource data was included in the alternative development and screening. As a part of the Tier 2 alternative development process, all cave features were identified as avoidance areas with a 200 feet buffer distance around the cave entrance defined. However, since the publication of the DEIS, ongoing public outreach lead to the identification of a cave with the proposed rights-of-way for all Section 4 Alternatives. This feature did not exist when surveys were completed in 2004 - 2006. It has been identified and added to the impacts for all alternatives. See Section 5.21.3.10 for more information about this cave.

In addition, areas of significant springs, other important karst features and high densities of karst features were evaluated for avoidance and minimization. The importance of karst features relates to factors such as infiltration capacity, airflow, presence of water, location, drainage area and the presence of biological activity. Additional information regarding karst feature importance is provided in Karst Report Addendum No. 1 (**Appendix AA**.)
Due to the high density of features identified within the corridor in the area northeast of Tramway Road in the northern portion of Section 4, consideration was given to moving alternatives outside of the corridor for avoidance or minimization of karst feature impacts. It was determined that alternatives near to and outside of the corridor within the limits of the karst study area would encounter areas of similar karst feature density and would not result in an appreciable difference in karst impacts. In addition, a review of the local geological formations extending a significant distance outside of the corridor was made for consideration of possible avoidance and minimization options. It was determined that the same sinkhole plain (Mitchell Plain) which is being crossed in this vicinity of the corridor extends for miles to the north and south with similar surface feature densities anticipated throughout this area. Based on review of the features identified within the karst study area and the local geology extending well beyond the corridor area, development of alternatives outside of the corridor was not considered to provide karst avoidance and minimization benefits.

5.21.3.4 Karst Impacts by Alternative

For the purposes of the following discussions the term “impact” means that a karst feature is located within the rights-of-way of the Section 4 Alternatives. Alternative 2 was recommended as the Preferred Alternative in the DEIS. Refinements to the Preferred Alternative design have been made since the DEIS. These refinements principally consist of minor changes to the vertical

roadway profile, minor changes to access roads, and minor shifts in the proposed right-of-way lines. These refinements were made to further reduce costs and to minimize impacts. The preferred alternative in this FEIS is a variant of DEIS Alternative 2 referred to as Refined Preferred Alternative 2.

Features within the construction limits may be bridged, capped, or filled. There is also the potential for changes in drainage patterns for features within and outside the construction limits if the project were to sever a conduit and reduce flows. The project also could add drainage, thereby increasing flows. The degree of impact upon each feature is case-specific depending upon the relationship of the feature relative to the proposed work. As recognized in Step 10 of the Karst MOU, information necessary to provide detailed discussions of, and signatory agency agreement on, the case-specific karst feature impacts and treatment measures (such as depths to openings of karst features and foundation alternatives) will not be determined until post-NEPA design and construction.

The area between the southern project terminus just east of US 231 and approximately Taylor Ridge in Greene County (**Figure 5.21-2**, p. 5-731) has been determined not to be karst terrain. Therefore, no impacts to karst resources are associated with the alternatives in this area.

Taylor Ridge to SR 54 (**Figure 5.21-2**, p. 5-731)
The alternatives share a common alignment throughout the majority of this hydrogeologic unit. Therefore, the alternatives, with one exception, will result in the same or similar impacts to karst features throughout most of this hydrogeologic unit.

The area of exception is an approximate 0.5 mile stretch between the eastern slope of Taylor Ridge, to the Black Ankle Creek valley. In that vicinity, several karst springs located along the northern corridor edge and two sinkholes located north of the corridor are the only identified karst features. Alternatives 2, 3 and Refined Preferred Alternative 2 (which follow the same alignment in this area) crest the ridge along the south edge of the corridor and traverse the eastern slope of Taylor Ridge in a southwest-northeast orientation. Alternatives 1 and 4 (which follow the same alignment in this area) crest the ridge along the northern edge of the corridor and traverse the eastern slope generally in an east-west orientation.

All alternatives merge to a common alignment along the northern edge of the corridor near the base of the western slope of the Black Ankle Creek valley. All alternatives avoid direct impacts upon a karst feature of high importance; a highly productive spring located along the east edge of the Black Ankle Creek valley. One small cave was recently identified within this hydrogeologic unit. All Section 4 Alternatives will impact this cave. See Section 5.21.3.10 for more information about this cave. When possible during alternative development and screening, areas of dense karst feature concentrations were avoided or skirted by routing the alternatives along a common alignment.

Alternative 1 would impact 12 (10)[1] karst features; 1 (1) 0 – 100' long cave, 1 (1) high infiltration sinkhole, 1 (1) medium infiltration sinkhole, 1 (1) high infiltration sinking stream, 3 (1) 0-1 gallon per minute (gpm) springs, 4 (4) 2-10 gpm springs, and 1 (1) high infiltration swallet.

Alternative 2, Alternative 3 and Refined Preferred Alternative 2 would each impact 10 (8) karst features; 1 (1) 0 – 100' long cave, 1 (1) high infiltration sinkhole, 1 (1) medium infiltration sinkhole, 1 (1) high infiltration sinking stream, 3 (1) 0-1 gpm springs, 2 (2) 2-10 gpm springs, and 1 (1) high infiltration swallet.

Alternative 4 would impact 12 (10) karst features; 1 (1) 0 – 100' long cave, 1 (1) high infiltration sinkhole, 1 (1) medium infiltration sinkhole, 1 (1) high infiltration sinking stream, 3 (1) 0-1 gpm springs, 4 (4) 2-10 gpm springs, and 1 (1) high infiltration swallet.

The Section 4 Alternatives would result in similar karst feature impacts within this hydrogeologic unit. Implementing the low-cost design criteria would not reduce impacts to recharge features or to higher discharge features. It would reduce the impacts to smaller springs (0-1 gpm) by 2.

SR 54 to Harmony Road (**Figure 5.21-2**, p. 5-731)
Through this hydrogeologic unit, the alternatives begin on a common alignment but soon diverge and later cross to form an "X" pattern as the corridor turns northerly in the vicinity of the Greene/Monroe County Line. The alignments for the alternatives then converge as the corridor turns generally east, merging to a common alignment just west of Breeden Road in Monroe County and continue on a common alignment throughout the remainder of this hydrogeologic unit. In this unit, 14 swallets, several caves, one sinking stream and numerous sinkholes and springs were identified within the Section 4 corridor. Caves are considered karst features of high importance. During the alternative development process, known cave entrances and passageways were avoided by all alternatives within this hydrogeologic unit. Throughout the southern portion of this unit, south of Carter Road, the density of identified karst features is low and impacts among alternatives are similar with one notable exception. Alternatives 1 and 3 cross a sinking stream downstream of the area where surface flow is lost to karst conduits, minimizing the potential for highway runoff to be directed into the karst system. Alternatives 2, 4 and Refined Preferred Alternative 2 cross the sinking stream at the location where flow is lost to karst conduits, increasing the chance for highway runoff to be directed into the karst system. In the northern and eastern portions of this unit, the density of identified karst features is much higher. Sinkholes are particularly prevalent. Avoidance of karst features in this vicinity is not possible since features are present across the entire width of the corridor. When possible during alternative development and screening, areas of dense karst feature concentrations were avoided or skirted by routing the alternatives along a common alignment.

[1] Karst feature impacts associated with initial design criteria are reported first, followed by karst feature impacts associated with low-cost design criteria in parentheses.

Alternative 1 would impact 22 (21) karst features; 2 (3) high infiltration sinkholes, 9 (8) medium infiltration sinkholes, 5 (4) low infiltration sinkholes, 3 (3) 0-1 gpm springs, 2 (1) 2-10 gpm springs, and 1 (2) high infiltration swallet.

Alternative 2 would impact 16 (17) karst features; 2 (3) high infiltration sinkholes, 8 (7) medium infiltration sinkholes, 1 (1) low infiltration sinkhole, 1 (1) high infiltration sinking stream, 2 (2) 0-1 gpm springs, 1 (1) 2-10 gpm springs, and 1 (2) high infiltration swallet.

Alternative 3 would impact 16 (17) karst features; 2 (3) high infiltration sinkholes, 8 (7) medium infiltration sinkholes, 2 (2) low infiltration sinkholes, 2 (2) 0-1 gpm springs, 1 (1) 2-10 gpm springs, and 1 (2) high infiltration swallet.

Alternative 4 would impact 20 (21) karst features; 2 (3) high infiltration sinkholes, 8 (8) medium infiltration sinkholes, 4 (3) low infiltration sinkholes, 1 (1) high infiltration sinking stream, 3 (3) 0-1 gpm springs, 1 (1) 2-10 gpm springs, and 1 (2) high infiltration swallet.

Refined Preferred Alternative 2 would impact 19 (17) karst features; 3 (3) high infiltration sinkholes, 8 (7) medium infiltration sinkholes, 1 (1) low infiltration sinkhole, 1 (1) high infiltration sinking stream, 2 (2) 0-1 gpm springs, 1 (1) 2-10 gpm springs, 2 (2) high infiltration swallets and 1 (0) medium infiltration swallet.

Impacts upon high and medium infiltration features are about equal for all alternatives. As noted above, Alternatives 2, 4 and Refined Preferred Alternative 2 would impact a high infiltration sinking stream that would be avoided by Alternatives 1 and 3.

In comparison to Alternatives 1 and 4, slightly fewer karst feature impacts are associated with Alternatives 2, 3 and Refined Preferred Alternative 2; however impacts to higher infiltration and/or recharge features are generally similar among the alternatives. Implementing the low cost design criteria would increase impacts to high infiltration sinkholes for Alternatives 1 through 4 and would not change impacts to high infiltration sinkholes for Refined Preferred Alternative 2. Implementing the low cost design criteria decrease impacts to medium infiltration sinkholes. Impacts to high infiltration swallets would increase (1 additional) for all alternatives except Refined Preferred Alternative 2 (no change). Under the initial design criteria, Refined Preferred Alternative 2 would impact a medium infiltration swallet that is not impacted by the other alternatives. Impacts to 2-10 gpm springs would be reduced for Alternative 1 (1 fewer).

Harmony Road to SR 37 (**Figure 5.21-2**, p. 5-731)
Through this hydrogeologic unit, the alternatives run on a common alignment until the Section 4 corridor begins to turn northerly, near Lodge Road. The alternatives diverge, with Alternatives 2, 3, 4 and Refined Preferred Alternative 2 trending to the south and east edges of the corridor near Tramway Road, while Alternative 1 essentially follows the west edge of the corridor. The alternatives begin to converge in the vicinity of Bolin Lane and merge just south of the proposed I-69/SR 37 interchange. Avoidance of all karst features in this unit is not possible since features are present across the entire width of the corridor. Known cave entrances and passageways within this hydrogeologic unit were avoided in the development of the alternatives.

Alternative 1 would impact 88 (77) karst features; 19 (16) high infiltration sinkholes, 21 (19) medium infiltration sinkholes, 30 (29) low infiltration sinkholes, 10 (5) 0-1 gpm springs, 6 (6) 2-10 gpm springs, 1 (1) 11-100 gpm springs and 1 (1) high infiltration swallet.

Alternative 2 would impact 81 (63) karst features; 10 (9) high infiltration sinkholes, 22 (19) medium infiltration sinkholes, 26 (20) low infiltration sinkholes, 1 (1) high infiltration sinking stream, 15 (8) 0-1 gpm springs, 5 (4) 2-10 gpm springs, 1 (1) high infiltration swallet and 1 (1) medium infiltration swallet.

Alternative 3 would impact 77 (63) karst features; 13 (12) high infiltration sinkholes, 19 (18) medium infiltration sinkholes, 21 (18) low infiltration sinkholes, 1 (1) high infiltration sinking stream, 15 (7) 0-1 gpm springs, 6 (5) 2-10 gpm springs, 1 (1) high infiltration swallet and 1 (1) medium infiltration swallet.

Alternative 4 would impact 81 (63) karst features; 10 (9) high infiltration sinkholes, 22 (19) medium infiltration sinkholes, 26 (20) low infiltration sinkholes, 1 (1) high infiltration sinking stream, 15 (8) 0-1 gpm springs, 5 (4) 2-10 gpm springs, 1 (1) high infiltration swallet and 1 (1) medium infiltration swallet.

Refined Preferred Alternative 2 would impact 79 (63) karst features; 10 (9) high infiltration sinkholes, 22 (19) medium infiltration sinkholes, 26 (20) low infiltration sinkholes, 1 (1) high infiltration sinking stream, 13 (8) 0-1 gpm springs, 5 (4) 2-10 gpm springs, 1 (1) high infiltration swallet and 1 (1) medium infiltration swallet.

A particularly dense concentration of karst features was identified on and around the hill just north of Tramway Road. Investigations of the features in this area indicate that the associated karst system is a local system, meaning that recharge features are located at and around the top of the hill and discharge features are located at and near the bottom of the hill. Karst groundwater flow paths were found to be short and predictable. Therefore, the typical highway-related karst system concerns (groundwater quality protection and the potential for transport of contaminants via unknown flowpaths over distance to unknown discharge points) are not as significant in this area. Because of the local and predictable nature of the karst system in this area, it was the opinion of the karst specialists that the number of karst feature impacts associated with an alternative should not be a prevailing factor in the selection of a Preferred Alternative. The Section 4 Alternatives utilize three alignments in this area and would affect a similar overall number of features. Refined Preferred Alternative 2, as well as Alternatives 2, 3 and 4 minimize impacts to higher infiltration features in comparison to Alternative 1. Even so, it was the opinion of the specialists that the alternatives would result in similar overall impacts to karst resources in this area. Refer to **Appendix AA** for additional information.

Alternative 1 would result in the highest number of karst feature impacts (108 to 122). Alternative 4 would result in the second highest number of karst feature impacts (94 to 113). Alternatives 2, Refined Preferred Alternative 2 and 3 would cause 88 to 107, 88 to 108, and 88 to 103 karst feature impacts, respectively. Alternatives 2, 3, 4 and Refined Preferred Alternative 2 would impact fewer high infiltration sinkholes, but would impact a high infiltration sinking

stream that is not affected by Alternative 1. Alternative 1 would impact one 11-100 gpm spring that is not affected by Alternatives 2, 3, 4 and Refined Preferred Alternative 2. Alternatives 2, 3, 4 and Refined Preferred Alternative 2 would impact one medium infiltration swallet that is not affected by Alternative 1. Refined Preferred Alternative 2 (initial design criteria) would impact an additional medium infiltration swallet that is not impacted by the other alternatives. All Alternatives will impact a recently identified cave. See Section 5.21.3.10 for additional information about this cave. Implementing the low-cost design criteria would generally decrease impacts to sinkholes and 2-10 gpm springs.

Potential karst feature impacts associated with the alternatives and identified by hydrogeologic unit are presented in **Table 5.21-2**. It should be noted that known caves were avoided in the development of all of the alternatives. However, since the publication of the DEIS, ongoing public outreach lead to the identification of a cave with the proposed rights-of-way for all Section 4 Alternatives. This feature did not exist when surveys were completed in 2004 - 2006. It has been identified and added to the impacts for all alternatives. See Section 5.21.3.10 for more information about this cave. The cave length designations pertain to known (mapped) or inferred lengths of caves, in feet.

Table 5.21-2: Potential Karst Feature Impacts, by Hydrogeologic Unit and Alternative

Karst Feature type	Features within the Corridor	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
		Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Hydrogeologic Unit 1 - Taylor Ridge to SR 54											
Caves: 0 - 100' long	1	1	1	1	1	1	1	1	1	1	1
Caves: 100' - 1000' long	0	0	0	0	0	0	0	0	0	0	0
Caves: 1000' - 5000' long	0	0	0	0	0	0	0	0	0	0	0
Caves: > 5000' long	0	0	0	0	0	0	0	0	0	0	0
High Infiltration Sinkhole	2	1	1	1	1	1	1	1	1	1	1
Medium Infiltration Sinkhole	3	1	1	1	1	1	1	1	1	1	1
Low Infiltration Sinkhole	4	0	0	0	0	0	0	0	0	0	0
High Infiltration Sinking Streams	4	1	1	1	1	1	1	1	1	1	1
Medium Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Low Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Springs: 0-1 gpm*	8	1	3	1	3	1	3	1	3	1	3
Springs: 2-10 gpm*	13	4	4	2	2	2	2	4	4	2	2
Springs: 11-100 gpm*	2	0	0	0	0	0	0	0	0	0	0
Springs: 101-1000 gpm*	1	0	0	0	0	0	0	0	0	0	0
High Infiltration Swallet	2	1	1	1	1	1	1	1	1	1	1
Medium Infiltration Swallet	0	0	0	0	0	0	0	0	0	0	0
Low Infiltration Swallet	0	0	0	0	0	0	0	0	0	0	0

Table 5.21-2: Potential Karst Feature Impacts, by Hydrogeologic Unit and Alternative

Karst Feature type	Features within the Corridor	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
		Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Hydrogeologic Unit Subtotal	**40**	**10**	**12**	**8**	**10**	**8**	**10**	**10**	**12**	**8**	**10**
Hydrogeologic Unit 2 - SR 54 to Harmony Road											
Caves: 0 - 100' long	4	0	0	0	0	0	0	0	0	0	0
Caves: 100' - 1000' long	0	0	0	0	0	0	0	0	0	0	0
Caves: 1000' - 5000' long	0	0	0	0	0	0	0	0	0	0	0
Caves: > 5000' long	0	0	0	0	0	0	0	0	0	0	0
High Infiltration Sinkhole	10	3	2	3	2	3	2	3	2	3	3
Medium Infiltration Sinkhole	32	8	9	7	8	7	8	8	8	7	8
Low Infiltration Sinkhole	20	4	5	1	1	2	2	3	4	1	1
High Infiltration Sinking Streams	1	0	0	1	1	0	0	1	1	1	1
Medium Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Low Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Springs: 0-1 gpm*	9	3	3	2	2	2	2	3	3	2	2
Springs: 2-10 gpm*	18	1	2	1	1	1	1	1	1	1	1
Springs: 11-100 gpm*	2	0	0	0	0	0	0	0	0	0	0
Springs: 101-1000 gpm*	0	0	0	0	0	0	0	0	0	0	0
High Infiltration Swallet	9	2	1	2	1	2	1	2	1	2	2
Medium Infiltration Swallet	2	0	0	0	0	0	0	0	0	0	1
Low Infiltration Swallet	3	0	0	0	0	0	0	0	0	0	0
Hydrogeologic Unit Subtotal	**110**	**21**	**22**	**17**	**16**	**17**	**16**	**21**	**20**	**17**	**19**
Hydrogeologic Unit 3 - Harmony Road to North Terminus											
Caves: 0 - 100' long	8	0	0	0	0	0	0	0	0	0	0
Caves: 100' - 1000' long	2	0	0	0	0	0	0	0	0	0	0
Caves: 1000' - 5000' long	0	0	0	0	0	0	0	0	0	0	0
Caves: > 5000' long	0	0	0	0	0	0	0	0	0	0	0
High Infiltration Sinkhole	50	16	19	9	10	12	13	9	10	9	10
Medium Infiltration Sinkhole	86	19	21	19	22	18	19	19	22	19	22
Low Infiltration Sinkhole	98	29	30	20	26	18	21	20	26	20	26
High Infiltration Sinking Streams	1	0	0	1	1	1	1	1	1	1	1
Medium Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Low Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Springs: 0-1 gpm*	23	5	10	8	15	7	15	8	15	8	13
Springs: 2-10 gpm*	24	6	6	4	5	5	6	4	5	4	5

Table 5.21-2: Potential Karst Feature Impacts, by Hydrogeologic Unit and Alternative

Karst Feature type	Features within the Corridor	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
		Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Springs: 11-100 gpm*	3	1	1	0	0	0	0	0	0	0	0
Springs: 101-1000 gpm*	0	0	0	0	0	0	0	0	0	0	0
High Infiltration Swallet	2	1	1	1	1	1	1	1	1	1	1
Medium Infiltration Swallet	1	0	0	1	1	1	1	1	1	1	1
Low Infiltration Swallet	0	0	0	0	0	0	0	0	0	0	0
Hydrogeologic Unit Subtotal	**298**	**77**	**88**	**63**	**81**	**63**	**77**	**63**	**81**	**63**	**79**
Total Karst Feature Impacts	**448**	**108**	**122**	**88**	**107**	**88**	**103**	**94**	**113**	**88**	**108**

*Flow rates (gallons per minute, or gpm) were estimated in the field and were not measured.

5.21.3.5 Areas of Importance

The Karst Report (**Appendix AA**) identified ten karst areas of importance based on hydrologic, geologic, engineering and cultural reasons. The ten areas of importance are listed below and potential impacts are discussed. It should be noted that some areas of importance are not within the rights-of-way of alternatives or the Section 4 corridor; however, the potential for indirect effects exists. Specific feature names have been removed for confidentiality purposes. The five-digit feature identification numbers listed in these discussions correlate to feature numbers presented in the Karst Report.

1. Cave A

Cave A is not located within the Section 4 corridor. However, dye tracing tests revealed that recharge to Cave A is derived in part from three sinking streams (4-1240, 4-1432, 1434, 4-1525, and 4-1524) which receive run-off from the Section 4 corridor, approximately 4 miles west of the cave. The drainage area associated with these recharge features (4-1240, 4-1432, 4-1434, 4-1525, and 4-1524) crosses into the Section 4 corridor. This cave will not be directly impacted by highway construction. The Section 4 Alternatives are about seven tenths of a mile south of the cave location. As the alternatives are on a common alignment in this area, all alternatives will result in the same encroachment upon the drainage areas of these sinking streams. It should be noted that the affected drainage areas are linked to this cave via unusually long flowpaths which include karst conduits in limestone. However, the elevation of the limestone and the streambeds indicates probability that the flowpath to this cave consists of a combination of conduit and surface flow. In this scenario the water could pass out of and back into the limestone one or more times. The majority of the recharge to the cave is derived from more proximal features. Therefore, it is not anticipated that the project will cause an appreciable degradation of the cave spring's water quality or quantity. Special planning should be conducted, where appropriate and practicable, to ensure drainage to recharge features 4-1240, 4-1432, 4-1434, 4-1525, and 4-1524 is dispersed through natural vegetation and/or an engineered treatment system before entering the

groundwater system. Also, special consideration, where appropriate and practicable, should be made such that construction does not sever these recharge features by sedimentation or impervious cover. Section 5.21.4, *Mitigation*, and the Karst Report identify examples of potential drainage treatment measures that could be used for these features.

2. Cave B

The entrance to Cave B is located approximately 0.6 miles north of the corridor. This cave will not be directly impacted by highway construction. However, dye tracing tests revealed that recharge to Cave B is derived in part from swallet 4-0037. The drainage area associated with swallet 4-0037 crosses into the Section 4 corridor. Construction within this drainage area could impact the recharge to Cave B. The Section 4 Alternatives are on a common alignment in this area, and will not encroach upon the drainage area associated with swallet 4-0037. Special planning should be conducted to insure highway derived runoff that may reach the drainage area of swallet 4-0037 is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, special consideration, where appropriate and practicable, should be made such that construction does not sever recharge features by sedimentation or impervious cover.

3. Cave C

Cave C is not located within the Section 4 corridor. This cave will not be directly impacted by highway construction. The Section 4 Alternatives are located approximately 0.7 miles from the cave. However, dye tracing tests revealed that recharge to Cave C is derived in part from four swallets (4-0166, 4-0173, 4-0175, and 4-1504) which receive run-off from the Section 4 corridor. Three other recharge features (4-0174, 4-0203, and 4-0204), which were not dye traced, are potentially hydrologically linked to Cave C. The drainage area associated with these recharge features (4-0166, 4-0173, 4-0174, 4-0175, 4-0203, 4-0204, and 4-1504) crosses into the Section 4 corridor. The Section 4 Alternatives are on a common alignment in the vicinity of the above-noted features, and all Alternatives will impact the features and associated drainage areas in the same manner. It should be noted that the affected drainage areas are linked to this cave via long flowpaths and the majority of the recharge to Cave C is derived from more proximal features. In the development of the highway drainage system design, care will be taken to perpetuate recharge to this cave, if appropriate and practicable. Therefore, it is not anticipated that the project will cause an appreciable degradation of the cave spring's water quality or quantity. Construction in this area could impact the recharge to Cave C. Special planning should be conducted to insure drainage to these recharge features is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, special consideration, where appropriate and practicable, should be made to insure that construction does not sever these recharge features by sedimentation or impervious cover.

4. Cave D

Cave D is located approximately 500 feet south of the Section 4 corridor. This cave will not be directly impacted by highway construction. Dye tracing tests revealed that recharge to a spring, which is known to be connected to Cave D, is derived in part from sinking stream 4-0661 which

receives run-off from the Section 4 corridor. Construction in this within this sinking stream's drainage area could impact the recharge to Cave D and the associated spring. The Section 4 Alternatives are on a common alignment in this area, and will not encroach upon the drainage area associated with sinking stream 4-0661. Due to the relationship between the proposed road and existing topography, it is not anticipated that highway derived runoff would be directed toward sinking stream 4-0661. However, special planning, where appropriate and practicable, should be conducted to insure drainage to this recharge feature is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, where appropriate and practicable, special consideration should be made such that construction does not sever this recharge feature by sedimentation or impervious cover.

5. Cave E

Cave E is located approximately 600 feet south of the Section 4 corridor. This cave will not be directly impacted by highway construction. However, dye tracing tests revealed that recharge to Cave E is derived in part from swallet 4-1035 which receives run-off from the Section 4 corridor. Construction in this area could impact the recharge to Cave E. The Section 4 Alternatives are on a common alignment, predominantly down-gradient of swallet 4-1035 in this area. The alternatives will impact the drainage area of swallet 4-1035 in a similar manner and therefore have the same potential to affect the cave spring's water quality or quantity. Special planning should be conducted to insure that highway derived runoff within the drainage area of swallet 4-1035 is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, where appropriate and practicable, special consideration should be made to insure that construction does not sever these recharge features by sedimentation or impervious cover.

6. Spring A

Spring A is located within the Section 4 corridor. The spring is an important landmark as well as a supplemental source of water for a several acre wetland. The spring will not be directly impacted by highway construction. Dye tracing tests revealed that a portion of the recharge to Spring A is derived from sinking stream 4-1228 in a drainage east of Spring A within the Section 4 corridor. It is likely that the area downstream of sinking stream 4-1228 acts as a losing stream during high flow periods and also provides recharge to Spring A. Sinking stream 4-1228 and the potential losing stream reach down gradient from it would receive run-off from the Section 4 corridor. Construction in the drainage area of sinking stream 4-1228 could impact the recharge to Spring A. The Section 4 Alternatives are on a common alignment in this area and will unavoidably cross sinking stream 4-1228. The alternatives will not encroach upon the drainage area of sinking stream 4-1228. The alternatives will cross sinking stream 4-1228 in a similar manner and therefore have the same potential to affect the spring's water quality or quantity. Special planning should be conducted to insure drainage to 4-1228 and the downstream area is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, where appropriate and practicable, special consideration should be made to insure that construction does not sever this recharge area by sedimentation or impervious cover.

7. Cave F

Cave F is not located within the Section 4 corridor. The cave will not be directly impacted by highway construction. Cave F is located 3,000 ft southeast of Cave A and lies between Cave A and the input features for the dye traces. Dye tracing tests revealed recharge to Cave A is derived in part from three sinking streams which receive run-off from the Section 4 corridor. It is possible that groundwater does flow from the Section 4 corridor towards Cave F. Although no dye was recovered at Cave F during the traces that were linked to Cave A, it may have a recharge area associated with, or similar to Cave A. The Section 4 Alternatives are about a half-mile south of the cave location and share a common alignment in this area. All alternatives would result in the same impact upon the drainage areas of potential Cave F recharge features located within the Section 4 corridor. It should be noted that the affected drainage areas are linked to this cave via unusually long flowpaths which include karst conduits in limestone. However, the elevation of the limestone and the streambeds indicates probability that the flowpath to this cave consists of a combination of conduit and surface flow. In this scenario the water could pass out of and back into the limestone one or more times. The majority of the recharge to the cave is derived from more proximal features. Therefore, it is not anticipated that the project will cause a material degradation of the cave spring's water quality or quantity.

8. Cave G

Cave G is located approximately 500 feet south of the Section 4 corridor. Cave G has been mapped and the cave passage trends toward the Section 4 corridor. The mapped extent of Cave G terminates outside the Section 4 corridor, over 1,000 feet south of the Section 4 Alternatives. Dye tracing tests revealed that recharge to Cave G is derived in part from sinking stream 4-1271 which receives run-off from the Section 4 corridor. Construction in this area could impact the recharge to Cave G. The Section 4 Alternatives share a common alignment in this area. All alternatives would result in the same impacts along the northern edge of the drainage area of sinking stream 4-1271. Where appropriate and practicable, special planning should be conducted so that highway derived runoff within the drainage area of sinking stream 4-1271 is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, where appropriate and practicable, special planning should be conducted so that construction does not sever this recharge feature by sedimentation or impervious cover.

9. SR 37 Interchange

Dye tracing tests (dye injection at sinkhole 4-1496) reveal the northeastern side of SR 37 near its intersection with Victor Pike to be part of the recharge area for one significant spring (4-1501). The southwestern side of SR 37 near its intersection with Victor Pike is a concern from an engineering standpoint due to the high density of karst features. The bedrock is likely highly fractured and could pose design and construction issues. This area lacks the non-carbonate cap rock that channels surface water off and away from karst forming bedrock. Additionally, the construction of SR 37 and surrounding development has already altered the land surface and drainage patterns. Sinkholes have been filled and altered which could be problematic during construction. Drainages and conduits have also been altered which present problems in studying

the hydrogeology. The Section 4 Alternatives share a common alignment in this area. All alternatives would result in the same encroachment within the recharge area along the northeastern side of SR 37 near Victor Pike. Special planning, where appropriate and practicable, should be conducted to insure that highway derived runoff within the drainage area of sinkhole 4-1496 is dispersed through natural vegetation and/or an engineered treatment system before entering the groundwater system. Also, where appropriate and practicable, special planning should be conducted so that construction does not sever this recharge feature by sedimentation or impervious cover.

10. Tramway Road Karst Area

This area is located within the corridor, north of Tramway Road and west of Victor Pike. Dye tracing tests reveal short localized groundwater systems and the karst features do not provide recharge to any significant springs. This area will need additional engineering measures to account for the high density of karst features and the highly fractured bedrock. This area lacks the non-carbonate cap rock that channels surface water off and away from karst forming bedrock. The instability of the bedrock was highlighted by a sinkhole collapse documented by the project team. This collapse occurred on the edge of a sinkhole (4-0133) identified during field mapping. This area was reviewed in detail relative to potential roadway engineering stability concerns. The review included a general review of potential alternatives outside the Section 4 corridor. The review did not identify that an alternative outside the corridor would provide substantial karst impact and/or roadway stability benefits compared to alternatives within the corridor. The Section 4 Alternatives utilize three alignments in this area and would affect a similar overall number of features. Refined Preferred Alternative 2, as well as Alternatives 2, 3 and 4 minimize impacts to higher infiltration features and minimize anticipated stability concerns in the area by cresting the hill north of Tramway Road on its east side, approximately 30 feet lower in elevation in comparison to Alternative 1.

5.21.3.6 Potential Impacts upon Unidentified Karst Features

The alternatives are located within karst terrain exhibiting dense concentrations of karst features distributed across the Section 4 corridor. Highway construction and operation-related impacts to identified karst features are unavoidable. It should be noted that unidentified subterranean karst features are undoubtedly present, and an unknown number of such unidentified features will be encountered and impacted during highway construction. The methodology developed for the karst survey included the identification of karst features that could be visually observed from the surface of the ground. Dye tracing was conducted in order to determine groundwater flow patterns in the area; however, due to the invasive ground disturbance necessary to identify all subsurface karst features, identification of such features was not included in the karst survey methodology. The Karst MOU was developed with the possibility of discovering previously unknown subsurface karst features. According to Step 14 of the Karst MOU, if during construction previously unknown karst features are identified and it is found that the mitigation agreement must be altered, all of the agencies will be contacted and agreement reached prior to work continuing in that specific area of the project. Mitigation for impacts to unidentified karst

features will be managed in the same manner as mitigation for impacts to identified features, as described below.

5.21.3.7 Potential Impacts upon Threatened and Endangered Species and Cave Biota

The federally-endangered Indiana bat (*Myotis sodalis*) and 11 state-listed species (three State Endangered (SE), one State-Endangered Candidate (SEC), one State-Threatened (ST), one State Rare (SR), and five Watch List (WL)) were identified during surveys of caves within and near the Section 4 corridor. The state listed species are the Indiana cave springtail (WL), Packard's groundwater amphipod (WL), Bollman's cave millipede (WL), Jeannel's groundwater ostracod (SE), Ray's cave beetle (SE), Krekeler's cave ant beetle (SE), Ashcraft cave springtail (SEC), hilly springtail (SR), Fountain cave springtail (ST), Weingartner's cave flatworm (WL), and the Indiana cave amphipod (WL).

Direct impacts to known caves were avoided in the development of the alternatives. However, since the publication of the DEIS, ongoing public outreach lead to the identification of a cave with the proposed rights-of-way for all Section 4 Alternatives. This feature did not exist when surveys were completed in 2004 - 2006. It has been identified and added to the impacts for all alternatives. Karst geologic experts surveyed the cave on January 25, 2011 and March 8, 2011. No insects, invertebrates, or other fauna were observed inside the cave during the March 8, 2011 field review. No evidence of Indiana bats was observed during the field review and based on the cave's characteristics, it is the opinion of the karst experts that this cave would not meet the criteria as an Indiana bat hibernaculum. See Section 5.21.3.10 for more information about this cave.

No direct impacts to known cave habitats and/or cave biota are anticipated. The 11 state-listed species were identified in three caves found to be present in or near (hydrologically linked) the Section 4 corridor. Surveys to identify such invertebrate species were conducted in six caves known to be hydrologically linked to the corridor or alternatives. The caves surveyed for cave fauna were selected based on the likelihood of impact from the proposed project. Four additional caves were found to have a hydrologic connection to the corridor, but were not surveyed because the alternatives either did not cross the connected feature's drainage area, or were down gradient of or in a cut section (a section where existing soil and bedrock will be removed such that the highway is lower than the currently existing ground level) near the connected feature and would not direct any highway drainage to the feature. Karst springs are present within these caves. An assessment was made of the project's potential to cause indirect impacts to state listed cave biota from changes in drainage areas contributing recharge to the cave springs as well as karst groundwater quantity and quality. It was concluded that the project will not result in such changes of a sufficient magnitude to adversely affect the identified state listed species. As required by Steps 4, 7, 8, and 10 of the Karst MOU, highway runoff will be treated through implementation of Best Management Practices (BMPs) prior to being directed toward a karst feature. Analysis which shows that these species will not be adversely affected is provided in Section 5.17, *Threatened and Endangered Species*.

5.21.3.8 Pollutant Loading Analysis

Step 2 of the Karst MOU requires that estimates of pollutant loads from the highway and drainage area within the right-of-way be made, including prior to, during and post construction. Pollutant loading estimates have been updated since publication of the DEIS and are included in **Appendix AA**. As required by Step 8 of the Karst MOU, a monitoring and maintenance plan will be developed for the project. IDNR, IDEM, and USFWS will be provided an opportunity to review this plan. Highway drainage will be treated in accordance with the monitoring and maintenance plan.

As part of the construction and construction oversight, strict adherence to the erosion control measures is essential. Runoff and sediment control are to be performed during construction in accordance with the Erosion and Sediment Control plans developed in compliance with the October, 2007 version of the Indiana Storm Water Quality Manual (IDEM). According to the "Results of MOU-Related Karst Studies for Indiana State Road 37, Lawrence County, Indiana (1992-1995)" (EarthTech, 1997), there were elevated levels of Total Suspended Solids (TSS) and Total Recoverable Metals (TRM) to the subsurface associated with the during-construction activities for the SR 37 project. These levels returned to pre-construction conditions about two years after construction. This pattern is anticipated for the I-69 construction.

5.21.3.9 Cumulative and Indirect Impacts

Within the Section 4 Induced Growth Study Area (Study Area, refer to Section 5.24 *Indirect and Cumulative Impacts* for more information), residential and commercial development and associated septic systems, agriculture, logging, and limestone quarrying have been and will continue to be the principal stressors of karst resources and private groundwater wells. The use of fertilizers, insecticides and pesticides, contaminated runoff from agricultural operations and septic systems all contribute to karst water quality impacts. In addition, continued development in Greene and Monroe counties changes infiltration and runoff patterns, which can affect karst flowpaths and potential contaminant introduction to karst resources and private groundwater wells.

This cumulative effects analysis focuses on the direct, indirect and other reasonably foreseeable changes to karst groundwater, and private groundwater wells associated with construction of the four Alternatives. Traffic Analysis Zones (TAZs) were established for this project and predictions of induced growth within TAZs were made. **Figure 5.24-1** (p. 5.24-827) depicts the location of the TAZs relative to the Section 4 corridor. The location of TAZs within which induced growth was predicted relative to karst resources within the Section 4 corridor was assessed. No karst features were identified west of Taylor Ridge Road in Greene County, and therefore TAZs west of Taylor Ridge Road were not considered in the assessment. Induced growth was predicted within 43 TAZs within the portion of the Section 4 corridor where karst resources were identified. These TAZs occur in two clusters; a small grouping of 4 TAZs just north of the north project terminus in Monroe County, and a large grouping of 39 TAZs bisected by the Section 4 corridor within eastern Greene County extending from the Greene/Monroe County line west to Koleen.

Within the 39 Greene County TAZs that are potentially within a karst terrain, the total acreage of land affected by induced growth was predicted to be 81.57 acres (79.30 acres for housing and 2.27 acres for employment related development). The number of induced homes was predicted to be 314 and 35 induced jobs were predicted. These TAZs occur within the water service area of the Eastern Heights Utility, Inc. Therefore it is likely that some percentage of the induced residential and employment related development will make use of the water utility. There are numerous existing private water wells and septic systems within these TAZs. Induced growth will cause more pressure on karst resources and private groundwater wells. The susceptibility of impacting private water supply wells is likely increased as the induced development increases in each TAZ. Only one TAZ is anticipated to have induced growth over 10 acres (10.25 acres). This TAZ is located east of the proposed County Line interchange. Only five of the 39 TAZs are anticipated to have between 5 and 10 acres of induced development. Most of these are located in the vicinity of SR 54 and Solsberry. The remaining 33 TAZs in Greene County are anticipated to have less than 5 acres of development, with 18 of them anticipated to have less than 1 acre of induced development. The total induced growth in Greene County is very small amount, approximately 0.13%, of the total 60,232 acres in the 39 TAZs studied. It is anticipated that the potential for negative effects upon drinking water supplies would be lessened somewhat through implementation of local septic system design review and approval processes currently in place. The four alternatives will result in similar impacts upon these resources. Impacts upon many karst features, including caves and areas of dense karst feature concentrations, were avoided and or minimized during alternative development and screening. Implementation of appropriate Best Management Practices and procedural steps required by the Karst MOU, during and after construction, will also lessen potential indirect and cumulative effects due to highway construction and operation.

Within the 4 Monroe County TAZs, the total acreage of land affected by induced growth was predicted to be 53.59 acres (31.12 acres for housing and 22.47 acres for employment related development). The number of induced homes was predicted to be 150 and 400 induced jobs were predicted. These TAZs occur within the water service area of the City of Bloomington Utilities. Therefore it is likely that some percentage of the induced residential and employment related development will make use of the water utility. Private water wells and septic systems exist within these TAZs. Induced growth will cause more pressure on karst resources and private groundwater wells. It is anticipated that the potential for negative effects upon drinking water supplies would be lessened somewhat through implementation of Monroe County Health Board ordinances pertaining to septic system design approval, as well as Monroe County zoning ordinances pertaining to karst and sinkhole development standards which establish review procedures, use limitations, design standards and performance standards applicable to site developments that encompass or affect sinkholes or other karst features. The intent of this ordinance is to protect the public health, safety and welfare by requiring the development and use of environmentally constrained areas to proceed in a manner that promotes safe and appropriate storm water management and ground water quality. The four alternatives will result in similar impacts upon these resources. Impacts upon many karst features, including caves and areas of dense karst feature concentrations, were avoided and or minimized during alternative development and screening. Implementation of appropriate Best Management Practices and procedural steps required by the Karst MOU, during and after construction, will also lessen potential indirect and cumulative effects due to highway construction and operation.

5.21.3.10 New Cave

A new cave was recently discovered within the right-of-way of all alternatives, including the Refined Preferred Alternative 2. INDOT was made aware of the cave by the property owner. The property owner stated that the cave didn't exist when the project team conducted karst field studies from 2004 - 2006. Karst geologic experts surveyed the cave on January 25, 2011 and March 8, 2011. This is a small cave, approximately 80 feet long at its maximum at the time of the field reconnaissance. The primary purpose for investigating the cave is to 1) determine if it meets the criteria for an Indiana bat hibernaculum and 2) determine if cave biota are present.

Karst biological studies were conducted from 2004 through 2006 for Section 4's EIS. During that time, the karst team coordinated and shared information regarding karst features and caves being documented in the field. This coordination included Section 7 Consultation with U.S. Fish and Wildlife Service (USFWS), Indiana Department of Natural Resources (IDNR), and signatories to the Karst MOU (1993). This consultation involved the development of an Indiana bat (*Myotis sodalis*) Winter Action Area (WAA). The WAA is the total area that falls within a 5-mile radius centered on each of the known Indiana bat hibernacula that have entrances located within 5 miles of the proposed 3C corridor. The Indiana Geological Survey and their karst experts located and verified approximately 347 caves in this area and evaluated them for their potential as Indiana bat hibernacula. There were 14 hibernacula entrances that were identified within 5 miles of the corridor and that were analyzed within the Tier 1 WAA. The evaluation of caves throughout the Indiana bat WAA is documented in the I-69 Evansville to Indianapolis Tier 2 Studies Cave Reconnaissance for Indiana Bat Hibernacula, January 26, 2006. The cave rankings as habitat as a part of that report were reviewed by numerous cave and bat experts, including USFWS.

The evaluation criteria for an Indiana bat hibernaculum as winter habitat are listed below:

- a chimney air flow effect,
- multiple cave openings,
- a large volume that stores cool air,
- constant winter air temperatures ranging from 3 to 6° C
- bats as recorded in the database in this cave, and
- the size and diversity needed as a hibernacula

The new cave is not a lengthy cave. It is only 80 feet at its maximum length, nor does it store a large volume of cool air. The temperature of the cave in March 2011 was likely above 10 degrees Centigrade, which is above the optimum temperature for Indiana bat winter habitat. No chimney air flow effect was observed. Finally, no evidence of Indiana bats was observed during the field review in March 2011. During the January observation this entrance was not sufficiently open to indicate that bats could ingress or egress. Due to the cave's length, size, configuration, temperature, and the lack of Indiana bat indicators, it is the opinion of the karst geologist who entered the cave that it would not meet the criteria as an Indiana bat hibernaculum. This opinion is based on field observations of the cave as well as 40 years of experience with caves and coordination with bat experts.

No insects, invertebrates, or other fauna were observed inside the cave during the March 8, 2011 field review.

Additional information on this cave can be found in the Karst Report Addendum No. 1 in **Appendix AA** of this FEIS.

5.21.4 Mitigation

A primary objective of the Karst MOU is to minimize the effects of highway construction and operation on karst resources. The four strategies outlined in the Karst MOU to achieve this objective, in order of priority and/or effectiveness, are avoidance, alternative drainage, mitigation/treatment, and operation and maintenance.

Karst biological communities are known to be susceptible to alterations in temperature and humidity within their ecosystem. In accordance with the Karst MOU, a monitoring and maintenance plan will be developed for affected karst features. Also in accordance with the Karst MOU, if during construction additional karst features are discovered and it is found that the mitigation agreement must be altered, all of the agencies will be contacted and agreement reached prior to work continuing in that specific area of the project. It is also recommended that temporary caps be placed over any exposed karst feature discovered during construction to limit changes to temperature and humidity within the karst ecosystem.

Per USEPA written comments on the DEIS, a firm commitment has been added that if active groundwater flow paths are discovered, measures will be taken to perpetuate the flow and protect water quality.

Avoidance is the preferred strategy for minimizing karst resource impacts associated with highway construction and operation. Within Section 4, I-69 would be constructed primarily on undeveloped land. The Section 4 corridor does not follow an existing highway corridor. Therefore, careful planning of the highway alignment is the best opportunity to avoid and minimize impacts to karst resources. While not all karst features can be avoided, caves are recognized as karst features of high importance, and direct impacts to caves were avoided during alternative development and screening. However, since the publication of the DEIS, ongoing public outreach lead to the identification of a cave with the proposed rights-of-way for all Section 4 Alternatives. This feature did not exist when surveys were completed in 2004 - 2006. It has been identified and added to the impacts for all alternatives. See Section 5.21.3.10 for more information about this cave.

Also avoided were direct impacts upon denser concentrations of karst features, where practicable. Unavoidable impacts are addressed via consideration of alternative drainage and other appropriate mitigation/treatment measures. As was described in Section 5.21.1, avoidance has been a key objective in earlier studies dating back to the early 1990's.

Collection and management of highway runoff is an important consideration during the development of the roadway design as well as the development of karst impact mitigation measures. The term "alternative drainage" involves directing highway runoff away from

recharge features such as sinkholes, swallets and sinking streams. Alternative drainage also includes avoiding severing karst conduits between recharge features and discharge features so as to avoid/minimize potential downstream effects upon troglobitic species (cave-dwelling species adapted to total darkness) that cannot be directly observed due to lack of adequate access to caves which serve as their habitat. Dye tracings of Section 4 showed, in rare cases, flowpaths as long as four miles between dye injection and dye recovery. Therefore, the potential exists for water quality degradation related to normal highway runoff as well as hazardous materials spills in locations removed from the Section 4 corridor. It should be noted that utilizing alternative drainage will not always be a viable option within the Section 4 corridor. In some areas karst features are distributed across the corridor, which could preclude diverting runoff from the highway away from all karst features. This is especially true in Monroe County. Identifying areas to divert runoff away from karst features may be easier to implement in portions of the corridor where the frequency of karst features is not as high. Because this project will require a Rule 5 Permit issued by IDEM, the design will need to devote particular detail to Rule 5, Item B1 of the Erosion Control Plan Development, which states:

> This item is included in the rule to place an emphasis on identification of pollutants that are associated with construction activity. In the past, the emphasis has been on sediment reduction; however the rule requires the plan preparer to identify other potential pollutants and their sources. Potential pollutant sources include material and fuel storage areas, fueling locations, exposed soils, leaking vehicles and equipment, etc.
>
> To satisfy this item, the plan needs to contain a written description of the expected pollutants that could enter Storm water during the construction operation, and where those potential pollutants might be generated. In addition, the plan preparer should include discussion of measures or operational activities that will be initiated to minimize the danger of pollutants entering Storm water.

Several erosion and sediment control methods could be utilized in steep terrain including but not limited to surface stabilization measures, runoff control measures, sediment barriers and filters, and other measures including surface roughening and the use of retaining walls where appropriate. Surface stabilization measures could include such measures as temporary seeding, erosion control blankets, and riprap slope protection. While, runoff control measures could include temporary and permanent diversions, water bars, rock check dams, and temporary slope drains. Finally, sediment barriers and filters could include silt fence, filter tubes/socks, and vegetative filter strips.

When alternative drainage is not an option, potential highway construction, operation and maintenance measures used to perpetuate and/or treat highway drainage include, but are not limited to, the following:

- As stated in the Section 4 BA, low salt zones will be defined within any drainage area of a karst feature which is used for highway drainage. Further coordination with the Karst MOU agencies will occur during the design phase of the project regarding low-salt zones.

- As stated in Step 8 of the Karst MOU, additional information on runoff treatment and protocol for long term monitoring will be developed in the design phase of the project and provided to the IDNR, IDEM and USFWS for review. As stated in Step 10 of the Karst MOU, an agreement between INDOT, IDNR, IDEM and USFWS that will specify the appropriate and practicable measures to offset unavoidable impacts to karst features will be signed prior to acceptance of final design plans.
- Installation of concrete caps, specially designed drainage structures, detention basins or swales, peat filters and spring boxes.
- Natural vegetative treatment for road runoff.
- Examination of the areas that receive runoff from the highway to detect soil piping or opening of buried karst features. Soil piping will be addressed by the contractor during the weekly erosion control inspections (or after every ½ inch of rainfall) required as part of the Rule 5 permit during construction. Inspections following construction will be determined during the final design phase as part of the monitoring and maintenance plan under Step 11 of the Karst MOU. It will be INDOT's responsibility or their designated agent's responsibility to perform these inspections. Quarterly inspections and inspections after all heavy rains are recommended for the first year. Annual or bi-annual inspections are recommended after the first year.
- Implementation of no-spray zones.
- Strict runoff/erosion control measures.
- Routine maintenance and inspection of treatment/containment structures.
- Development of a spill response plan.

Class V injection well permits may be required for various types of projects. For example such a permit could be required by EPA Region 5 if a Class V injection well is located within the karst region of the state, a sole source aquifer area, a state designated source water protection area for a public water supply, or anywhere untreated fluids discharged through a Class V well may otherwise endanger an underground source of drinking water. If there are measures in place to prevent contamination of groundwater, a Class V well could be authorized by rule rather than by a permit. A Class V Well Inventory Form would need to be provided to EPA Region 5 prior to construction of a Class V injection well so that EPA could determine if a Class V injection well permit will be required for any Class V wells. For the I-69 project, if the inventory information provided indicates that any injection well would likely contaminate any underground source of drinking water, a permit would be required. Any permit would need to be applied for and obtained prior to construction of the Class V well.

The Karst Report (**Appendix AA**) identifies additional Best Management Practices (BMPs) that will be considered for implementation for the project and includes additional information pertaining to mitigation. Under the Step 8 of the Karst MOU, a monitoring and maintenance plan will be developed for affected karst features. A listing of karst feature treatment circumstances which may require BMP implementation, BMPs that may be implemented, and a numerical cross-reference to applicable Indiana Department of Transportation (INDOT) Standard Specifications such as Standard Specification 205 pertaining to soil liners, is included in **Table 5.21-2a** below. The INDOT Standard Specifications are available on-line at: http://www.in.gov/dot/div/contracts/standards. This listing is not intended to be all-inclusive. These and other BMPs will be considered for implementation on a case by case basis.

Table 5.21-2a: Best Management Practices (BMPs) in Karst Terrain

Best Management Practice (BMP)	Description	Numerical Reference to INDOT Standard Specification[2] (where applicable)
Ditch Lining		
Compacted clay liner	Lined ditches can be utilized to prevent erosion. The hydraulic analysis in design will determine the water flow and velocity to select the proper lining. This will not only reduce erosion, but limit the sediment transport into karst features.	205 describes the installation of pond liners, synthetic liners and soil liners and could be adapted to this work.
Geosynthetic clay liner	This is an effective method to protect groundwater penetration along a road side ditch.	205 describes the installation of pond liners, synthetic liners and soil liners and could be adapted to this work.
Flexible membrane liners	Beneficial since these will conform to undulating topography.	205 describes the installation of pond liners, synthetic liners and soil liners and could be adapted to this work.
Concrete, portland cement or asphalt	Can be used although not as aesthetic as the other options.	607 describes paved side ditch construction for both concrete and asphalt work.
Sinkhole - Bridging		
Culvert or bridges	The INDOT Drainage Design Manual will be used to size the openings of bridges and culverts. Unique backwater conditions created by karst features will be evaluated further in design to assure proper detention storage. If a karst feature cannot be avoided, filled or capped, the roadway should span the feature and be anchored (reinforced) into competent bedrock. Cuts into bedrock should be minimized when possible.	714, 715, 723 describe different culverts and concrete boxes and 3-sided structures that can be installed.
Reinforcing within cave	The mortar will coat and strengthen the cave walls.	708 describes pneumatically placed mortar (shotcrete).
Ground modification	Can strengthen soils by injecting concrete or lime.	203 describes soils modification with chemical.
Geopier with cap	Typically installs quicker than traditional piers or piles; will provide strength to wide range of soils	INDOT does not directly address Geopier, but 701 gives requirements for piles and piers.
Piles with cap	Traditional method for vertical reinforcement of soils.	710 addresses pile installation.
Sinkhole - Filling		
Rock pads	Works where the velocity of the storm water needs to be decreased to prevent erosion.	205 describes rock splash pads as an erosion control measure.
Large rock fill	Effective for slope stability issues.	203 describes placing large rock fill before backfilling with structure backfill or borrow.
Compaction grouting	Useful where soil is loose or soft and does not need a large area for installation.	A standard would have to be written for this.
Cement grouting	Effective where there are significant voids and cracks in load bearing rock	206 describes the process for grout injection.
Dynamic compaction	Will increase the density of the soil, even soil	203 describes excavation and

[2] INDOT has not developed standard specifications for every conceivable mitigation need which may be encountered. If specific field conditions require a mitigation measure for which INDOT presently has no Standard Specification, then a Unique Special Provision could be developed and approved by INDOT.

Table 5.21-2a: Best Management Practices (BMPs) in Karst Terrain		
Best Management Practice (BMP)	**Description**	**Numerical Reference to INDOT Standard Specification[2] (where applicable)**
	below the groundwater; best for granular soils.	backfilling requirements as well as chemical soil modification.
Excavation, overlapping geotextiles, soil backfill	If a sinkhole is located within the new right of way, yet has a very small drainage area, then capping is more appropriate (versus installing a catch basin and standpipe).	203 describes excavation and backfilling requirements as well as chemical soil modification.
Excavation, concrete cap, soil backfill	If a sinkhole is located within the new right of way, yet has a very small drainage area, then capping is more appropriate (versus installing a catch basin and standpipe).	203 describes excavation and backfilling requirements as well as chemical soil modification.
Other		
Avoidance	The alternatives have been screened for the number of karst features that may be affected. As design further details the road's cross section and alignment at a particular karst feature, avoidance should continue to be considered if cost effective and within appropriate design criteria.	
Alternative drainage	Redirecting highway runoff away from karst recharge features. Will be implemented where feasible. In some areas, this is not an option due to karst features being distributed across the corridor (especially the eastern portion of Section 4).	
Earth berm construction	Provides a natural look to the erosion control.	205 describes diversion berms of earth or rock as an erosion control method.
Gabion berm construction	May be appropriate at very steep slopes (>10%).	Recurring provision 625-R-194 describes the requirements and placement of gabions.
Open standpipe installation	A chimney (standpipe), catch basin and rock filter is a common BMP for sinkholes located within the right of way of the new road. These were used in the SR 37 project.	A standard would have to be written for this.
Concrete catch basin installation	A chimney (standpipe), catch basin and rock filter is a common BMP for sinkholes located within the right of way of the new road. These were used in the SR 37 project. They can be enhanced to include a special basin to act as a hazardous material trap (HMT) that can be specially drained to avoid the adjacent watershed.	720 describes catch basins and installation.
Natural vegetative buffers	Could be constructed in appropriate locations to detain/treat runoff prior to discharge. Same season re-vegetation should occur when possible.	Section 621 describes installation of vegetative cover, as well as timeline for when they must be installed, and the method for installation.
Peat/sand/gravel filters	Could be constructed in appropriate locations to detain/treat runoff prior to discharge.	205 describes placement of erosion control and filtering devices as an erosion control measure.
Spring boxes	Use to protect spring discharge	205 describes placement of erosion control and filtering devices as an erosion control measure.

Table 5.21-2a: Best Management Practices (BMPs) in Karst Terrain		
Best Management Practice (BMP)	**Description**	**Numerical Reference to INDOT Standard Specification[2] (where applicable)**
Energy dissipation devices (e.g. scour holes, riprap linings, stilling basins)	Use at culvert and storm sewer outlet locations to prevent erosion to existing channels. Will be based on INDOT's Drainage Design Manual.	Section 616 describes riprap placement and type for energy dissipation and scour protection.
Agencies (IDNR, IDEM, USFWS) attend field checks/meetings	Meet during later design in effort to negate/minimize adverse effects.	Would need special standard provision; Indiana Design Manual defines the parties required to attend field checks during design, and Section 105 defines coordination procedures and agencies the contractor much include and coordinate with.
Notify the USFWS & IDNR if a state/federal listed species is observed during construction	Work will stop within the project area and these agencies will be notified.	Would need special standard provision; Section 107 describes contractor's responsibilities to follow permits, laws, responsibility to the public.
Newly discovered cave during construction	Karst experts will be consulted to determine the significance of the cave.	Would need special standard provision; Section 107 describes contractor's responsibilities to follow permits, laws, responsibility to the public.
Geogrid or geotextile layers	Could be installed in the lower reaches of embankments, embankment foundations or roadway subgrades.	214 describes geogrid installation requirements.
Operation/Maintenance		
Discovery of karst features previously not known	Examination of areas that receive runoff from highway to detect soil piping or opening of buried karst features.	A standard would have to be written for this.
No-mowing, low salt or no-spray zones and associated signage	Implemented in order to increase vegetative groundcover and filter runoff prior to leaving right-of-way.	Section 621 describes "Do Not Spray" and "Do Not Mow" signage and placement.
Routine maintenance and inspection of treatment/containment structures	Verify capacity, integrity and operational efficiency of structure.	Section 205 describes the type and frequency of inspection of temporary erosion control devices; INDOT assume responsibility of permanent devices after final acceptance of the project.
Emergency response plan	To be developed post-NEPA, as stated in Step 11 of the Karst MOU.	
Installation of signage alerting public that all spills are potentially hazardous	In order to increase public awareness in sensitive areas.	Would need a special provision; 802 describes sign placement and type for unique sign types.

5.21.5 Summary

The Section 4 Alternatives are located within karst terrain. The project is being developed in a manner consistent with the 17 procedural steps outlined Karst MOU. The majority of Steps 1 through 4 have been completed to date. Steps 5 through 17 will be completed as the project design advances, as well as during and after construction.

Highway construction in karst terrain can be challenged by physical geological conditions (construction within bedrock) and also by the need to manage highway runoff in a manner that avoids and/or minimizes groundwater quality and quantity effects. Changes in groundwater quality and quantity have the potential for effects upon private and public drinking water supplies and karst (primarily cave) biota. Dye traces indicate that karst groundwater flowpaths can discharge to locations well removed from the corridor.

A summary of karst feature impacts by alternative is presented in **Table 5.21-3.**

Table 5.21-3: Potential Karst Feature Impact Summary

Karst Feature type	Total Corridor Features	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
		Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Low-Cost Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
Caves: 0 - 100' long	13	1	1	1	1	1	1	1	1	1	1
Caves: 100' - 1000' long	2	0	0	0	0	0	0	0	0	0	0
Caves: 1000' - 5000' long	0	0	0	0	0	0	0	0	0	0	0
Caves: > 5000' long	0	0	0	0	0	0	0	0	0	0	0
High Infiltration Sinkhole	62	20	22	13	13	16	16	13	13	13	14
Medium Infiltration Sinkhole	121	28	31	27	31	26	28	28	31	27	31
Low Infiltration Sinkhole	122	33	35	21	27	20	23	23	30	21	27
High Infiltration Sinking Streams	6	1	1	3	3	2	2	3	3	3	3
Medium Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Low Infiltration Sinking Streams	0	0	0	0	0	0	0	0	0	0	0
Springs: 0-1 gpm*	40	9	16	11	20	10	20	12	21	11	18
Springs: 2-10 gpm*	55	11	12	7	8	8	9	9	10	7	8
Springs: 11-100 gpm*	7	1	1	0	0	0	0	0	0	0	0
Springs: 101-1000 gpm*	1	0	0	0	0	0	0	0	0	0	0
High Infiltration Swallet	13	4	3	4	3	4	3	4	3	4	4
Medium Infiltration Swallet	3	0	0	1	1	1	1	1	1	1	2
Low Infiltration Swallet	3	0	0	0	0	0	0	0	0	0	0
Total Karst Features	**448**	**108**	**122**	**88**	**107**	**88**	**103**	**94**	**113**	**88**	**108**

*Flow rates (gallons per minute, or gpm) were estimated in the field and were not measured.

Of the alternatives presented in the DEIS, Alternative 2 impacted the second-fewest karst features (between 88 and 107), which factored favorably toward its selection as the DEIS Preferred Alternative. While Alternative 3 would impact slightly fewer karst features (between 88 and 103), consideration of impacts upon other resources (including one business relocation) detracted from its selection as the DEIS Preferred Alternative. Refer to Chapter 6 for more detailed information. Alternative 4 would impact more karst features (between 94 and 113) than Alternatives 2 and 3. Alternative 1 would impact the greatest number of karst features (between 108 and 122). Since the DEIS, the design of Alternative 2 has been modified and is now referred to as Refined Preferred Alternative 2. While the overall impact footprint of Refined Preferred Alternative 2 is smaller in comparison to Alternative 2, there is very little difference in karst

impacts. Over all, in comparison to Alternative 2, Refined Preferred Alternative 2 would impact one additional karst feature, under the initial design criteria only.

In accordance with the Karst MOU, unavoidable impacts upon karst features will be mitigated through implementation of alternative drainage, where feasible. If alternative drainage is not possible, impacts will be mitigated through implementation of BMPs including water quality treatment measures, and appropriate operation and maintenance measures.

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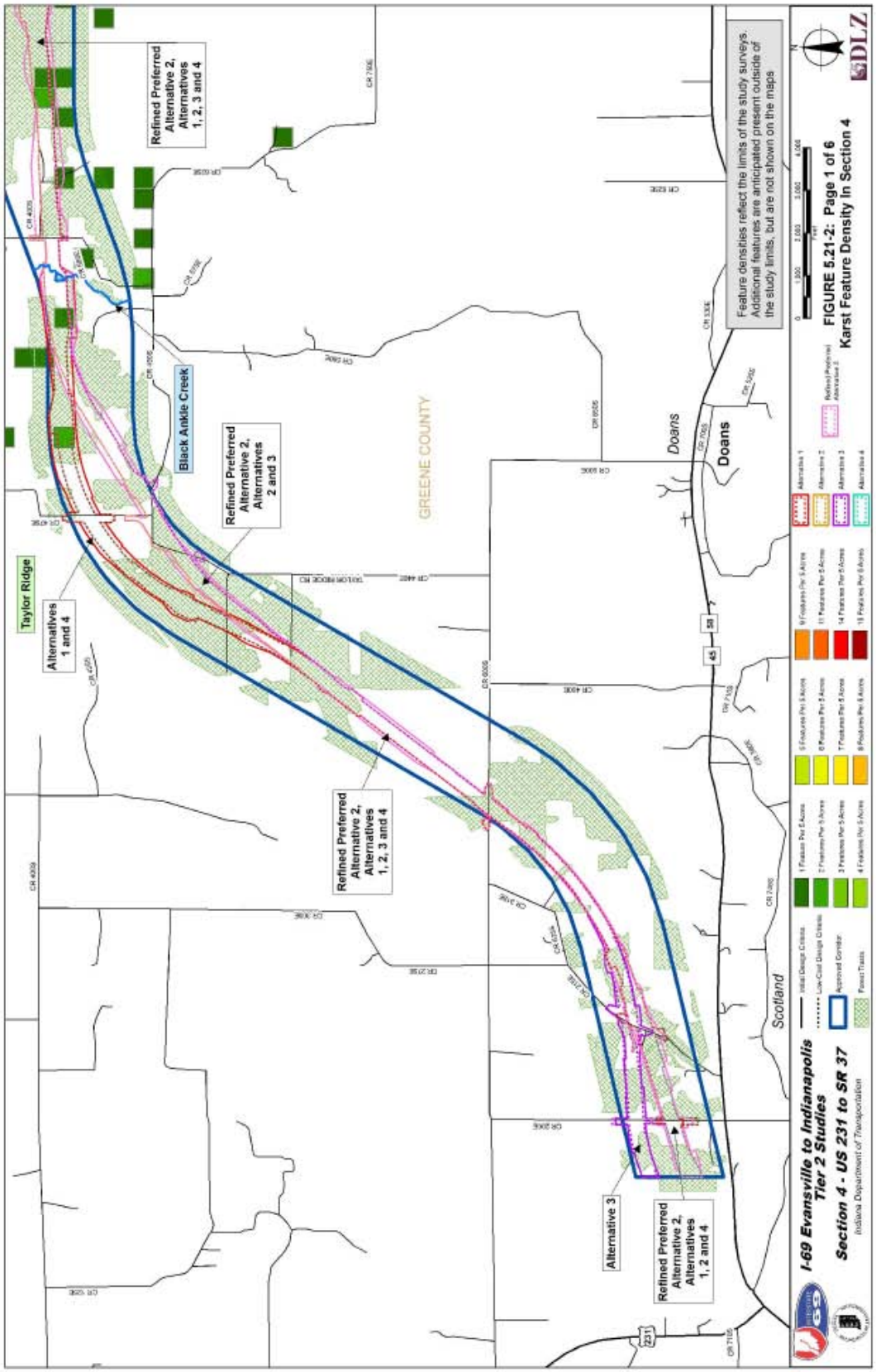
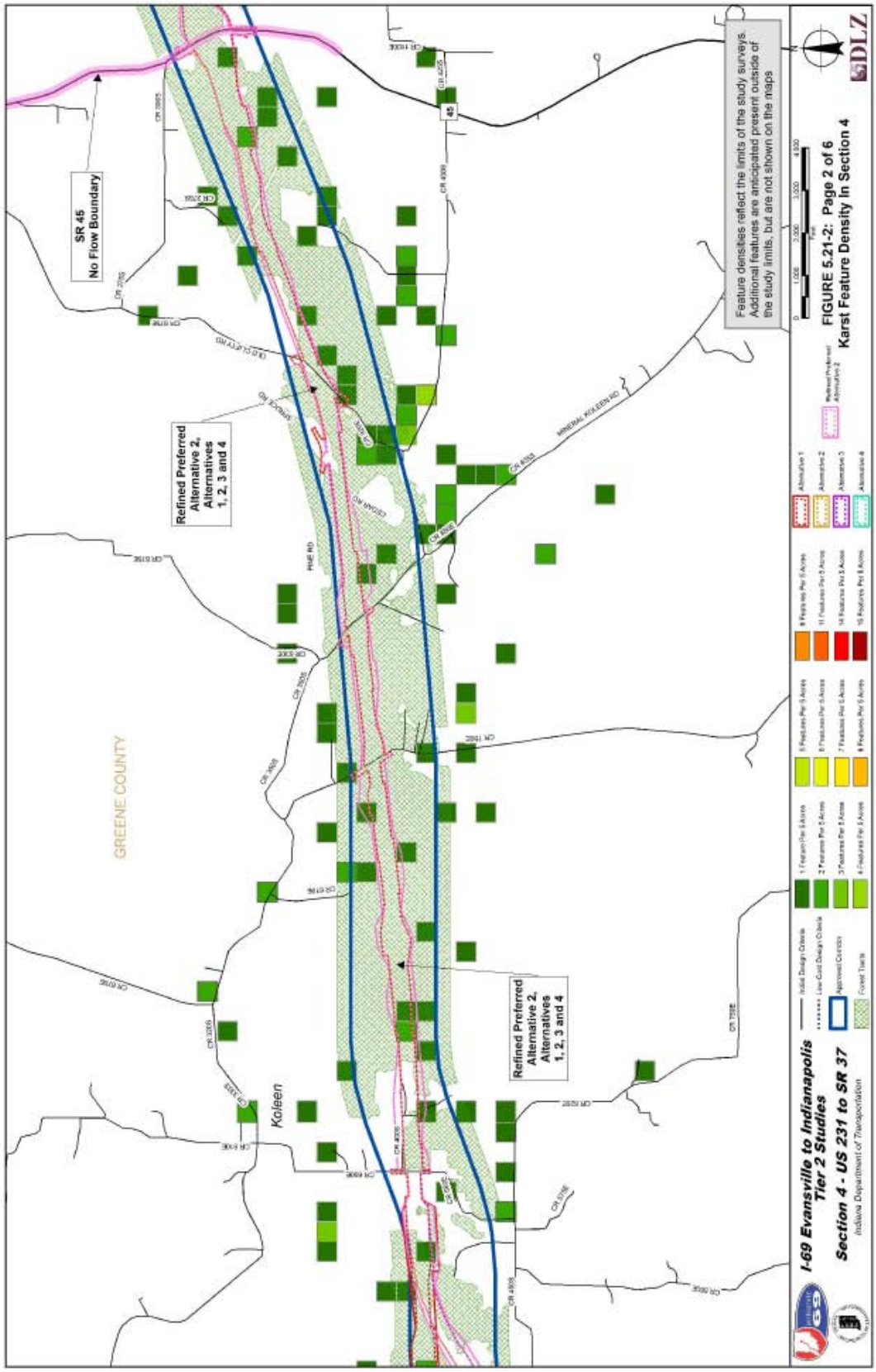
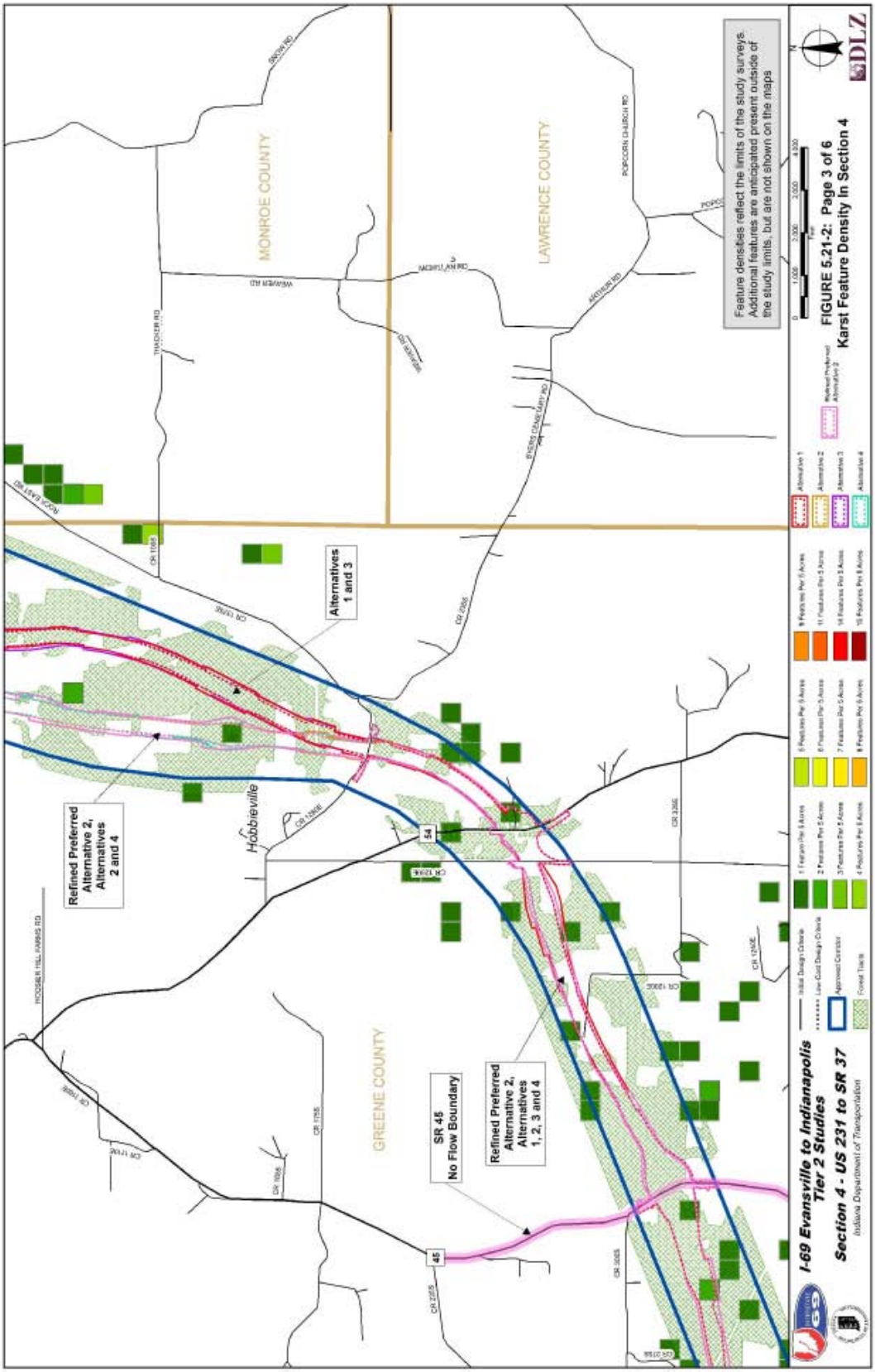
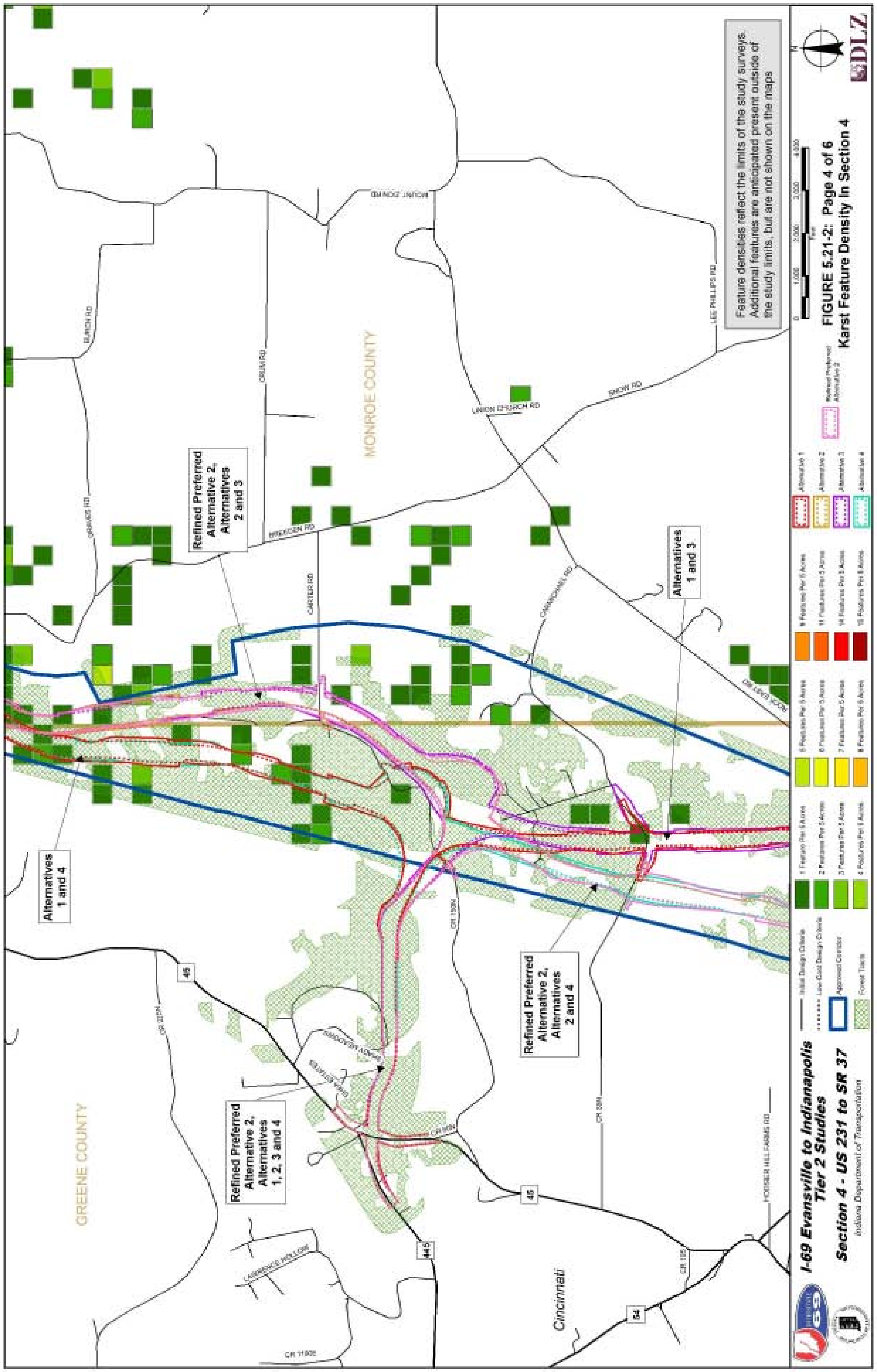

Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Black Ankle Creek
Refined Preferred Alternative 2, Alternatives 2 and 3
Taylor Ridge
Alternatives 1 and 4
GREENE COUNTY
Doans
Doans
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Scotland
Alternative 3
Refined Preferred Alternative 2, Alternatives 1, 2 and 4
Feature densities reflect the limits of the study surveys. Additional features are anticipated present outside of the study limits, but are not shown on the maps
FIGURE 5.21-2: Page 1 of 6
Karst Feature Density In Section 4
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


SR 45
No Flow Boundary
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
GREENE COUNTY
Koleen
Feature densities reflect the limits of the study surveys. Additional features are anticipated present outside of the study limits, but are not shown on the maps
FIGURE 5.21-2: Page 2 of 6
Karst Feature Density In Section 4
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


MONROE COUNTY
LAWRENCE COUNTY
GREENE COUNTY
Hobbieville
Alternatives 1 and 3
Refined Preferred Alternative 2, Alternatives 2 and 4
SR 45 No Flow Boundary
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Feature densities reflect the limits of the study surveys. Additional features are anticipated present outside of the study limits, but are not shown on the maps
FIGURE 5.21-2: Page 3 of 6
Karst Feature Density In Section 4
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ


Feature densities reflect the limits of the study surveys. Additional features are anticipated present outside of the study limits, but are not shown on the maps
FIGURE 5.21-2: Page 4 of 6
Karst Feature Density In Section 4
DLZ
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
MONROE COUNTY
GREENE COUNTY
Cincinnati
Refined Preferred Alternative 2, Alternatives 2 and 3
Alternatives 1 and 3
Alternatives 1 and 4
Refined Preferred Alternative 2, Alternatives 2 and 4
Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4

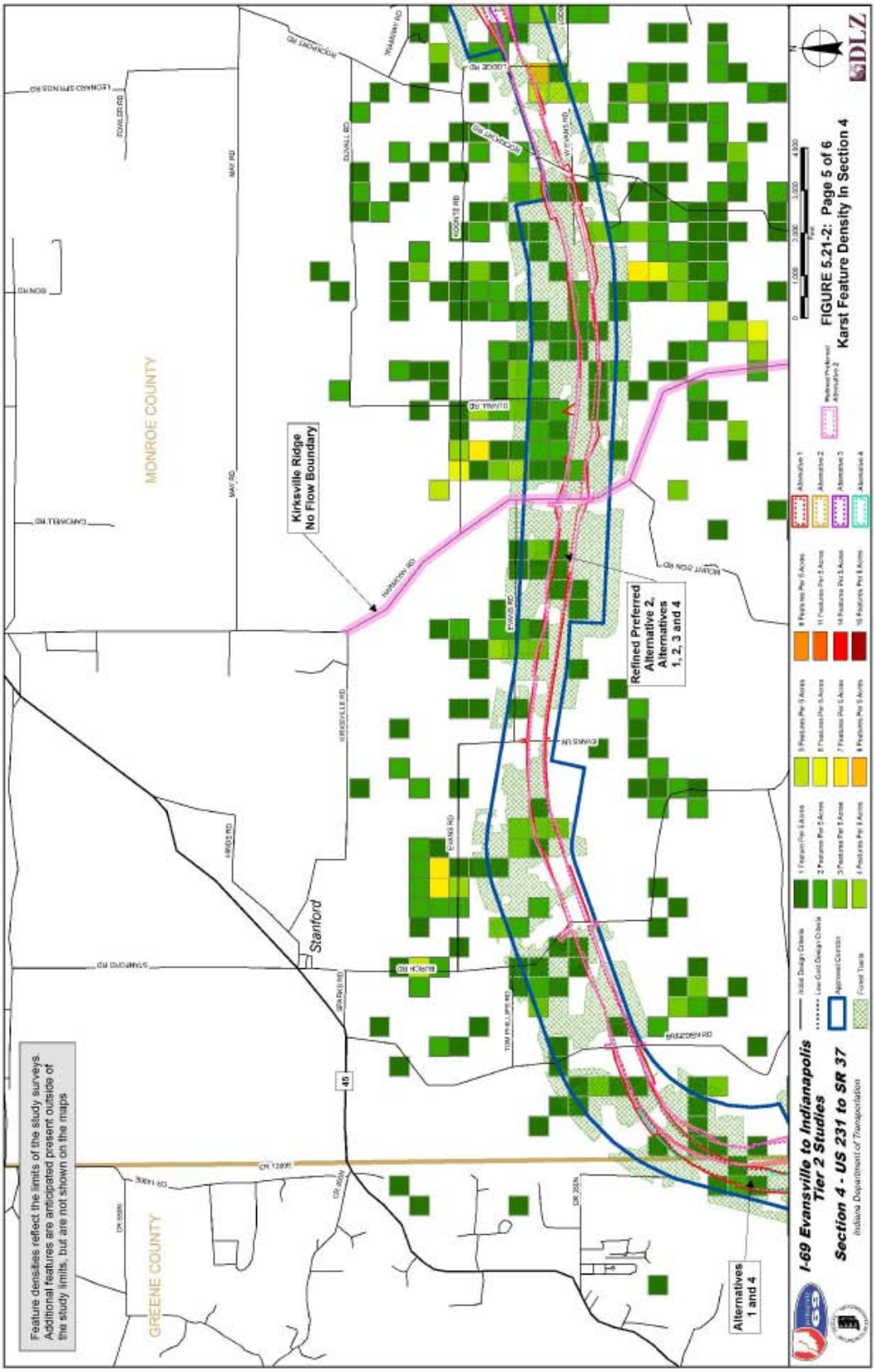
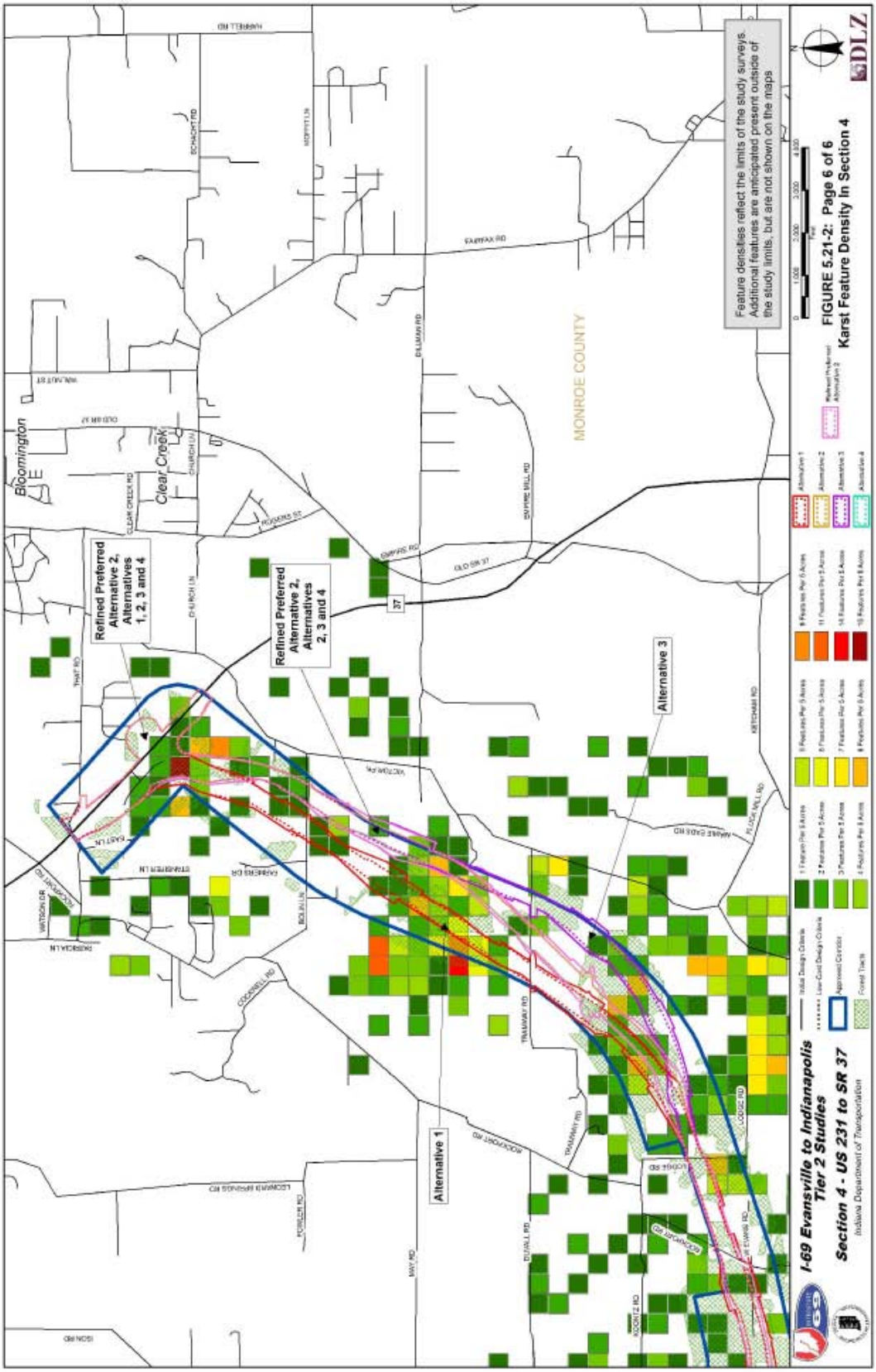


FIGURE 5.21-2: Page 5 of 6
Karst Feature Density In Section 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Feature densities reflect the limits of the study surveys. Additional features are anticipated present outside of the study limits, but are not shown on the maps
MONROE COUNTY
GREENE COUNTY
Stanford
Kirksville Ridge
No Flow Boundary
Refined Preferred
Alternative 2,
Alternatives
1, 2, 3 and 4
Alternatives
1 and 4
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Refined Preferred Alternative 2
1 Feature Per 5 Acres
2 Features Per 5 Acres
3 Features Per 5 Acres
4 Features Per 5 Acres
5 Features Per 5 Acres
6 Features Per 5 Acres
7 Features Per 5 Acres
8 Features Per 5 Acres
9 Features Per 5 Acres
11 Features Per 5 Acres
14 Features Per 5 Acres
16 Features Per 5 Acres
Initial Design Criteria
Low Cost Design Criteria
Approved Corridor
Forest Tracts
DLZ


Refined Preferred Alternative 2, Alternatives 1, 2, 3 and 4
Refined Preferred Alternative 2, Alternatives 2, 3 and 4
Alternative 1
Alternative 3
Bloomington
Clear Creek
MONROE COUNTY
Feature densities reflect the limits of the study surveys. Additional features are anticipated present outside of the study limits, but are not shown on the maps
FIGURE 5.21-2: Page 6 of 6
Karst Feature Density In Section 4
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
DLZ

5.22 Managed Lands and Natural Areas

- Section 5.22.3 – Updated the discussion of tax implications relating to withdrawal of land from the Classified Forest and Wildlands Program.
- Section 5.22.3 – Updated to remove Managed Land Property 37 from consideration as a Managed land.
- Section 5.22.3 – Updated to include discussion of impacts associated with Refined Preferred Alternative 2.
- **Figure 5.22-**1 through **Figure 5.22-12** were revised to depict Refined Preferred Alternative 2.
- Section 5.22.5 – Updated to include discussion of impacts associated with Refined Preferred Alternative 2. Reference to Managed Land Property 37 was removed from this section.
- **Table 5.22-1** - Updated to present impacts associated with Refined Preferred Alternative 2. Managed Land Property 37 was removed from the table.

5.22.1 Introduction

Managed lands and natural areas include federal, state, or private lands managed for timber production, wildlife habitat, recreation, education, or other such purposes. These areas also may be designated for a specific purpose (not necessarily actively managed) or high quality natural areas. There are federal and state interests in many of the privately owned managed lands in the form of cost-sharing agreements, purchased easements, or property tax reductions. Federal and state funds have been or are being expended on many of these properties.

Federal- or state-owned managed lands in Southern Indiana include Crane Naval Surface Warfare Center (Crane NSWC), Hoosier National Forest, Morgan-Monroe State Forest, and many others. Federal, state and municipally-owned managed lands in the vicinity of the Section 4 Corridor include Martin State Forest (IDNR), Crane NSWC (US Department of Defense), Leonard Springs Park (Bloomington Parks and Recreation Department), and County Farm Karst Park (Monroe County). Privately-owned managed lands near the Section 4 Corridor include Wayne's Woods (Sycamore Land Trust) and Cedar Bluffs Nature Preserve (The Nature Conservancy). None of these federal- or state-owned managed lands or natural areas are located within the Section 4 Corridor. A Martin State Forest property known as the Combs Unit abuts the northern edge of the corridor in Greene County, just west of Black Ankle Creek near Koleen.

Privately-owned managed lands investigated for this study include properties enrolled in the following government cost share programs, which generally are geared towards the management of resources for conservation purposes:

- United States Fish and Wildlife Service (USFWS)

  - Partners for Fish and Wildlife Program
- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
  - Wetlands Reserve Program (WRP)
  - Grasslands Reserve Program (GRP)
  - Wildlife Habitat Incentives Program (WHIP)
  - Environmental Quality Incentive Program (EQIP)
- USDA Farm Services Agency (FSA)
  - Conservation Reserve Program (CRP)
  - Conservation Reserve Enhancement Program (CREP)
- Indiana Department of Natural Resources (IDNR)
  - Classified Forest and Wildlands Program (CFWP)
  - Game Bird Habitat Development Program (GBHDP)

5.22.2 Methodology

Managed lands play an important role in preserving and protecting plant and animal species. For the purposes of this study, managed lands include all of the following: all outdoor recreational facilities, all publicly managed lands, and all private properties whose owners participate in federal, state, and local wetland, habitat, or other conservation and management programs. These lands were identified within the corridor based on GIS mapping.

Coordination was undertaken with appropriate federal and state agencies to determine whether there are properties within the Section 4 corridor enrolled in managed lands programs such as those listed above.

The following sections describe the results of agency coordination, managed land activities identified in the project corridor, potential impacts to the areas as a result of the project, and mitigation for the impacts.

5.22.3 Analysis

Coordination with the appropriate agencies concluded that there are no properties within the Section 4 corridor that are currently enrolled or have participated in the Partners for Fish and Wildlife Program, the CREP, the WRP, the GRP, the WHIP, and the GBHDP.

The DEIS identified thirty-nine (39) privately-owned managed land properties within the Section 4 corridor that participated in other state and/or federal funded programs, as described below. The relationship of the managed land properties to the Section 4 corridor is shown on **Figure 4.3-20** (p. 4-122). It should be noted that, in a written comment received subsequent to the August 26, 2010 DEIS public hearing, the owner of one managed land (Managed Land Property

37) informed the project team that this property is not enrolled in any managed land program. Therefore it was removed from the FEIS.

USDA-NRCS Environmental Qualities Incentives Program (EQIP) —EQIP addresses locally identified problems with natural resources. High priority is given to assistance where agricultural improvements will help meet water quality objectives. EQIP offers contracts that provide incentive payments and cost sharing for conservation practices, such as manure management systems, pest management, erosion control, and other practices to improve and maintain the health of natural resources (NRCS[1] website).

USDA-NRCS Conservation Reserve Program (CRP)[2] —CRP is a voluntary program for agricultural landowners who can receive cost-share assistance to establish long-term, resource-conserving covers on eligible farmland. Participants enroll in CRP for 10 to 15 years. The program is administered through the Farm Service Agency (FSA), and program support is provided by NRCS, Cooperative State Research and Education Extension Service, state forestry agencies, and local Soil and Water Conservation Districts. (FSA[3] website)

IDNR Classified Forest and Wildlands Program (CFWP) — CFWP allows landowners with at least 10 contiguous acres supporting a growth of native or planted trees, grasslands, wetlands or other acceptable types of land cover that have been set aside and managed for the production of timber, wildlife habitat and watershed protection. In return for meeting program guidelines, landowners receive property tax breaks, forestry literature and periodic free inspections by a professional forester while the tract is enrolled in the program. The lands are eligible for assessment at $1.00 per acre and taxes are paid on that assessment. The owner of classified forest and wildlands does not relinquish ownership or control of his property and the IDNR Division of Forestry does not become connected in any way with the ownership of the land. Part or all of the classified forest and wildlands can be withdrawn from classification at any time by completing and recording the withdrawal forms provided by the district forester upon request. When a part of classified forest is withdrawn, the remaining area must be a minimum of 10 acres. If it is less than this, the whole tract must be withdrawn. The state forester may also withdraw the land from classification if the requirements of the law are not being met. When withdrawing land from classification, the owner must go to the county assessor and have the assessor complete a report on the real property taxes that would have been paid had the property not been classified (IDNR 2008). The owner must repay 10 years of back taxes plus a 10% penalty, plus pay a $100 fee, plus a $50/acre fee (the latter two fees do not apply for CFWPs enrolled prior to 2008).

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1 http://www.nrcs.usda.gov/programs/eqip/

2 FSA, Indiana Office has recently begun to enter its information on CRP properties into a GIS platform. The initial data entry has been completed by FSA for all of the counties that comprise the I-69 Tier 2 Study Corridor. However, as of December 2005 none of the data has been verified for accuracy and may still be incomplete. FSA acknowledges that some CRP areas may still be missing from the GIS data entered thus far. Despite the potential incomplete and unverified status of the data, FSA has agreed to allow the information to be used for the I-69 project, with the understanding that they (FSA) have disclosed all possible shortcomings of the material in its current state. Therefore, the analysis of impacts to CRP properties reported here carries with it an unknown degree of certainty.

3 http://www.fsa.usda.gov/dafp/cepd/crp.htm

The following discussions identify the range of anticipated managed lands impacts associated for the four Section 4 Alternatives associated with the initial design criteria and the low-cost design criteria. Initial design criteria impacts are presented first, and low-cost design criteria impacts are presented in parentheses. Figures which depict the relationships of managed lands to the Section 4 Alternatives are referenced in the following discussions. Parcels shaded yellow are enrolled in CRP. Parcels shaded green are enrolled in CFWP.

Managed Land Property 1 (**Figure 5.22-1**, p. 5-755) is approximately 38.76 acres in size and accessed via CR 200E and CR 215E in Greene County. The property is enrolled in the IDNR Classified Forest and Wildlands Program (CFWP), with approximately 26.72 managed acres within the Section 4 corridor. All Section 4 Alternatives would impact the property.

Alternatives 1, 2 and 4 will require the acquisition of 3.20 managed acres (2.24) for right-of-way. The managed acres will not be fragmented. Approximately 35.56 managed acres (36.52) would remain north of the Interstate and would continue to be accessible from CR 200E and CR 215E. The remaining managed land is greater than 10 acres in size, and therefore is eligible to remain in the CFWP.

Alternative 3 will require the acquisition of 7.82 managed acres (6.30) for right-of-way. The managed acres will be severed. Approximately 23.94 managed acres (24.82) would remain north of the Interstate and would continue to be accessible from CR 200E and CR 215E. The remaining managed land is greater than 10 acres in size, and therefore is eligible to remain in the CFWP. Approximately 7.00 managed acres (7.64) would remain south of the Interstate and would continue to be accessible from CR 215E. The remaining managed land is less than 10 acres in size, and therefore is ineligible to remain in the CFWP.

Refined Preferred Alternative 2 will require the acquisition of 3.18 managed acres (2.23) for right-of-way. The managed acres will not be fragmented. Approximately 35.58 managed acres (36.53) would remain north of the Interstate and would continue to be accessible from CR 200E and CR 215E. The remaining managed land is greater than 10 acres in size, and therefore is eligible to remain in the CFWP.

Managed Land Property 2 (**Figure 5.22-2**, p. 5-755) is approximately 14.52 acres in size and accessed via CR 315E and CR 600S in Greene County. The property is enrolled in the Conservation Reserve Program (CRP), with approximately 3.84 managed acres within the Section 4 corridor. All Section 4 Alternatives would impact the property equally as the alternatives share a common alignment in this location.

All Alternatives would require the acquisition of 2.88 managed acres (2.53) for right-of-way. The managed acres will be severed. Approximately 0.01 managed acres (0.02) will remain east of the interstate and will not be accessible. Approximately 11.63 managed acres (11.97) will remain west of the interstate and will be accessible from the existing access location.

Managed Land Property 3 (**Figure 5.22-2**, p. 5-755) is approximately 28.27 acres in size and accessed via CR 315E in Greene County. The property is enrolled in the CFWP, with approximately 17.61 managed acres within the Section 4 corridor. None of the Section 4

Alternatives will require the acquisition of right-of-way from this property. The property will no longer be accessible from the current access location.

Managed Land Property 4 (**Figure 5.22-2**, p. 5-755) is approximately 55.01 acres in size and accessed via SR 58/SR 45, in Greene County. The property is enrolled in the CFWP with approximately 24.66 managed acres within the Section 4 corridor. None of the Section 4 Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 5 (**Figure 5.22-2**, p. 5-755) is approximately 34.61 acres in size and accessed via CR 600S in Greene County. The property is enrolled in the CRP, with approximately 24.21 managed acres within the Section 4 corridor. None of the Section 4 Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 6 (**Figure 5.22-3**, p. 5-756) is approximately 3.63 acres in size and accessed via CR 425S in Greene County. The property is enrolled in the CFWP, with approximately 2.45 managed acres within the Section 4 corridor. None of the Section 4 Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 7 (**Figure 5.22-3**, p. 5-756) is approximately 21.88 acres in size and accessed via CR 450S and CR 475E in Greene County. The property is enrolled in the CFWP, with approximately 0.09 managed acres within the Section 4 corridor. None of the Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 8 (**Figure 5.22-3**, p. 5-756) is approximately 1.29 acres in size and accessed via CR 440E in Greene County. The property is enrolled in the CRP and is located entirely within the Section 4 corridor. None of the Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 9 (**Figure 5.22-3**, p. 5-756) is approximately 12.03 acres in size and accessed via CR 440E in Greene County. The property is enrolled in the CRP, with approximately 1.44 managed acres within the Section 4 corridor. None of the Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 10 (**Figure 5.22-3**, p. 5-756) is approximately 48.68 acres in size and accessed via CR 450S and CR 475E in Greene County. The property is enrolled in the CRP, with approximately 34.63 managed acres within the Section 4 corridor. All Section 4 Alternatives would impact the property.

Alternatives 1 and 4 will require the acquisition of 15.10 managed acres (10.14) for right-of-way. The managed acres will be severed. Approximately 18.61 managed acres (21.09) will remain north of the interstate and will continue to be accessible. Approximately 14.97 managed acres (17.45) will remain south of the interstate and will continue to be accessible.

Alternatives 2 and 3 will require the acquisition of 1.66 managed acres (1.65) for right-of-way. The managed acres will not be severed. Approximately 47.02 managed acres (47.03) will remain north of the interstate and will continue to be accessible.

Refined Preferred Alternative 2 will require the acquisition of 1.66 managed acres (1.66) for right-of-way. The managed acres will not be severed. Approximately 47.02 managed acres (47.02) will remain north of the interstate and will continue to be accessible.

Managed Land Property 11 (**Figure 5.22-3**, p. 5-756) is approximately 19.47 acres in size and accessed via CR 440E in Greene County. The property is enrolled in the CFWP and is located entirely within the Section 4 corridor. All Section 4 Alternatives will impact the property.

Alternatives 1 and 4 will require the acquisition of 2.14 managed acres (1.16) for right-of-way. The managed acres will not be severed. Approximately 17.33 managed acres (18.31) will remain south of the interstate and will continue to be accessible. The remaining CFWP managed land is greater than 10 acres in size, and therefore is eligible to remain in the program.

Alternatives 2, 3 and Refined Preferred Alternative 2 will require the acquisition of 3.54 managed acres (2.33) for right-of-way. The managed acres will not be severed. Approximately 15.93 managed acres (17.14) will remain north of the interstate and will continue to be accessible. The remaining CFWP managed land is greater than 10 acres in size, and therefore is eligible to remain in the program.

Managed Land Property 12 (**Figure 5.22-3**, p. 5-756) is approximately 31.14 acres in size and accessed via CR 450S and CR 475E in Greene County. The property is enrolled in the CRP, with approximately 26.73 managed acres within the Section 4 corridor.

Alternatives 1 and 4 will require the acquisition of 14.23 managed acres (8.47) for right-of-way. The managed acres will be severed. Approximately 5.41 managed acres (8.40) will remain north of the interstate and will continue to be accessible. Approximately 11.50 managed acres (14.27) will remain south of the interstate and will continue to be accessible.

Alternatives 2 and 3 will require the acquisition of 1.93 managed acres (1.38) for right-of-way. The managed acres will not be severed. Approximately 29.21 managed acres (29.76) will remain north of the interstate and will continue to be accessible.

Refined Preferred Alternative 2 will require the acquisition of 1.94 managed acres (1.38) for right-of-way. The managed acres will not be severed. Approximately 29.20 managed acres (29.76) will remain north of the interstate and will continue to be accessible.

Managed Land Property 13 (**Figure 5.22-3**, p. 5-756) is approximately 20.49 acres in size and accessed via CR 450S in Greene County. The property is enrolled in the CFWP, with approximately 14.69 managed acres within the Section 4 corridor.

Alternatives 1 and 4 will require the acquisition of 9.99 managed acres (5.45) for right-of-way. The managed acres will be severed. Approximately 6.22 managed acres (8.81) will remain north of the interstate and will continue to be accessible. The remaining CFWP managed land is less

than 10 acres in size, and therefore is ineligible to remain in the program. Approximately 4.28 managed acres (6.23) will remain south of the interstate and will not be accessible. The remaining CFWP managed land is less than 10 acres in size, and therefore is ineligible to remain in the program.

Alternatives 2, 3 and Refined Preferred Alternative 2 will require the acquisition of 0.35 managed acres (0.00) for right-of-way. The managed acres will not be severed. Approximately 20.14 managed acres (20.49) will remain north of the interstate and will continue to be accessible. The remaining CFWP managed land is greater than 10 acres in size, and therefore is eligible to remain in the program.

Managed Land Property 14 (**Figure 5.22-4**, p. 5-756) is approximately 23.94 acres in size and accessed via CR 400S in Greene County. The property is enrolled in the CFWP, with approximately 16.61 managed acres within the Section 4 corridor.

All Alternatives will require the acquisition of 0.19 managed acres (0.04) for right-of-way. The managed acres will not be severed. Approximately 23.75 managed acres (23.90) remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the Interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 15 (**Figure 5.22-4**, p. 5-756) is approximately 36.06 acres in size and located to the southeast of Managed Land Property 14, approximately 0.5 mile east of CR 600E in Greene County. The property has no apparent direct access. The property is enrolled in the CFWP, with approximately 24.31 managed acres within the Section 4 corridor.

Alternatives 1 through 4 will require the acquisition of 11.49 managed acres (7.93) for right-of-way. The managed acres will not be severed. Approximately 24.57 managed acres (28.13) remain south of the interstate. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 11.49 managed acres (7.95) for right-of-way. The managed acres will not be severed. Approximately 24.57 managed acres (28.11) remain south of the interstate. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 16 (**Figure 5.22-4**, p. 5-756) is approximately 65.74 acres in size and located to the east of Managed Land Property 15, approximately 0.75 mile east of CR 600E in Greene County. The property has no apparent direct access. The property is enrolled in the CFWP, with approximately 23.51 managed acres within the Section 4 corridor.

Alternatives 1 through 4 will require the acquisition of 7.88 managed acres (5.08) for right-of-way. The managed acres will not be severed. Approximately 57.86 managed acres (60.66) remain south of the interstate. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 7.89 managed acres (5.10) for right-of-way. The managed acres will not be severed. Approximately 57.85 managed acres

(60.64) remain south of the interstate. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 17 (**Figure 5.22-5**, p. 5-757) is approximately 143.87 acres in size and accessed via CR 610E in Greene County. The property is enrolled in the CFWP, with approximately 99.77 managed acres within the Section 4 corridor.

All Alternatives will require the acquisition of 28.15 managed acres (20.03) for right-of-way. The managed acres will be severed. Approximately 34.41 managed acres (37.20) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 81.31 managed acres (86.64) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 18 (**Figure 5.22-5**, p. 5.22-623) is approximately 100.38 acres in size and accessed via CR 750E in Greene County. The property is enrolled in the CFWP, with approximately 22.98 managed acres within the Section 4 corridor. None of the Section 4 Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 19 (**Figure 5.22-5**, p. 5-757) is approximately 40.00 acres in size and accessed via CR 360S in Greene County. The property is enrolled in the CFWP, with approximately 29.63 managed acres within the Section 4 corridor.

Alternatives 1 through 4 will require the acquisition of 15.41 managed acres (10.66) for right-of-way. The managed acres will be severed. Approximately 17.95 managed acres (20.09) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 6.64 managed acres (9.25) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 15.41 managed acres (10.67) for right-of-way. The managed acres will be severed. Approximately 17.95 managed acres (20.09) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 6.64 managed acres (9.24) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Managed Land Property 20 (**Figure 5.22-5**, p. 5-757) is approximately 45.09 acres in size and accessed via CR 750E in Greene County. The property is enrolled in the CFWP, with approximately 27.30 managed acres within the Section 4 corridor. None of the Section 4 Alternatives will require the acquisition of right-of-way from this property, nor will they affect access.

Managed Land Property 21 (**Figure 5.22-6**, p. 5-757) is approximately 92.57 acres in size and accessed via CR 920E in Greene County. The property is enrolled in the CFWP, with approximately 54.80 managed acres within the Section 4 corridor.

All Alternatives will require the acquisition of 0.86 managed acres (0.87) for right-of-way. The managed acres will not be severed. Approximately 91.71 managed acres (91.70) will remain south of the interstate and will continue to be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 22 (**Figure 5.22-6**, p. 5-757) is approximately 101.90 acres in size and accessed via CR 400S in Greene County. The property is enrolled in the CFWP, with approximately 33.42 managed acres within the Section 4 corridor.

All Alternatives will require the acquisition of 1.03 managed acres (0.34) for right-of-way. The managed acres will not be severed. Approximately 100.87 managed acres (101.56) will remain south of the interstate and will continue to be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 23 (**Figure 5.22-6**, p. 5-757) is approximately 72.36 acres in size and accessed via CR 300S in Greene County. The property is enrolled in the CFWP, with approximately 42.71 managed acres within the Section 4 corridor.

All Alternatives will require the acquisition of 15.48 managed acres (11.21) for right-of-way. The managed acres will be severed. Approximately 43.89 managed acres (45.71) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 12.99 managed acres (15.44) will remain south of the interstate and will not be accessible from the existing access location. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 24 (**Figure 5.22-6**, p. 5-757) is approximately 35.00 acres in size and accessed via CR 300S in Greene County. The property is enrolled in the CFWP, with approximately 27.31 managed acres within the Section 4 corridor.

Alternatives 1 through 4 will require the acquisition of 10.56 managed acres (9.38) for right-of-way. The managed acres will be severed. Approximately 15.27 managed acres (15.35) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 9.17 managed acres (10.27) will remain south of the interstate and will not be accessible from the existing access location. Under the initial design criteria, the remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program. Under the low-cost design criteria, the remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 10.57 managed acres (9.38) for right-of-way. The managed acres will be severed. Approximately 15.27 managed acres (15.35)

will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 9.16 managed acres (10.27) will remain south of the interstate and will not be accessible from the existing access location. Under the initial design criteria, the remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program. Under the low-cost design criteria, the remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 25 (**Figure 5.22-7**, p. 5-758) is approximately 100.00 acres in size and accessed via SR 45 in Greene County. The property is enrolled in the CFWP, with approximately 24.27 managed acres within the Section 4 corridor.

Alternatives 1 through 4 will require the acquisition of 4.16 managed acres (3.64) for right-of-way. The managed acres will be severed under the low-cost design criteria. Approximately 95.84 managed acres (96.28) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Under the low-cost design criteria, the remnant south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 4.10 managed acres (3.64) for right-of-way. The managed acres will be severed. Approximately 95.88 managed acres (96.28) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 0.02 managed acres (0.08) will remain south of the interstate and will continue to be accessible. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Managed Land Property 26 (**Figure 5.22-7**, p. 5-758) is approximately 80.00 acres in size and accessed via SR 45 in Greene County. The property is enrolled in the CFWP, with approximately 79.20 managed acres within the Section 4 corridor.

Alternatives 1 through 4 will require the acquisition of 37.23 managed acres (33.72) for right-of-way. The managed acres will be severed. Approximately 12.80 managed acres (14.70) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 29.97 managed acres (31.58) will remain south of the interstate and will not be accessible from the existing access location. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternatives 2 will require the acquisition of 37.31 managed acres (33.82) for right-of-way. The managed acres will be severed. Approximately 12.70 managed acres (14.60) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 29.99 managed acres (31.58) will remain south of the

interstate and will not be accessible from the existing access location. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 27 (**Figure 5.22-7**, p. 5-758) is approximately 60.00 acres in size and located to the east of Managed Land Property 25, approximately 0.32 mile east of SR 45 in Greene County. The property has no apparent direct access. The property is enrolled in the CFWP, with approximately 2.89 managed acres within the Section 4 corridor. None of the Section 4 Alternatives will require the acquisition of right-of-way from this property.

Managed Land Property 28 (**Figure 5.22-8**, p. 5-758) is approximately 80.31 acres in size and accessed via CR 400S in Greene County. The property is enrolled in the CFWP, with approximately 21.14 managed acres within the Section 4 corridor. None of the Section 4 Alternatives will require the acquisition of right-of-way from this property.

Managed Land Property 29 (**Figure 5.22-9**, p. 5-759) is approximately 58.26 acres in size and accessed via CR 1250E in Greene County. The property is enrolled in the CFWP, with approximately 40.75 managed acres within the Section 4 corridor.

Alternatives 1 through 4 will require the acquisition of 19.11 managed acres (12.03) for right-of-way. The managed acres will be severed. Approximately 9.78 managed acres (14.99) will remain north of the Interstate and will continue to be accessible. Under the initial design criteria, the remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Under the low-cost design criteria, the remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 29.37 managed acres (31.24) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 16.24 managed acres (12.03) for right-of-way. The managed acres will be severed. Approximately 12.25 managed acres (14.99) will remain north of the Interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 29.77 managed acres (31.24) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 30 (**Figure 5.22-10**, p. 5-759) is approximately 30.94 acres in size and accessed via CR 150N in Greene County. The property is enrolled in the CFWP, and is not located within the Section 4 corridor. This property is located within the area studied for a potential interchange in the vicinity of the Greene County/Monroe County line.

Alternative 1 will require the acquisition of 9.94 managed acres (9.13) for right-of-way. The managed acres will be severed. Approximately 3.68 managed acres (4.18) will remain north of the interstate and will not be accessible. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 17.32 managed acres (17.63) will remain south of the interstate and will not be

accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 2 and Refined Preferred Alternative 2 will require the acquisition of 10.01 managed acres (9.15) for right-of-way. The managed acres will be severed. Approximately 3.78 managed acres (4.25) will remain north of the interstate and will not be accessible. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 17.15 managed acres (17.54) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 3 will require the acquisition of 9.80 managed acres (9.35) for right-of-way. The managed acres will be severed. Approximately 3.81 managed acres (4.19) will remain north of the interstate and will not be accessible. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 17.33 managed acres (17.40) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 4 will require the acquisition of 10.30 managed acres (9.07) for right-of-way. The managed acres will be severed. Approximately 3.81 managed acres (4.18) will remain north of the interstate and will not be accessible. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 16.83 managed acres (17.69) will remain south of the interstate and will not be accessible. The remaining managed CFWP land south of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 31 (**Figure 5.22-10**, p. 5-759) is approximately 17.49 acres in size and located approximately 0.1 mile north of CR 150N in Greene County. The property has no apparent direct access. The property is enrolled in the CFWP, and is not located within the Section 4 corridor. This property is located within the area studied for a potential interchange in the vicinity of the Greene County/Monroe County line.

Alternative 1 will require the acquisition of 9.21 managed acres (8.10) for right-of-way. The managed acres will be severed. Approximately 3.25 managed acres (3.75) will remain north of the interstate. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 5.03 managed acres (5.64) will remain south of the interstate. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Alternative 2 will require the acquisition of 9.43 managed acres (8.48) for right-of-way. The managed acres will be severed. Approximately 4.92 managed acres (5.40) will remain north of the interstate. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 3.14 managed acres (3.61) will remain south of the interstate. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Alternative 3 will require the acquisition of 8.86 managed acres (8.47) for right-of-way. The managed acres will be severed. Approximately 5.40 managed acres (5.53) will remain north of the interstate and will not be accessible. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 3.23 managed acres (3.49) will remain south of the interstate and will continue to be accessible. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Alternative 4 will require the acquisition of 8.80 managed acres (7.36) for right-of-way. The managed acres will be severed. Approximately 3.46 managed acres (4.76) will remain north of the interstate. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 5.23 managed acres (5.37) will remain south of the interstate. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 9.43 managed acres (8.49) for right-of-way. The managed acres will be severed. Approximately 4.92 managed acres (5.40) will remain north of the interstate. The remaining managed CFWP land north of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 3.14 managed acres (3.60) will remain south of the interstate. The remaining managed CFWP land south of the interstate will be less than 10 acres in size and ineligible to remain in the program.

Managed Land Property 32 (**Figure 5.22-11**, p. 5-760) is approximately 183.94 acres in size and accessed via CR 1375E in Greene County. The property is enrolled in the CFWP, with approximately 171.30 managed acres within the Section 4 corridor.

Alternative 1 will require the acquisition of 23.34 managed acres (17.02) for right-of-way. The managed acres will be severed. Approximately 36.29 managed acres (39.82) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 124.31 managed acres (127.10) will remain west of the interstate and will not be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 2 will require the acquisition of 25.46 managed acres (18.42) for right-of-way. The managed acres will be severed. Approximately 126.48 managed acres (129.12) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 32.00 managed acres (36.40) will remain west of the interstate and will not be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 3 will require the acquisition of 24.00 managed acres (16.65) for right-of-way. The managed acres will be severed. Approximately 36.11 managed acres (39.86) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Approximately 123.83 managed acres (127.43) will remain west of the interstate and will not be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and ineligible to remain in the program.

Alternative 4 will require the acquisition of 24.73 managed acres (17.87) for right-of-way. The managed acres will be severed. Approximately 126.62 managed acres (129.77) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 32.59 managed acres (36.30) will remain west of the interstate and will not be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 25.47 managed acres (18.28) for right-of-way. The managed acres will be severed. Approximately 126.48 managed acres (129.26) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 31.99 managed acres (36.40) will remain west of the interstate and will not be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 33 (**Figure 5.22-10**, p. 5-759) is approximately 65.54 acres in size and located to the northeast of Managed Land Property 31, approximately 0.17 mile north of CR 150N in Greene County. The property has no apparent direct access. The property is enrolled in the CFWP, and is not located within the Section 4 corridor. This property is located within the area studied for a potential interchange in the vicinity of the Greene County/Monroe County line.

Alternative 1 will require the acquisition of 1.21 managed acres (1.07) for right-of-way. The managed acres will not be severed. Approximately 64.33 managed acres (64.47) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land north of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 2 and Refined Preferred Alternative 2 will require the acquisition of 0.62 managed acres (0.35) for right-of-way. The managed acres will not be severed. Approximately 64.92 managed acres (65.19) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 3 will require the acquisition of 0.44 managed acres (0.46) for right-of-way. The managed acres will not be severed. Approximately 65.10 managed acres (65.08) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 4 will require the acquisition of 1.21 managed acres (1.32) for right-of-way. The managed acres will not be severed. Approximately 64.33 managed acres (64.22) will remain north of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 34 (**Figure 5.22-10**, p. 5-759) is approximately 29.02 acres in size and accessed via CR 150N in Greene County. The property is enrolled in the CFWP, with approximately 19.38 managed acres within the Section 4 corridor.

Alternative 1 will require the acquisition of 8.06 managed acres (8.68) for right-of-way. The managed acres will not be severed. Approximately 20.96 managed acres (20.34) will remain west of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 2 will require the acquisition of 11.22 managed acres (10.66) for right-of-way. The managed acres will be severed. Approximately 1.68 managed acres (1.72) will remain east of the interstate and will not be accessible. The remaining managed CFWP land east of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 16.12 managed acres (16.64) will remain west of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 3 will require the acquisition of 10.31 managed acres (9.16) for right-of-way. The managed acres will be severed. Approximately 1.49 managed acres (1.69) will remain east of the interstate and will not be accessible. The remaining managed CFWP land east of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 17.22 managed acres (18.17) will remain west of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 4 will require the acquisition of 9.91 managed acres (10.10) for right-of-way. The managed acres will not be severed. Approximately 19.11 managed acres (18.92) will remain west of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 11.22 managed acres (10.72) for right-of-way. The managed acres will be severed. Approximately 1.68 managed acres (1.66) will remain east of the interstate and will not be accessible. The remaining managed CFWP land east of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 16.12 managed acres (16.64) will remain west of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 35 (**Figure 5.22-10**, p. 5-759) is approximately 76.71 acres in size and accessed via Carter Road in Greene County. The property is enrolled in the CFWP and is located entirely within the Section 4 corridor.

Alternative 1 will require the acquisition of 10.71 managed acres (9.37) for right-of-way. The managed acres will be severed. Approximately 50.42 managed acres (50.85) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 15.58 managed acres (16.49) will remain west of the interstate and will not be

accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 2 and Refined Preferred Alternative 2 will require the acquisition of 5.28 managed acres (3.51) for right-of-way. The managed acres will not be severed. Approximately 71.43 managed acres (73.20) will remain west of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 3 will require the acquisition of 6.39 managed acres (3.78) for right-of-way. The managed acres will not be severed. Approximately 70.32 managed acres (72.93) will remain west of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 4 will require the acquisition of 9.56 managed acres (7.65) for right-of-way. The managed acres will be severed. Approximately 50.88 managed acres (51.51) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be greater than 10 acres in size and eligible to remain in the program. Approximately 16.27 managed acres (17.55) will remain west of the interstate and will not be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 36 (**Figure 5.22-10**, p. 55-759) is approximately 28.49 acres in size and accessed via Carter Road in Greene County. The property is enrolled in the CFWP and is located entirely within the Section 4 corridor.

Alternative 1 will require the acquisition of 5.56 managed acres (4.15) for right-of-way. The managed acres will not be severed. Approximately 22.93 managed acres (24.34) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 2 will require the acquisition of 10.95 managed acres (8.76) for right-of-way. The managed acres will be severed. Approximately 7.97 managed acres (9.67) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 9.57 managed acres (10.06) will remain west of the interstate and will not be accessible. Under the initial design criteria, the remaining managed CFWP land west of the interstate will be less than 10 acres in size and ineligible to remain in the program. Under the low-cost design criteria, the remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 3 will require the acquisition of 12.01 managed acres (9.00) for right-of-way. The managed acres will be severed. Approximately 8.08 managed acres (9.36) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 8.40 managed acres (10.13) will remain west of the Interstate and will not be accessible. Under the initial design criteria, the remaining managed CFWP land west of the

interstate will be less than 10 acres in size and ineligible to remain in the program. Under the low-cost design criteria, the remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Alternative 4 will require the acquisition of 5.15 managed acres (4.08) for right-of-way. The managed acres will not be severed. Approximately 23.34 managed acres (24.41) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Refined Preferred Alternative 2 will require the acquisition of 10.95 managed acres (8.39) for right-of-way. The managed acres will be severed. Approximately 7.97 managed acres (9.66) will remain east of the interstate and will continue to be accessible. The remaining managed CFWP land east of the interstate will be less than 10 acres in size and ineligible to remain in the program. Approximately 9.57 managed acres (10.44) will remain west of the interstate and will not be accessible. Under the initial design criteria, the remaining managed CFWP land west of the interstate will be less than 10 acres in size and ineligible to remain in the program. Under the low-cost design criteria, the remaining managed CFWP land west of the interstate will be greater than 10 acres in size and eligible to remain in the program.

Managed Land Property 37 is not considered a managed land in this FEIS, based upon information provided to the project team by the property owner subsequent to the August 26, 2010 DEIS public hearing. Therefore, no impacts are reported.

Managed Land Property 38 (**Figure 5.22-12**, p. 5-760) is approximately 65.49 acres in size and accessed via Victor Pike in Monroe County. The property is enrolled in the CRP, with approximately 61.66 managed acres within the Section 4 corridor.

Alternative 1 will require the acquisition of 19.89 managed acres (17.93) for right-of-way. The managed acres will be severed. Approximately 36.73 managed acres (37.39) will remain east of the interstate and will continue to be accessible. Approximately 8.87 managed acres (10.17) will remain west of the interstate and will not be accessible.

Alternative 2 will require the acquisition of 14.05 managed acres (12.36) for right-of-way. The managed acres will be severed. Approximately 23.39 managed acres (24.25) will remain east of the interstate and will continue to be accessible. Approximately 28.05 managed acres (28.88) will remain west of the interstate and will not be accessible.

Alternative 3 will require the acquisition of 14.03 managed acres (12.48) for right-of-way. The managed acres will be severed. Approximately 23.42 managed acres (24.13) will remain east of the interstate and will continue to be accessible. Approximately 28.04 managed acres (28.88) will remain west of the interstate and will not be accessible.

Alternative 4 will require the acquisition of 14.05 managed acres (12.36) for right-of-way. The managed acres will be severed. Approximately 23.39 managed acres (24.25) will remain east of the interstate and will continue to be accessible. Approximately 28.05 managed acres (28.88) will remain west of the interstate and will not be accessible.

Refined Preferred Alternative 2 will require the acquisition of 14.05 managed acres (12.37) for right-of-way. The managed acres will be severed. Approximately 23.39 managed acres (24.25) will remain east of the interstate and will continue to be accessible. Approximately 28.05 managed acres (28.87) will remain west of the interstate and will not be accessible.

Managed Land Property 39 (**Figure 5.22-12**, p. 5-760) is approximately 34.24 acres in size and accessed via That Road in Monroe County. The property is enrolled in the CRP, with approximately 18.57 managed acres within the Section 4 corridor.

All Alternatives will require the acquisition of 7.35 managed acres (7.34 – Alternative 1 only) for right-of-way. The managed acres will not be severed. Approximately 26.89 managed acres (26.90 – Alternative 1 only) will remain east of the interstate and will continue to be accessible from the existing access location.

The figures presented on the following pages depict managed lands impacts associated with the four Section 4 Alternatives (labeled by number) for two sets of design criteria; initial design criteria (solid lines) and low-cost design criteria (dashed lines). Refined Preferred Alternative 2 is the alternative delineated in pink. Managed land parcels are shaded in color and numbered. CFWP properties are shown in green and CRP properties are shown in yellow.

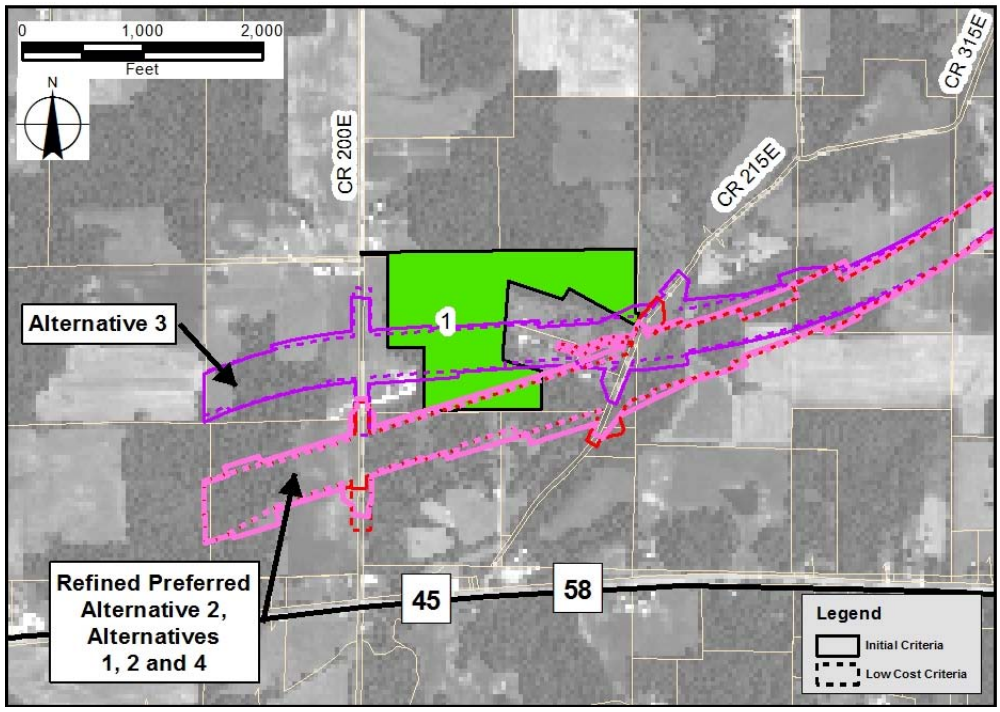

Figure 5.22-1: Managed Land Property 1

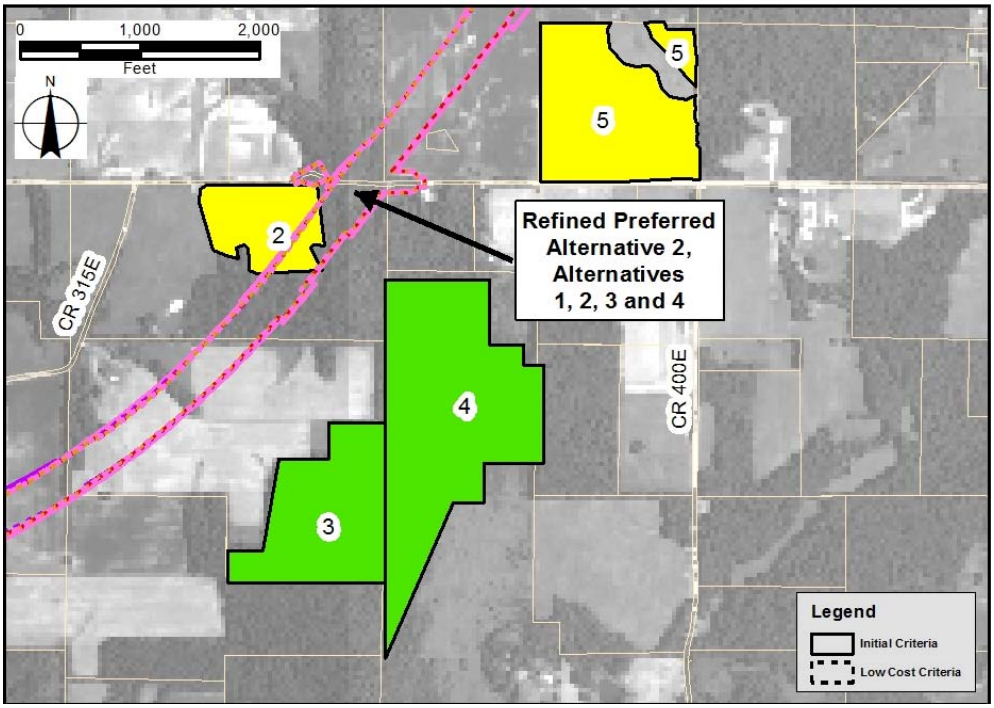

Figure 5.22-2: Managed Land Properties 2, 3, 4 and 5

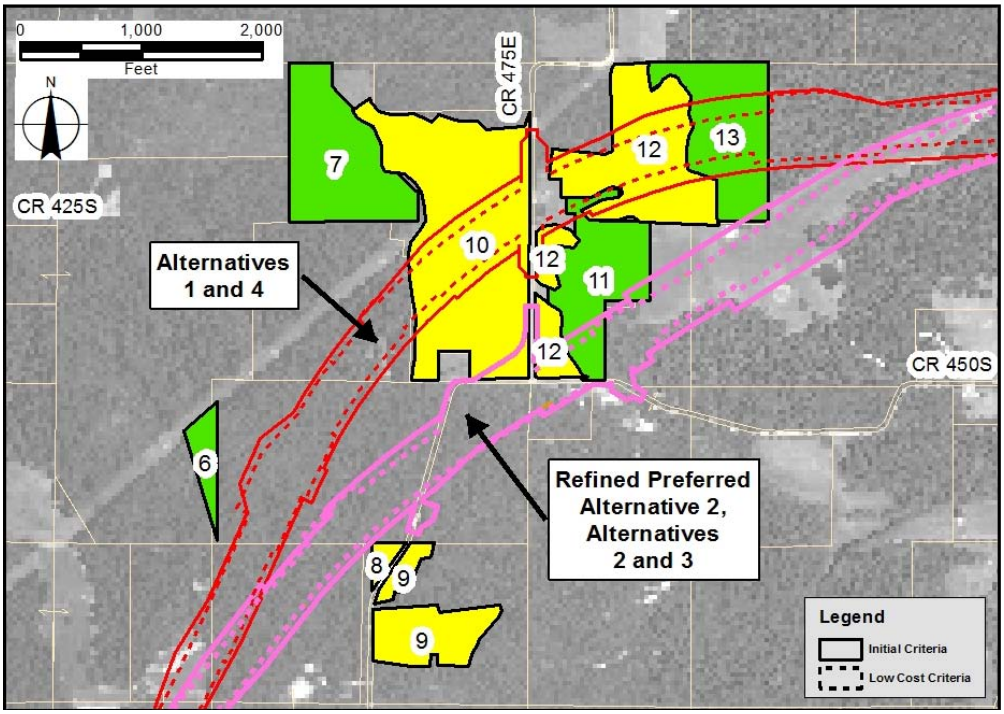

Figure 5.22-3: Managed Land Properties 6, 7, 8, 9, 10, 11, 12 and 13

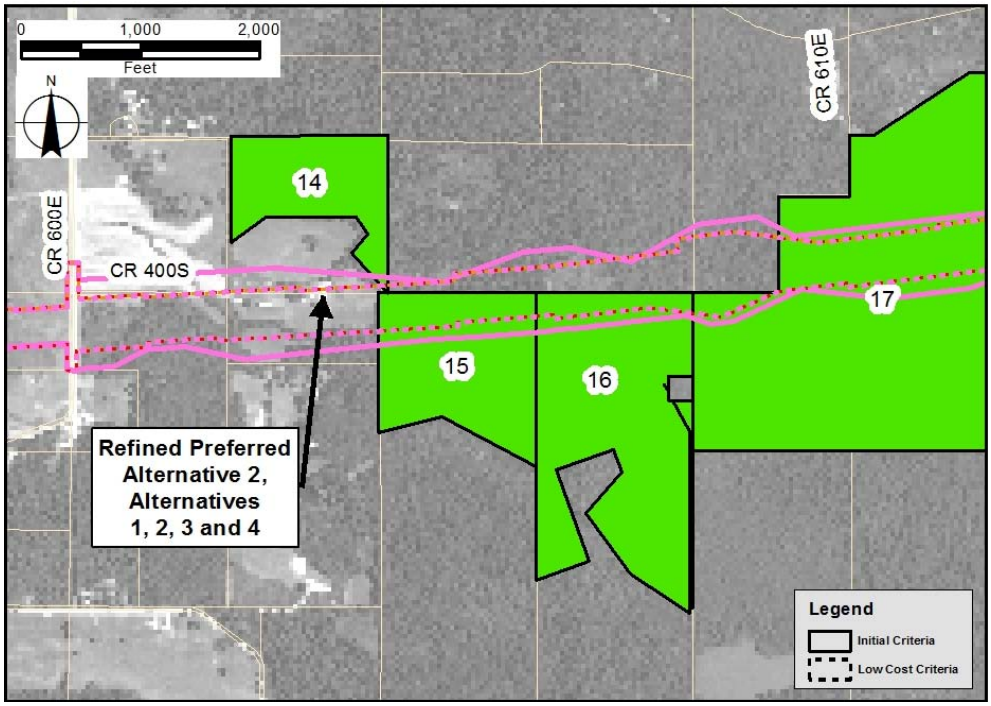

Figure 5.22-4: Managed Land Properties 14, 15 and 16

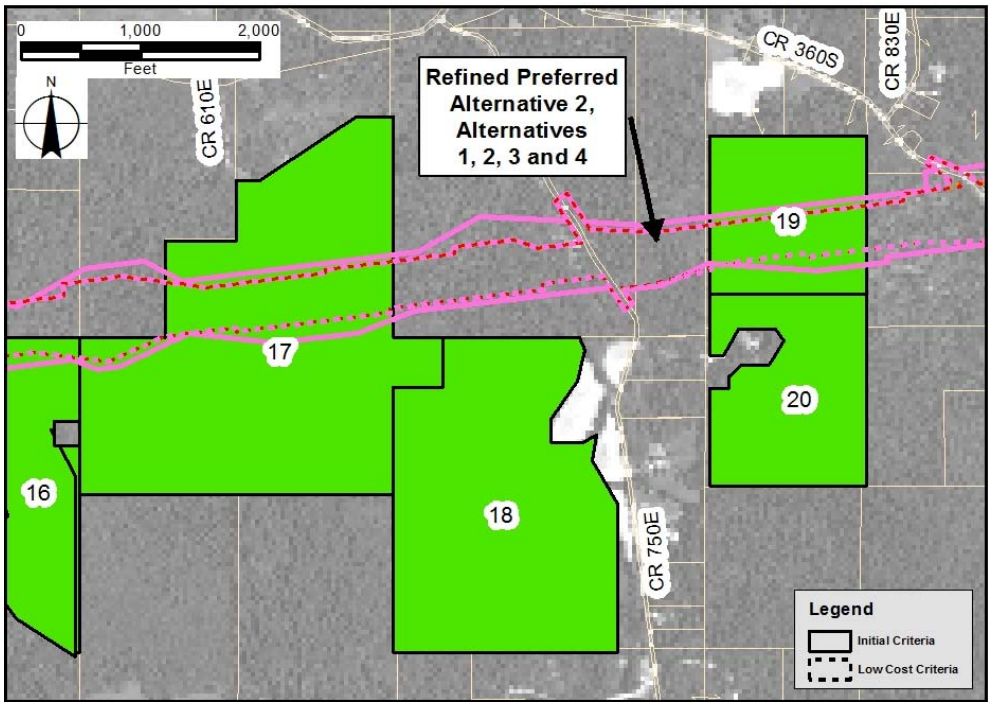

Figure 5.22-5: Managed Land Properties 17, 18, 19 and 20

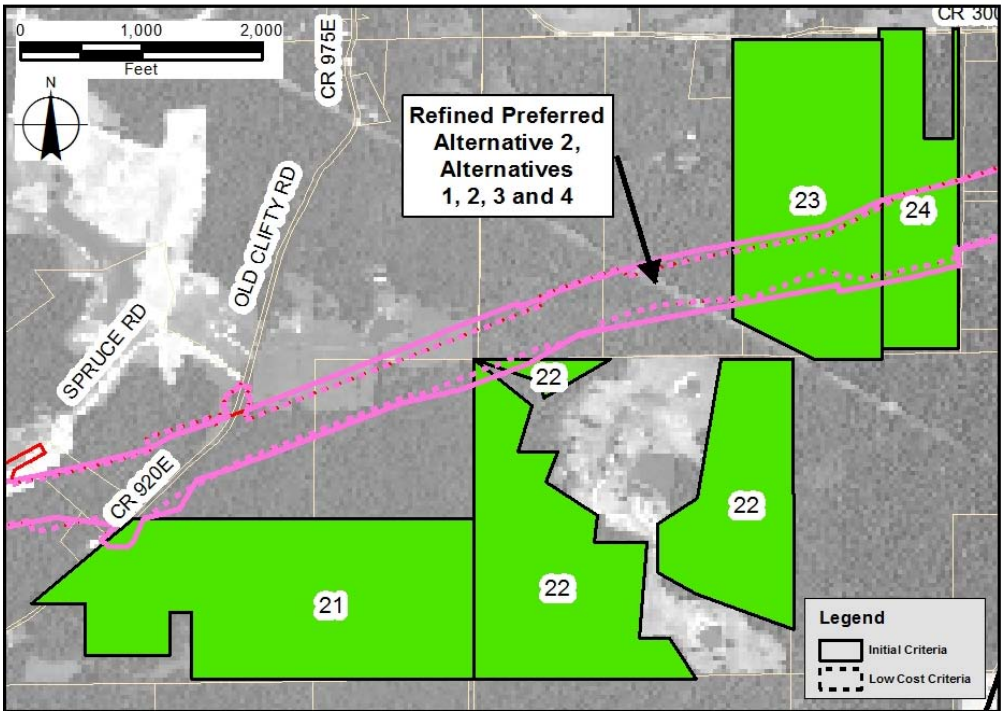

Figure 5.22-6: Managed Land Properties 21, 22, 23 and 24

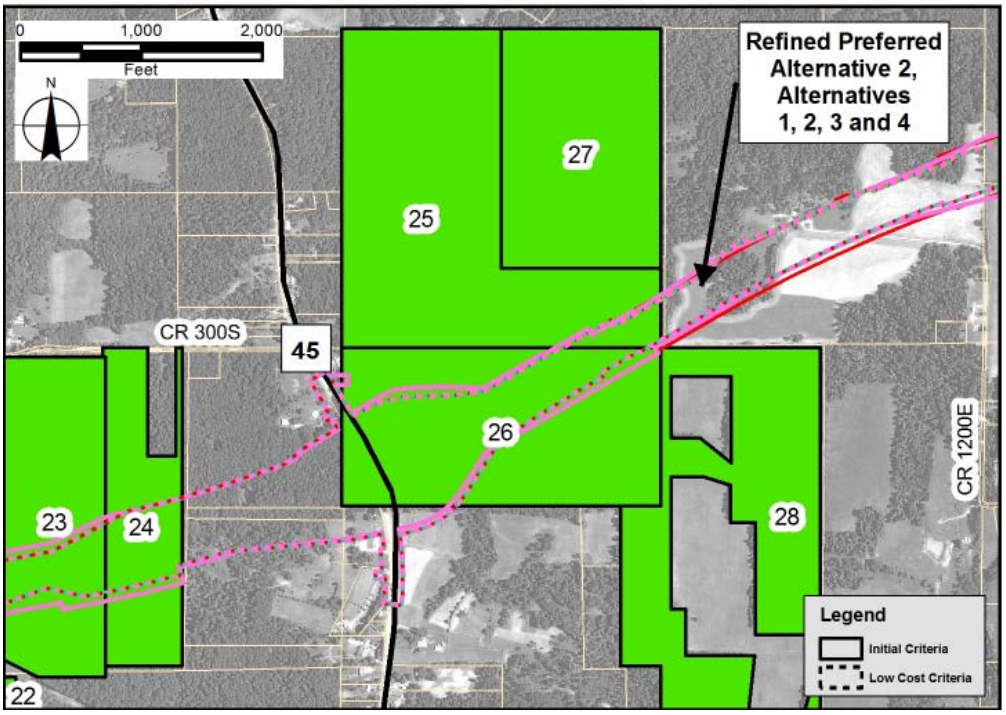

Figure 5.22-7: Managed Land Properties 25, 26 and 27

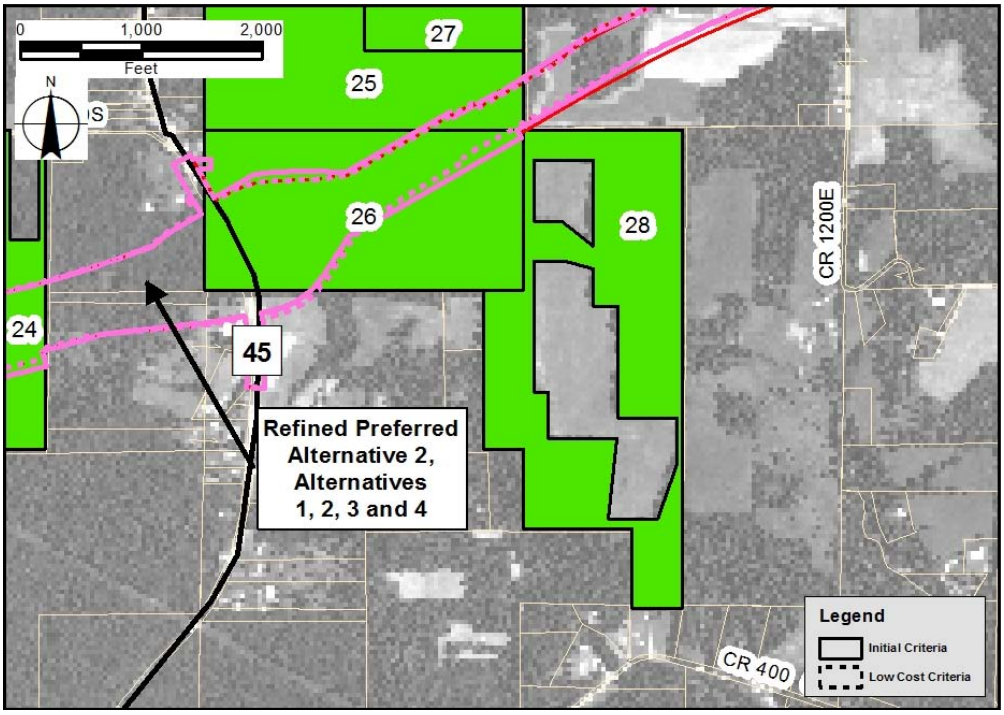

Figure 5.22-8: Managed Land Property 28

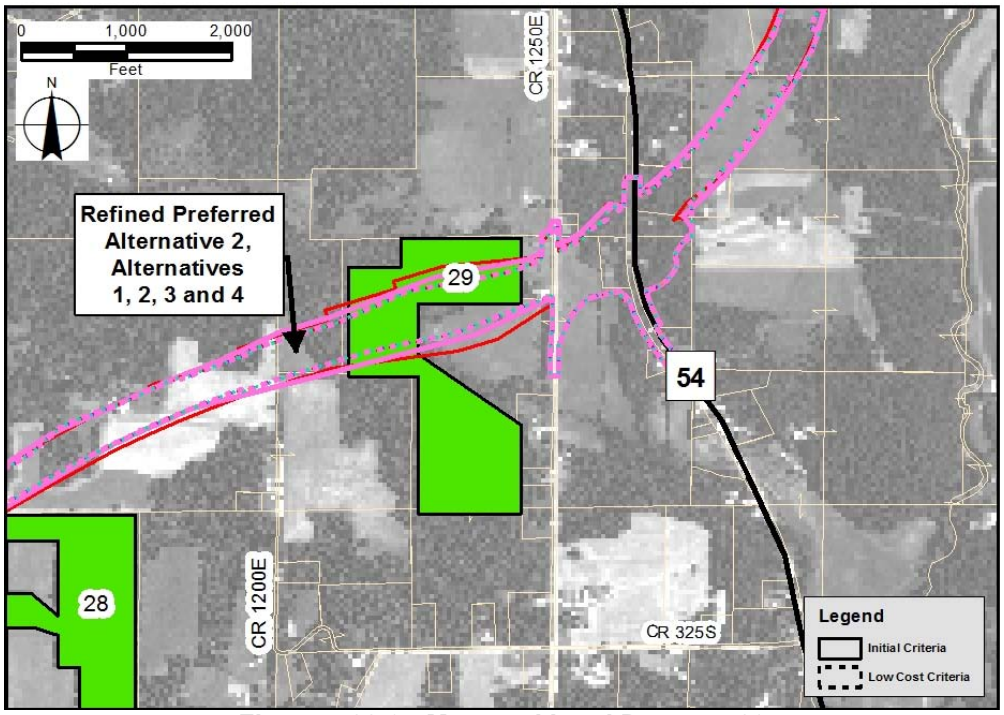

Figure 5.22-9: Managed Land Property 29

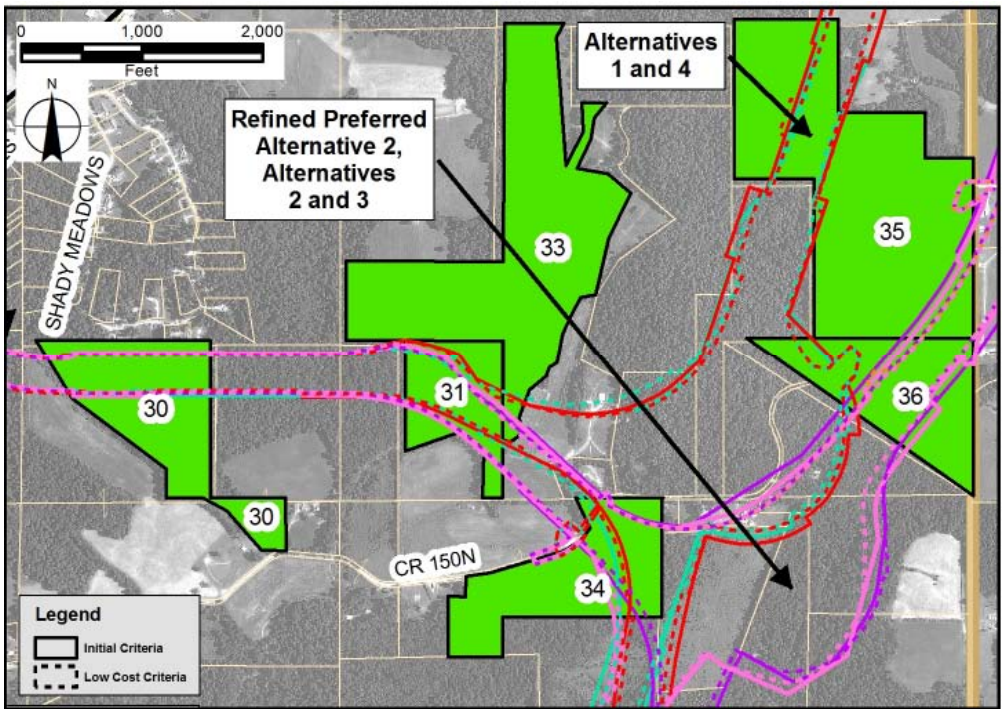

Figure 5.22-10: Managed Land Properties 30, 31, 33, 34, 35 and 36

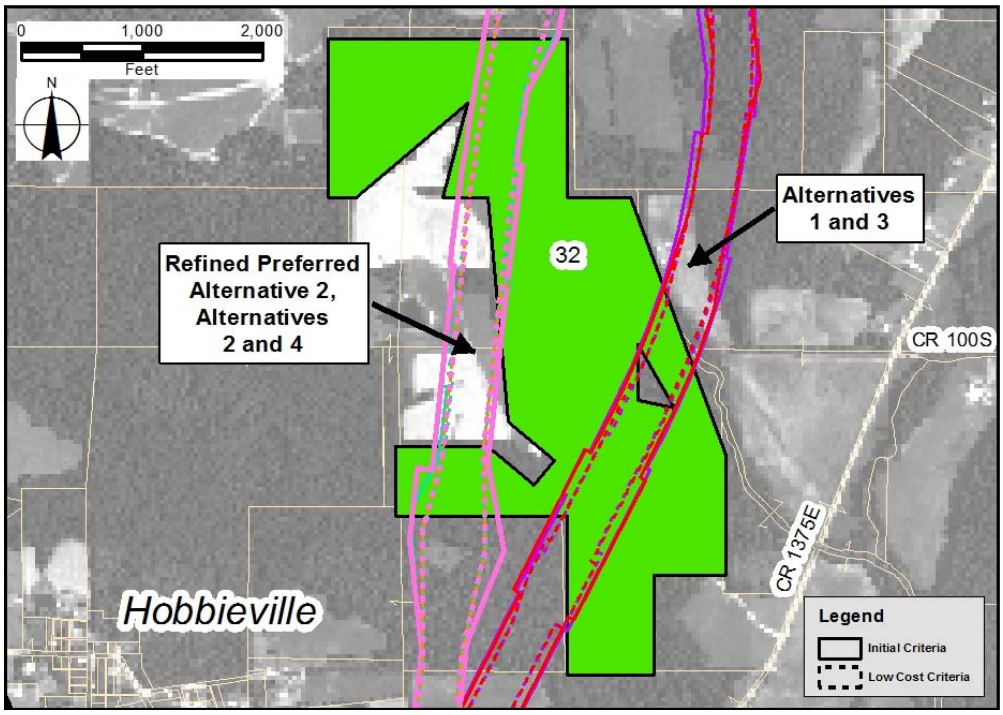

Figure 5.22-11: Managed Land Property 32

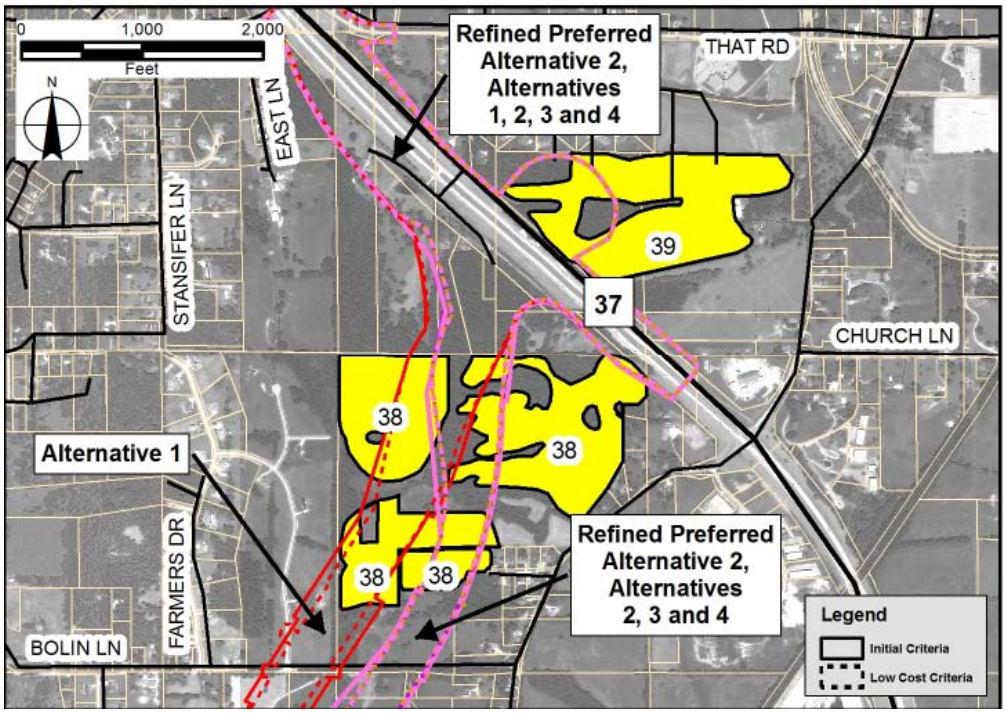

Figure 5.22-12: Managed Land Properties 38 and 39

5.22.4 Mitigation

None of the programs described above involve relinquishment of ownership of the property through dedication of a permanent conservation easement or other method of terminating property rights. The properties are privately-owned and are not officially designated as a park, recreational area, or wildlife or waterfowl refuge; therefore they do not qualify for protection under Section 4(f) of the Department of Transportation Act of 1966, 49 USC 303(c). (See Chapter 8 of this DEIS for a discussion of Section 4(f).) With the exception of any wetland and forest areas within the managed properties, mitigation for impacts to the managed land areas could be accomplished through repayment to the resource agencies of amount associated with each cost-sharing agreement and abiding by other agreement stipulations. These mitigation measures would apply only if the agreements are still in force (i.e., the time stipulated periods have not expired). Mitigation for impacts to wetlands is described in Section 5.19.2, *Surface Waters*, and in Chapter 7, *Mitigation and Commitments.* Mitigation for impacts to forests is described in Section 5.20.4, *Forests*, and in Chapter 7, *Mitigation and Commitments*.

5.22.5 Summary

There are 38 privately-owned managed land properties located throughout the Section 4 corridor. Thirty participate in the IDNR Classified Forest and Wildlands Program. Eight are enrolled in the USDA-NRCS Conservation Reserve Program.

Eleven managed land properties (Nos. 3 – 9, 18, 20, 27 and 28) were avoided by all Section 4 Alternatives. Implementation of the low-cost design criteria would result in a general reduction in the amount of required right-of-way acquisition, but would not avoid the acquisition of right-of-way from any managed lands properties affected by the initial design criteria. All alternatives would require right-of-way acquisition from the remaining twenty-seven managed land properties.

Fifteen managed lands parcels would be impacted about equally, as the alternatives share a common alignment in proximity to these properties. The alternatives will result in a similar number of inaccessible managed land parcel remnants, and will also result in a similar number of CFWP-managed parcels smaller than 10 acres in size that will not be eligible to remain in the program. Implementation of the low-cost design criteria may avoid the creation of CFWP remnants not eligible to remain in the program for managed land property No. 24. Implementation of the low-cost design criteria with Alternatives 2, 3 and Refined Preferred Alternative 2 may avoid the creation of CFWP remnants not eligible to remain in the program for managed land property No. 36. Under the initial design criteria, Refined Preferred Alternative 2 would not result in a CFWP remnant north of the interstate that is ineligible to remain in the program for managed land property 29.

Table 5.22-1 summarizes impacts to managed land properties in the Section 4 corridor. The table identifies the total right-of-way acquisition for each managed land, the amount of managed acres that remain on each side of the interstate, remaining acres that will become inaccessible and CFWP properties with remnants that are under 10 acres in size and not eligible to remain in the program.

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Table 5.22-1 Managed Lands Impacts by Alternative

Managed Land Parcel Number	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
1 – CFWP, 38.76 Managed Acres	2.24	3.20	2.24	3.20	6.30	7.82	2.24	3.20	2.23	3.18
Remnant Managed Ac. North / South	36.52 / N/A	35.56 / N/A	36.52 / N/A	35.56 / N/A	24.82 / 7.64	23.94 / 7.00	36.52 / N/A	35.56 / N/A	36.53 / N/A	35.58 / N/A
2 – CRP, 14.52 Managed Acres	2.53	2.88	2.53	2.88	2.53	2.88	2.53	2.88	2.53	2.88
Remnant Managed Ac. East / West	0.02* / 11.97	0.01* / 11.63	0.02*/ 11.97	0.01* / 11.63	0.02* / 11.97	0.01* / 11.63	0.02* / 11.97	0.01* / 11.63	0.02* / 11.97	0.01* / 11.63
3 – CFWP, 28.27 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4 - CFWP, 55.01 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5 - CRP, 34.61 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6 - CFWP, 3.63 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7 - CFWP, 21.88 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8 - CRP, 1.29 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9 - CRP, 12.03 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10 - CRP, 48.68 Managed Acres	10.14	15.10	1.65	1.66	1.65	1.66	10.14	15.10	1.66	1.66
Remnant Managed Ac. North / South	21.09 / 17.45	18.61 / 14.97	47.03 / N/A	47.02 / N/A	47.03 / N/A	47.02 / N/A	21.09 / 17.45	18.61 / 14.97	47.02 / N/A	47.02 / N/A
11 - CFWP, 19.47 Managed Acres	1.16	2.14	2.33	3.54	2.33	3.54	1.16	2.14	2.33	3.54
Remnant Managed Ac. North / South	N/A / 18.31	N/A / 17.33	17.14 / N/A	15.93 / N/A	17.14 / N/A	15.93 / N/A	N/A / 18.31	N/A / 17.33	17.14 / N/A	15.93 / N/A
12 - CRP, 31.14 Managed Acres	8.47	14.23	1.38	1.93	1.38	1.93	8.47	14.23	1.38	1.94
Remnant Managed Ac. North / South	8.40 / 14.27	5.41 / 11.50	29.76 / N/A	29.21 / N/A	29.76 / N/A	29.21 / N/A	8.40 / 14.27	5.41 / 11.50	29.76 / N/A	29.20 / N/A

Table 5.22-1 Managed Lands Impacts by Alternative

Managed Land Parcel Number	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
13 - CFWP, 20.49 Managed Acres	5.45	9.99	0.00	0.35	0.00	0.35	5.45	9.99	0.00	0.35
Remnant Managed Ac. North / South	8.81 / 6.23	6.22 / 4.28	N/A	20.14 / N/A	N/A	20.14 / N/A	8.81 / 6.23	6.22 / 4.28*	N/A	20.14 / N/A
14 - CFWP, 23.94 Managed Acres	0.04	0.19	0.04	0.19	0.04	0.19	0.04	0.19	0.04	0.19
Remnant Managed Ac. North / South	23.90 / N/A	23.75 / N/A	23.90 / N/A	23.75 / N/A	23.90 / N/A	23.75 / N/A	23.90 / N/A	23.75 / N/A	23.89 / N/A	23.75 / N/A
15 - CFWP, 36.06 Managed Acres	7.93	11.49	7.93	11.49	7.93	11.49	7.93	11.49	7.95	11.49
Remnant Managed Ac. North / South	N/A / 28.13	N/A / 24.57	N/A / 28.13	N/A / 24.57	N/A / 28.13	N/A / 24.57	N/A / 28.13	N/A / 24.57	N/A / 28.11	N/A / 24.57
16 - CFWP, 65.74 Managed Acres	5.08	7.88	5.08	7.88	5.08	7.88	5.08	7.88	5.10	7.89
Remnant Managed Ac. North / South	N/A / 60.66	N/A / 57.86	N/A / 60.66	N/A / 57.86	N/A / 60.66	N/A / 57.86	N/A / 60.66	N/A / 57.86	N/A / 60.64	N/A / 57.85
17 - CFWP, 143.87 Managed Acres	20.03	28.15	20.03	28.15	20.03	28.15	20.03	28.15	20.03	28.15
Remnant Managed Ac. North / South	37.20 / 86.64*	34.41 / 81.31*	37.20 / 86.64	34.41 / 81.31*	37.20 / 86.64*	34.41 / 81.31*	37.20 / 86.64*	34.41 / 81.31*	37.20 / 86.64	34.41 / 81.31*
18 - CFWP, 100.38 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19 - CFWP, 40.00 Managed Acres	10.66	15.41	10.66	15.41	10.66	15.41	10.66	15.41	10.67	15.41
Remnant Managed Ac. North / South	20.09 / 9.25*	17.95 / 6.64*	20.09 / 9.25*	17.95 / 6.64*	20.09 / 9.25*	17.95 / 6.64*	20.09 / 9.25	17.95 / 6.64*	20.09 / 9.24*	17.95 / 6.64*
20 - CFWP, 45.09 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21 - CFWP, 92.57 Managed Acres	0.87	0.86	0.87	0.86	0.87	0.86	0.87	0.86	0.87	0.86
Remnant Managed Ac. North / South	N/A / 91.70	N/A / 91.71	N/A / 91.70	N/A / 91.71	N/A / 91.70	N/A / 91.71	N/A / 91.70	N/A / 91.71	N/A / 91.70	N/A / 91.71
22 - CFWP, 101.90 Managed Acres	0.34	1.03	0.34	1.03	0.34	1.03	0.34	1.03	0.34	1.03
Remnant Managed Ac. North / South	N/A / 101.56	N/A / 100.87	N/A / 101.56	N/A / 100.87	N/A / 101.56	N/A / 100.87	N/A / 101.56	N/A / 100.87	N/A / 101.56	N/A / 100.87
23 - CFWP, 72.36 Managed Acres	11.21	15.48	11.21	15.48	11.21	15.48	11.21	15.48	11.21	15.48
Remnant Managed Ac. North / South	45.71 / 15.44*	43.89 / 12.99*	45.71 / 15.44*	43.89 / 12.99*	45.71 / 15.44*	43.89 / 12.99*	45.71 / 15.44*	43.89 / 12.99*	45.71 / 15.44*	43.89 / 12.99*
24 - CFWP, 35.00 Managed Acres	9.38	10.56	9.38	10.56	9.38	10.56	9.38	10.56	9.38	10.57
Remnant Managed Ac. North / South	15.35 / 10.27*	15.27 / 9.17*	15.35 / 10.27*	15.27 / 9.17*	15.35 / 10.27*	15.27 / 9.17*	15.35 / 10.27*	15.27 / 9.17*	15.35 / 10.27*	15.27 / 9.16*

Table 5.22-1 Managed Lands Impacts by Alternative

Managed Land Parcel Number	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
25 - CFWP, 100.00 Managed Acres	3.64	4.16	3.64	4.16	3.64	4.16	3.64	4.16	3.64	4.10
Remnant Managed Ac. North / South	96.28 / 0.08	95.84 / N/A	96.28 / 0.08	95.84 / N/A	96.28 / 0.08	95.84 / N/A	96.28 / 0.08	95.84 / N/A	96.28 / 0.08	95.88 / 0.02
26 - CFWP, 80.00 Managed Acres	33.72	37.23	33.72	37.23	33.72	37.23	33.72	37.23	33.82	37.31
Remnant Managed Ac. North / South	14.70 / 31.58*	12.80 / 29.97*	14.70 / 31.58*	12.80 / 29.97*	14.70 / 31.58*	12.80 / 29.97*	14.70 / 31.58*	12.80 / 29.97*	14.60 / 31.58*	12.70 / 29.99*
27 - CFWP, 60.00 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28 - CFWP, 80.31 Managed Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Remnant Managed Ac.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29 - CFWP, 58.26 Managed Acres	12.03	19.11	12.03	19.11	12.03	19.11	12.03	19.11	12.03	16.24
Remnant Managed Ac. North / South	14.99 / 31.24*	9.78 / 29.37*	14.99 / 31.24*	9.78 / 29.37*	14.99 / 31.24*	9.78 / 29.37*	14.99 / 31.24*	9.78 / 29.37*	14.99 / 31.24*	12.25 / 29.77*
30 - CFWP, 30.94 Managed Acres	9.13	9.94	9.15	10.01	9.35	9.80	9.07	10.30	9.15	10.01
Remnant Managed Ac. North / South	4.18* / 17.63*	3.68* / 17.32*	4.25* / 17.54*	3.78* / 17.15*	4.19* / 17.40*	3.81* / 17.33*	4.18* / 17.69*	3.81* / 16.83*	4.25* / 17.54*	3.78* / 17.15*
31 - CFWP, 17.49 Managed Acres	8.10	9.21	8.48	9.43	8.47	8.86	7.36	8.80	8.49	9.43
Remnant Managed Ac. North / South	3.75 / 5.64	3.25 / 5.03	5.40 / 3.61	4.92 / 3.14	5.53 / 3.49	5.40 / 3.23	4.76 / 5.37	3.46 / 5.23	5.40 / 3.60	4.92 / 3.14
32 - CFWP, 183.94 Managed Acres	17.02	23.34	18.42	25.46	16.65	24.00	17.87	24.73	18.28	25.47
Remnant Managed Ac. East / West	39.82 / 127.10*	36.29 / 124.31*	129.12 / 36.40*	126.48 / 32.00*	39.86 / 127.43*	36.11 / 123.83*	129.77 / 36.30*	126.62 / 32.59*	129.26 / 36.40*	126.48 / 31.99*
33 - CFWP, 65.54 Managed Acres	1.07	1.21	0.35	0.62	0.46	0.44	1.32	1.21	0.35	0.62
Remnant Managed Ac. North / South	64.47 / N/A	64.33 / N/A	65.19 / N/A	64.92 / N/A	65.08 / N/A	65.10 / N/A	64.22 / N/A	64.33 / N/A	65.19 / N/A	64.92 / N/A
34 - CFWP, 29.02 Managed Acres	8.68	8.06	10.66	11.22	9.16	10.31	10.10	9.91	10.72	11.22
Remnant Managed Ac. East / West	N/A / 20.34	N/A / 20.96	1.72 */ 16.64	1.68* / 16.12	1.69* / 18.17	1.49* / 17.22	N/A / 18.92	N/A / 19.11	1.66 */ 16.64	1.68* / 16.12
35 - CFWP, 76.71 Managed Acres	9.37	10.71	3.51	5.28	3.78	6.39	7.65	9.56	3.51	5.28
Remnant Managed Ac. East / West	50.85 / 16.49*	50.42 / 15.58*	N/A / 73.20	N/A / 71.43	N/A / 72.93	N/A / 70.32*	51.51 / 17.55	50.88 / 16.27*	N/A / 73.20	N/A / 71.43
36 - CFWP, 28.49 Managed Acres	4.15	5.56	8.76	10.95	9.00	12.01	4.08	5.15	8.39	10.95
Remnant Managed Ac. East / West	24.34 / N/A	22.93 / N/A	9.67 / 10.06*	7.97 / 9.57*	9.36 / 10.13*	8.08 / 8.40*	24.41 / N/A	23.34 / N/A	9.66 / 10.44*	7.97 / 9.57*

Table 5.22-1 Managed Lands Impacts by Alternative

Managed Land Parcel Number	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria
38 - CRP, 65.49 Managed Acres	17.93	19.89	12.36	14.05	12.48	14.03	12.36	14.05	12.37	14.05
Remnant Managed Ac. East / West	37.39 / 10.17*	36.73 / 8.87*	24.25 / 28.88*	23.39 / 28.05*	24.13 / 28.88	23.42 / 28.04*	24.25 / 28.88*	23.39 / 28.05*	24.25 / 28.87*	23.39 / 28.05*
39 - CRP, 34.24 Managed Acres	7.34	7.35	7.35	7.35	7.35	7.35	7.35	7.35	7.35	7.35
Remnant Managed Ac. East / West	26.90 / N/A	26.89 / N/A	26.89 / N/A	26.89 / N/A	26.89 / N/A	26.89 / N/A	26.89 / N/A	26.89 / N/A	26.89 / N/A	26.89 / N/A
Total Managed Acre Impacts	227.71	294.36	204.1	259.48	205.82	262.92	222.08	290.15	203.82	256.65

Note: * - Inaccessible parcel remnants, ## - Parcel remnants that are not large enough to remain enrolled in the CFWP

5.23 Permits

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- 5.23.2—Updated stream and wetland information.
- Section 5.23.2 – Added clarification that the USEPA reviews jurisdictional determinations by the USACE under the CWA.
- Section 5.23.4 – Added clarification that the USEPA reviews jurisdictional determinations by the USACE under the CWA.
- 5.23.4—Updated isolated wetland information.
- 5.23.8 – Revised Class V injection well permit discussion.

5.23.1 Introduction

Each of the end-to-end alternatives would require permit issuance prior to beginning construction within applicable permit areas. Permits that may be required include: U.S. Army Corps of Engineers' (USACE) Section 404 Permit; Section 401 Water Quality Certification (WQC) and an isolated wetland permit from Indiana Department of Environmental Management (IDEM); Construction in a Floodway Permit from Indiana Department of Natural Resources (IDNR); and Class 5 Injection Well Permit from United States Environmental Protection Agency (USEPA). IDEM's National Pollutant Discharge Elimination System (NPDES), including the Rule 5 permit, may also be required.

The Section 404 Permit, Section 401 WQC and NPDES permits are authorized under the Federal Clean Water Act (CWA), and the decisions are subject to the state of Indiana's water quality standards under Indiana Administrative Code (IAC) Title 327 of the Water Pollution Control Board (WPCB). IDNR will require permit approvals for floodway impacts under the state of Indiana's Flood Control Act IC 14-28-1. Rule 5 (327 IAC 15-5), required under NPDES guidelines, regulates contaminant discharge via stormwater runoff from construction sites. In addition to Rule 5, other NPDES stormwater permit requirements may apply to this project.

All necessary permits will be applied for and obtained prior to the construction of this project, and the terms and conditions of these permits will be adhered to during the construction and maintenance of this facility. Contractors will be required to obtain the necessary permits that are related to their construction practices such as for construction of temporary roads and causeways for bridge construction or waste and borrow pits, if necessary.

An overall I-69 permitting and mitigation tracking method has been developed in consultation with permitting agencies and USEPA. The tracking will be accomplished within a GIS database with GIS linked map information. INDOT will provide to permitting agencies and USEPA a

tracking summary on an annual basis as a part of mitigation monitoring reports. The summary will identify the permitting and mitigation commitments and describe the status of the activities-to-date associated with each commitment.

5.23.2 Section 404 Permit and Section 10 Permit

Projects involving excavation and/or discharges of dredged or fill material into waters of the United States, or placement of structures or any activity that disturbs soil/sediments below the ordinary high water elevation of a navigable waterway or within jurisdictional wetlands, and not authorized under either a general or a nationwide permit, require an Individual USACE Section 404/Section 10 Permit, or a letter of permission from the USACE, prior to the commencement of construction. Section 404/Section 10 Permits will be applied for before or during the design phase of the project. **Figure 5.23-1** (p. 5-772) shows an example of a wetland subject to these regulations. There are two different types of Section 404 Permits that pertain to impacts to wetlands and streams. The first type of Section 404 Permit is called a Regional General Permit (RGP), which covers impacts to wetlands or streams (area below the ordinary high water mark [OHWM]) that are less than one acre in size and less than 1,500 linear feet of stream impacts. The second type of Section 404 Permit is an Individual Permit (IP), which covers impacts to wetlands and streams (area below the OHWM) that are more than one acre in size or 1,500 linear feet of stream. The RGP is used for minor and less significant impacts to waters of the United States and is generally granted in a shorter time period. The IP is used for larger and more significant impacts to waters of the United States, and in general is much more involved and takes longer to secure.

The Individual Section 404/Section 10 Permit process will be initiated by the formal submittal requesting a jurisdictional determination from the USACE for the potentially impacted water resources associated with the project. Following the jurisdiction determination response from the USACE, the applicant would prepare and submit of an application documenting all anticipated water resources impacts of the project and any needed compensatory mitigation proposal. Upon confirmation that the application material is complete, the USACE will publish a public notice of the project for a 30-day comment period. Following the comment period, the USACE will prepare their decision document for the project, which will include addressing NEPA requirements, and evaluating the project based on Section 404 and Section 10 requirements. If the USACE determines that those requirements have been met and all appropriate documentation has been provided, they will provide an authorization letter notifying the applicant that they project has been approved for construction, typically with some conditions.

The *Final Stream Assessment* Report prepared for Section 4 (See Section 5.19, *Water Resources*, and **Appendix M**, *Final Stream Assessment Report*) identified 420 stream crossing locations in the project corridor that would be considered "waters of the U.S." and therefore be under USACE jurisdiction. The report indicated that potential stream impacts from the four Alternatives using the low-cost design criteria would range from 90,053 linear feet (Alternative 4) to 93,610 linear feet (Alternative 3). The total stream impacts of the four alternatives using the initial design criteria range from 108,083 linear feet (Alternative 4) to 112,801 linear feet (Alternative 2). The Refined Preferred Alternative 2 would impact between 93,196 and 111,247

linear feet of stream. None of the alternatives cross every stream in the corridor; however, in some instances a single alternative may have more than one crossing of a single stream.

The *Final Wetland Technical Report* prepared for Section 4 (See Section 5.19 and **Appendix F**, *Final Wetland Technical Report*) identified 23 wetland complexes (each comprised of one or more community type) within the five alternatives. The total area of wetlands within the construction limits of the five alternatives using the low-cost design criteria range from 5.26 acres (Alternative 3) to 7.56 acres (Alternative 1). The impacts to potentially jurisdictional wetlands (not including isolated wetlands) range from 5.26 acres (Alternative 3) to 7.23 acres (Alternative 1) for the alternatives using the low-cost design criteria. The total area of wetlands within the construction limits of the four alternatives using the initial design criteria range from 9.43 acres (Alternative 3) to 13.09 acres (Alternative 1). The impacts to potentially jurisdictional wetlands (not including isolated wetlands) range from 9.43 acres (Alternative 3) to 12.76 acres (Alternative 1) for the alternatives using the initial design criteria. The Refined Preferred Alternative 2 impacts between 5.32 and 9.55 acres of wetlands, all of which are Waters of the U.S. under USACE jurisdiction. **Figure 5.23-1** (p. 5-772) shows an example of a wetland subject to these regulations. In addition to the above wetlands, there are 15 palustrine unconsolidated bottom features (i.e. ponds) impacted within the four alternatives.

USACE has not issued its jurisdictional determinations that will take into account all aquatic resources (including wetlands, streams and ditches) subject to Section 404 jurisdiction. The nature of the Section 404 permits (whether individual, nationwide, or general) requires USACE to make a jurisdictional determination on all wetlands and streams to be impacted prior to the permit application. A *Waters of the United States Jurisdictional Determination Report* will be prepared for each individual section of I-69 and submitted to USACE prior to the submittal of the permit applications. USEPA will review and has the authority to make the final decision on the Federal jurisdictional determinations as part of its responsibility in jointly administering Section 404 of the Clean Water Act.

5.23.3 Section 401 Water Quality Certification

The Section 401 WQC is a state's review of applications for Section 404 USACE's permits for compliance with state water quality standards. Any activity involving dredging, excavation, or filling within waters of the United States requires a Section 401 WQC from IDEM. Section 401 WQC will be applied for before or during the design phase of the I-69 project.

While the USACE 404 Permit addresses broad national waterway issues, the IDEM review focuses on how the project may impact the water quality of state waters as applied under the CWA within the jurisdiction of Indiana's water quality standards under IAC Title 327. The IDEM review of water quality impacts, while focusing primarily on wetland and stream impacts, must include a review of the physical, biological, and chemical impacts on water quality. While USEPA has reviewed and approved Indiana's water quality standards, USEPA has no oversight of Section 401 WQCs for states. The certifications are undertaken by states to ensure that the Federal Permit does not adversely impact state water quality.

5.23.4 Isolated Wetlands

Under the Indiana Isolated Wetlands Regulatory Program, IDEM regulates wetlands that do not fall under USACE jurisdiction (Isolated Wetlands). Isolated wetlands are those wetlands that are not considered connected or adjacent to "waters of the U.S." Isolated wetlands are grouped into one of three classes based upon wetland quality. Class III isolated wetlands are generally of higher quality and Class I wetlands of lower quality, while Class II wetlands fall somewhere in the middle. Different wetland classes require different mitigation requirements.

Official determination of regulatory status of wetlands as "waters of the U.S." or "isolated" must be made by the USACE in a formal Jurisdiction Determination. USEPA will review and has the authority to make the final decision on the Federal jurisdictional determinations as part of its responsibility in jointly administering Section 404 of the Clean Water Act.

Alternatives 1 and 4 using both the low-cost design criteria and initial design criteria each impact 0.33 acres of one wetland considered isolated based on preliminary review. Alternatives 2,3, and the Refined Preferred Alternative 2 do not impact the isolated wetland using either the low-cost design criteria or initial design criteria. It is anticipated that an IDEM Isolated Wetland Permit would be required for the one isolated wetland if impacted by the Preferred Alternative. The alternatives also impact seven isolated ponds; however, isolated ponds are exempt and would not be regulated by IDEM because they were open water ponds constructed in upland areas for agricultural or recreational use. The application for the IDEM Isolated Wetland Permit would be made together with the application for IDEM's Section 401 WQC.

5.23.5 Construction within a Floodway Permit

Indiana's Flood Control Act (IC 14-28-1) requires that any person proposing to construct a structure, place fill, or excavate material at a site located within the floodway of any river or stream, unless that activity is exempted, must obtain the written approval of IDNR prior to initiating the activity. This law was originally enacted to protect Indiana citizens from the loss of lives and property caused by floods, and it ensures that floodway channels are not inhabited and kept free and clear of interference or obstruction that will result in undue restriction to the capacity of the floodway. Since its enactment, the scope of IDNR's analysis has been expanded to protect Indiana's natural resources located in the floodway. If needed, a construction in a Floodway Permit(s) would be applied for before or during the design phase of this project.

5.23.6 National Pollution Discharge Elimination Permit

Water pollution degrades surface waters making them unsafe for drinking, fishing, swimming, and other activities. Since its introduction in 1972, the NPDES Permit program is responsible for significant improvements to our Nation's water quality. As authorized by the CWA, the NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Industrial, municipal, and other facilities, which maintain discrete separate stormwater discharges directly to surface waters, must obtain NPDES Permits under 327 IAC 15-13 (Rule 13). INDOT, similarly, is required to permit discrete separate stormwater discharges under 327

IAC 5-4-6. While the INDOT permit and requirements have not yet been finalized by IDEM, it is anticipated that this project will include some requirements under this NPDES Permit.

5.23.7 Rule 5 – Erosion Control

Rule 5 is a state regulation (327 IAC 15-5) to control erosion resulting from construction activity. The purpose of Rule 5 is to reduce pollutants, principally sediment as a result of soil erosion, in stormwater discharges into surface waters. The requirements of Rule 5 apply to all persons who are involved in construction activity that results in the disturbance of one acre or more of total land area. Compliance with Rule 5, which requires a Rule 5 permit or, in the case of a significant disturbance and impact, an individual stormwater permit, requires the development of an erosion control plan. IDEM is the agency responsible for administering Rule 5 permits.

A stormwater pollution prevention plan will be developed during the design phase and submitted for review to IDEM. Best management practices (BMPs) for erosion control will be followed. BMPs could change in the future and the project will follow the most current BMPs. Once the plan is approved, it will be incorporated into the design plans and included in the contract documents. The applicant must submit a Notice of Intent to IDEM for review and to obtain a permit. The notice must state the project start date, which is then used by IDEM to determine the five-year duration date of the permit. Plan implementation must occur before, during, and after construction. Upon completion of construction, a Notice of Termination must be submitted to IDEM.

Figure 5.23-2 (p. 5-772) illustrates the type of erosion that can occur in the course of a construction project.

5.23.8 Class V Injection Well Permit

Class V injection well permits may be required for various types of projects. For example such a permit could be required by EPA Region 5 if a Class V injection well is located within the karst region of the state, a sole source aquifer area, a state designated source water protection area for a public water supply, or anywhere untreated fluids discharged through a Class V well may otherwise endanger an underground source of drinking water. If there are measures in place to prevent contamination of groundwater, a Class V well could be authorized by rule rather than by a permit. A Class V Well Inventory Form would need to be provided to EPA Region 5 prior to construction of a Class V injection well so that EPA could determine if a Class V injection well permit will be required for any Class V wells. EPA would determine if a permit is required for any Class V injection well that may contaminate an underground source of drinking water. Any permit would need to be applied for and obtained prior to construction of the Class V well.

Figure 5.23-1: Typical Wetland Subject to Regulation

Figure 5.23-2: Typical Construction Site Erosion

5.24 Indirect and Cumulative Impacts

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- 5.24.3— Revised **Figure 5.24-1** (p. 5-827) to be more legible and to include the estimated number of induced growth acres in each TAZ.
- **Table 5.24-5** – Updated the number of caves based on recently discovered cave.
- 5.24.3— Updated the discussion to include information for Refined Preferred Alternative 2.
- 5.24.3— Corrected the induced growth estimate for TAZ numbers 2801506 and 2801602.
- 5.24.3— Updated the impacted acres information for agricultural land.
- 5.24.3— Updated the impacted acres information for forests.
- 5.24.3— Updated the impacted acres information for wetlands.
- 5.24.3— Updated the impacted linear feet information for streams.
- 5.24.3— Updated the impacted number of karst features for Refined Preferred Alternative and for recently discovered cave.
- 5.24.3 – Added information on recently discovered cave.
- 5.24.3— Corrected references to tables in Chapter 5.19.
- 5.24.3— Updated text discussion of anticipated induced growth in relation to existing sanitary sewer service and environmentally sensitive areas.
- 5.24.3— Updated text discussion to include references to new **Figures 5.24-2** (p. 5-790), **5.24-3** (p. 5-791) and **5.24-4** (p. 5-832).
- 5.24.4— Updated **Tables 5.24-6**, **5.24-7** and **5.24-8** to include information for Refined Preferred Alternative 2.
- 5.24.4— Updated text to include information for Refined Preferred Alternative 2.

5.24.1 Introduction

The cumulative effects are the sum of the project's direct and indirect impacts added to those of the past, present, and reasonably foreseeable future actions of others. The basis for this project's indirect effects analysis is the anticipated changes in land use that the project alternatives are predicted to cause in Greene and Monroe counties. The cumulative impacts analysis will be analyzed in this same project area.

The project has the potential for indirect and cumulative impacts. For example, new businesses and industries stimulated by improved access create job opportunities that attract employees into an area. The job growth may spur residential development, which in turn impacts schools and community support services, and creates a demand for additional businesses, thereby increasing the potential for more development. Indirectly, the project could influence the location of new

developments and affect the expected rate of growth. A typical scenario is the conversion of farmland or undeveloped land to residential, commercial, or a mix of uses, particularly near proposed interchanges. The land taken from agricultural use for development is added to the land taken from agricultural use for right-of-way to recognize the cumulative total effect of the project. In addition, the new highway-induced development could spur more road improvements or new roads, which would, in turn, result in additional use of currently undeveloped land for development.

CEQ regulations define direct impacts as "effects which are caused by the action and occur at the same time and place." A direct impact for I-69 Section 4 would be the use of a particular piece of property for right-of-way for a project alternative.

CEQ defines indirect impacts as "effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." An indirect impact for I-69 Section 4 would be the change in the use of a particular piece of property as a result of a project alternative. These changes in land use are anticipated to occur in areas that are currently undeveloped and have not been identified as part of a proposed development, but are reasonably foreseeable as a result of the proposed action.

Cumulative effects include "other" past, present, and reasonably foreseeable future actions in addition to the proposed I-69 project within the project area, regardless of what agency (federal or non-federal) or person undertakes such actions (40 CFR 1580.7). Cumulative effects are the environmental impacts resulting from both the I-69 project (including both direct and indirect impacts) and from other past, present, and reasonably foreseeable future actions.

5.24.2 Methodology

The methods detailed in the following resources were used in determining the cumulative impacts in both the Tier 1 and Tier 2 EISs:

- Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process (FHWA, January 2003)
- "Indirect and Cumulative Impact Assessment in the Highway Project Development Process" (FHWA Position Paper, HEP-32, April 1992)
- "Considering Cumulative Effects Under the National Environmental Policy Act" (Council on Environmental Quality, January 1997)
- Guidance for Estimating the Indirect Effects of Proposed Transportation Projects, 1998 (National Cooperative Highway Research Program Report (NCHRP) Report 403)
- "Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects" (NCHRP Report 466, 2002)
- "Consideration of Cumulative Impacts in EPA Review of NEPA Documents" (USEPA 315-R-99-002, May 1999)
- "The National Environmental Policy Act – Conducting Quality Cumulative Effects Analyses" (USEPA Region 5, August 8-10, 2000, Chicago, Illinois)

The Tier 1 I-69 Evansville to Indianapolis FEIS analyzed cumulative impacts using the 11-step method described in the CEQ handbook entitled "Considering Cumulative Effects Under the National Environmental Policy Act." The cumulative impacts for three resources—farmland, forests, and wetlands—were analyzed in consultation with resource agencies. Tier 1 analyzed a 26-county region through a forecast year of 2025. The Tier 1 EIS compared the overall projected loss of farmland, forest, and wetlands to the loss resulting from direct and indirect I-69 project impacts. The findings were that I-69 losses account for a very small percentage of overall losses for these three resources. The selected alternative—Alternative 3C— accounted for an additional 1.1% loss in farmland, 0.1% loss in forest, and 0.04% loss in wetlands throughout the 26-county project area. The impacts of the selected alternative were typical of the alternatives studied in the Tier 1 EIS; see **Figures 5.26-8**, **5.26-9**, and **5.26-10** (pp. 5-292 through pp. 5-294) in the Tier 1 EIS.

The eleven-step process for conducting the cumulative impacts analysis is as follows:

1. Identify the significant cumulative effects issues associated with I-69.
2. Establish the geographic scope for the analysis.
3. Establish the time frame for the analysis.
4. Identify other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping and explain how they have historically changed.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems and human communities.
9. Determine the magnitude and significance of cumulative effects by identifying the changes as a result of I-69.
10. Modify or add alternatives to avoid, minimize or mitigate significant cumulative impacts.
11. Monitor the cumulative effects of the alternatives and provide documentation.

The Tier 2 analysis follows a similar methodology in determining resources, impacts, and significant effects. Unlike Tier 1, the Tier 2 process considers a much more local study area and a more detailed analysis. The data from the Tier 1 analysis will be carried through Tier 2 and further refined. The resources identified for the analysis in I-69 Tier 2, Section 4 are forests, farmland, streams, wetlands and karst.

The analyses of indirect impacts were based on Traffic Analysis Zone (TAZ)[1] data rather than Census Block data; therefore, the boundaries of the Study Area for these analyses were different

[1] A traffic analysis zone (TAZ) is one of many small areas within a larger geographical study area that has been subdivided for purposes of obtaining socioeconomic and traffic data in a manageable fashion. The geographical scope of Section 4 was identified as Greene and Monroe counties. Growth induced by the I-69 Section 4 project (indirect impact) was predicted to

than the Year 2000 Census Block Group boundaries that comprise the Study Area in other sections of this document.

TAZs were found to be more favorable for the analysis because (1) compared to Census Blocks, TAZs are small in size, which permits more comprehensive data gathering and more detailed analysis, (2) the socioeconomic data for the TAZs (including population and employment statistics) was readily available, having been developed for each section of the Tier 2 I-69 project for use in forecasting traffic volumes, and (3) these analyses involve indirect impacts that may extend beyond the immediate vicinity of the project itself. Therefore, the Study Area for indirect effects was modified to follow TAZ boundaries rather than Census Block Group boundaries.

To determine what land use changes –and, therefore, impacts to existing resources—could occur as a result of predicted induced development, it was necessary to identify existing land cover. Land cover was identified using the National Land Cover Database Zone 49 Land Cover Layer obtained from the USGS. This 2001 National Land Cover Dataset for Zone 49 (southern half of Indiana) was made publicly available on November 27, 2006. Based on the Land Cover Codes in this dataset, the land area of each TAZ that has induced growth was categorized, and land cover types within the categories identified as follows:

- *Developed: Open Water; Developed, Open Space; Developed, Low Intensity; Developed, Medium Intensity; and Developed, High Intensity.*
- *Unusable: Woody Wetlands; and Emergent Herbaceous Wetlands.*
- *Agriculture Land/Other: Barren Land (Rock/Sand/Clay); Shrub/Scrub; Grassland/ Herbaceous; Pasture/Hay; and Cultivated Crops.*
- *Agriculture Land/Other in Floodplain: (Same cover type as Agriculture Land/Other, above)*
- *Forest Land: Deciduous Forest; Evergreen Forest; and Mixed Forest.*
- *Forest Land in Floodplain: (Same cover type as Agriculture Land/Other, above)*

5.24.3 Analysis

The following section presents the analysis of the direct, indirect, and cumulative impacts of the project on forests, farmland, streams, wetlands and karst. To facilitate this review, the historic and future trends of each resource have been researched, as well as anticipated land use changes identified by the "Expert Land Use Panel" (described in *Step 3*, below). These trends and potentially foreseeable land use changes were then utilized in determining the cumulative and indirect impacts on forests, farmland, streams, wetlands and karst in the Tier 2 study of Section 4. The following discussion uses the 11-step process identified above to assess the overall cumulative impacts for Section 4. (Note that the first of these eleven steps includes within it, a nine-step process to identify indirect impacts. To avoid confusion, all future

occur in a total of 55 TAZs distributed within these two counties. (See **"2. Establish geographic scope for the analysis,"** herein, for additional discussion.

references to the latter nine-step process for indirect impacts will employ the word "*Step*" followed by its number, in italics*, e.g., Step 1*.)

1. Identify the significant cumulative effects issues associated with I-69

This project is located within a potential karst features area based on the October 1993 Karst MOU between INDOT, IDNR, IDEM, and USFWS. It should be noted that for this project, FHWA has invited the United States Environmental Protection Agency (USEPA) to participate in the karst study and assessment. Coordination received from the USEPA on August 31, 2006, identified the sensitivity of karst resources within I-69 Tier 2 Sections 4 and 5, and recommended that potential karst impacts be carefully considered in the Tier 2 cumulative impacts analysis.

Upon review of both existing data, mapping and local coordination, in general, the farmland, streams, and wetlands account for significantly smaller acreage than the forests in any given induced growth traffic analysis zone (TAZ). I-69 Section 4 is much more heavily forested than Sections 1 through 3 of the Tier 2 I-69 Corridor where it was determined that forested land would likely not be impacted by indirect development. Therefore, an estimate of 40% of the induced growth occurring on forested land was established based on an analysis of development of specific land uses within the Section 4 project Study Area (see **Appendix CC**, *Agency Coordination Correspondence*). This 40% estimate does not include the 12 TAZs in the vicinity of the US 231 interchange as those TAZs were determined to primarily consist of agricultural land. Indirect impacts in those 12 TAZs were previously analyzed and considered in the Section 3 Tier 2 FEIS. **Appendix CC** also provides additional verification of the findings in the Section 3 FEIS, which showed that all induced growth in these 12 TAZs will occur on agricultural or other open land.

Assuming 40% of the anticipated 135 acres of induced growth caused by Section 4 (in those TAZs outside of the US 231 vicinity) will occur on forested lands, the predicted impact is 54 acres (32 acres in Greene County and 22 acres in Monroe County), and the predicted impact to agricultural/other land use is 81 acres (49 acres in Greene County and 32 acres in Monroe County). Indirect impacts in those TAZs in the vicinity of US 231 are estimated to be 25 acres; therefore, the total estimated induced growth impacts for the Section 4 project are 160 acres of which 106 acres are agricultural land and 54 acres are forest land.[2] **Table 5.24-1** shows the total amount of land, by land type and county, in the 55 TAZs predicted to experience growth as a result of the I-69 Section 4 project. Land cover categorized as Agricultural/Other (in and out of a floodplain) represents 26% of the total acres in the TAZs compared with 71% forest, 3% developed, and less than 0.1% unusable (i.e., wetlands).

[2] The geographic scopes of the cumulative impact analyses in adjacent sections of I-69 of necessity overlap. As a result, some actions will be counted as cumulative impacts in more than one Tier 2 EIS; thus, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS.

Table 5.24-1: USGS National Land Cover Database: Amount of Land Cover Types in Induced Growth TAZs

County (# TAZs represented)	Developed (acres)	Unusable (acres)	Ag/Other in Floodplain (acres)	Available Ag/Other (acres)	Forest in Floodplain (acres)	Available Forest (acres)	Total Acres in TAZs
Greene (12)*	668	1	147	6,237	146	5,613	12,812
Greene (39)**	1,766	18	460	11,756	1,407	44,825	60,232
Monroe (4)**	127	0	32	282	35	302	778
Totals	2,561 (3%)	19 (< 0.1%)	18,914 (26% of total TAZ acres)		52,328 (71% of total TAZ acres)		73,822

Source: USGS 2001 National Land Cover Dataset for Zone 49.
Cover types:
Developed: Open Water; Developed, Open Space; Developed, Low Intensity; Developed, Medium Intensity; and Developed, High Intensity.
Unusable: Woody Wetlands; and Emergent Herbaceous Wetlands.
Agriculture Land/Other: Barren Land (Rock/Sand/Clay); Shrub/Scrub; Grassland/Herbaceous; Pasture/Hay; and Cultivated Crops.
Forest Land: Deciduous Forest; Evergreen Forest; and Mixed Forest.
* Induced growth in these TAZs is anticipated to impact 100% agricultural/other land use (see ***Appendix CC***)
** Induced growth in these TAZs is anticipated to impact 40% forest / 60% agricultural land use (see ***Appendix CC***).

Past history and future development potential were used to determine impacts to wetlands, forests, and streams. A more in-depth process was used for Tier 2 to address the impacts to farmland and karst. To estimate indirect impacts to land use, the following nine-step process was used:

Step 1: Obtain the economic forecasts for 2030 from Tier 1 that assume the construction of the selected alternative, Alternative 3C. This provides the induced or indirect growth resulting from I-69 for the forecast year for Tier 2.

Prior to determining the magnitude and significance of the cumulative effects in Section 4, an analysis was completed for anticipated land use changes in the Section 4 study area. Several scenarios were identified by reviewing the TAZ data estimates for the No-Build scenario and for the five alternatives. For instance, maps of TAZs within Greene, and Monroe counties were used to identify where project-induced land use changes would be expected to occur. The number of new houses and new jobs by the year 2030 were forecasted by TAZ for both the No-Build scenario and for the five alternatives. Induced growth is anticipated to occur where the numbers for the alternatives are higher than for the No-Build scenario. Also, as expected, the Refined Preferred Alternative 2 scenario shows more employment and housing than the No-Build scenario for the two-county area. The Tier 1 economic forecasts indicated that building I-69 would induce 476 new housing units and 771 new jobs in Greene and Monroe counties, the geographic scope for the Section 4 project. **Figure 5.24-1** (p. 5-827) shows the location of the TAZs with predicted induced growth under any of the five alternatives.

Step 2: Allocate the induced growth to individual counties.

These forecasts were allocated in Tier 1 to the two individual counties, as follows:

- 371 jobs and 326 housing units within Greene County
- 400 jobs and 150 housing units within Monroe County[3]

These forecasts of induced jobs and housing units at the county level include the induced growth effects of all of the other Sections of I-69. This would include induced growth effects associated with the Section 3 interchanges in southern Greene County, and with the proposed Section 5 interchanges in Monroe County. The distribution of these county-level induced growth effects specifically to the TAZs influenced by Section 4 is discussed in the following sections.

Step 3: Meet with the Expert Land Use Panel to determine the location and comparative order of magnitude of growth by TAZ.

Estimating indirect impacts relied upon input from an Expert Land Use Panel assembled in Section 4. According to a USDOT report,[4] "Expert panels can be a very effective way to organize input and gain general consensus on the range of impacts that might be expected. The use of expert panels seems to be an effective way to determine what is 'reasonably foreseeable' since it utilized the judgments of reasonable people." Two Expert Land Use Panels were established for Section 4. The first expert panel was established in coordination with the Section 3 project and included representatives from Greene (and Daviess) County. A second expert panel was established in coordination with the Section 5 project and included representatives from Monroe County. The Greene County expert panel for Section 4 was convened May 6, 2005, and was composed of the following members:

- Larry Hasler (Greene County Commissioner)
- Charley Dibble (Ex. Dir., Greene County Economic Development Corporation)
- W. Edward Cullison (Greene County Council and local financial institution)

The Monroe County expert panel for Section 4 was convened April 13, 2005, and was composed of the following members:

- Bob Cowell (Monroe County Planning)
- Mary Ogle (Monroe County Planning)
- Toby Turner (Monroe County Planning)

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[3] The number of induced housing units in Greene County in the Section 4 Study Area is low in proportion to the number of induced jobs because some of the housing units for these jobs will be outside the Section 4 Study Area in Daviess, Greene, Lawrence, and Monroe counties. The number of induced housing units in Monroe County in the Section 4 Study Area is low in proportion to the number of induced jobs because some of the housing units for these jobs will be outside the Section 4 Study Area in Greene County, and in Monroe County in the Section 5 Study Area. The locations of where growth is expected to occur were based on input from the expert land use panel.

[4] "Environmental Stewardship and Transportation Infrastructure Project Review: Executive Order 13274 Indirect and Cumulative Impacts Work Group Draft Baseline Report." ICF Consulting for U.S. Department of Transportation. March 15, 2005. Website: icireporticf031405.pdf

- Patrick Shay (Bloomington-Monroe MPO)
- Steve Crider (Crider & Crider)
- Travis Vencel (Vencel Services)
- Lori Abram (Bloomington Board of Realtors)
- Frank Nierzwicki (Town of Elletsville)

The Expert Land Use Panels were convened to inform the study team's assessment of the potential for Section 4 of I-69 to influence the location and intensity of future growth in the Study Area. The panel indicated those TAZs that they felt would be most likely to experience induced growth with the new interchanges to be provided by I-69, as included in the Tier 1 Alternative 3C and preliminary alternatives. Minutes of the meetings with the Expert Land Use Panels are presented in **Appendix E**, *Expert Land Use Panel Meeting Notes*.

Step 4: Using these growth guidelines from the expert panels, allocate the induced growth for the counties to individual TAZs in proportion to the relative order of magnitude established by the Expert Land Use Panels.

The Expert Land Use Panels focused on the TAZs within the two counties to determine the order of magnitude of growth that can be expected within each TAZ. The panels then allocated the anticipated induced growth in housing units and employment into each TAZ, as shown in **Table 5.24-2** and on **Figure 5.24-1** (p. 5-827).

Table 5.24-2: Number of Jobs, Households, and Acres Induced With I-69 in Section 4

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing*	Induced Acres for Jobs**	Total Induced Acres Changes & % of Total TAZ Acres	Total Acres in TAZ
Greene County (US 231 Vicinity*)**						
2800504	1	0	0.3	0.0	0.3	1,907
2800506	2	0	0.5	0.0	0.5	971
2800514	0	84	0.0	5.5	5.5	174
2801803	1	0	0.3	0.0	0.3	866
2801804	1	0	0.3	0.0	0.3	2,704
2801805	2	0	0.5	0.0	0.5	709
2801810	1	0	0.3	0.0	0.3	2,882
2802011	1	0	0.3	0.0	0.3	402
2802012	1	0	0.3	0.0	0.3	1,002
2802013	1	0	0.3	0.0	0.3	637
2803203	1	168	0.3	11.0	11.3	462
2803204	0	84	0.0	5.5	5.5	96
*Subtotals^*	*12*	*336*	*3*	*22*	*25 (0.2%)*	*12,812*
Greene County****						
2800601	7	0	1.8	0.0	1.8	3,586
2800602	9	0	2.3	0.0	2.3	2,366
2800603	5	0	1.3	0.0	1.3	263
2800604	1	0	0.3	0.0	0.3	91
2800605	32	0	8.1	0.0	8.1	1,822

Table 5.24-2: Number of Jobs, Households, and Acres Induced With I-69 in Section 4

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing*	Induced Acres for Jobs**	Total Induced Acres Changes & % of Total TAZ Acres	Total Acres in TAZ
2800606	1	0	0.3	0.0	0.3	97
2800607	1	0	0.3	0.0	0.3	277
2800608	8	0	2.0	0.0	2.0	952
2800801	1	0	0.3	0.0	0.3	1,122
2800802	1	0	0.3	0.0	0.3	487
2800803	2	0	0.5	0.0	0.5	420
2800804	38	10	9.6	0.6	10.2	1,750
2800805	10	10	2.5	0.6	3.1	581
2800806	7	0	1.8	0.0	1.8	1,838
2800807	2	0	0.5	0.0	0.5	570
2800808	3	0	0.8	0.0	0.8	98
2800809	6	0	1.5	0.0	1.5	606
2800810	4	0	1.0	0.0	1.0	343
2800811	2	0	0.5	0.0	0.5	24
2800812	1	0	0.3	0.0	0.3	468
2800904	2	0	0.5	0.0	0.5	281
2800906	31	0	7.8	0.0	7.8	3,288
2801501	7	0	1.8	0.0	1.8	1,630
2801502	4	0	1.0	0.0	1.0	1,160
2801503	7	0	1.8	0.0	1.8	2,109
2801504	2	0	0.5	0.0	0.5	2,395
2801505	21	0	5.3	0.0	5.3	2,892
2801506	15	0	3.8	0.0	3.8	4,140
2801507	2	0	0.5	0.0	0.5	427
2801601	24	15	6.1	1.0	7.1	1,281
2801602	24	0	6.1	0.0	6.1	4,701
2802701	7	0	1.8	0.0	1.8	2,929
2802702	3	0	0.8	0.0	0.8	3,410
2802703	2	0	0.5	0.0	0.5	1,668
2803001	1	0	0.3	0.0	0.3	996
2803002	11	0	2.8	0.0	2.8	2,571
2803003	3	0	0.8	0.0	0.8	1,107
2803801	5	0	1.3	0.0	1.3	2,372
2803802	2	0	0.5	0.0	0.5	3,114
*Subtotals^*	*314*	*35*	*79*	*2*	*81 (0.1%)*	*60,232*
*Greene County Subtotals^*	326	371	82	25	106 (0.1%)	73,044
Monroe County****						
Traffic Analysis Zone (TAZ)	**Induced Number of Housing Units**	**Induced Number of Jobs**	**Induced Acres for Housing***	**Induced Acres for Jobs****	**Total Induced Acres Changes & % of Total TAZ Acres**	**Size of TAZ (acres)**
5300721	150	0	31.1	0.0	31.1	238
5300728	0	100	0.0	5.6	5.6	416
5300729	0	50	0.0	2.8	2.8	47
5303311	0	250	0.0	14.0	14.0	76

Table 5.24-2: Number of Jobs, Households, and Acres Induced With I-69 in Section 4

Traffic Analysis Zone (TAZ)	Induced Number of Housing Units	Induced Number of Jobs	Induced Acres for Housing*	Induced Acres for Jobs**	Total Induced Acres Changes & % of Total TAZ Acres	Total Acres in TAZ
*Monroe County Subtotals^*	150	400	31	22	54 (6.9%)	778
Total	**476**	**771**	**113**	**47**	**160 (0.2%)**	**73,822**

*Greene County utilized 3.96 units/acre; Monroe County used 4.82 units/acre *(see Step 7*, below).
***Greene County utilized 15.4 units/acre; Monroe County used 17.8 units/acre (*see *Step 7*, below).
Induced growth in these TAZs was independently verified by the Section 4 Expert Land Use Panel. This growth is anticipated to impact 100% agricultural/other land use (see ***Appendix CC).
****Induced growth in these TAZs was independently verified by the Section 4 Expert Land Use Panel. This growth is anticipated to impact 40% forest / 60% agricultural land use (see ***Appendix CC***).
^Subtotals have been rounded.

Steps 5 and 6: Determine any shifts in employment resulting from accessibility changes as a result of interchanges. Allocate any shifts in employment to the TAZs; and, d*etermine a value for I-69-induced growth and growth from employment shifts resulting from changes in accessibility for each TAZ.*

Shifts in employment resulting from accessibility changes are anticipated in the induced growth TAZs surrounding the new interchanges. For example, shifting may occur as a result of new businesses such as medical, science and technology, engineering, manufacturing, assembly, distribution, gas stations, hotels, and restaurants which may choose to locate at these interchanges creating new jobs in the area. See **Figure 5.24-1** (p. 5-827) for the location of these TAZs.

Step 7: Convert the growth into acres of developed land uses based on values from "Trip Generation – 6th Edition" from the Institute of Transportation Engineers, 1997.

The number of induced housing and new jobs was converted to acres of induced new development based on the following assumptions:

The Tier 1 economic analysis determined that within the Southwest Indiana region, (including Daviess, Greene, Martin, and Pike counties) the average number of dwelling units per acre was 3.96, while in Monroe County, the average number of dwelling units per acre was determined to be 4.82. These estimates were based on a combination of three single-family dwelling units per acre and seven multi-family units per acre, weighted by the percent of single-family verses multi-family units. These estimates were also used for Tier 2.

The Tier 2 economic analysis for jobs was based on a weighted average of the standard employees per acre by employment type. The percentage of each type (i.e., the weight given) was based on the number of anticipated job types within the Southwestern Indiana region. The employees-per-acre, per-employment-type data were developed from the Institute of Transportation Engineer's (ITE) Code per Trip Generation 6th Edition, and are as follows: 18.5 employees per acre for Durable Manufacturing and Non-Durable Manufacturing jobs; 8.2 employees per acre for Mining, Construction, Transportation Public

& Utilities, and Agricultural Service jobs; 55.8 employees per acre for Finance, Insurance, Real Estate, and Services jobs; 8.7 employees per acre Retail Trade jobs; and 14.7 employees per acre Wholesale Trade jobs. Weighted against the overall anticipated number of each type of job for each county, the average is 15.4 employees per acre for Greene County and 17.8 employees per acre for Monroe County.

The forecasted 476 new housing units in Section 4 will require conversion of 113 acres, and the forecasted 771 employees will require conversion of 47 acres, using the averages developed for the two counties. Combined, a total of 160 acres of indirect land use changes are anticipated to occur as a result of building the project. The geographic scopes of the cumulative impact analyses Section 4 will necessary overlap with those in adjacent sections (3 and 5) of I-69. Some cumulative impacts will be counted in more than one Tier 2 EIS; thus, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS. The proximity of the five alternatives within the generally 2,000-foot-wide study corridor and the essentially identical locations for interchanges with the five alternatives results in no meaningful difference in the induced land use changes that the five alternatives will cause.

Step 8: Determine which resources will be impacted by these changes in land use in each TAZ.

Forests, farmland, streams, wetlands and karst are the principal resources that the project's indirect land use changes would potentially affect. I-69 Section 4 is much more heavily forested than Sections 1 through 3 where it was determined that the abundance of more easily developed agricultural land greatly reduces the likelihood that forested land would be impacted by indirect development. Therefore, a conservative estimate of 40% of the induced growth occurring on forested land was established based on an analysis of land use patterns in the Section 4 project area (see **Appendix CC**). This 40% estimate does not include the 12 TAZs in the vicinity of the US 231 interchange, since those TAZs were determined in the Section 3 study to primarily consist of agricultural land.

To predict the amount of forest that may be impacted by induced growth resulting from I-69, land use changes having historically occurred in representative Section 4 TAZs were evaluated. Aerial photographs of the TAZs taken in 1998 and 2008 were compared to estimate the change in land use during this period. The results of the evaluation indicate that approximately 36% of forest land in the developed areas was converted to residential land use within the ten-year period. Therefore, a worst-case estimate of 40% forest impact in the induced growth areas was established for the Section 4 Study Area, excluding those 12 TAZs in the US 231 vicinity (see **Figure 5.24-1**, p. 5-827).

Assuming 40% of the anticipated 135 acres of induced growth caused by Section 4 (in those TAZs outside of the US 231 vicinity) will occur on forested lands, the predicted impact is 54 acres (32 acres in Greene County and 22 acres in Monroe County). The predicted impact to agricultural/other land use is 81 acres (49 acres in Greene County and 32 acres in Monroe County). Indirect impacts in those TAZs in the vicinity of US 231 are estimated to be 25 acres; therefore, the total estimated induced growth impacts for the Section 4 project are 160 acres of which 106 acres are agricultural land and 54 acres are forest land.

Most of the induced growth in Section 4 is expected around the SR 45/SR 445 intersection in Greene County and around the SR 37/Victor Pike intersection area in Monroe County. In two of the more forested TAZs, numbers 2801506 and 2801602 near the SR 45/SR 445 intersection in Greene County (refer to **Figure 5.24-1**, p. 5-827), 78.6% of the combined land cover is forest, but there are still 1,508 acres of agricultural land available for the projected 9.9 acres of induced development anticipated under the year 2030 build scenario. Collectively in the TAZs that are anticipated to experience induced growth, forest is the predominant land use (see **Table 5.24-1**).

Given the availability of agricultural land in the more desirable locations, it is reasonable to assume that, in the foreseeable future, the majority of land (estimated at 60%) required for induced commercial development will be converted from agricultural land. Although forest is the predominant land use in Section 4, land requiring a greater amount of site preparation presents an economic disadvantage and is typically less desirable to a commercial business.

Step 9: Use these indirect impacts to the resources in the cumulative impact analysis.

The cumulative impact analysis includes the consideration of direct and other impacts to forests, farmlands, streams, wetlands, and karst resources, as well as the indirect impacts quantified above.

2. Establish the geographic scope for the analysis

The Section 4 Study Area used for both the economic impact analysis (Section 5.5) and the cumulative impact analysis (Section 5.24) is different than the year 2000 census block group or census tract boundaries that comprise the Study Area in other sections of this document. The use of a different study area was necessary for these two analyses because TAZ data is used in the analysis of economic and cumulative impacts, and the TAZ boundaries do not precisely correspond with the census-based boundaries that define the Section 4 Study Area for other purposes. The study area defined for the cumulative impacts analysis is referred to as the "geographic scope," which, for Section 4 includes Greene and Monroe counties, within which direct, indirect, and "other" impacts are identified. Within the geographic scope is the Indirect Impact Study Area, which is comprised of the induced growth TAZs associated with Section 4, within Greene and Monroe counties (see **Figure 5.24-1**, p. 5-827).

Maps of TAZs within Greene and Monroe counties were used to identify where project-induced land use changes would be expected to occur. The number of new houses and new jobs by the year 2030 were forecasted by TAZ for both the No-Build scenario and for the Build scenario. Induced growth is anticipated to occur where the numbers for the Build scenario are higher than for the No-Build scenario.

The Expert Land Use Panels, described in *Step 3* above, were consulted to analyze the project's impacts within the geographic scope. These local officials used knowledge of local property conditions, development patterns, vacant land development constraints, vacant lots, and availability of infrastructure to establish the anticipated magnitude of population and employment growth by TAZ. Maps of the TAZs within Greene and Monroe counties were presented to the Expert Land Use Panels for verification or revision, and to determine the

probable location and order of magnitude of the growth in population and employment. The panel gave specific consideration to the areas surrounding proposed interchanges as having high potential for development. Potential induced growth land use changes in the vicinity of US 231 were assessed in the Section 3 study.

The information that the Expert Land Use Panels provided helped determine which TAZs would be more likely to experience future growth as a result of building I-69. As described in *Step 4* and *Step 5* above, the panel allocated the induced growth to TAZs, distributing the forecasted population and employment induced growth among the 55 TAZs, all in the vicinity of the proposed interchanges, see **Figure 5.24-1**, (p. 5-827). These 55 TAZs comprise the Indirect Impact Study Area for this analysis. For the purpose of estimating the induced growth caused by Section 4, the Expert Land Use Panels assumed that interchanges would be constructed at US 231, SR 45, the Greene/Monroe County Line, and SR 37. The panel also provided insight on where land use changes would likely occur regardless of whether I-69 was constructed. As expected, the Build scenario shows more employment and housing than the No-Build scenario for the two-county area.

3. Establish the time frame for the analysis

The time period studied for this cumulative impact analysis includes past years through the present day to the year 2030. Available information has guided the extent of the past analysis. Information for farmland was available back to 1900. Information for forests and wetlands were estimated back 200 years. Stream data has come from the last 100 years, while the karst data is more recent. For the future analysis, the year 2030 is also the future analysis year for the economic modeling and the transportation modeling.

The year 2030 is the future analysis horizon for the transportation modeling and the population and employment forecasts, and is therefore the time horizon for the cumulative effects analysis for the Tier 2 analysis. The Tier 2 process used the same base traffic modeling tools and forecasting methodologies as were used in Tier 1 for consistency. The various GIS layers of information used in Tier 1 have been updated with new information, which was used in the cumulative impacts analysis for Tier 2.

The Tier 1 economic forecasts provided population and employment forecasts for the Year 2030 for geographic areas which included Greene and Monroe counties for the year 2030.

4. Identify other actions affecting the resources, ecosystems, and human communities of concern.

The analysis of cumulative impacts for the Tier 2 I-69 project in Section 4 considered the I-69 direct and indirect impacts as well as the impacts from other major federal, state, and private sector actions in the Indirect Impact Study Area not related to the I-69 project.

Foremost among the “other actions” that will affect the geographic scope is the summation of all of the minor normal changes and natural growth in both population and employment that is expected to occur by the year 2030 whether I-69 is built or not. These population and employment forecasts form the baseline condition for land use changes by 2030. The “No-

Build" population forecasts[5] have been determined based on birth rate, death rate, in migration, and out migration, and are independent of the I-69 project. This component of growth is referred to in this chapter as "Other Projected Growth." **Table 5.24-3** is based on the change from base year 2000 TAZs to the 2030 No-Build TAZ forecasts.

Table 5.24-3: Other Projected Growth Within Section 4 Geographic Scope (No-Build Scenario)

I-69 Section 4 Geographic Scope	Year 2000 (by TAZ)			Year 2030 NB (by TAZ)			Increase by Year 2030		
	Population	Households	Total Employment	Population	Households	Total Employment	Increase in Population	Increase in Households	Increase in Employment
Greene County	33,157	13,372	11,608	35,085	14,908	11,608	1,928	1,536	0
Monroe County	120,563	46,898	78,141	159,271	65,946	100,416	38,708	19,048	22,275
Totals	**153,720**	**60,270**	**89,749**	**194,356**	**80,854**	**112,024**	**40,636**	**20,584**	**22,275**

Source: BLA TAZ Shapefiles, May 2010

As shown in **Table 5.24-3**, Monroe County is projected to have the larger increase in population under the No-Build forecasts, approximately 32% from 2000 to 2030. Greene County is estimated to increase population approximately 6%. Monroe County is forecast to increase the most in total employment, with an increase of nearly 29%. Greene County's employment is not expected to increase. Overall, the Section 4 geographic scope will see a 26% increase in population, a 34% increase in households, and a 25% increase in total employment with the No-Build scenario.

Using the same land conversion ratios presented in *Step 7* of the indirect impact analysis (see pages 5-## to ##), estimates were prepared for the amount of undeveloped land that would need to be converted to accommodate these totals of new households and employment expected to occur with the No-Build scenario, whether I-69 is constructed or not. The Expert Land Use Panel again reviewed the TAZ maps to provide insight on where these land use changes would likely occur.

[5] The "No-Build" term refers only to the assumption regarding construction of the new I-69 highway. The normal growth and minor incremental changes expected during the time period, referred to here as "Other Projected Growth," are understood to be included in the "No-Build" scenario, but not any growth induced by the construction of I-69 or the major "Other" projects discussed in this chapter.

Table 5.24-4: Land Use Changes By 2030 for the No-Build Scenario

	Increase in Households	Acres for New Housing*	Increase in Employment	Acres for New Employment**	Total Acres for No-Build Growth (Unconstrained)	Equivalent Development Acres in TAZs without Open Land	Total Acres for No-Build Growth (Constrained)
Greene County	1,536	388	0	0	388	0	388
Monroe County	19,048	3,952	22,275	1,251	5,203	-1,207	3,996
Totals	**20,584**	**4,340**	**22,275**	**1,251**	**5,591**	**-1,207**	**4,384**

** Greene County utilized 3.96 units/acre, and Monroe County utilized 4.82 units/acre.*

*** Greene County utilized 15.4 employees/acre, and Monroe County utilized 17.8 employees/acre.*

In **Table 5.24-4**, a computation for acreage impacted due to the growth in population and employment in the "no build" case was made using the acreage calculation factors shown in the table. This is what is shown in the column labeled "Total Acres for No-Build Growth (Unconstrained)". A detailed review of the TAZs where this growth was forecasted to occur indicated that applying these factors in 142 of the Monroe County TAZs resulted in forecasted impacts to land use which exceeded the availability of undeveloped land, as shown in the year 2001 National Land Cover Database (NLCD). Eighty-seven (87) of the Monroe County TAZs are shown in the year 2001 NLCD as having only developed land. The NCLD categorizes developed land in several categories, including: Developed, Open Space; Developed, Low Intensity; Developed, Medium Intensity; and Developed, High Intensity.

For this analysis, it was assumed (for those TAZs where the forecasted impacts to open land exceeded the available amount of open land) that the added population and employment would use all available open land, but that these TAZs also would see developed land go to a higher level of development. For example, single-story office buildings may be replaced by a two- or three-story office building. The 1,207 acres subtracted from the "unconstrained" no-build growth in Monroe County takes into account that population and employment growth in a TAZ can impact no more than the remainder of any available land. **Appendix CC** of this DEIS provides more details about these calculations.

In addition, information on other major development projected to occur whether or not the project is constructed was obtained through a review of local land use plans where such exist and discussions with representatives of local governments, local and regional economic development groups/agencies, and major employers. The results of this review indicated the following "other" reasonably foreseeable major future (by the year 2030) actions could add to the project's potential direct and indirect impacts:

Section 3 of I-69[6]—FHWA's March 2004 Tier 1 ROD for the Evansville to Indianapolis project selected a corridor for I-69 between Evansville and Indianapolis. In addition, the Tier 1 ROD divided the Evansville to Indianapolis project into six separate sections for more detailed Tier 2 studies. The central portion of these six sections includes Sections 3, 4 and 5. Section 3 begins at US 50 east of Washington in Daviess County, Indiana, and ends at US 231 in Greene County, which is the beginning of Section 4. It is important to note that all traffic modeling conducted for the I-69 Evansville to Indianapolis project takes into account that this project will be constructed. The FHWA issued the ROD on January 27, 2010, for Section 3 Refined Preferred Alternative 1.

The potential direct impacts from Section 3 within Section 4's geographic scope were included in the Tier 2 Section 3 FEIS analysis. This includes Section 3's subsection E in Greene County, along with the US 231 interchange, which overlaps with Section 4's Subsection 4A. The geographic scopes of the cumulative impact analyses in adjacent sections of I-69 will of necessity overlap. As a result, some actions will be counted as cumulative impacts in more than one Tier 2 EIS; thus, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS.

The potential direct impacts to the five identified resources within the geographic scope of Section 4 as a result of the Section 3 project are as follows: farmland, 220 acres; forests, 40 acres; wetlands, 2.8 acres; streams, 9,438 linear feet; and no karst features. These direct impacts will be offset by mitigation measures incorporated into the Section 3 project, with both forest and wetland impacts being mitigated at ratios greater than 1 to 1. The totals presented in this analysis, however, do not include the mitigation totals from the adjacent Section 3 project.

I-69 From Evansville to Indianapolis: Section 5[7]—Section 5 begins at the SR 37 interchange in Monroe County, Indiana, and continues north along the existing SR 37 alignment to SR 39 in Morgan County, Indiana. The direct impacts from Section 5 within Section 4's geographic scope were included in the analysis. This includes portions of Section 5's alternatives in Monroe County. The potential impacts (direct) to the five identified resources within the geographic scope of Section 4 as a result of the project are as follows (the alternatives with the greatest impacts were used in the measurements): farmland, 80 acres; forests, 369 acres; wetlands, 14 acres; streams, 48,232 linear feet; and karst, 544 features. As with Section 3, the direct impacts to forests, wetlands and streams will be mitigated, but those totals are not included in this analysis.

Limestone Quarrying—The only other potential major action identified as being independent of the I-69 Section 4 project is limestone quarrying, which has been a prominent industry in the Section 4 project area since the early 19th century. There are several active limestone quarries in the project area, albeit outside the Section 4 corridor. There has been relatively little change in

[6] The information for I-69 From Evansville to Indianapolis: Section 3 impacts are from the Section 3 Final Environmental Impact Statement, 2009.

[7], The Section 5 impact information is from the May 2007 Preliminary Alternatives Analysis and Screening report. These data are subject to change as the project is further developed.

quarry land use in Greene or Monroe counties over the past 50 years. The current trend is for limestone companies to reopen former mines rather than starting work at a new site.

Approximately 250 acres of agricultural and forested land within the corridor around Tramway Road are zoned for mineral extraction. The mines have indicated that they would consider these 250 acres a part of their long range (100-year) plan; however, they have no formal published mine plan to verify this. Indiana requires no mining permit, plan or mitigation for limestone operations. Based on conversations with the limestone quarries, the conversion of the 250 acres of mineral extraction zoned land to limestone quarry in the foreseeable future is not likely.

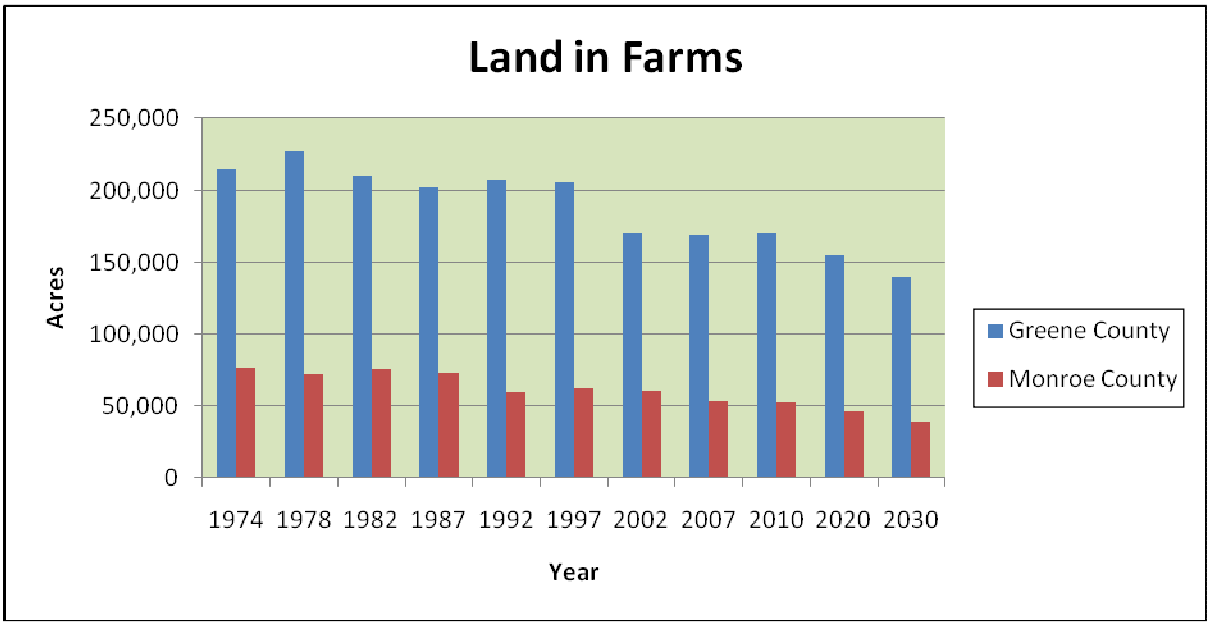
5. Characterize the resources, ecosystems, and human communities of concern and explain how they have historically changed.

Based on coordination with resource agencies, the resources potentially affected in Section 4 are forests, farmland, streams, wetlands and karst. Baseline reports for each resource's land use were evaluated to analyze the quantitative historic changes for each resource in the counties of the I-69 Section 4 study corridor. (Refer to the specific resource chapters for their respective baseline data sources.) Data to create a baseline analysis was unavailable at the TAZ level. The best available data was the county level, thereby covering the geographic scope of the Section 4 Study Area. The following data give an overall view of the historic trends for farmland, forested land, wetlands, and streams for each county, which does not include changes from the direct or indirect impacts of I-69. Future trends for these resources are discussed in Step 7.

Farmland—This cumulative effects analysis focuses on the direct, indirect, and other changes in farmland resulting from road construction. Past trends in agricultural land use and future projections were evaluated to analyze these changes. **Figure 5.24-2** (p. 5-790) shows the acres of agricultural land in Greene and Monroe counties from 1974 to present, and a straight-line projection (i.e., a linear regression analysis) of acres of land in farms to the year 2030.

The data indicates that from 1974 to 2007, Greene County experienced a 21% reduction in farmland acreage. The forecast for Greene County projects the acres of agricultural land to continue to decrease from 169,750 in 2007 to 139,970 by 2030, a loss of an additional 18%. Between 1974 and 2007 in Monroe County, the acres of land in farms decreased by 23,143 acres, or 30% (from 76,681 to 53,538 acres). The forecast for Monroe County projects the acres of agricultural land to continue to decrease from 62,149 to 39,048, a loss of an additional 37%.[8] These data and forecasts give an overall view of the baseline trends and projections of farmlands for each county. They do not include changes resulting from the direct or indirect impacts of I-69 or changes from other activities.

[8] Source: U.S. Agricultural Census 1974 through 2007: DLZ Indiana projections for 2010 through 2030.



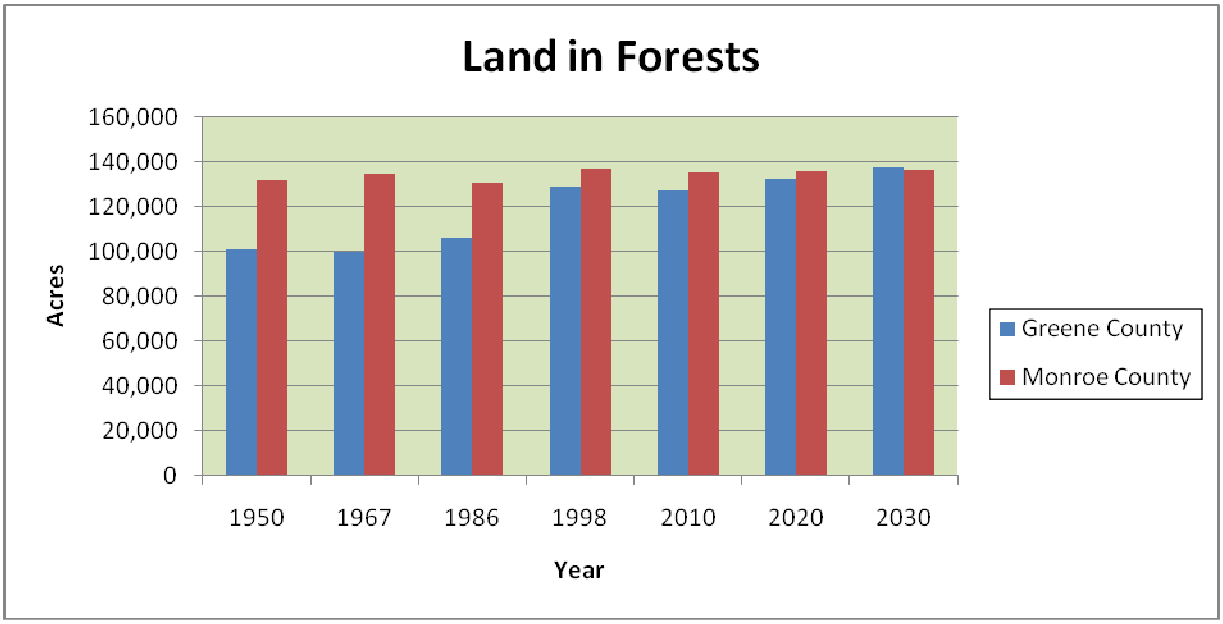
Source: U.S. Agricultural Census 1974 through 2002

Figure 5.24-2: Land in Farms—Greene and Monroe Counties—History and Trends

Forests—Approximately 4.5 million acres, or 20%, of Indiana is forested. Most forests are located in the southern half of the state (Tormoehlen et al., 2000). As noted in the Tier 1 FEIS (Appendix G), almost 200 years ago, forests covered about 85% of Indiana's land area. As farming became a central part of Indiana's economy, forests began to be replaced by farmland. Estimates indicate that by the mid-1800s, Indiana had lost almost 50% of its forestland. However, as Tier 1 further states, in Southwestern Indiana, 1950 to 1998 showed an increase in forests from 1,904,000 to 2,026,500 acres, an increase of 6.4% compared to previous years. During that same period, Greene County experienced a 27.5% increase in forestland, and Monroe County experienced a 3.5% increase in forestland acreage. The period from 1986 to 1998 also showed an increase in total forest acreage in both Greene and Monroe counties. Changing land management practices are contributing to this trend of increased forestation as some cropland and pasture are allowed to revert to forest and existing narrow wooded strips are allowed to expand. However, the statewide estimate for the period from 1986 to 1998 also showed a slight decline in total acreage was common suggesting that increases in forest acreage within other counties may have reached a plateau. A survey of Indiana's forests, 1999-2003, published by the USDA Forest Service identified a total of 256,800 acres of forest in the two counties in the Section 4 Study Area, as follows:

- Greene County—114, 200 acres
- Monroe County –142,600 acres

Figure 5.24-3 (p. 5-791) shows the land in forest in Greene and Monroe Counties from 1950 through 1998, and projected through 2030.[9]



Source: I-69 Tier 1 DEIS, USDA Forest Service

Figure 5.24-3: Land in Forest—Greene and Monroe Counties

As noted in the Tier 1 FEIS, future trends of forests in the Section 4 Study Area are anticipated to be similar to that of the State of Indiana, i.e., it is expected forests will show evidence of an achieved balance with little change in the actual amount of forestland.

Wetlands—USFWS estimates that between 1780 and 1950 Indiana has lost millions of acres of wetlands (see the Tier 1 FEIS Appendix H). Current wetland figures show 813,000 acres remaining by the mid-1980s, according to the most recent and complete analysis by the Department of Natural Resources in 1991. The Indiana Wetlands Conservation Plan states that with the majority of wetland resources having been lost or converted, all remaining wetlands are important and should be considered important for conservation (IDNR, 1996). The stresses on wetlands include impacts to water quality, alterations of water levels, and other surface disturbances. As a result, the biological diversity of Indiana's natural wetlands has been degraded. Of all wetland types, the palustrine forested (PFO) wetlands (bottomland hardwoods) have been identified in Indiana as the state wetland priority type (IDNR, 1988). The Tier 1 FEIS identified the following NWI wetland acreages for Greene and Monroe counties:

[9] Sources: 1950 data Keith, 1967 data Spencer, 1986 data Smith, Golitz, 1998 data Schmidt, Hansen, Solomakos, DLZ Indiana years 2010 through 2030 projections.

Greene County— 9,847 acres
Monroe County—14,475 acres

These acreages are expected to be similar today since very little development has occurred in these counties, and coordination with local resource agency officials appears to indicate wetland acres may be increasing in recent years. The location of I-69 in these counties is rural, and wetlands are in floodplains for the most part. State and federal regulations today along with the "No Net Loss" policy for wetlands have curbed their loss and with programs such as the Wetland Reserve Program,[10] acreages are expected to increase.

The *Final Wetland Assessment Report*, which includes an INWRAP evaluation of wetlands within the right-of-way of Section 4 alternatives, is included in **Appendix F** of this FEIS. There is no county-by-county level information that will allow forecasting future wetland trends. Current mitigation measures often require a four to one (4 to 1) replacement for any wetland loss. These measures both reduce the amount of existing wetland being drained, and increase the overall wetland acreage for the area.

Streams—The Lower White River Watershed and Lower East Fork White River Watershed are the two major watersheds traversed by the project corridor. Information regarding water quality in the two major watersheds and their sub-watersheds within the project corridor is summarized below.

Lower White River Watershed

Numerous streams identified in the project corridor are within the Lower White River Watershed. These streams are tributaries to the White River, which drains to the Wabash River. Several streams in the watershed are included in the State of Indiana's 2008 Clean Water Act Section 303(d) list of impaired waterbodies (IDEM 2008), including the White River itself. Of these, the Section 4 corridor, as well as all alternatives, crosses Black Ankle Creek and Plummer Creek. **Table 5.19-7** identifies the major streams and tributaries within the right-of-way of each alternative carried forward for detailed analysis.

In Northern Greene County, the Lower (West Fork) White River flows through areas of sand, silt and gravel (Schnoebelen et al, 1999). The White River is listed as impaired due to its impaired biotic communities, Fish Consumption Advisory (FCA) for Mercury, and FCA for PCBs. The Section 4 project corridor does not traverse the White River, but many of the identified streams are within its watershed.

Section 4 of the I-69 corridor crosses six sub-watersheds of the Lower White River Watershed. The six sub-watersheds are briefly described below (IGS GIS Atlas).

[10] The Wetland Reserve Program is administered by the USDA Natural Resources Conservation Service (NRCS) as a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support for these programs.

Doans Creek-Headwaters Watershed

This sub-watershed encompasses approximately 10,639 acres, and it covers the southwestern portion of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

Doans Creek-Bogard Creek Watershed

This sub-watershed encompasses approximately 6,444 acres, and it also covers a portion of the southwestern end of the Section 4 corridor. There are no NPDES discharge points in the watershed.

Beech Creek Watershed

This sub-watershed encompasses approximately 14,860 acres. It is located west of SR 45 at the South Connector Road intersection and covers the center of the Section 4 corridor. There are no NPDES discharge points in the watershed.

Plummer Creek-Lower Watershed

This sub-watershed encompasses approximately 11,747 acres, and it covers the western third of the Section 4 corridor. There are no NPDES discharge points in the watershed.

Plummer Creek-Black Ankle Creek Watershed

This sub-watershed encompasses approximately 15,036 acres, and it also covers a portion of the western third of the Section 4 corridor. There are no NPDES discharge points in the watershed.

Clifty Branch Watershed

This sub-watershed encompasses approximately 11,184 acres, and it covers the center third of the Section 4 corridor. There are no NPDES discharge points in the watershed.

Lower East Fork White River Watershed

Numerous streams identified in the project corridor are within the Lower East Fork White River Watershed. These streams are tributaries to the Lower East Fork White River which originates from the confluence of the Upper East Fork White River and Muscatatuck River near Medora then flows southwest before joining the Lower White River near Petersburg and ultimately discharging into the Wabash River. Several streams in the watershed are in the State of Indiana's 2008 Clean Water Act Section 303(d) list of impaired waterbodies (IDEM 2008), including the Lower East Fork White River itself and Clear Creek. Neither the Lower East Fork White River or Clear Creek are within the Section 4 corridor; however, tributaries to the Lower East Fork White River and Clear Creek are in the Section 4 corridor.

Section 4 of the I-69 corridor crosses five sub-watersheds of the Lower East Fork White River Watershed. The five sub-watersheds are briefly described below (IGS GIS Atlas).

Indian Creek-Town Branch Watershed

This sub-watershed encompasses approximately 13,168 acres, and it covers the center third of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

Indian Creek-Little Indian Creek Watershed

This sub-watershed encompasses approximately 13,465 acres, and it covers the east central portion of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

Indian Creek-Headwaters (Monroe) Watershed

This sub-watershed encompasses approximately 15,636 acres, and it also covers the east central portion of the Section 4 corridor. There are no National Pollutant Discharge System (NPDES) discharge points in the watershed.

Clear Creek-May Creek Watershed

This sub-watershed encompasses approximately 19,182 acres, and it covers the east portion of the Section 4 corridor. There are two National Pollutant Discharge System (NPDES) discharge points in the watershed. One is for the Dillman Road Waste Water Treatment Plant that discharges into Clear Creek. This is located southeast and downstream of the corridor. The other is a stormwater discharge far north of the project area at ABB Power T&D Co. Inc. However, this facility actually discharges into Beanblossom Creek via a tributary of Stout Creek.

Clear Creek-Jackson Creek Watershed

This sub-watershed encompasses approximately 16,074 acres, and it covers the northeastern terminus of the Section 4 corridor. There is one National Pollutant Discharge System (NPDES) discharge point in the watershed located at Keil Brothers Oil service Station for groundwater treatment. This discharges into Jackson Creek that discharges into Clear Creek, located east and downstream of the corridor.

IGIS stream data shapefiles were used to estimate the total length of streams within the two-county area. There are approximately 1,691 miles (8,930,143 linear feet) of streams within the two counties, distributed as follows:

Greene County—390 miles (2,060,000 linear feet)

Monroe County—1,301 miles (6,870,143 linear feet)

Karst—Karst features within Indiana are most prevalent from the area just north of Greencastle (in West Central Indiana) extending south to the Ohio River just west of New Albany. Within the Section 4 corridor, karst features begin approximately at Taylor Ridge southwest of Koleen and extend north and east throughout the remainder of the corridor. No karst-forming rocks were

identified in the portion of the corridor south and west of Taylor Ridge (see Section 5.21, *Karst Impacts*, on **Figure 5.21-1** (p. 5-827).

Karst ecosystems are an important feature of Southern Indiana. Karst forms as water dissolves bedrock. Water resources in karst areas are especially sensitive to impairment as very little water purification occurs in karst areas because the water flows directly through cracks and fissures in rocks rather than percolating slowly through soil as in other types of terrain. Therefore, water quality is an important concern in karst areas since karst flowpaths can convey pollutants to these water sources. While the Section 4 Study Area is served by private water utilities, there are no municipal drinking water supply or wastewater treatment facilities.

Karst resources also are important because they provide habitat for a number of rare, threatened, and endangered species. Many species of bats including the federally-endangered Indiana bat (*Myotis sodalis*) use caves which form in karst areas. Cave fauna surveys conducted for this project identified representatives of 76 taxa; including the Indiana bat, little brown bat and eastern pipistrelle. All of the bats observed were found at a cave, which is located north of the Section 4 corridor in Greene County. Fourteen (14) obligate subterranean species were found, and one non-obligate subterranean animal was also found. A detailed description of the survey methodologies and results of this study can be found in *Interstate 69 Evansville to Indianapolis, Tier 2 Studies: Section 4 Cave Fauna* (Cave, Karst & Groundwater Consulting, in association with ESI, 2006), provided as part of **Appendix AA**, *Final Karst Report/Addendum to Karst Report (Redacted)*.

Karst resources in the Section 4 Study Area historically have been impacted to a limited extent by agriculture, residential and commercial development, limestone quarrying, and logging. The avoidance and minimization of impacts to karst features has been an environmental concern for the Indiana Department of Transportation (INDOT) and the Federal Highway Administration (FHWA) since studies in the early 1990s. INDOT developed a karst report as part of the Southwest Indiana Highway Study entitled "Karst Features in the Bloomington to Evansville Highway" as early as 1994. This study was published as Appendix G in the March, 1996 DEIS for the Southwest Indiana Highway. The study area for this report extended from SR 37 south of Bloomington in Monroe County to SR 57 near the town of Newberry in Greene County, Indiana, a distance of approximately 32 miles.

To define guidelines for the development of transportation projects in karst areas and minimize the impact of construction projects, INDOT, Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources (IDNR), and the U.S. Fish and Wildlife Service (USFWS) entered into the Karst Memorandum of Understanding (Karst MOU) in 1993. Monroe County adopted a zoning ordinance (*Karst and Sinkhole Development Standards*, revised, June 2, 2000) to protect karst features within that county, and karst resource protection is also a stated goal of the Greene County comprehensive plan adopted August 3, 2009. It should be noted that for this project, FHWA has invited the United States Environmental Protection Agency (USEPA) to participate in the karst study and assessment.

The karst landscape is continually evolving. Karst features can change rapidly with subsequent opening and infilling of sinkholes, caves and swallets as well as increase and decrease in spring discharges. Impervious surfaces, such as roads, alter the natural patterns of runoff and

infiltration and can also be a source of pollution entering karst systems. Private and water utility wells located within the karst zones of susceptibility could be impacted by changes in surface runoff to karst features resulting from road construction and the effects of induced growth. **Table 5.24-5** shows the types and quantities of karst features indentified within the Section 4 Karst Study Area.

Table 5.24-5: Karst Features Identified Within Karst Study Area

Karst Feature Type	Within Section 4 Corridor	Outside Corridor - Hydrologically Associated to Section 4 Corridor	Total
Caves	15	49	64
Swallets	19	43	62
Sinking Streams	6	9	15
Springs	103	228	331
Sinkholes	305	688	993
Totals	**448**	**1,017**	**1,465**

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

Farmland—The conversion of farmland to urban development has been the result of several demographic trends including more single person households, smaller households, bigger commercial facilities and larger, single level industrial plants. In light of these trends, one of the goals of the Natural Resources Conservation Service (NRCS) Farmland Protection Program is to protect and slow the loss of farmland. Preservation strategies concentrate effects to direct industrial, residential, and commercial growth to areas less suitable for farming.

Forest—Over the past 50 years forests have been increasing in Indiana. Changing land management practices are contributing to this trend of increased forestation as some cropland and pasture are allowed to revert to forest and existing narrow wooded strips are allowed to expand. The increase in forests due to these changing practices has been greater than losses from the conversion of forests to agriculture, urban/suburban expansion, and other uses in the past 50 years. Development pressures stress forests; the fragmentation of forest areas also adversely affects wildlife. Fragmentation of forests may affect core forest habitat, which in turn may adversely affect a variety of species living in this core habitat. Wildlife dependent upon this habitat will be affected if these forests decline or continue to become fragmented. The goal of the Forest Service of the U.S. Department of Agriculture is to continue the conservation programs and protect the forests. In the two-county geographic scope, agriculture and commercial and residential development have been and continue to be the principal stressors of

this resource. Although urbanization is occurring in the Bloomington area extending southward along the SR 37 corridor, its primary impact is to cleared agricultural land.

Wetlands—In the two-county geographic scope, agriculture and to a lesser extent residential and commercial development have been and continue to be the principal stressors of this resource. This includes the use of fertilizers, insecticides and pesticides, and the presence of contaminated runoff from agricultural operations, all of which contribute to water quality impacts. Also, in Monroe County along the SR 37 corridor south of the City of Bloomington, urbanization has been extending southward from Bloomington, further stressing this resource.

Streams—Black Ankle Creek, Dry Branch Creek, Plummer Creek, Mitchell Branch Creek, Indian Creek and two unnamed tributaries of Clear Creek are the perennial streams in the Section 4 Corridor. Within the corridor, portions of Black Ankle Creek, Indian Creek and an unnamed tributary of Clear Creek have been channelized. Stream channelization increases soil erosion, turbidity (with siltation), water temperature, risks to public health, and degradation to habitat and water quality. Additional stresses on these waterways, as well as on others in the corridor, include sewage (particularly in locations where septic systems operate poorly or are not maintained properly), agricultural run-off, logging activities, contaminated road salt in surface water runoff from roadways/parking areas, limestone quarry activities, and landfill runoff.

Karst—Within the Section 4 geographic scope, residential and commercial development and associated septic systems, agriculture, logging, and limestone quarrying have been and will continue to be the principal stressors of karst resources. The use of fertilizers, insecticides and pesticides, contaminated runoff from agricultural operations and septic systems all contribute to karst water quality impacts. In addition, continued development in Greene and Monroe counties changes infiltration and runoff patterns, which can affect karst flowpaths and potential contaminant introduction to karst resources and private groundwater wells.

7. Define a baseline condition for the resources, ecosystems, and human communities

Farmland—The future trend for farmland in the two county geographic scope is continued loss of land for use in agriculture. A linear regression analysis for land in farms in the study area from 1950 to 2007 shows a downward trend (see **Figure 5.24-2**, p. 5-790). At this rate the land in farms in Greene and Monroe counties would be approximately 179,000 acres by 2030 representing a projected loss of approximately 20% of the total farmland from the year 2007. In terms of a loss per year of farmland, this decline is approximately 1,925 acres per year in the two counties.

Forest—The future trend for forests in Greene and Monroe counties seems to indicate that the increase in forest acres in recent decades has begun to plateau. That trend is expected to continue with little increase in forest acres anticipated for the foreseeable future (see **Figure 5.24-3,** p. 5-791). A survey of Indiana's forests published by the USDA Forest Service (1998) showed approximately 265,500 acres of forestland in the two-county area with 128,800 acres in Greene County and 136,700 acres in Monroe County.

Wetlands—The *Final Wetland Assessment Report* (see **Appendix F**) contains detailed INWRAP data on the 23 wetlands (these 23 wetland complexes contain 25 wetland units) that

would be directly impacted by the alternatives carried forward for detailed analysis, including a description of each wetland and its rating ("poor," "fair," or "good") for quality of animal habitat, botanical measures, and hydrology. **Table 5.19-4** in Chapter 5, *Environmental Consequences*, illustrates the general quality of each wetland or wetland complex and provides a comparison of wetlands affected by each proposed alternative. In summary, the INWRAP evaluation of each of the 23 wetlands (25 units) potentially impacted by the project yielded the following ratings for animal habitat, botanical measures and hydrology:

Animal habitat:	11 are "poor"	14 are "fair"	0 are "good"
Botanical:	13 are "poor"	12 are "fair"	0 are "good"
Hydrology:	0 are "poor"	8 are "fair"	17 are "good"

The general quality of the wetlands impacted by alternatives carried forward for detailed analysis is poor to fair. The majority of the wetlands show poor to fair quality in their regard to animal habitat; poor to fair in botanical quality; and, fair to good quality in their hydrology measure.

Streams—The Qualitative Habitat Evaluation Index (QHEI) and Headwater Habitat Evaluation Index (HHEI) have been completed on all streams within the project corridor, as appropriate. A total of 287 streams were identified in the Section 4 corridor and an assessment was completed for each. If the habitat along the length of the stream changed, a separate assessment was made. There were a total of 288 assessments made. Named streams crossed by the Section 4 Alternatives include Dowden Branch, Black Ankle Creek, Dry Branch Creek, Plummer Creek, Mitchell Branch Creek and Indian Creek. As the QHEI/HHEI scores indicate, the majority (about 60%) of streams crossed by the alternatives have at least moderate water quality. About 57% of the QHEI scores (8 of the 14 crossing locations) fell into the highest quality category. About 29% of the HHEI scores (78 of the 274 crossing locations) fell into the highest quality categories.

Black Ankle Creek, Dry Branch Creek, Plummer Creek, Mitchell Branch Creek, Indian Creek, an unnamed tributary to Clear Creek and another unnamed tributary to Clear Creek are the perennial streams within the Section 4 corridor.

The QHEI score at the westerly crossing of Indian Creek south of Carmichael Road in Greene County (Alternatives 2, 4 and Refined Preferred Alternative 2) was 42. Based on IDEM criteria (see Section 5.19.2.2), a score of less than 51 indicates a stream that may not provide suitable habitat to sustain the plants and animals typically found in this region of Indiana. In this location, the creek has been modified by channelization.

The QHEI scores at the crossings of Dry Branch Creek, Plummer Creek, and Mitchell Branch fell between 55 and , as did the crossings of Indian Creek associated with the County Line Interchange Connector Road (in Greene County), and the Indian Creek Crossing west of Breeden Road in Monroe County. Based on IDEM criteria, a score between 51 and 64 indicates a stream that may be partially supportive of their aquatic life use designations. These six streams have either not been modified by channelization or had recovered from channelization.

The QHEI scores at the easterly crossing of Black Ankle Creek, Indian Creek south of Carmichael Road in Greene County, the crossings of Indian Creek south of the Timber Trace subdivision in Greene County and Monroe County, and the crossings of two unnamed tributaries to Clear Creek in Monroe County were above 64. Based on IDEM criteria, a score over 64 indicates a stream may be capable of supporting a balanced warm water community.

The QHEI/HHEI data and maps are provided in the *Final Stream Assessment Report*, **Appendix M**.

Karst—The Section 4 survey of karst features for the corridor and adjacent areas known and/or inferred to be linked through groundwater flowpaths or surface flow areas identified a total of 1,464 karst features (see Section 5.21, *Karst Impacts*, **Table 5.21-1**). This survey documents reviews of karst information relevant to the Section 4 corridor, field checks of previously recorded karst features, field investigations to identify previously unrecorded karst features, water chemistry analysis, dye tracing of karst features, and recommendations for karst feature avoidance, impact minimization, and mitigation of unavoidable impacts. The general locations of the identified karst features relative to the Section 4 corridor are depicted in **Figure 5.21-2** (p. 5-731). The five Alternatives are located within karst terrain exhibiting dense concentrations of karst features distributed across the Section 4 corridor. Karst terrain within the Section 4 corridor begins in Greene County approximately at Taylor Ridge, southwest of Koleen, and extends north and east throughout the remainder of the corridor. No karst forming rocks are exposed in the Greene County portion of the corridor south and west of Taylor Ridge. Three distinct areas (hydrogeologic units) of karst geology were identified within the study area in the vicinity of Taylor Ridge and SR 54, which are located in Greene County, and Harmony Road in Monroe County. These features are discussed in Section 5.21, *Karst Impacts*, and shown on **Figure 5.21-2** (p. 5-731).

Groundwater and surface water are both used as potable water sources in the Section 4 Study Area. Groundwater wells are used abundantly throughout Section 4, and springs are also used as a potable water supply for individual landowners. The spring discharge within the Study Area varies greatly, due to the hydrogeologic nature of the spring and flow conditions. Spring discharge could potentially be altered by changes in flowpaths resulting from highway construction. Tools including a karst ordinance are in place in Monroe County to control development through karst and sinkhole development standards, land use planning, and subdivision and zoning regulations. Greene County's recently adopted comprehensive plan includes recommendations for protection of karst resources.

The NRCS sewage disposal septic tank absorption field rating classes identified for the Section 4 project area include somewhat limited, not rated, and very limited soils. A soil septic absorption map showing soil/septic system suitability for Greene and Monroe Counties is included as **Figure 5.24-4** (p. 5-832). Soil associations and shallow bedrock present within the Section 4 project vicinity are described in Chapter 4.3, *Natural Environment*. A soil association map also is included in Chapter 4.3 as **Figure 4.3-2** (p. 4-107)**.** Environmentally sensitive areas and karst feature densities in Greene and Monroe Counties are shown in relation to the TAZs with anticipated induced growth from I-69 on **Figure 5.24-5** (p. 5-837).

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities

The five major resources considered in this cumulative effects analysis are farmland, forest, wetlands, streams, and karst. The most common cause-and-effect issue is land conversion from farmland, forests, and wetlands to other uses, the primary one being residential development. Greene County is primarily forested and agricultural and expected to remain so in the foreseeable future. Local officials are supportive of maintaining both land uses while also encouraging development to spur local economies. Greene County recently adopted a comprehensive plan to provide local planning officials the tools to control development through land use planning.

Urbanization is occurring in southwest Monroe County due to the presence of the City of Bloomington. While urbanization is occurring along the SR 37 corridor north of Section 4, in accordance with land use plans in place in Monroe County, residential development and to a lesser extent commercial development and limestone quarries are the primary human activities that impact resources. Tools including a karst ordinance are in place in Monroe County to control development through karst and sinkhole development standards, land use planning, and subdivision and zoning regulations.

The following plans were developed as a result of the I-69 Planning Grant Program. These plans identify sensitive environmental areas and recommend further measures including zoning ordinances to protect karst features, water quality, ecosystems, and natural resources.

- The Bloomfield 2009 Comprehensive Plan
- City of Bedford 2010 Comprehensive Plan
- Greene County 2009 Comprehensive Plan
- Lawrence County 2009 Strategic Plan
- Monroe County Draft 2010 Comprehensive Plan
- Monroe County 2010 SR 37 Corridor Plan

Farming practices can adversely affect the ecosystem in certain situations: land clearing can fragment or denude forested land; tilling can lead to erosion and stream sedimentation; stormwater and irrigation runoff can deposit fertilizers, herbicides, and insecticides into streams and aquifers, thereby impacting water quality; etc. Regarding conversion of forest and farmland for limestone quarry operations, there are no regulations requiring the reclamation of limestone quarry lands; therefore, no assumption is made that these lands would be restored to forest or agricultural use.

9. Determine the magnitude and significance of cumulative effects by identifying the changes in Section 4 as a result of I-69.

The cumulative changes (direct, indirect and other) in Section 4 as a result of I-69 for each of the five identified resources are as follows:

Farmlands—

- Direct: The direct conversion of farmland to highway right-of-way for Refined Preferred Alternative 2 would range from an estimated 356.03 acres under the low-cost design criteria to 461.36 acres for the initial design criteria. The ability to access parcels severed by the new road is also a consideration when determining direct farmland impacts. I-69 is a fully-controlled access facility; therefore, the only access will be at the three proposed interchange locations. Some parcels would be landlocked, although access to most severed parcels will be available via adjacent roads or new frontage roads, etc. The disposition of uneconomic remnants and severed parcels will be addressed during final design.

  Potential impacts to farmland are addressed in detail in Section 5.4, *Farmland Impacts.* Mitigation measures for impacts to farmland are described in Section 7.3.10, *Farmland Impacts*.

- Indirect: I-69 Section 4 is much more heavily forested than Sections 1 through 3 of the Tier 2 I-69 Corridor. It was determined in the ROD for Sections 1, 2 and 3 that forested land would likely not be impacted by indirect development within their project study areas. Due to the significantly higher percentage of forest land within the Section 4 study area, an estimate of 60% of induced growth occurring on farmland and 40% of the induced growth occurring on forested land was established based on an analysis of development of specific land uses within the Section 4 project (see **Appendix CC**). However, this 40% estimate is not applicable in the 12 TAZs in the vicinity of the US 231 interchange. Due to the larger percentage of agricultural land in the US 231 vicinity, induced growth within these 12 TAZs was anticipated in the Section 3 FEIS to impact agricultural land (see **Appendix CC** for further discussion). Indirect development within these 12 (US 231 vicinity) TAZs is therefore anticipated to impact 25 acres of agricultural land.

  A total of 106 acres of farmland (including 25 acres in the US 231 vicinity) are forecasted to be converted within Section 4 as a result of induced growth from I-69 (see **Table 5.24-2**). These indirect land use changes are the same for any of the Alternatives because each is located within the same corridor, varying only slightly between the actual alignments, and include the same number and locations of interchanges. The location and number of interchanges are most closely related to the location of induced growth. The forecasted amount of traffic, which creates much of the economic demand for the amount of indirect land use changes, is the same for each alternative. Combined, the interchange locations and traffic volumes generally affect the location and amount of indirect land use changes.

  The average number of housing units per acre in the Greene County region is 3.96 units, while the average number of housing units per acre in Monroe County is 4.82 units per acre. The estimated number of households that would be established as a result of the I-69 project is 326 in Greene County and 150 in Monroe County. By dividing the number of households by the average number of units per acre, it is estimated that the number of acres to be converted to residential use as a result of the project (i.e., indirectly affected) would be as follows: Greene County, 82 acres; and Monroe County, 31 acres.

The average number of employees per acre in the Greene County region is 15.4, while the average number of employees per acre in the Monroe County region is 17.8. The estimated number of jobs that would be induced as a result of the I-69 project is 371 in Greene County and 400 in Monroe County. By dividing the number of induced jobs in Greene County by the average of 15.4 employees per acre, and 17.8 employees per acre in Monroe County, it is estimated that the number of acres to be converted to employment-related uses would be as follows: Greene County, 25 acres; and Monroe County, 22 acres. The employees-per-acre, per-employment-type data were developed from the Institute of Transportation Engineer's (ITE) Code per Trip Generation 6th Edition.

The total number of acres converted as a result of induced growth compared with the total number of acres in the TAZs where induced growth is predicted to occur is as follows:

Greene County: 106 acres (0.1% of the 73,044 acres in the TAZs) 74 acres of agricultural land will be indirectly converted including 25 acres from the US 231 TAZs and 60% of the remaining 81 acres in Greene County. Approximately 32 acres forest land (40% of the 81 acres in Greene County) would be indirectly converted.

Monroe County: 54 acres (6.9% of the 778 acres in the TAZs) Approximately 32 acres agricultural land (60% of 54 acres) will be indirectly converted, while 22 acres forest land (40% of 54 acres) will be indirectly converted.

The total 106 acres of induced growth in Greene and Monroe counties that will likely occur on farmland plus 888 to 1,116 acres of farmland proposed for mitigation of direct impacts (15.79 to 29.14 acres for wetlands and 872 to 1,087 acres for reforestation) equals 994 to 1,222 acres—about 0.2% of the two-county total land area of 599,087 acres (for the low cost design criteria and initial design criteria, respectively). As **Figure 5.24-1** (p. 5-827) shows, the majority of the predicted development would occur near the interchanges with US 231, the Greene/Monroe County Line, and SR 37.

As indicated above, it is also anticipated that mitigation within the Section 4 geographic scope for direct impacts of the Section 4 project to forests and wetlands will require some further acquisition and conversion of farmland. INDOT and FHWA have voluntarily committed to mitigate impacts to upland forests at a 3 to 1 ratio averaged over the entire length of the I-69 corridor, which includes a 1 to 1 ratio of replacement plus a 2 to 1 ratio of forest preservation (see Section 7.2, *Major Mitigation Initiatives*). Actual ratios within each individual section may vary from the overall average. For purposes of this analysis, a 1 to 1 replacement of upland forest impacts will be assumed within the Section 4 geographic scope. (The 2 to 1 conservation of existing forest land will not require new conversion of any farmland.) Thus it is estimated that approximately 872 to 1,087 acres of agricultural land will be converted for the Section 4 upland forest mitigation program for the low-cost design criteria and the initial design criteria, respectively.

Likewise there will be some conversion of agricultural land to provide for the mitigation of direct impacts to wetlands, including forested wetlands, within the Section 4 geographic scope. A Memorandum of Understanding executed between INDOT, USFWS, and IDNR in 1991 (See **Appendix W**) established mitigation ratios for a variety of wetland types. Based

on those ratios, it is estimated that approximately 15.79 to 29.14 acres of agricultural land (See Table 5.19-9) will be converted to wetlands as part of the wetland mitigation program within Section 4 for the low-cost design criteria and the initial design criteria, respectively.

Total loss of farmland due to mitigation for forest and wetland losses will be approximately 888 to 1,116 acres. Total indirect impacts due to induced development (106 acres) and conversion of farmland for upland forest and wetland mitigation would therefore be approximately 994 to 1,222 acres for the low-cost design criteria and the initial design criteria, respectively.

- Other: Other developments that are anticipated to convert agricultural land to developed land primarily result from population and employment forecasts for the No-Build scenario.

One other major potential conversion of farmland is limestone quarrying, which is a prominent land use in Monroe County. Most farmland impacts from limestone quarrying occur when the land surface is stripped (rather than mining occurring underground). Local officials and limestone quarrying companies have been contacted in an effort to identify plans for quarrying land in the Section 4 project area. No new limestone quarries have been proposed within the project corridor; however, approximately 250 acres of agricultural and forested land within the corridor around Tramway Road are zoned for mineral extraction. Based on conversations with the limestone quarries, the conversion of this land to mineral extraction in the foreseeable future is not likely. The potential contribution to cumulative farmland impact will be re-evaluated if any such quarries are proposed during the development of this highway documentation process.

The portion of Section 3 of I-69 from Evansville to Indianapolis within Section 4's geographic scope will directly impact 220 acres of farmland. The portion of Section 5 of I-69 from Evansville-to-Indianapolis within Section 4's geographic scope will directly impact 80 acres of farmland within the Section 4 study area**.** Please note, the geographic scopes of the cumulative impact analyses in adjacent sections will of necessity overlap. As a result, some actions will be counted as cumulative impacts in more than one Tier 2 EIS; thus, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS.

The population and employment forecasts form the baseline condition for land usage needed by the 2030 population. The No-Build population forecasts have been determined based on birth rate, death rate, in migration, and out migration, and are independent of the I-69 project. They are as follows:

Greene County: New households by 2030: 1,536; employment: 0. These added households result in 388 acres of total impacts (or 0.11% of the 346,967 acres of Greene County). Impacts to farmland are estimated to be 233 acres (60% of 388 acres). According to the expert land use panel, most of this growth would occur in areas outside of the immediate Section 4 construction project area. As noted above, **Figure 5.24-1** (p. 5-827) shows, the majority of the predicted development would occur near the interchanges with US 231, the Greene/Monroe County Line, and SR 37.

Monroe County: New households by 2030: 19,048; employment: 22,275. These added households result in 3,996 acres of impacts (or 1.6% of the 252,381 acres of Monroe County). Impacts to farmland within Monroe County are estimated to be 2,397 acres (60% of 3,996 acres). According to the expert land use panel, most of this growth would occur in areas outside of the Section 4 project area. Total impact to farmland from the projected No-Build growth for both Greene and Monroe counties is estimated to be 2,630 acres converted.

Summary: Direct impacts to farmland will result from the acquisition of farmland for right-of-way needed for construction of I-69. Direct impacts to farmland in Section 4 are estimated at 356.03 acres for Refined Preferred Alternative 2 low-cost design criteria and 461.36 acres for the initial design criteria. Growth induced by the construction of Section 4 of I-69 is estimated to require the conversion of 106 additional acres of agricultural land within the two-county area. Indirect impacts to agricultural land will also include approximately 888 to 1,116 acres (for the low-cost design criteria and initial design criteria, respectively) for mitigation of impacts to forests and wetlands. Growth expected to occur within the two-county area even if I-69 is not constructed is estimated to require the conversion of 2,630 acres of agricultural land (60% of the 4,384 acre total No-Build growth estimate). Other major projects that have been identified within the geographic scope of this analysis that will have a permanent effect on land use include Section 3 of I-69 in Greene County, and Section 5 of I-69 in Monroe County. Direct impacts to agricultural land due to these other projects are estimated to be approximately 220, and 80 acres, respectively, for a total of 300 acres of agricultural land. The combined total of direct, indirect and other impacts to agricultural land within the two-county area is estimated to be 4,280 to 4,613 acres for the low-cost design criteria and initial design criteria, respectively. The cumulative effects would thus convert approximately 1.9 to 2.1% of the total of 223,288 acres of agricultural land within the two-county area. Total loss of farmland due to mitigation for forest and wetland losses will be approximately 888 acres for Refined Preferred Alternative 2 low-cost design criteria and 1,116 acres for the initial design criteria. Total indirect impacts due to induced development and conversion of farmland for upland forest and wetland mitigation would therefore be approximately 994 acres for Refined Preferred Alternative 2 low-cost design criteria and 1,222 acres for the initial design criteria.

Impacts to farmland resulting from other projected growth (No-Build scenario) are projected to be 2,630 acres (60% of the 4,384 acre total No-Build growth estimate). Sections 3 and 5's direct impacts on farmland within the Section 4 geographic scope would be 300 acres.

Combined, the direct, indirect, and other impacts total a cumulative conversion of 4,280 to 4,613 acres of agricultural land to non-agricultural land by the year 2030 for the low-cost design criteria and initial design criteria, respectively. **Tables 5.24-6** and **5.24-7** summarize the cumulative land use changes for farmland. In 2007, within Greene and Monroe counties, there were 223,288 acres within farms (169,750 in Greene, and 53,538 in Monroe). Therefore, the cumulative impact is approximately 1.9% to 2.1% of the current amount of land in farms within the two counties.

Forest—A survey of Indiana's forests, 1999-2003, published by the USDA Forest Service identified a total of 256,800 acres of forest in the two counties in the Section 4 Study Area.

Exact comparisons between the forest areas in the USDA survey and the forest areas identified during field surveys in Section 4 cannot be made due to the changing nature of the resource (e.g., some forested areas identified in the USDA survey may no longer exist). However, generalizations can be made based on the available data.

- Direct: A direct impact for forests in the Section 4 Study Area would be the fragmentation of forested areas for right-of-way taking. Approximately 4,420 acres of forest (4,409 are upland acres) are within the corridor. The 4,420 acres would be approximately 1.7 percent of the two-county total. Of the 4,420 acres, from 872.12 acres (low-cost design criteria) to 1,087.37 acres (initial design criteria) of upland forest are within the right-of-way of Refined Preferred Alternative 2 for this project. Although an exact comparison of Forest Service and Section 4 forest survey data cannot be made, it is not likely there would be a notable difference in the percentages of impact.

  Potential impacts to forests are addressed in detail in Section 5.20, *Forest Impacts.* Upland forest impacts will be mitigated at a 3 to 1 ratio, including 1 to 1 replacement and 2 to 1 preservation for the I-69 Evansville to Indianapolis project as a whole; within individual sections these ratios may vary depending on the mitigation opportunities presented. Proposed mitigation within Section 4 will provide 872.12 to 1,087.37 new replacement acres of upland forest on land converted from agricultural uses. (Forested wetlands will be mitigated as wetlands, at a ratio of 3 to 1, thereby adding at least another 11.28 acres of forest; however these are included in the wetlands totals to avoid double counting. The 872.12 to 1,087.37 acres (for the low-cost design criteria and initial design criteria, respectively) of upland forest will be replaced by using 872 to 1,087 acres of agricultural land (see **Table 5.24-6**). Mitigation measures for impacts to forests are described in Section 7.3.11, *Forest Impacts*.

- Indirect: An indirect impact for forests would be the possibility of adjacent land taken for commercial or residential development, as a result of new access provided by I-69. The Expert Land Use Panel identified the proposed new interchanges at US 231, the Greene/Monroe County Line, and SR 37 as the probable locations of the 160 acres of new development that would occur as a result of the construction of I-69. Within the approximately 73,822 acres (total) of TAZs identified as potential locations for project-induced development, the 160 acres predicted to be developed as a result of the project are as follows: 47 acres are projected for job induced development in the two county study area (25 acres in Greene County and 22 acres in Monroe County), and 113 acres of induced residential development are predicted to occur in the two county study area (82 acres in Greene County and 31 acres in Monroe County). Approximately 66% of all such development is predicted to occur within Greene County.

  I-69 Section 4 is much more heavily forested than Sections 1 through 3 where it was determined that due to the abundance and lower cost of developing agricultural land, forested land would likely not be impacted by indirect development. Therefore, an estimate of 40% of the induced growth occurring on forested land was established through research for the Section 4 project (see **Appendix CC**). This 40% estimate does not include the 12 TAZs in the vicinity of the US 231 interchange as those TAZs were determined in the Section 3 study to primarily consist of agricultural land.

To predict the amount of forest that may be impacted by induced growth resulting from I-69, land use changes having historically occurred in representative Section 4 TAZs were evaluated. Aerial photographs of the TAZs taken in 1998 and 2008 were compared to estimate the change in land use during this period. The results of the evaluation indicate that approximately 36% of forest land in the developed areas was converted to residential land use within the ten-year period. Therefore, a worst-case estimate of 40% forest impact in the induced growth areas was established for the Section 4 Study Area, excluding those 12 TAZs in the US 231 vicinity (see **Figure 5.24-1**, p. 5-827).

Most of the induced growth in Section 4 is expected around the Greene/Monroe County Line interchange in Greene County and around the SR 37 interchange in Monroe County. In two of the more forested TAZs, numbers 2801506 and 2801602 near the Greene/Monroe County Line interchange in Greene County (refer to **Figure 5.24-1**, p. 5-827), 78.6% of the combined land cover is forest, but there are still 1,508 acres of agricultural land available for the projected 9.9 acres of induced development anticipated under the year 2030 build scenario. Collectively in the TAZs that are anticipated to experience induced growth, forest is the predominant land use (see **Table 5.24-1**).

Given the availability of agricultural land in the more desirable locations, it is reasonable to assume that, in the foreseeable future, the majority of land (estimated at 60%) required for induced commercial development will be converted from agricultural land. Although forest is the predominant land use in Section 4, land requiring extraordinary site preparation or permitting through a time-consuming and often expensive process presents an economic disadvantage and is typically less desirable to a commercial business.

Assuming 40% of the anticipated 135 acres of induced growth caused by Section 4 (in those TAZs outside of the US 231 vicinity) will occur on forested lands, the predicted impact is 54 acres (32 acres in Greene County and 22 acres in Monroe County). The predicted impact to agricultural/other land use is 81 acres (49 acres in Greene County and 32 acres in Monroe County). Indirect impacts in those TAZs in the vicinity of US 231 are estimated to be 25 acres; therefore, the total estimated induced growth impacts for the Section 4 project are 160 acres of which 106 acres are agricultural land and 54 acres are forest land.

- Other: The portions of the two proposed I-69 projects within the geographic scope of Section 4 are estimated to have direct impacts to forests as follows: Tier 2 I-69 Section 3, 40 acres; and Tier 2 I-69 Section 5, 369 acres. Please note, the geographic scopes of the cumulative impact analyses in adjacent sections will of necessity overlap. As a result, some actions will be counted as cumulative impacts in more than one Tier 2 EIS; thus, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS. No-Build growth within the Section 4 project area is anticipated to impact about 1,754 acres of forest; however, there are no other areas currently planned for development.

  A potential major action identified as being independent of the I-69 project is limestone quarrying. While there are currently no active limestone quarries within the Section 4 corridor area, there is one area in Monroe County that is zoned for mineral extraction. This area goes from about ¼ mile northeast to about 1¼ miles southwest of Tramway Road and is

comprised of approximately 250 acres of agricultural and wooded lands. There are no known quarry plans for mining activity to occur on these 250 acres in the foreseeable future. The current trend is the reopening of former limestone mining sites before mining of previously undisturbed land occurs. There are no reforestation requirements for any land converted to limestone quarry. In addition, there are no reclamation requirements to ensure that there will be no long term reductions in forested lands from ongoing major limestone quarry activities.

Summary: Direct impacts on forests will result from the acquisition of forestland for additional right-of-way needed for road construction. The project will require the acquisition of about 872 acres of forestland for right-of-way under the low-cost design criteria and 1,087 acres of forestland required for right-of-way under the initial design criteria. Assuming 40% of the anticipated 135 acres of induced growth caused by Section 4 (in those TAZs outside of the US 231 vicinity) will occur on forested lands, the predicted impact is 54 acres (32 acres in Greene County and 22 acres in Monroe County).

Combined direct (872 to 1,087 acre reductions), indirect (54 acre reduction), and other (2,163 acre reduction) impacts reasonably foreseeable to occur total a cumulative conversion of 3,089 to 3,304 acres of forest to non-forest use. However, measures are proposed to mitigate direct impacts to forests due to the Section 4 project. There is proposed to be a total of approximately 2,616 to 3,262 acres of forest mitigation including 1 to 1 replacement and 2 to 1 preservation to offset the approximate 872.12 to 1,087.37 acres of direct impacts. Of this amount, 872 to 1,087 acres would be replacement (planted non-wetland bottomland forest), thereby resulting in no direct loss to forest. (Note: the impacts to forested wetlands would be mitigated using the appropriate wetland replacement ratio for "forested wetland" [i.e., 3 to 1 or 4 to 1] rather than "forest" [generally 1 to 1]). After accounting for the 872 to 1,087 acres of replacement forest from mitigation, the total cumulative conversion of forest acreage is a 2,217 acre loss for both the low-cost design criteria and the initial design criteria (see **Table 5.24-6**).

A survey of Indiana's forests, 1999-2003, published by the USDA Forest Service identified a total of 256,800 acres of forest in the two counties (114,200 in Greene County and 142,600 in Monroe County). Therefore, the cumulative impact of forest lost due to conversion is less than 0.9% of the current amount of land in forest within these counties.

Wetlands—

- Direct: The direct impacts for wetlands in Section 4 would be the taking of a wetland for right-of-way for an interchange or roadway construction. The Tier 1 FEIS identified 24,322 acres of wetlands in Greene and Monroe counties. Field survey and delineation of wetlands conducted for Section 4 located approximately 41.52 acres within the corridor. Of those 41.52 acres, Refined Preferred Alternative 2 would impact 5.32 acres of wetland for the low-cost design criteria and 9.55 acres of wetland for the initial design criteria. The maximum 9.55 acres of impact would represent less than 0.04% of the total area of wetlands in the Study Area. Regarding the importance assigned to PFO wetlands, only 1.81 to 4.83 acres are within the project construction limits, depending on which alternative is considered. Refined Preferred Alternative 2 would impact 1.81 acres of PFO wetland for the low-cost design criteria and 3.76 acres of PFO wetland for the initial design criteria.

Surface water runoff of pollutants (including de-icing chemicals) and erosion and siltation from the roadway construction could also be considered as direct impacts to adjacent wetlands. The pollutant loadings in surface water runoff have been analyzed by the FHWA with the results showing that pollutant concentrations due to runoff from the highway are below the applicable EPA criteria. Permits required for construction of the interstate will include a detailed mitigation and monitoring plan for wetland and stream impacts.

Section 5.23, *Permits,* provides more detailed information about permits that may be required. Best Management Practices will be used to prevent non-point source pollution, to control surface water runoff, and to minimize sediment damage to water quality and aquatic habitats. INDOT *Standard Specifications and Special Provisions* will govern construction activities to control erosion and subsequent water pollution. Consequently, it is expected that the project would have minimal impact as a result of runoff on wetlands and streams.

Potential impacts to wetlands are addressed in detail in Section 5.19, *Water Resources.* The ***Revised Tier 1 Forest and Wetland Mitigation and Enhancement Plan*** includes a commitment to replace wetlands at a ratio of 3 to 1 for forested and scrub/shrub wetlands, and a ratio of 2 to 1 for emergent wetlands. The no net loss policy coupled with mitigation requirements have, based on coordination with local officials, actually increased the amount of wetlands in the area. Mitigation for wetland impacts in Section 4 could range from approximately 15.79 to 29.14 acres. Mitigation measures for impacts to wetlands are described in Section 7.3.9, *Wetland Impacts*.

- Indirect: Anticipated indirect impacts for wetlands could be wetlands bought by a developer to build a service facility such as a gas station and/or convenience food mart at an interchange or a residential development. IDNR has stated a goal of "no net loss of wetlands," which nearly eliminates the possibility of future indirect impacts from development of wetlands. Development near wetlands could result in impacts to wetlands due to pollutants (including de-icing chemicals) in runoff from impervious surfaces such as access roads and parking lots, and due to erosion and siltation from construction activities. However, with few exceptions (some of which are direct impacts of the Section 4 project), wetlands within Section 4's geographic scope are not in the immediate vicinity of interchanges, where most of the project-induced development is predicted to occur. No indirect acreage impacts to wetlands are anticipated due to the implementation of I-69.

- Other: Limestone quarry activities and other projected growth from the 2030 No-Build condition are not expected to have direct impacts to wetlands due to current policies and regulations requiring mitigation of wetlands. Tier 2 I-69 Section 3 would potentially impact approximately 2.8 acres of wetlands in Section 4's geographic scope. Tier 2 I-69 Section 5 would potentially impact approximately 14 acres of wetlands in Section 4's geographic scope. Mitigation would be required for wetland impacts resulting from these projects. Please note, the geographic scopes of the cumulative impact analyses in adjacent sections will of necessity overlap. As a result, some actions will be counted as cumulative impacts in more than one Tier 2 EIS; thus, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS.

Summary: Direct impacts to wetlands will result from the acquisition of wetland areas for additional right-of-way needed for road construction. Refined Preferred Alternative 2 will require the acquisition of about 5.32 to 9.55 acres of wetlands for right-of-way for the low-cost and initial design criteria, respectively. No indirect impacts are expected. Measures proposed to mitigate direct impacts to wetlands due to the Section 4 project would produce gains in wetland acreage in the two-county area. The Section 4 project proposes the development of 15.79 to 29.14 acres of wetlands to mitigate direct impacts to 5.32 to 9.55 acres—a 10.47 to 19.59-acre gain. Impacts from "other" projects include a total of 16.8 acres of wetland loss from Sections 3 and 5 of I-69 within Section 4's geographic scope. Combined direct, indirect, and other impacts total a cumulative wetland impact of -6.33 acres (reduction) to 2.79 acres (gain) for the low-cost and initial design criteria, respectively (see **Table 5.24-6**). The Tier 1 FEIS identifies 24,322 acres of wetlands in the two-county study area: Greene County (9,847 acres) and Monroe County (14,475 acres). The cumulative wetland impact of -6.33 acres (reduction) to +2.79 acres (gain) due to conversion is less than 0.03% of the current amount of wetlands within these counties. Mitigation of wetlands impacts, determined in coordination with regulatory agencies, would be required of the other projects causing the impacts.

Streams—

- Direct: Approximately 1,691 miles (approximately 8,930,143 linear feet) of streams were identified in Greene and Monroe counties—where the Section 4 corridor is located. By way of comparison, the linear feet of streams within the right-of-way of Refined Preferred Alternative 2 ranges from 93,196 linear feet for the low-cost design criteria to 111,247 linear feet for the initial design criteria. Potential stream relocations (low-cost design criteria) range from 24,876 linear feet (Alternative 4) low-cost design criteria to 31,328 linear feet (Alternative 3). The total *acres* of impact (linear feet *x* width of stream's ordinary high water mark) range from 15.09 acres to 15.80 acres (low-cost design criteria), with only 0.71 acre separating the alternatives with the greatest and least impact. The total acres of impact range from 18.64 acres to 19.80 acres (initial design criteria), with only 1.16 acres separating the alternatives with the greatest and least impact.

  A habitat assessment of the perennial streams directly impacted by the project indicated the majority of the streams that were assessed received generally low scores, suggesting they may not provide suitable habitat to sustain the plants and animals typically found in this region of Indiana, or that they may be partially supportive of their aquatic life use designations. The QHEI scores at the easterly crossing of Indian Creek south of Carmichael Road in Greene County, the crossings of Indian Creek south of the Timber Trace subdivision in Greene County and Monroe County, and the crossings of two unnamed tributaries of Clear Creek in Monroe County indicated these streams in these locations may be capable of supporting a balanced warm water community. (See Section 5.19.2, "*Surface Waters*," for a detailed discussion of the stream assessments conducted in Section 4.)

  Water quality data provided by IDEM (2008 list) indicated that there are two impaired stream systems within the Section 4 corridor; Black Ankle Creek (E.coli) and Plummer Creek (E.coli). All five Section 4 Alternatives cross Black Ankle Creek and Plummer Creek.

Impaired waters downstream of the Section 4 corridor include White River (West Fork) (Impaired Biotic Communities and Fish Consumption Advisories for PCBs and Mercury), Lower East Fork White River (Fish Consumption Advisories for PCBs and Mercury), and Clear Creek (Fish Consumption Advisories for PCBs). **Figure 5.19-4** (p. 5-621) shows the location of impaired streams in the vicinity of Section 4. (Table 4.3-1 in Chapter 4, *Affected Environment*, lists the impaired waterbodies in the vicinity of Section 4 and identifies the causes of their impairment.)

As noted in item 6, the above stresses on the waterways in the project area include dredging of legal drains, sewage, agricultural practices, and contaminants/road salt in surface water runoff from roadways/parking areas, mine acid, and landfill run-off.

Potential impacts to streams are addressed in detail in Section 5.19, *Water Resources.* Mitigation measures for impacts to streams, aquatic habitat, and water quality are described in Section 7.3.12, *Water Body Modifications Impacts*, and 7.3.13, *Ecosystems Impacts,* and 7.3.14, *Water Quality Impacts*.

- Indirect: Streams would have the same indirect impacts as wetlands, whereby land surrounding the streams could be bought by a developer to build a commercial or residential establishment, and impacts could occur from surface water runoff and construction activities. However, development near streams tends to be adjacent to a stream rather than interrupting the stream to create a proposed development. Depending on the location, type of development, and potential stream/water quality impact, various permitting requirements would have to be met (such as a Section 404 Permit, Section 401 WQC and NPDES permits authorized under the Federal Clean Water Act (CWA); IDNR permit approvals for floodway impacts under the state of Indiana's Flood Control Act IC 14-28-1 and Navigable Waterways Act IC 14-29-1; Rule 5 (327 IAC 15-5) required under NPDES guidelines; etc.). As noted in "Wetlands," above, the results of FHWA's analysis of surface water runoff shows that pollutant concentrations due to runoff are below the applicable USEPA criteria. Best Management Practices will be used to prevent non-point source pollution, to control surface water runoff, and to minimize sediment damage to water quality and aquatic habitats. INDOT *Standard Specifications* will govern construction activities to control erosion and subsequent water pollution.

  Following Resource Agency review and comments on the Section 2 Tier 2 DEIS, additional analysis of potential indirect impacts to streams was conducted. In particular, the USFWS disagreed with the DEIS finding of no indirect impacts to streams resulting from the Section 2 project. Upon reviewing USFWS' comment it was determined that the assertion of "no indirect impacts to streams" as stipulated in the DEIS was not correct. It is more correct to say that, while there will inevitably be some indirect impact to streams, any such indirect impact will be insignificant. It is assumed that this would be representative of the streams that would potentially be impacted in the Section 4 project. That such indirect impacts will be insignificant is supported by the document cited by USFWS in its Section 2 Tier 2 DEIS comment. The USFWS referenced a publication entitled Measuring the Impact of Development on Maine Surface Waters (Morse, Chandler and S. Kahl. 2003). This

publication discusses the threshold of land disturbance above which ecological damage to surface waters occurs. The publication states (pages 2-4):

> [t]he percentage of the total impervious area (PTIA), or the amount of the watershed covered by surfaces preventing water infiltration, has been found to be predictive of the amount of stress and degradation to the stream (p.4). Studies from many places in the US have identified a threshold for development at about 10% (PTIA) of the watershed area, above which surface waters become degraded (p.2). Watershed imperviousness (caused by pavement, gravel, roads, sidewalks, driveways and roofs which prevent water from soaking into the soil) was found to be a good predictor of the level of degradation of the overall stream condition (p. 2).

While the publication studied the PTIA thresholds in Maine and the impervious threshold of degradation can be somewhat variable across the nation, an analysis of the PTIA (using the methodology used in the publication) within the Section 4 project area establishes that direct and/or indirect impacts from the Section 4 project will not result in a high level (over 10%) of impervious surfaces within any of the watersheds impacted.

An analysis was conducted of the twenty watersheds crossed by Section 4 and calculated both high and low range estimates of PTIA for them based on the USGS National Land Cover Database (NLCD) a subset of the Multi-Resolution Land Characteristics (MRLC) Consortium NLCD. The high and low estimates were based on the ranges that separated the development into different classes. These classes were defined by the NLCD 2001 Land Cover Class Definitions as follows: high development 80-100% impervious surfaces, medium development 50-79% impervious surfaces, low development 20-49% impervious surfaces, and open-development less than 20% impervious surfaces. These are the ranges used in the analysis for percent impervious; however, for open-development 20% impervious was used for the high calculation and 10% (rather than 0.1%) was used for the low. The analysis was done by calculating the PTIA for each watershed using the above data. Both induced growth as well as no build growth was included in the analysis by using 25-50% impervious surfaces as our range. The direct impact, being the estimated I-69 pavement in each watershed, was also factored in each total. The analysis was performed for the existing conditions, the 2030 no-build conditions, and 2030 build conditions. The analysis indicated that the high estimates for the 2030 build conditions range from 1.42% to 30.10% while the low estimates range from 0.84% to 15.97%. Although, this is above the generally accepted PTIA threshold of 10%, it is believed that Section 4 will not result in significant degradation to surface waters. Only one watershed is above this threshold, the Clear Creek/Jackson Creek Watershed. The range for this watershed is 15.97% to 30.10%. The existing conditions for this watershed range from 11.78% to 21.92%, which is already above the 10% threshold. The 2030 No-Build conditions increase this range from 15.72% to 29.79%. This shows an increase of only 0.25% to 0.31% between the 2030 no-build and the 2030 build conditions.

There is agreement with the referenced publication: Source Water Protection: Linking Surface Water Quality to the Watershed (Schmitt and Peckenham 2002), that residential, commercial and highway development does indeed "impact" associated surface waters. However, it is concluded that the direct and/or indirect impacts to streams resulting from the Section 4

project will not result in a significant degradation to surface waters based on an analysis of the PTIA threshold.

- Other: Tier 2 I-69 Section 3 would potentially impact 9,438 linear feet of streams in Section 4's geographic scope. Tier 2 I-69 Section 5 would potentially impact 48,232 linear feet in Section 4's geographic scope. Please note, the geographic scopes of the cumulative impact analyses in adjacent sections will of necessity overlap. As a result, some actions will be counted as cumulative impacts in more than one Tier 2 EIS; thus, the cumulative impacts of the I-69 project as a whole cannot be calculated by "adding up" the cumulative impacts totals that are given in each Tier 2 EIS.

- Summary: Direct impacts to streams will result from the crossing of streams by the roadway, requiring the construction of bridges or the placement of culverts/pipes to carry the streams under the road. The I-69 project in Section 4 would have approximately 93,196 linear feet of stream impact for Refined Preferred Alternative 2 low-cost design criteria and 111,247 linear feet of stream impacts for the initial design criteria. Using GIS shapefiles, approximately 1,691 miles (8,930,143 linear feet) of streams were identified in Greene and Monroe counties. Combined direct, indirect, and other impacts for Refined Preferred Alternative 2 low-cost design criteria total a cumulative impact of 150,866 linear feet of impact—approximately 1.7% of the two-county total. Under the initial design criteria, combined direct, indirect, and other impacts for Refined Preferred Alternative 2 total 168,917 linear feet of impact—approximately 1.9% of the two-county total. Stream mitigation will be a part of this project. More details regarding mitigation will be available in the FEIS. In addition, the plan proposes on-site mitigation will be completed in all areas suitable within the Section 4 Refined Preferred Alternative 2 right-of-way to help offset the stream impacts.

  A habitat assessment (QHEI) of the perennial streams directly impacted by the project indicated the majority of the streams that were assessed received generally low scores, suggesting they may not provide suitable habitat to sustain the plants and animals typically found in this region of Indiana, or that they may be partially supportive of their aquatic life use designations. The QHEI scores at the easterly crossing of Indian Creek south of Carmichael Road in Greene County, the crossings of Indian Creek south of the Timber Trace subdivision in Greene County and Monroe County, and the crossings of two unnamed tributaries to Clear Creek in Monroe County indicated these streams in these locations may be capable of supporting a balanced warm water community.

  Water quality data provided by IDEM (2008 303d list) indicated that there are two impaired stream systems within the Section 4 corridor; Black Ankle Creek and Plummer Creek. All five Section 4 Alternatives cross Black Ankle Creek and Plummer Creek.

Karst—

- Direct: Highway construction and operation related impacts to identified karst features are unavoidable. Potential karst feature impact totals associated with the five alternatives are presented in Section 5.21 *Karst Impacts* (see **Table 5.21-3)**. Refined Preferred Alternative 2 would impact between 88 and 108 karst features. While Alternatives 2 and 3 would impact slightly fewer karst features (between 88 and 103 for Alternative 3 and between 88 and 107

for Alternative 2), consideration of impacts upon other resources detracted from their selection as the Preferred Alternative. Alternative 4 would impact more karst features (between 94 and 113) than Refined Preferred Alternative 2, and Alternatives 2 and 3. Alternative 1 would impact the greatest number of karst features (between 108 and 122).

Unavoidable impacts upon karst features will be mitigated through implementation of alternative drainage, where feasible. If alternative drainage is not possible, impacts will be mitigated through implementation of water quality treatment measures, and appropriate operation and maintenance measures.

Potential karst feature impacts can occur where highway runoff enters the karst system and/or where the construction of the highway and related drainage features alters the amount of water entering the karst system. The adverse impacts resulting from highway construction can be difficult to manage because of the potential for changes in water quality, changes in flow volumes within the karst system if karst conduits are plugged or severed, and, the potential for associated effects upon karst (primarily cave) biota.

The federally endangered Indiana bat (*Myotis sodalis*) and 11 state-listed species (three State-Endangered (SE), one State-Endangered Candidate (SEC), one State-Threatened (ST), one State-Rare (SR), and five Watch List (WL)) were identified during surveys of caves within and near the Section 4 corridor. An assessment was made of the project's potential to cause direct or indirect impacts to state-listed cave biota from changes in drainage areas contributing recharge to the cave springs as well as karst groundwater quantity and quality. It was concluded that the project will not result in direct habitat loss or negative effects of a sufficient magnitude to adversely affect the identified state-listed species. Analysis which shows that these species will not be adversely affected is provided in Section 5.17, *Threatened and Endangered Species*.

Direct impacts to known cave openings and passageways were avoided in the development of the five alternatives. However, since the publication of the DEIS, ongoing public outreach lead to the identification of a cave with the proposed rights-of-way for all Section 4 Alternatives. This feature did not exist when surveys were completed in 2004 - 2006. It has been identified and added to the impacts for all alternatives. See Section 5.21.3.10 for more information about this cave.

However, while most known caves were avoided in the development of the five alternatives, it should be noted that unidentified subterranean karst features are undoubtedly present, and an unknown number of such unidentified features will be encountered and impacted during highway construction. Features within the construction limits may be bridged, capped or filled. There is also the potential for changes in drainage patterns if the project were to sever a conduit and reduce flows, or by adding drainage, thereby increasing flows.

The Karst MOU requires that investigations of pollutant loadings are performed for the project area's existing drainage as well as the proposed highway drainage. The degree of impact upon each feature is case-specific depending upon the situation of the feature relative to the proposed work. Calculations of estimates of pollutant loads from the highway and

drainage within the right-of-way of Refined Preferred Alternative 2 will be made, including prior to and post construction estimates. Pollutant loads will be calculated based on methodology developed by the Federal Highway Administration. The calculated pollutant loads for the applicable karst features will be tabulated for use by INDOT and the MOU signatory agencies for the evaluation of avoidance, alternative drainage, treatment, and maintenance alternatives and in development of the Erosion and Sediment Control plans, in compliance with the Indiana Handbook for Erosion Control in Developing Areas.

- Indirect: Induced growth will change infiltration and stormwater runoff patterns and also will increase the likelihood of potential contaminant introduction impacts to the karst resources. Therefore, residential and commercial developments anticipated with the induced growth in Section 4 and their associated septic systems could negatively impact water quantity and water quality entering karst resources. The induced growth is projected to be 476 homes within the Study Area, of which 464 (111 acres) are within karst zones of susceptibility. Under any of the five alternatives, the number of induced jobs is projected to be 771 of which 435 (25 acres) would be created within karst zones of susceptibility. While the identification of karst features within the karst zones of susceptibility in the induced growth areas is beyond the scope of this EIS, it is assumed that induced development within the karst zones of susceptibility will have an impact on karst features.

  Anticipated induced growth areas are shown in **Figure 5.24-1** (p. 5-827). Public and private rural water supplies are available to the entire Section 4 study area. These are described in Chapter 4.3, *Natural Environment*.

  Four TAZs with anticipated induced growth from I-69 are currently served by sanitary sewers. The only commercial area within the vicinity of the Section 4 project with existing or planned sanitary sewer service is the Robinson Industrial Park. Please see Chapter 5.3, *Land Use and Community Impacts*, **Figure 5.3-5** (p. 5-137). A Bloomington Sanitary Sewer Map showing the induced growth TAZ's in relation to existing sanitary sewer service is included as **Figure 5.24-6** (p. 5-842). The remainder of the project area is served by on-site sewage absorption septic systems.

  Private water well locations are present in the project area. Existing water well locations are shown in Chapter 4.3, *Natural Environment*, as **Figure 4.3-4**, (p. 4-111). The karst features and ultimately the private wells in the Study Area could potentially be impacted by changes in surface runoff to karst features and altered groundwater flowpaths resulting from road construction and the effects of induced growth. However, changes in surface and groundwater quality and quantity within the study area as a result of any of the Alternatives are not anticipated to have significant negative effects on drinking water supplies or karst (primarily cave) biota.

  The general locations of the identified karst features relative to the Section 4 corridor are depicted in Chapter 5.21, *Karst Impacts*, **Figure 5.21-2** (p. 5-137). Springs used for individual potable water supplies are present in the project vicinity. Where groundwater from private, individual wells is the principal source of potable water, impacts will be mitigated on a case-by-case basis. See Chapter 7, *Mitigation and Commitments*, for a discussion of potential mitigation measures.

Soil associations and shallow bedrock present within the Section 4 project vicinity are described in Chapter 4.3, *Natural Environment*. A soil association map also is included in Chapter 4.3 as **Figure 4.3-2** (p. 4-107)**.** A soil septic absorption map showing soil/septic system suitability for Greene and Monroe Counties is included as **Figure 5.24-4** (p. 5-832). Environmentally sensitive areas in Greene and Monroe Counties are shown in relation to the TAZs with anticipated induced growth from I-69 on **Figure 5.24-5** (p. 5-837).

Local septic system design review and approval processes currently in place in Greene and Monroe Counties are anticipated to lessen somewhat the negative effects of induced growth upon drinking water supplies. Chapter 5.21, *Karst Impacts*, Section 5.21.3.9, *Cumulative and Indirect Impacts*, describes the potential drinking water quality impacts from induced growth. It is not anticipated that Lawrence County would experience a net change in accessibility resulting in induced growth as a result of I-69.

The following ordinances and laws regulate the design, construction, installation, location, maintenance and operation of on-site wastewater treatment systems.

- Greene County Ordinance 1992-1, Monroe County Code Title 3 *Health and Environment* Chapter 365 *Private Sewage Disposal Systems* (http://www.co.monroe.in.us/tsd/Government/Support/Legal/MonroeCountyCode/Title3HealthandEnvironment.aspx).
- Bedford Indiana Code of Ordinances Chapter 51, *Sewers* (http://www.amlegal.com/bedford_in/).
- Indiana Board of Health Rule 410 IAC 6.8-1 (http://www.in.gov/isdh/files/410_IAC_6_8_1.pdf).
- Indiana Board of Health Rule 410 IAC 6.10 (http://www.in.gov/isdh/21965.htm).

The Greene County Comprehensive Plan was developed as a result of the I-69 Planning Grant Program. The stated land use development policy of the Greene County Comprehensive Plan includes the identification, preservation and development of economic development sites at the proposed interchanges of I-69. The plan also includes environmental preservation policy objectives that include the following:

> **Objective 4.4:** Discourage development in areas subject to severe environmental constraints (floodplains, wetlands, steep slopes significant natural wildlife habitats, etc.) and ensure any development in such areas minimize adverse environmental impacts.
>
> **Objective 4.5:** Ensure that public health and safety regulations are enforced to protect against problems of illegal dumping and failing septic tanks.

The Monroe County SR 37 Corridor Plan was developed as a result of the I-69 Planning Grant Program. The plan recommends that the County Line interchange should provide no direct access to Monroe County roads, be limited access only, and development in the vicinity of the proposed I-69 Section 4 County Line interchange (South Connector Road - located in Greene County) be strongly discouraged. The plan further recommends that

construction in the connector road area be limited to rural residences and traditional agricultural-related facilities.

In addition to the SR 37 Corridor Plan, the following policy statements are included in the Monroe County November 5, 2010 Draft Comprehensive Plan:

A. Vulnerable Land shall not be disturbed to accommodate further growth and development.

B. Rural property shall not be subdivided to allow urban densities.

C. The presumed future use of rural property shall be the current vested use.

D. The scope of commercial use for rural property that depends upon natural resources available from the land shall be limited to operations related to agriculture or quarrying. Farm-related commercial and industrial uses that are not dependent upon the nature of the land shall not be permitted on rural property.

E. The conversion of rural property to urban property shall occur when either:

a. Inclusion of the Rural property fits into an adjacent Urban property area (requirement for contiguous growth) or,

b. Creation of a new urban property area with the adoption of a new Designated Community Plan that approximates the mean area of the existing Designated Communities.

F. Designated Community Plans shall include a full array of field studies demonstrating the availability of adequate public infrastructure and services required for the planned community area similar to the Sewer Service Extension Area maps developed in partnership with the Monroe County Plan Commission and the City of Bloomington Utilities Service Board.

G. Urban property in aggregation shall provide a range of options for residential density, and intensity of commercial, and industrial activity.

H. Urban property shall use sanitary sewers.

I. Increases in the intensity of use for a Resilient property use adjoining Vulnerable Land shall provide adequate buffers to minimize the impact of intense property use upon the Vulnerable Land.

J. Neither urban nor rural property use shall increase in intensity without a public process and approval by an appropriate hearing body of Monroe County.

K. Urban property for business and employment activities shall be designated and should be sufficient to meet the identified needs over the planning period. Prior to development, provision of sufficient infrastructure to support economic activities must be present.

The Lawrence County 2009 Strategic Plan was developed as a result of the I-69 Planning Grant Program. This strategic plan includes the following "Natural Features Goals": (NF-1) Protect Floodways and Floodplains, (NF-2) Eliminate Potentially Hazardous Septic Systems, (NF-3) Preserve and Enhance County Waterways, and (NF-7) Encourage Environmentally-

Sensitive Development Practices. Lawrence County has not established planning and zoning regulations.

The City of Bedford 2010 Comprehensive Plan was developed as a result of the I-69 Planning Grant Program. The plan states: "The culmination of these planning efforts has resulted into a Future Land Use Map which should be used as a guide for future growth…." It was not determined that Lawrence County or the City of Bedford would have induced growth resulting from the construction of I-69.

- Other: Adjacent to Section 4 on the south end, Section 3 is not expected to impact karst features; however, Section 5 to the north would potentially impact approximately 544 karst features identified within the geographic scope of Section 4. Other developments that are anticipated to convert undeveloped land to developed land have the potential to impact karst features, groundwater quality, and cave biota. Changes in groundwater quality and quantity have the potential for associated effects upon private and public drinking water supplies and karst (primarily cave) biota. Under the No-Build scenario, an estimated 4,384 acres are anticipated to be developed by the year 2030 and the majority of this would likely occur in karst feature areas. While the identification of karst features within the karst zones of susceptibility in the geographic scope of Section 4 is beyond the scope of this EIS, it is assumed that other developments within the karst zones of susceptibility will have an impact on karst features.

- Summary: Refined Preferred Alternative 2 would directly impact between 88 and 108 karst features. I-69 Section 3 would impact no karst features within the Section 4 geographic scope. However, Section 5 would potentially impact 544 karst features within Section 4's geographic scope. Therefore, combined direct and other impacts to karst features would be between 632 to 652 features. Since karst features were not identified in the induced growth TAZs that are within the karst zones of susceptibility, the number of karst features that may be affected by induced growth from I-69 has not been assessed as part of this study.

  Changes in groundwater and surface water quality and quantity have the potential for associated short and long-term effects upon private and public drinking water supplies and karst (primarily cave) biota. The projects' potential to cause indirect impacts upon state-listed cave biota relating to changes in drainage areas contributing recharge to the cave springs as well as karst groundwater quantity and quality, was assessed. It was concluded that the project will not result in such changes of a sufficient magnitude to adversely affect the identified state-listed species (refer to Section 5.17, *Threatened and Endangered Species*).

  Induced growth within the Study Area will cause more pressure on karst resources including, but not limited to, both groundwater and surface water quality. The following plans were developed as a result of the I-69 Planning Grant Program and are in place to protect karst resources in the project area. These plans identify sensitive environmental areas and recommend further measures including zoning ordinances to protect karst features, water quality, ecosystems and natural resources.

- Bloomfield 2009 Comprehensive Plan
- City of Bedford 2010 Comprehensive Plan
- Greene County 2009 Comprehensive Plan
- Lawrence County 2009 Strategic Plan
- Monroe County Draft 2010 Comprehensive Plan
- Monroe County 2010 SR 37 Corridor Plan

The five alternatives will result in similar impacts upon karst features. Impacts upon many karst features, including most known caves and areas of dense karst feature concentrations, were avoided and or minimized during alternatives development and screening.

Unavoidable impacts upon karst features will be mitigated through consideration of alternative drainage. If alternative drainage is not possible, impacts will be mitigated through implementation of water quality treatment measures, and appropriate operation and maintenance measures.

Identification of karst resources within the Study Area has included thorough review of previously conducted karst research and extensive research of potentially affected karst features not previously documented. Impacts to karst resources would be similar for any of the five alternatives. Further identification, avoidance, minimization and mitigation efforts to protect karst resources from direct and indirect impacts will be ongoing throughout final design and construction of Sections 4 and 5.

10. Modify or add alternatives to avoid, minimize or mitigate significant cumulative impacts.

Agricultural impacts in the form of permanent conversion of farmland to non-farmland use generally cannot be mitigated easily by the creation of new farmland elsewhere. For this reason, the mitigation of agricultural impacts focused on those practices that assist in avoiding and/or minimizing conversion, or designing alignments to minimize disruption to existing agricultural patterns. General practices that were considered in developing alternatives for Section 4 included the following:

- When reasonable, alignments were developed to follow existing property lines and minimize dividing or splitting of large tracts of farmland.
- Agricultural property lines were followed as much as possible or fields were crossed at perpendicular angles to reduce point rows and the creation of uneconomic remnants.
- Where reasonable, access is proposed to parcels that would otherwise be landlocked as a result of the project.
- Overpasses were proposed at several locations to maintain the connectivity of county roads, thereby facilitating access to farm fields and farm operations severed by the interstate.

Greene and Monroe counties participated in the I-69 Community Planning Program. FHWA and INDOT provided financial and technical assistance for local land use planning through the I-69

Community Planning Program. This program included grants to local governments to support land use and economic development planning. This program also assisted local governments in developing plans that protect farmland. The grant application program has been developed and grants were made available to eligible communities in two phases beginning in August 2007. On October 29, 2007, INDOT awarded $950,000 in grants to communities located along the I-69 corridor in southwest Indiana. Greene and Monroe counties and the cities of Bloomfield, Ellettsville, Linton and Bloomington were eligible for grants. The City of Bloomington elected not to participate in the program. In the first phase, Greene County, the Town of Bloomfield, and the City of Linton together were awarded a grant for $150,000. Using this grant, Greene County developed its Draft Comprehensive Plan on August 3, 2009. On February 1, 2008, Monroe County submitted an application for a $50,000 grant. Monroe County and the city of Ellettsville together were awarded a grant for $100,000. The grant was awarded to Monroe County in the second phase of the program on July 30, 2008, and this grant was used for the preparation of a transportation corridor plan for SR 37/I-69. Section 7.2, *Major Mitigation Initiatives*, describes the program in greater detail.

Potential impacts to forests are addressed in detail in Section 5.20, *Forest Impacts.* Direct upland forest impacts will be mitigated at a 3 to 1 ratio, including 1 to 1 replacement and 2 to 1 preservation for the I-69 Evansville to Indianapolis project as a whole; within individual sections these ratios may vary depending on the mitigation opportunities presented. Since I-69 Section 4 is much more heavily forested than Sections 1 through 3, a conservative estimate of 40% of the induced growth occurring on forested land was established through research for the Section 4 project (see **Appendix CC**). There is proposed to be a total of approximately 2,616 to 3,262 acres of forest mitigation to offset the approximate 872.12 to 1,087.37-acre direct impact. Of this amount, 872 to 1,087 acres would be replacement (planted non-wetland bottomland forest), thereby resulting in no direct loss to forest.

Cumulative stream impacts for Refined Preferred Alternative 2 range from 150,866 linear feet of impact to 168,917 linear feet of impact. Stream mitigation will be a part of this project. More details regarding mitigation will be available in the FEIS. In addition, the plan proposes on-site mitigation will be completed in all areas suitable within the Section 4 Refined Preferred Alternative right-of-way to help offset the stream impacts. Best Management Practices will be used to prevent non-point source pollution, to control surface water runoff, and to minimize sediment damage to water quality and aquatic habitats. INDOT *Standard Specifications and Special Provisions* will govern construction activities to control erosion and subsequent water pollution to streams and wetlands. Consequently, it is expected that the project would have minimal impact as a result of runoff on wetlands and streams.

The Karst MOU requires that investigations of pollutant loadings are performed for the project area's existing drainage as well as the proposed highway drainage. The degree of impact upon each feature is case-specific depending upon the situation of the feature relative to the proposed work. Unavoidable impacts upon karst features will be mitigated through consideration of alternative drainage. If alternative drainage is not possible, impacts will be mitigated through implementation of water quality treatment measures, and appropriate operation and maintenance measures.

Identification of karst resources within the Study Area has included thorough review of previously conducted karst research and extensive research of potentially affected karst features not previously documented. Impacts to karst resources would be similar for any of the five Alternatives. Further identification, avoidance, minimization and mitigation efforts to protect karst resources from direct and indirect impacts will be ongoing throughout final design and construction of Sections 4 and 5.

11. Monitor the cumulative effects of the alternatives and provide documentation.

From among the alternatives developed for this project, Refined Preferred Alternative 2 is being identified as the Preferred Alternative based on consideration of environmental impacts and performance. Refined Preferred Alternative 2 is approximately 27 miles in length. The refined subsection alternatives that were combined to create Refined Preferred Alternative 2 are Refined Alternative 4A-2, Refined Alternative 4B-1, Refined Alternative 4C-2, Refined Alternative 4D-1, Refined Alternative Hybrid 4E-1/4E-2, Refined Alternative 4F-3, Refined Alternative 4G-2, and Refined Alternative 4H-2. These refined subsection alternatives are described in greater detail in Section 6.2 *Comparison of Alternatives*. Mitigation commitments associated with the potential impacts of Refined Preferred Alternative 2 are described in detail in Chapter 7.

Monitoring would be an effective practice where potential impacts to karst resources are anticipated. Because it was determined through this analysis that there were no significant impacts to farmland, wetlands, and streams, no monitoring system would be put in place for these resources. However, INDOT agrees to develop a monitoring and maintenance plan for the affected karst features. IDNR, IDEM and USFWS will be provided an opportunity to review this plan. The establishment of water quality and a point at which a standard is established for remediation will be a part of each monitoring plan. The results of the monitoring will be submitted to IDNR, USFWS and IDEM on a regular basis. It should be noted that several of the mitigation commitments detailed in Chapter 7 will have ongoing monitoring of resources associated with the commitments.

5.24.4 Summary

Five resources were identified for further analysis of cumulative impacts in Section 4. These resources included farmland, forests, wetlands, streams and karst. Identifying indirect impacts to these resources followed the 11-step process for indirect and cumulative impact analysis developed by the Council on Environmental Quality and identified in Tier 1. The process resulted in the identification of forest land and farmland as the most impacted resources in Section 4. Potential impacts to forest and farmland resources warranted a more detailed quantitative analysis of the cumulative impacts of the project. Because forest and farmland are measurable land uses, a more quantitative analysis of direct, indirect and other impacts was completed for these resources. The cumulative analysis of wetlands, streams and karst included a quantitative analysis of direct impacts where possible, but a more qualitative analysis of impacts from indirect and other projected growth. The summary of cumulative impacts within the geographic scope of Section 4 for all five resources can be found in **Table 5.24-6**.

Direct impacts would occur at the same time and place as Refined Preferred Alternative 2 is implemented. Refined Preferred Alternative 2 is being identified as the Preferred Alternative

based on consideration of environmental impacts and performance. Refined Preferred Alternative 2 is approximately 27 miles in length. The refined subsection alternatives that were combined to create Refined Preferred Alternative 2 are Refined Alternative 4A-2, Refined Alternative 4B-1, Refined Alternative 4C-2, Refined Alternative 4D-1, Refined Alternative Hybrid 4E-1/4E-2, Refined Alternative 4F-3, Refined Alternative 4G-2, and Refined Alternative 4H-2. These refined subsection alternatives are described in greater detail in Section 6.2, *Comparison of Alternatives*.

The following is a summary of the indirect and cumulative impacts for farmland and forest impacted in the Section 4 Study Area as a result of implementing any of the five alternatives.

Information from the USGS 2001 National Land Cover Dataset for Zone 49 indicates that from 1950 to 1998, Indiana experienced an 8.7% increase in forestland. During that same period, Greene County experienced a 27.5% increase in forestland, and Monroe County experienced a 3.5% increase in forestland acreage. Of the 4,408.74 upland forest acres within the Section 4 corridor, from 872.12 acres (low-cost design criteria) to 1,087.37 acres (initial design criteria) of upland forest are within the right-of-way of Refined Preferred Alternative (2) for this project.

Direct impacts on farmland will result from the acquisition of farmland for additional right-of-way needed for road construction. Refined Preferred Alternative 2 will require the acquisition of about 356.03 to 461.36 acres (for the low-cost design criteria and for the initial design criteria, respectively) of cultivable farmland for additional right-of-way.

Induced growth is anticipated to account for 54 acres of forest and 106 acres of farmland conversion by the year 2030. Total loss of farmland due to mitigation for forest and wetland losses will be approximately 888 to 1,116 acres for the low-cost design criteria and for the initial design criteria, respectively. There is proposed to be a total of approximately 2,616 to 3,262 acres of forest mitigation to offset the approximate 872.12 to 1,087.37-acre direct impact. Of this amount, 872 to 1,087 acres would be replacement (planted non-wetland bottomland forest), thereby resulting in no net direct loss of forest.

The impacts of other projects to farmland and forest resources within Section 4's geographic scope have also been considered. By the year 2030 for the No-Build scenario, it is anticipated that within the two counties, the geographic scope of this Section 4 analysis, the baseline population and employment growth will convert 2,630 acres of agricultural land to non-agricultural land and 1,754 acres of forest land to developed land (see **Tables 5.24-7** and **5.24-8**). This growth is anticipated with or without the I-69 project, and is considered "other" development that is calculated into the overall anticipated impacts. Sections 3 and 5's impacts on farmland within the Section 4 geographic scope would be 300 acres.

Combined, the direct, indirect, and other impacts total a cumulative conversion of 4,280 to 4,613 acres of agricultural land to non-agricultural land by the year 2030 for the low-cost design criteria and for the initial design criteria, respectively. **Tables 5.24-6** and **5.24-7** summarize the cumulative land use changes for farmland. In 2002, within Greene and Monroe counties, there were 223,288 acres within farms (169,750 in Greene, 53,538 in Monroe). Therefore, the cumulative impact is approximately 1.9 to 2.1% of the current amount of land in farms within the two counties.

Combined direct (872 to 1,087 acres), indirect (54 acres), and other (2,163 acres) forest impacts reasonably foreseeable to occur total a cumulative conversion of 3,089 to 3,304 acres of forest to non-forest use. **Tables 5.24-6** and **5.24-8** summarize the cumulative land use changes for forest land. There is proposed to be a total of approximately 2,616 to 3,262 acres of forest mitigation to offset the approximate 872 to 1,087-acre direct impact. Of this amount, 872 to 1,087 acres would be replacement (planted non-wetland bottomland forest), thereby resulting in no direct loss to forest. After accounting for the 872 to 1,087 acres of replacement forest from mitigation, the total cumulative conversion of forest acreage for Refined Preferred Alternative 2 is a 2,217 acre loss for both the low-cost criteria and the initial design criteria (see **Table 5.24-6**).

On August 3, 2009, Greene County adopted a comprehensive plan. Greene County does not presently have structured subdivision, or zoning regulations; however, the comprehensive plan does 1) provide guidance for land use changes in and around the proposed highway corridor, and 2) provide support for the continuance of desired land uses throughout the county including most of the project area. Monroe County does have structured land use planning, subdivision and zoning regulations. Therefore, since these tools are in place to promote desired land uses and protect natural resources within Greene and Monroe counties, the indirect effects of the project on forest and farmland will be possible to regulate.

Table 5.24-6 shows the direct and indirect impacts to all five resources associated with I-69 Section 4, and the direct impacts associated with other major projects within the geographic scope of Section 4. The results of the analysis of cumulative impacts to agricultural and forest resources are summarized on **Table 5.24-7** and **Table 5.24-8**, respectively.

Table 5.24-6: Impacts of I-69 Section 4 and Other Major Projects Within the Section's Geographic Scope

Potential Impacts to. . .	I-69 - Tier 2 Section 4 (Greene & Monroe Cos.)					I-69 - Tier 2 Section 3 (Greene Co.)	I-69 - Tier 2 Section 5 (Monroe Co.)	Other Projected Growth**	ESTIMATED TOTAL IMPACTS (Low Cost Design Criteria & Initial Design Criteria, Respectively) *
	Alternative 2 (Refined Preferred)					*Selected Alternative (Refined Preferred Alternative 1)*	*Worst Case Scenario* (Subsections With Most Direct Impacts)	60/40 Split Ag/Forest No-Build Growth	
	Direct /		*Indirect*	*Mitigation**					
	Low-Cost Design Criteria	Initial Design Criteria		Low-Cost Design Criteria	Initial Design Criteria				
Farmland Acres (ac)	-356.03	-461.36	-106	-888	-1,116	-220	-80	-2,630	-4,280 to 4,613 reduction
Upland Forests (ac)	-872	-1,087	-54	+872	+1,087	-40	-369	-1,754	-2,217 reduction
Wetlands (ac)* **	-5.32	-9.55	0	+15.79	+29.14	-2.8	-14.0	0	-6.33 reduction to +2.79 net gain
Streams (lf)	93,196	111,247	0	Best Management Practices	Best Management Practices	9,438	48,232	0	150,866 to 168,917 impact
Karst (features)	88	108	Has not been determined ****	Best Management Practices	Best Management Practices	0	544	Has not been determined ****	631 to 651 impact

* TOTALS include Indirect Impact & Mitigation for Refined Preferred Alternative 2, only. Quantifiable data for these impacts are not available for "Other" projects. However, as with Section 4 of I-69, direct impacts to wetlands, streams, and forests would be mitigated at appropriate ratios in consultation with resource agencies and as required by permitting stipulations. Note also: stream and karst impacts are not treated as reductions or gains. Section 5.19, 5.20 and 5.21 describe the methodology used to identify appropriate mitigation measures for impacts to water resources, forests, and karst respectively.

** "Other Projected Growth" is the growth expected within the Section 4 geographic scope that is expected to occur even if I-69 is not constructed (the "No-Build" scenario), and which is not attributed to the remaining Other projects listed in the table. Other Projected Growth in this area is anticipated to impact 40% forest / 60% agricultural land use (see ***Appendix*** CC).

*** Wetland acreages are shown within construction limits. See Table 5.19-12.

**** The identification of karst features within the karst zones of susceptibility in the induced growth areas or geographic scope has not been completed as part of this study.

ˆSubtotals have been rounded.

Section 3 (within Section 4's geographic scope) Final Environmental Impact Statement, 2009

Section 5 (within Section 4's geographic scope) Preliminary Alternatives Analysis and Screening Package, May 2007

Table 5.24-7: Summary of Cumulative Land Use Changes to Farmland (Refined Preferred Alternative 2)

Land Use Changes	As a Result of Tier 2 I-69 Section 4 and / or "Other" Projects											
	Tier 2 I-69 Section 4 Greene County		Tier 2 I-69 Section 4 Monroe County		Tier 2 I-69 Section 4 TOTAL		I-69 - Tier 2 Section 3 (Greene Co.)	I-69 - Tier 2 Section 5 (Monroe Co.) (Worst Case)	"Other" Projected Growth	"Other" Projects Total	Cumulative Impacts: Section 4 + "Other" TOTAL	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria					Low-Cost Design Criteria	Initial Design Criteria
Direct Conversion of Agricultural Land (Acres)	-195	-255	-161	-206	*-356*	-461	-220	-80	-2,630	-2,930	-3,286	-3,391
Indirect / Induced Conversion of Agricultural Land (Acres)	-74	-74	-32	-32	**-106**	-106	Not Applicable	Not Applicable	Not Applicable	Not Applicable	-106	-106
Mitigation	Has not been determined	Has not been determined	Has not been determined	Has not been determined	-888	-1,116	Not Applicable	Not Applicable	Not Applicable	Not Applicable	-888	-1,116
TOTAL					**-1,350**	**-1,683**	**-220**	**-80**	**-2,630**	**-2,930**	**-4,280**	**-4,613**

Note: Indirect conversion of farmland by I-69 Section 4 includes agricultural land converted to forest (872 to 1,087ac) and wetland (15.79 to 29.14ac) as mitigation of direct impacts to those resources.

For these purposes, mitigation is assumed to take place within the same county as the direct impact, although this may not necessarily be the case.

"Other Projected Growth" is the growth expected within the Section 4 geographic scope that is expected to occur even if I-69 is not constructed (the "No-Build" scenario), and which is not attributed to the remaining Other projects listed in the table.

ˆSubtotals have been rounded.

Section 3 (within Section 4's geographic scope) Final Environmental Impact Statement, 2009

Section 5 (within Section 4's geographic scope) Preliminary Alternatives Analysis and Screening Package, May 2007

Table 5.24-8: Summary of Cumulative Land Use Changes to Upland Forest (Refined Preferred Alternative 2)

Land Use Changes	As a Result of Tier 2 I-69 Section 4 and / or "Other" Projects											
	Tier 2 I-69 Section 4 Greene County		Tier 2 I-69 Section 4 Monroe County		Tier 2 I-69 Section 4 TOTAL		I-69 - Tier 2 Section 3 (Greene Co.)	I-69 - Tier 2 Section 5 (Monroe Co.) (Worst Case)	"Other" Projected Growth	"Other" Projects Total	Cumulative Impacts: Section 4 + "Other" TOTAL	
	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria	Low-Cost Design Criteria	Initial Design Criteria					Low-Cost Design Criteria	Initial Design Criteria
Direct Conversion of Upland Forest Land (Acres)	-608.06	-750.02	-264.06	-337.35	*-872.12*	-1,087.37	-40	-369	-1,754	-2,163	**-3,035**	**-3,250**
Indirect / Induced Conversion of Upland Forest Land (Acres)	-32	-32	-22	-22	-54	-54	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**-54**	**-54**
Mitigation	+608.06	+750.02	+264.06	+337.35	*+872.12*	+1,087.37	Not Applicable	Not Applicable	Not Applicable	Not Applicable	*+872.12*	+1,087.37
TOTAL	**-32**	**-32**	**-22**	**-22**	**-54**	**-54**	**-40**	**-369**	**-1,754**	**-2,163**	**-2,217**	**-2,217**

Note: "Other Projected Growth" is the growth expected within the Section 4 geographic scope that is expected to occur even if I-69 is not constructed (the "No-Build" scenario), and which is not attributed to the remaining Other projects listed in the table.

ˆSubtotals have been rounded.

Section 3 (within Section 4's geographic scope) Final Environmental Impact Statement, 2009

Section 5 (within Section 4's geographic scope) Preliminary Alternatives Analysis and Screening Package, May 2007

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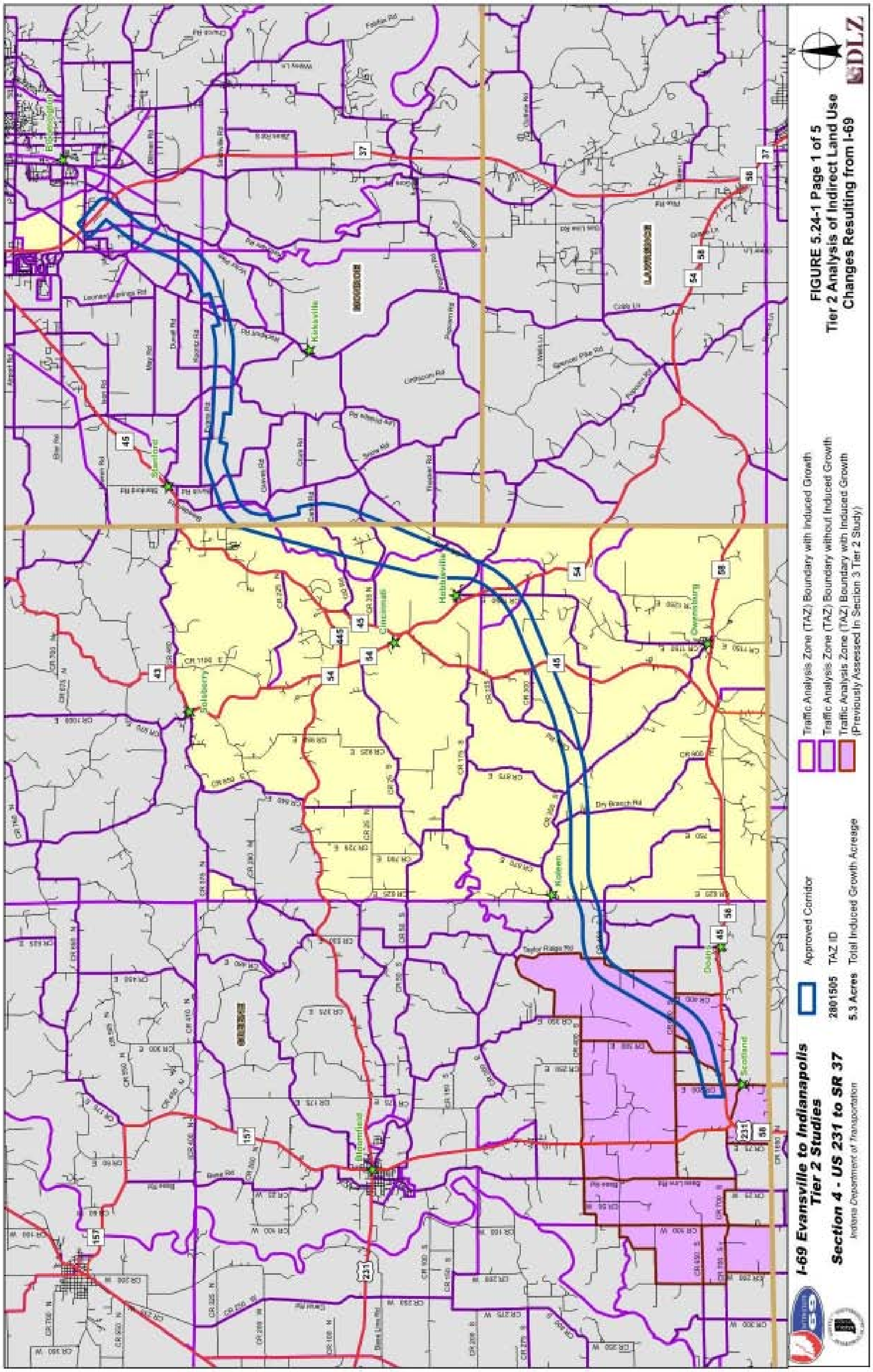
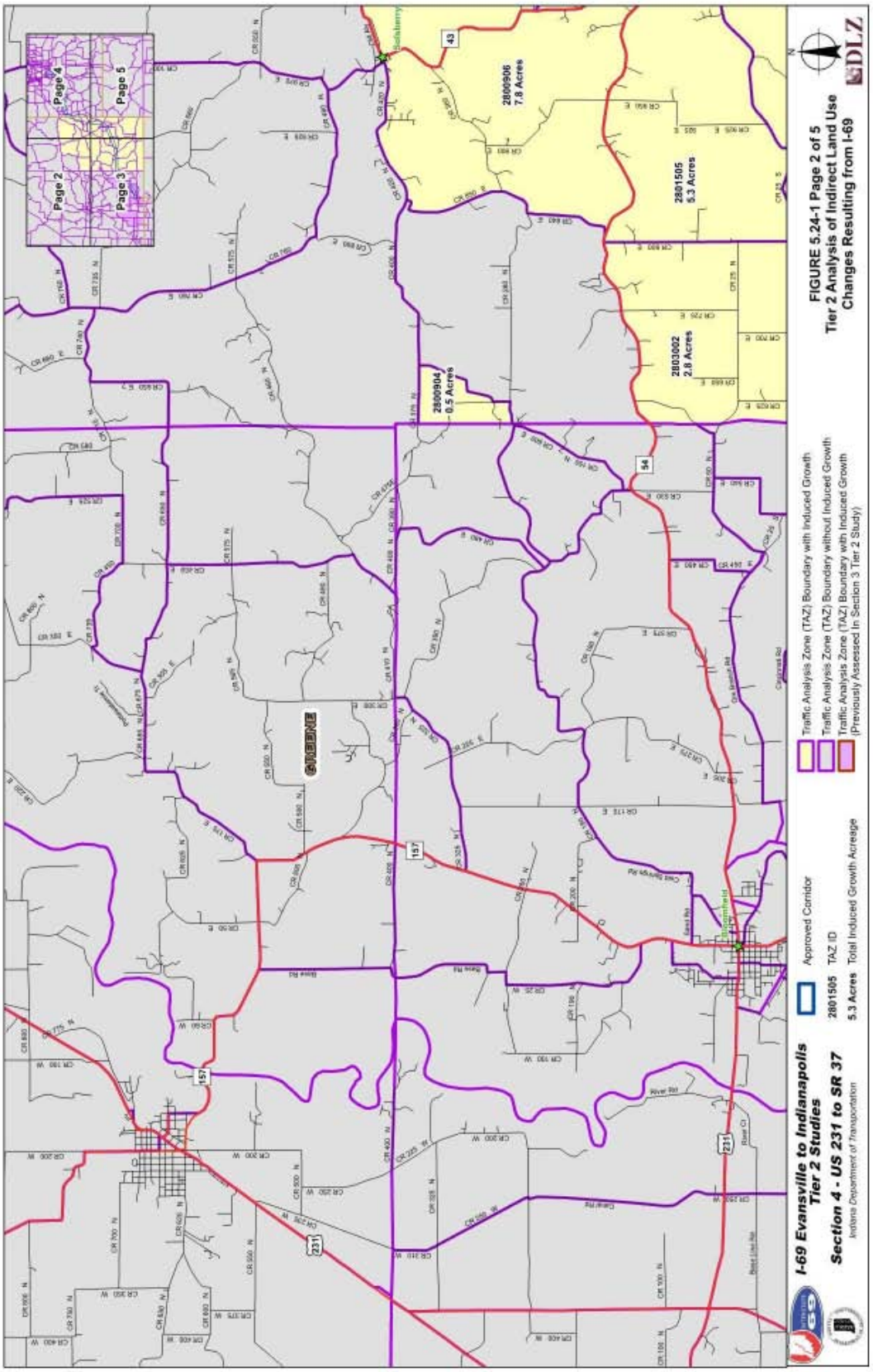
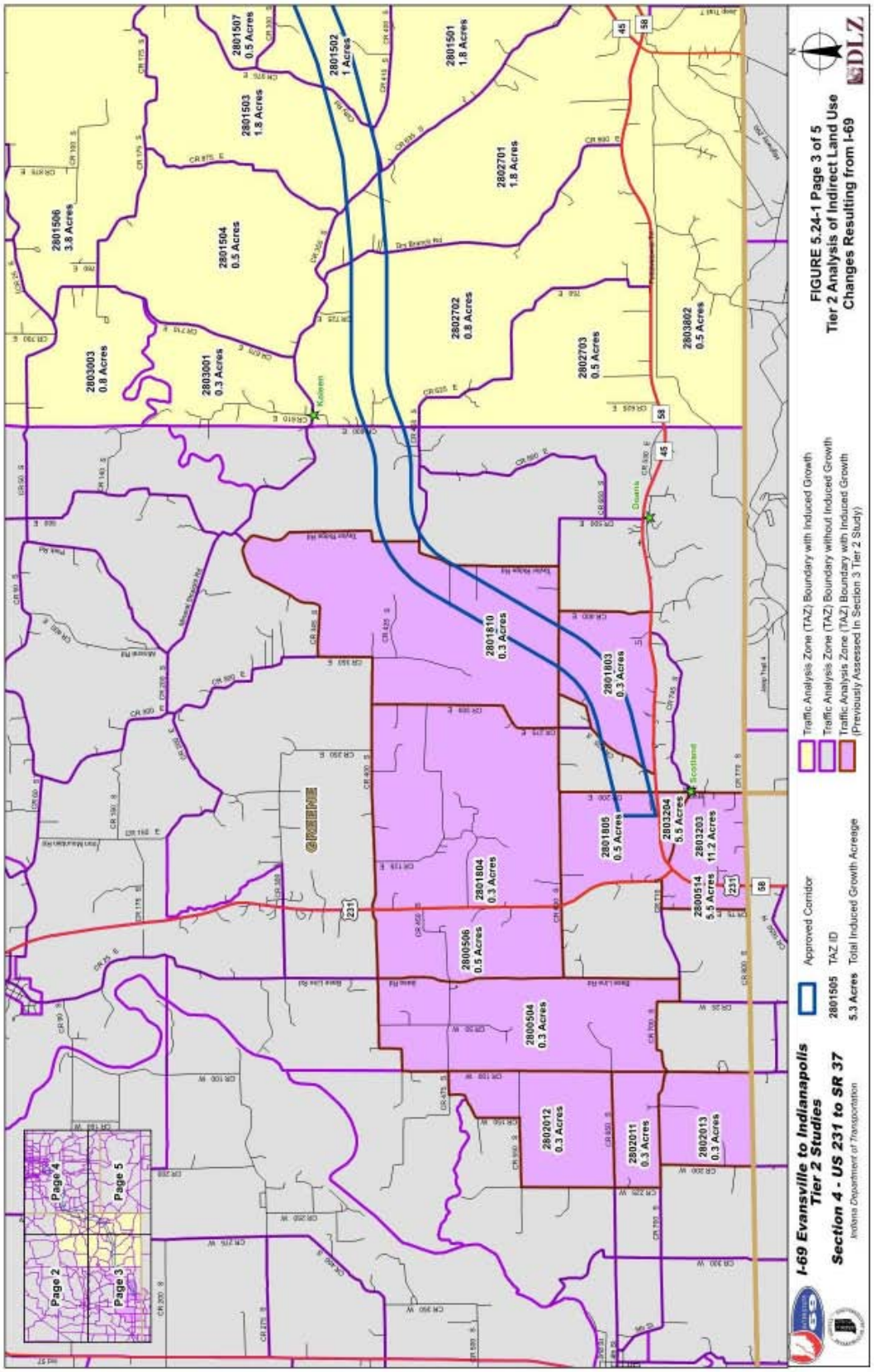


FIGURE 5.24-1 Page 1 of 5
Tier 2 Analysis of Indirect Land Use Changes Resulting from I-69


Page 2
Page 3
Page 4
Page 5
2800906
7.8 Acres
2801505
5.3 Acres
2803002
2.8 Acres
2800904
0.5 Acres
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
(Previously Assessed in Section 3 Tier 2 Study)
Approved Corridor
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-1 Page 2 of 5
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69
DLZ


2801507
0.5 Acres
2801503
1.8 Acres
2801502
1 Acres
2801501
1.8 Acres
2801506
3.8 Acres
2801504
0.5 Acres
2802701
1.8 Acres
2802702
0.5 Acres
2802703
0.5 Acres
2803002
0.5 Acres
2803003
0.8 Acres
2803001
0.3 Acres
Kolmen
Oaktrie
2801810
0.3 Acres
2801803
0.3 Acres
Scotland
2801805
0.5 Acres
2803204
5.5 Acres
2803203
11.2 Acres
2800514
5.5 Acres
2801804
0.3 Acres
2800506
0.5 Acres
2800504
0.3 Acres
2802012
0.3 Acres
2802011
0.3 Acres
2802013
0.3 Acres
Page 4
Page 5
Page 2
Page 3
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Approved Corridor
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
(Previously Assessed In Section 3 Tier 2 Study)
FIGURE 5.24-1 Page 3 of 5
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69
DLZ

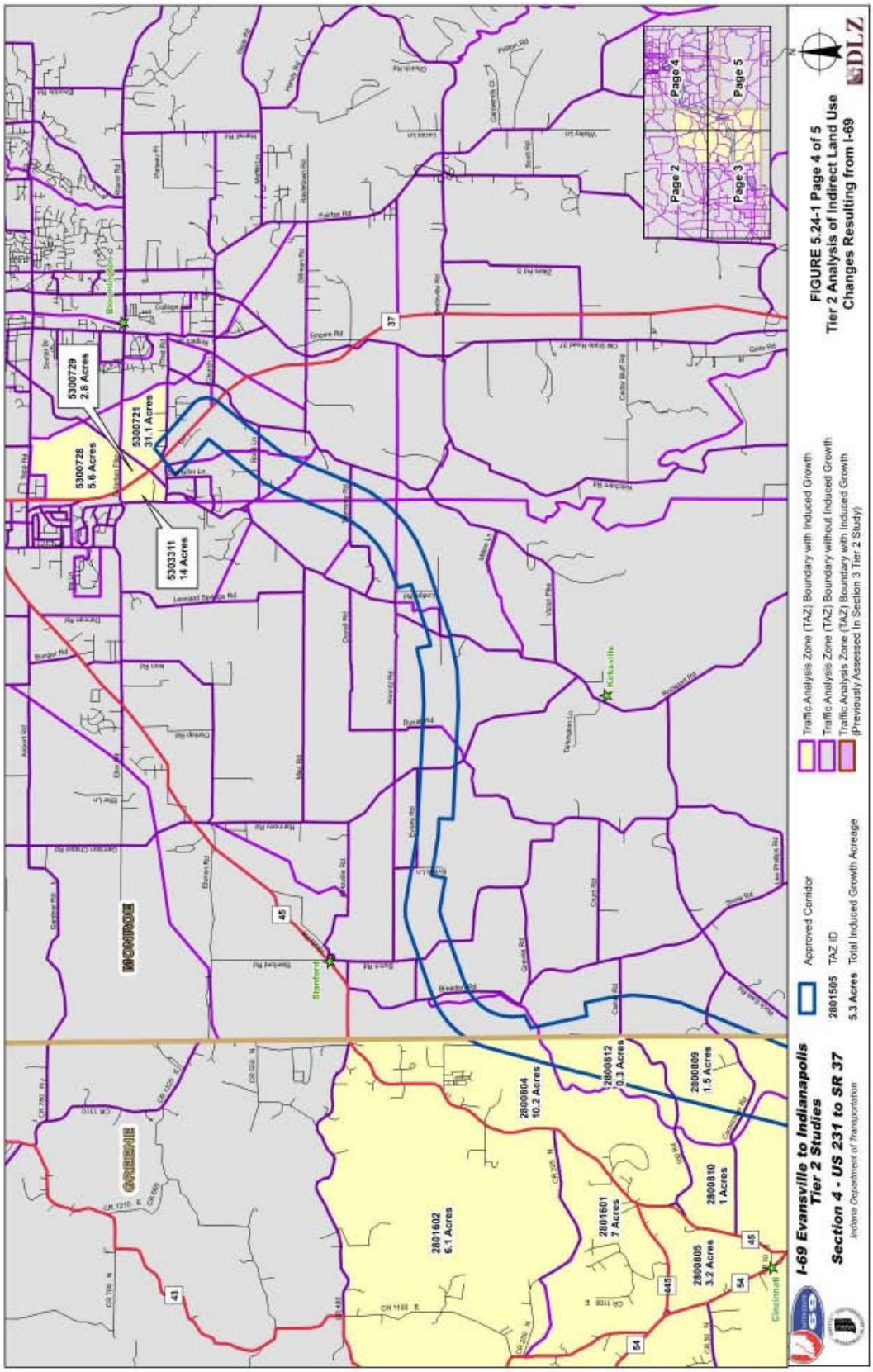


FIGURE 5.24-1 Page 4 of 5
Tier 2 Analysis of Indirect Land Use Changes Resulting from I-69

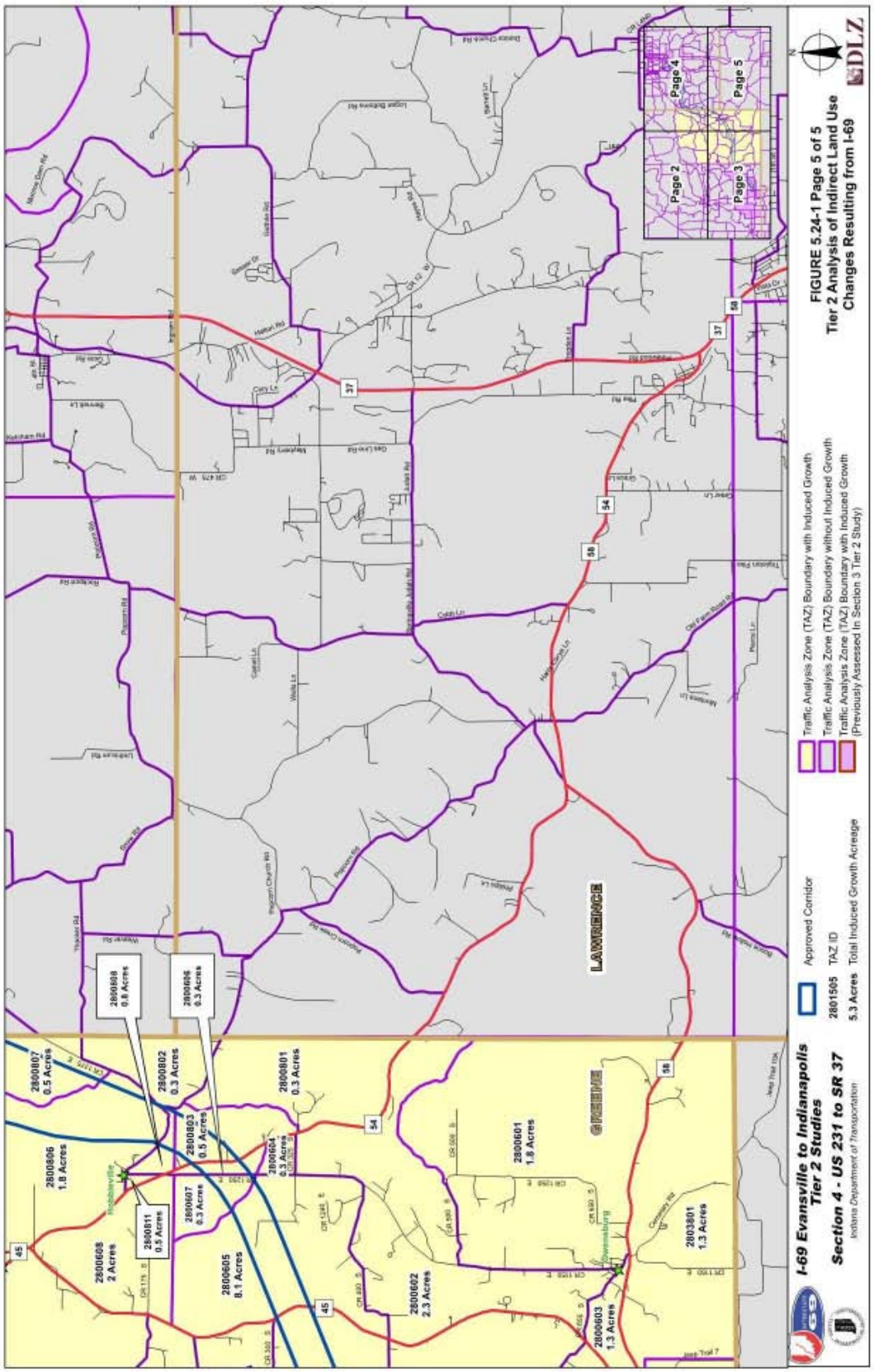
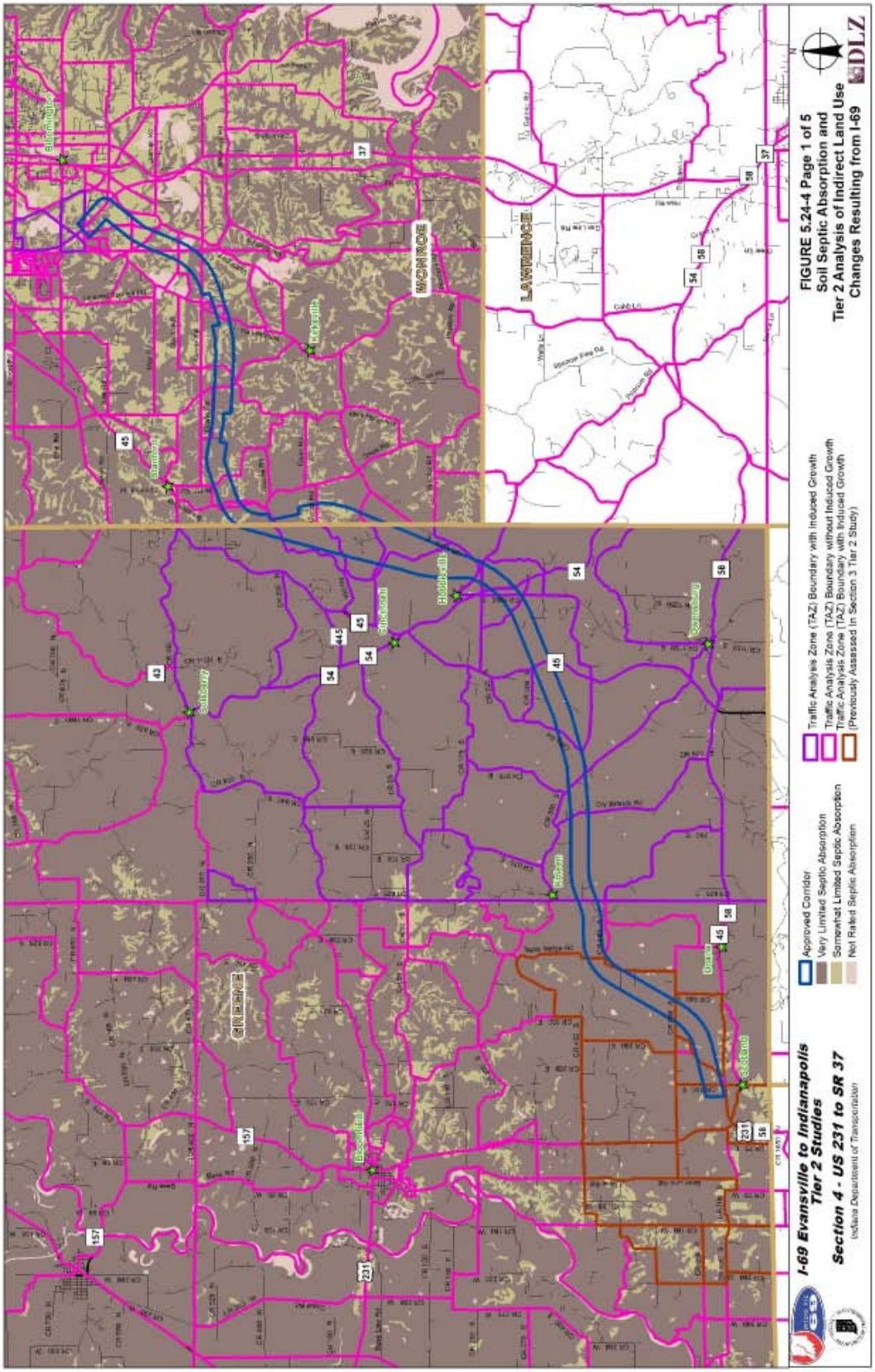


FIGURE 5.24-1 Page 5 of 5
Tier 2 Analysis of Indirect Land Use Changes Resulting from I-69
Page 2
Page 3
Page 4
Page 5
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed In Section 3 Tier 2 Study)
Approved Corridor
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
LAWRENCE
2800808 0.8 Acres
2800806 0.3 Acres
2800807 0.5 Acres
2800802 0.3 Acres
2800803 0.5 Acres
2800801 0.3 Acres
2800804 0.3 Acres
2800807 0.3 Acres
2800806 1.8 Acres
2800811 0.5 Acres
2800608 2 Acres
2800605 8.1 Acres
2800602 2.3 Acres
2800601 1.8 Acres
2800603 1.3 Acres
2803801 1.3 Acres


Approved Corridor
Very Limited Septic Absorption
Somewhat Limited Septic Absorption
Not Rated Septic Absorption
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
(Previously Assessed In Section 3 Tier 2 Study)
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-4 Page 1 of 5
Soil Septic Absorption and
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69
DLZ
MONROE
LAWRENCE
Bloomington
Ellettsville
Stinesville
Smithville
Unionville
Harrodsburg
Bedford
Oolitic
Springville
Shoals
Loogootee
Jasper
Dubois
Huntingburg
Ferdinand
Jasper
Dale
Santa Claus
Rockport
Boonville
Newburgh
Evansville
Tell City
Cannelton
Troy
Cloverdale
Greencastle
Bainbridge
Fillmore
Mooresville
Martinsville
Plainfield
Avon
Indianapolis
Speedway
Beech Grove
Greenwood
Franklin
Edinburgh
Columbus
Seymour
Brownstown
Salem
Scottsburg
Clarksville
New Albany
Jeffersonville
Sellersburg
Charlestown
Jeffersonville
Clarksville
Sellersburg
Scottsburg
Salem
Brownstown
Seymour
Columbus
Edinburgh
Franklin
Greenwood
Beech Grove
Speedway
Indianapolis
Avon
Plainfield
Martinsville
Mooresville
Greencastle
Cloverdale
Troy
Cannelton
Tell City
Rockport
Newburgh
Boonville
Santa Claus
Dale
Jasper
Ferdinand
Huntingburg
Dubois
Jasper
Loogootee
Springville
Oolitic
Bedford
Harrodsburg
Unionville
Smithville
Stinesville
Ellettsville
Bloomington
Bloomington
Ellettsville
Stinesville
Smithville
Unionville
Harrodsburg
Bedford
Oolitic
Springville
Loogootee
Jasper
Dubois
Huntingburg
Ferdinand
Jasper
Dale
Santa Claus
Rockport
Boonville
Newburgh
Evansville
Tell City
Cannelton
Troy
Cloverdale
Greencastle
Bainbridge
Fillmore
Mooresville
Martinsville
Plainfield
Avon
Indianapolis
Speedway
Beech Grove
Greenwood
Franklin
Edinburgh
Columbus
Seymour
Brownstown
Salem
Scottsburg
Clarksville
New Albany
Jeffersonville
Sellersburg
Charlestown
Jeffersonville
Clarksville
Sellersburg
Scottsburg
Salem
Brownstown
Seymour
Columbus
Edinburgh
Franklin
Greenwood
Beech Grove
Speedway
Indianapolis
Avon
Plainfield
Martinsville
Mooresville
Greencastle
Cloverdale
Troy
Cannelton
Tell City
Rockport
Newburgh
Boonville
Santa Claus
Dale
Jasper
Ferdinand
Huntingburg
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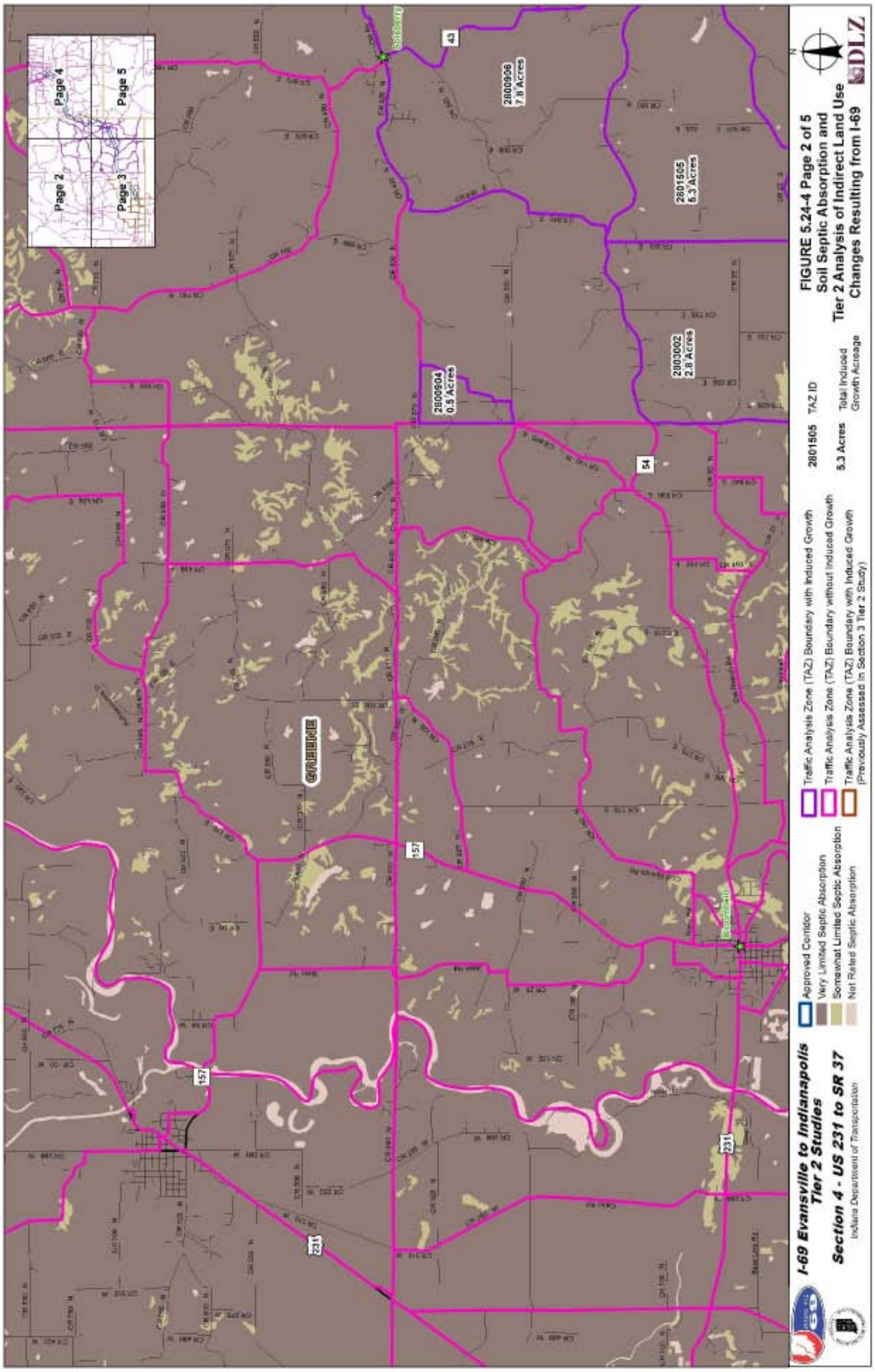
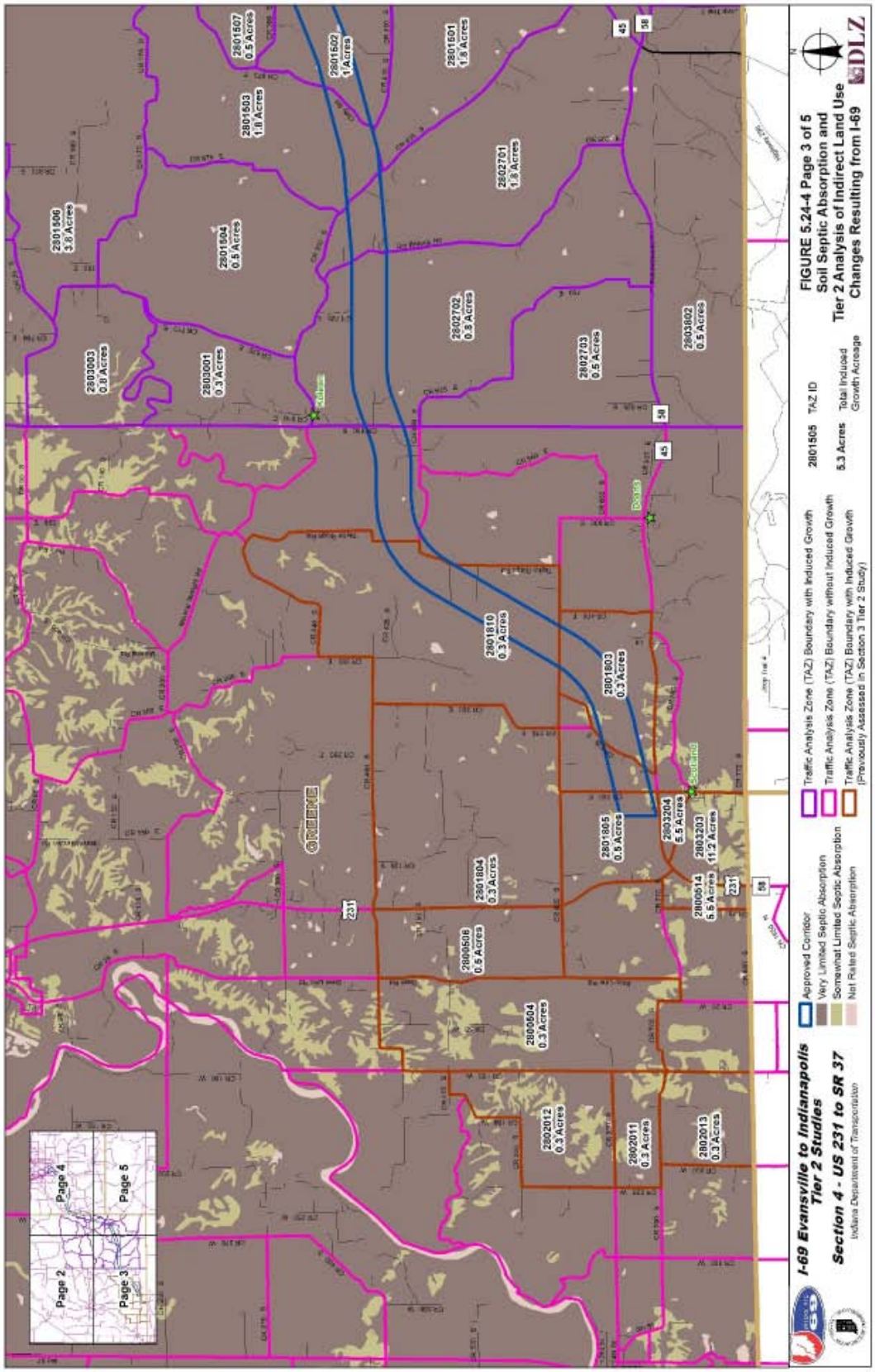
Bedford
Harrodsburg
Unionville
Smithville
Stinesville
Ellettsville
Bloomington


Page 2
Page 3
Page 4
Page 5
2800904
0.5 Acres
2800906
7.8 Acres
2801505
5.3 Acres
2803002
2.8 Acres
GREENE
Bloomfield
Sullivan
43
54
57
231
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
Approved Corridor
Very Limited Septic Absorption
Somewhat Limited Septic Absorption
Not Rated Septic Absorption
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
(Previously Assessed in Section 3 Tier 2 Study)
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
FIGURE 5.24-4 Page 2 of 5
Soil Septic Absorption and
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69
DLZ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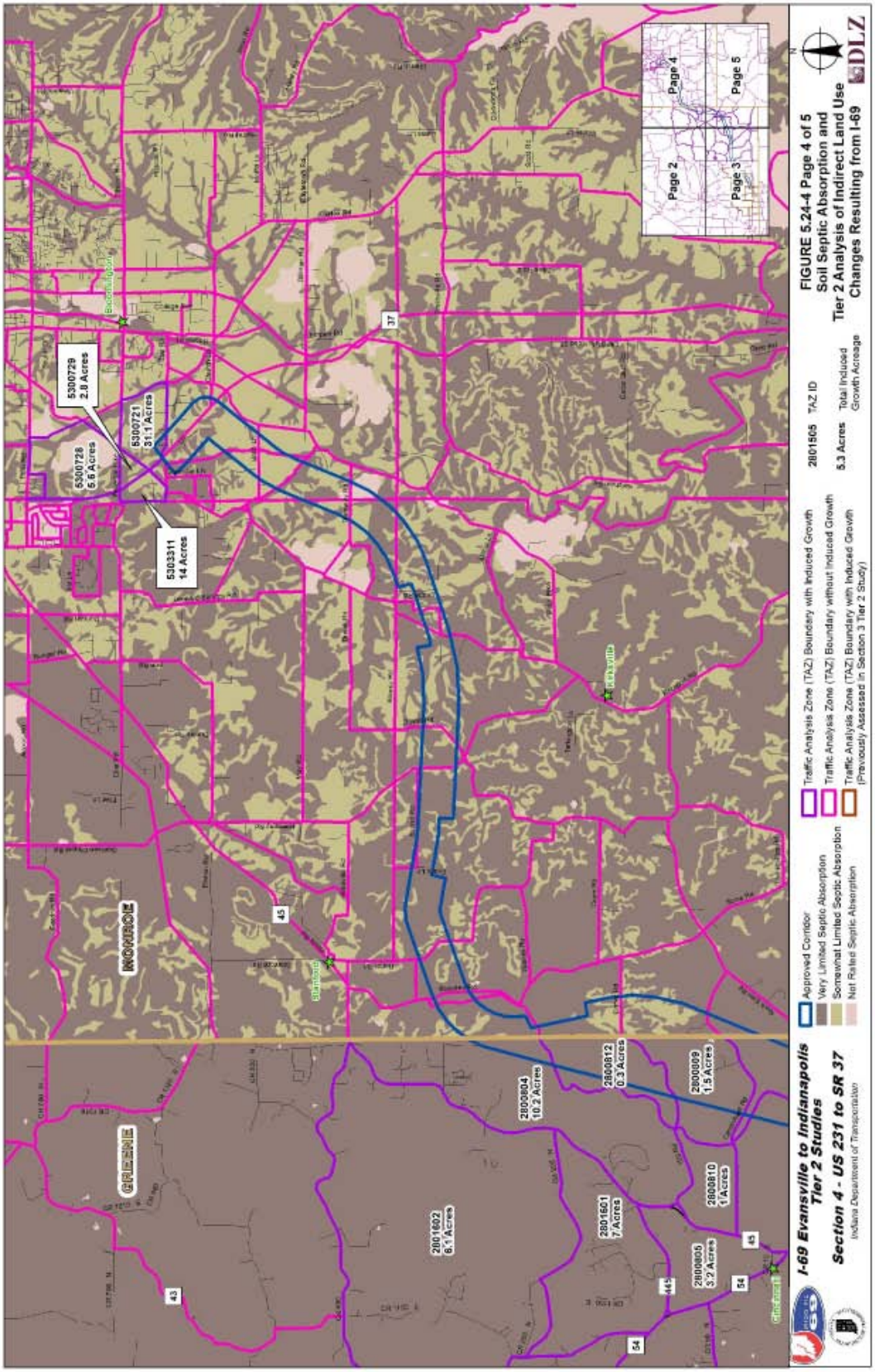
2802702 0.5 Acres
2802703 0.5 Acres
2803802 0.5 Acres
2803003 0.8 Acres
2803001 0.3 Acres
2801810 0.3 Acres
2801803 0.3 Acres
2801805 0.5 Acres
2803204 5.5 Acres
2803203 11.2 Acres
2800614 5.5 Acres
2801804 0.3 Acres
2800608 0.5 Acres
2800604 0.3 Acres
2802012 0.3 Acres
2802011 0.3 Acres
2802013 0.3 Acres
Page 2
Page 3
Page 4
Page 5
Approved Corridor
Very Limited Septic Absorption
Somewhat Limited Septic Absorption
Not Rated Septic Absorption
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed in Section 3 Tier 2 Study)
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-4 Page 3 of 5
Soil Septic Absorption and Tier 2 Analysis of Indirect Land Use Changes Resulting from I-69
DLZ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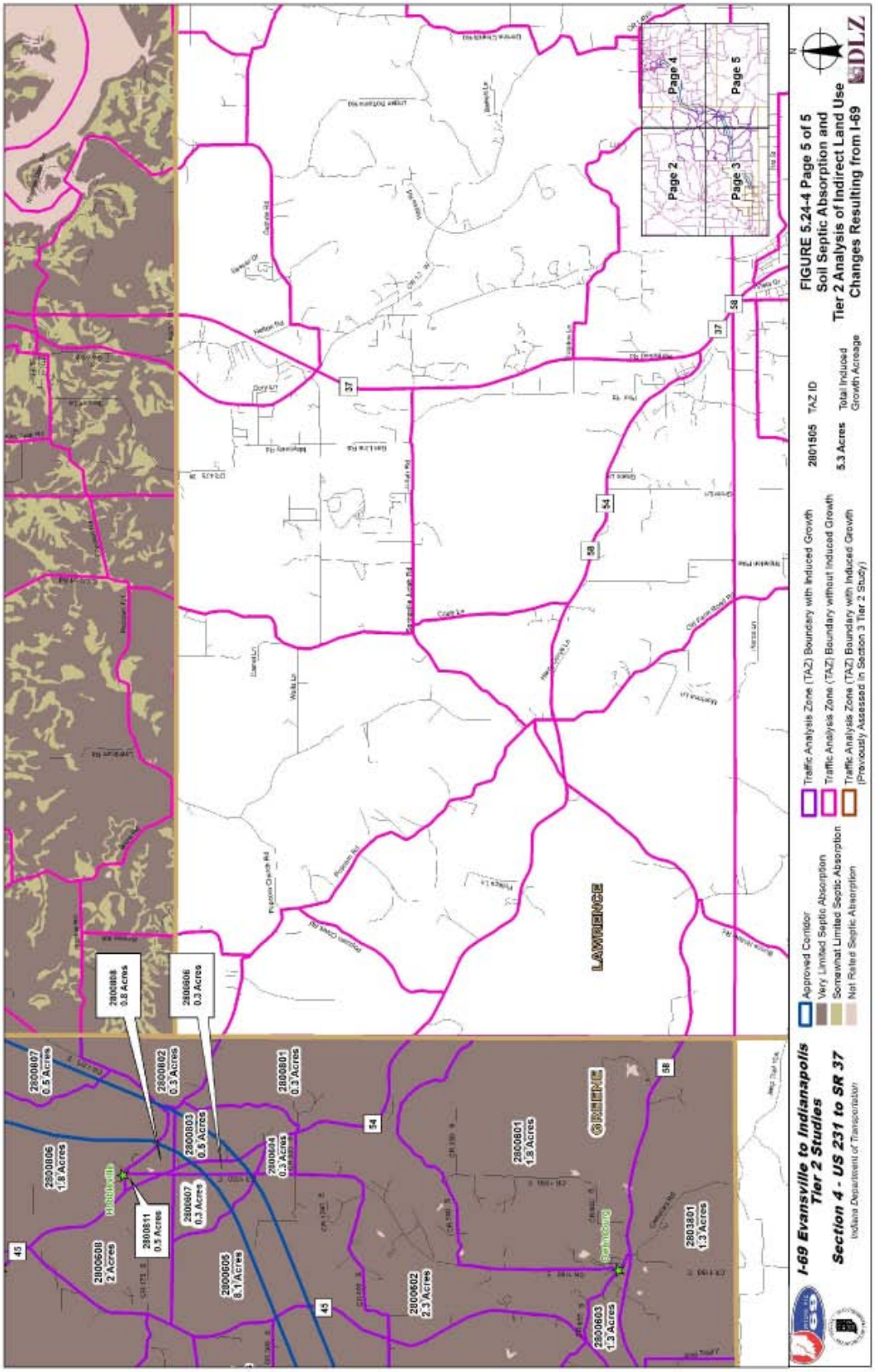
2.8 Acres
5300728
5.6 Acres
5300721
31.1 Acres
5303311
14 Acres
2800904
10.2 Acres
2800812
0.3 Acres
2800809
1.5 Acres
2801602
8.1 Acres
2801601
7 Acres
2800810
1 Acres
2800805
3.2 Acres
Page 2
Page 3
Page 4
Page 5
Approved Corridor
Very Limited Septic Absorption
Somewhat Limited Septic Absorption
Not Rated Septic Absorption
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed in Section 3 Tier 2 Study)
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-4 Page 4 of 5
Soil Septic Absorption and
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69
DLZ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2800806 1.8 Acres
2800808 0.8 Acres
2800606 0.3 Acres
2800802 0.3 Acres
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2800801 0.3 Acres
2800804 0.3 Acres
2800807 0.3 Acres
2800811 0.3 Acres
2800500 2 Acres
2800605 0.1 Acres
2800602 2.3 Acres
2800601 1.8 Acres
2803301 1.3 Acres
2800603 1.3 Acres
Mooresville
Martinsville
LAWRENCE
Page 2
Page 3
Page 4
Page 5
Approved Corridor
Very Limited Septic Absorption
Somewhat Limited Septic Absorption
Not Rated Septic Absorption
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed in Section 3 Tier 2 Study)
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
FIGURE 5.24-4 Page 5 of 5
Soil Septic Absorption and
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
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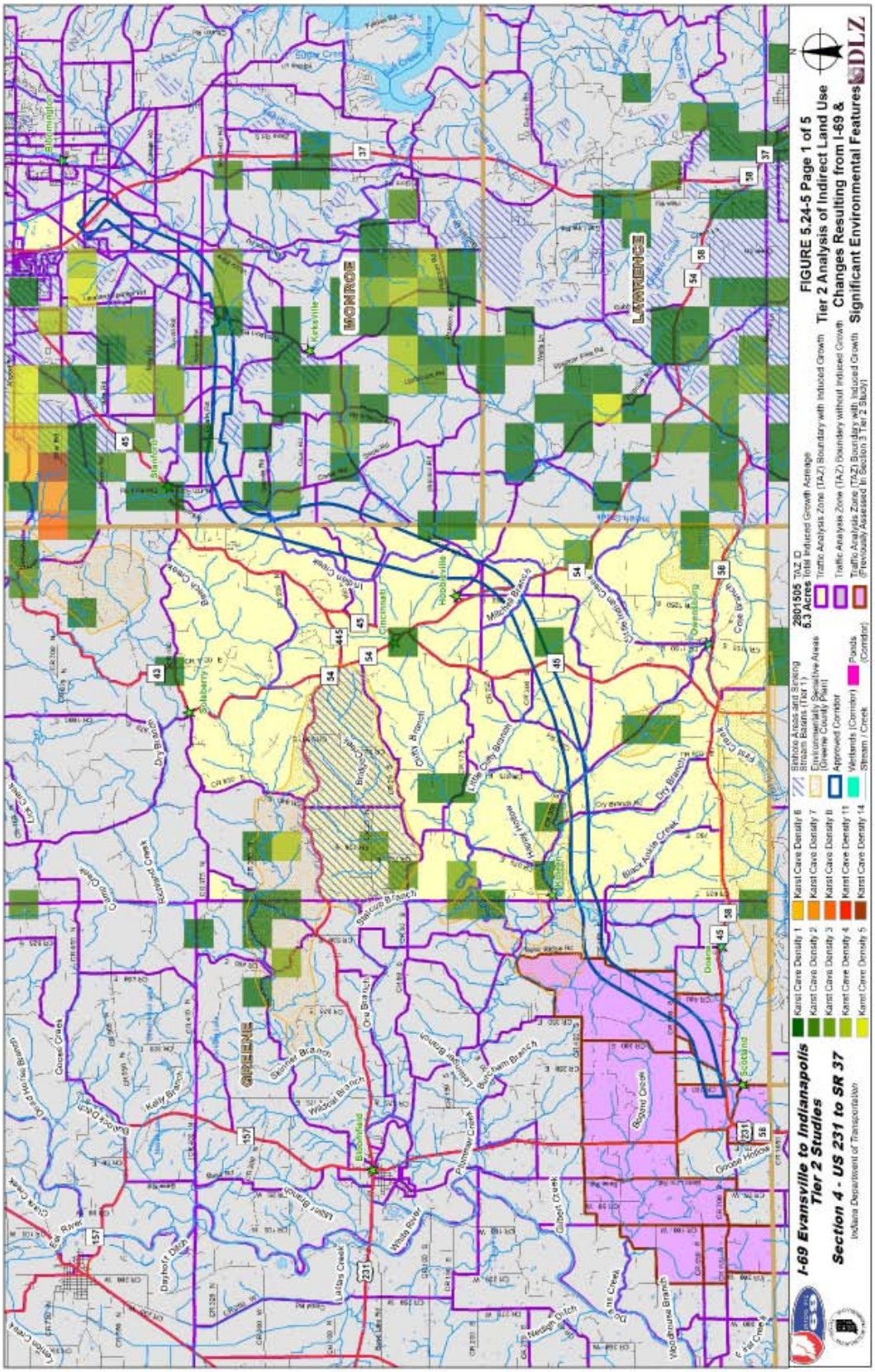
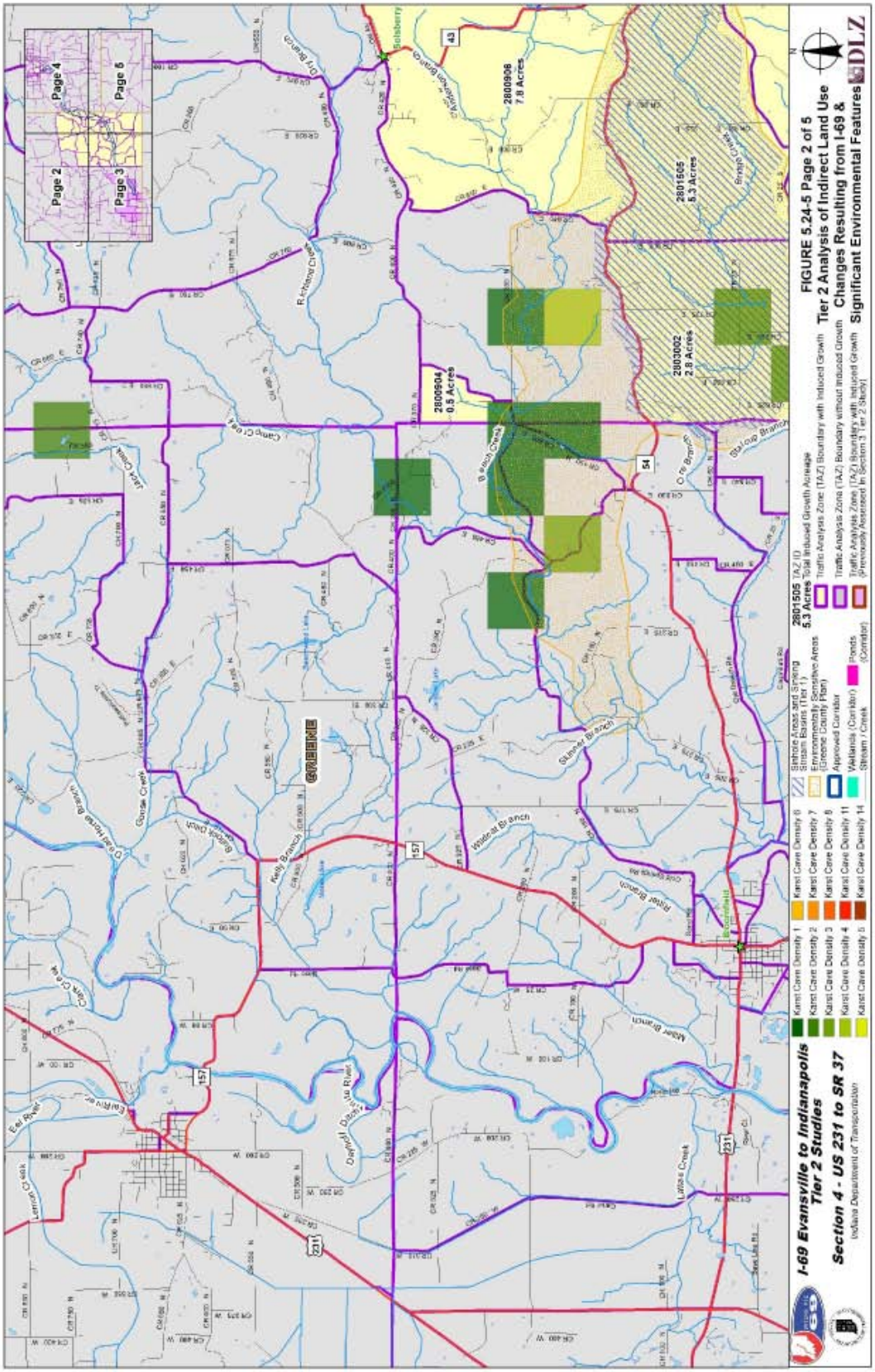

I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-5 Page 1 of 5
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69 &
Significant Environmental Features
DLZ
MONROE
LAWRENCE
GREENE
Bloomington
Ellettsville
Stinesville
Smithville
Bedford
Oolitic
Scotland
Karst Cave Density 1
Karst Cave Density 2
Karst Cave Density 3
Karst Cave Density 4
Karst Cave Density 5
Karst Cave Density 6
Karst Cave Density 7
Karst Cave Density 8
Karst Cave Density 11
Karst Cave Density 14
Sinkhole Areas and Sinking Stream Basins (Tier 1)
Environmentally Sensitive Areas (Greene County Part)
Approved Corridor
Wetlands (Corridor)
Ponds (Corridor)
Stream / Creek
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed In Section 3 Tier 2 Study)


Page 2
Page 3
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Page 5
2800906
7.8 Acres
2801505
5.3 Acres
2803002
2.8 Acres
2800904
0.5 Acres
GREENE
Karst Cave Density 1
Karst Cave Density 2
Karst Cave Density 3
Karst Cave Density 4
Karst Cave Density 5
Karst Cave Density 6
Karst Cave Density 7
Karst Cave Density 8
Karst Cave Density 11
Karst Cave Density 14
Sinkhole Areas and Sinking Stream Basins (Tier 1)
Environmentally Sensitive Areas (Greene County Plan)
Approved Corridor
Wetlands (Corridor)
Stream / Creek
Ponds (Corridor)
2801505 TAZ ID
5.3 Acres Total Induced Growth Acreage
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed in Section 3 Tier 2 Study)
I-69 Evansville to Indianapolis Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-5 Page 2 of 5
Tier 2 Analysis of Indirect Land Use Changes Resulting from I-69 & Significant Environmental Features
DLZ

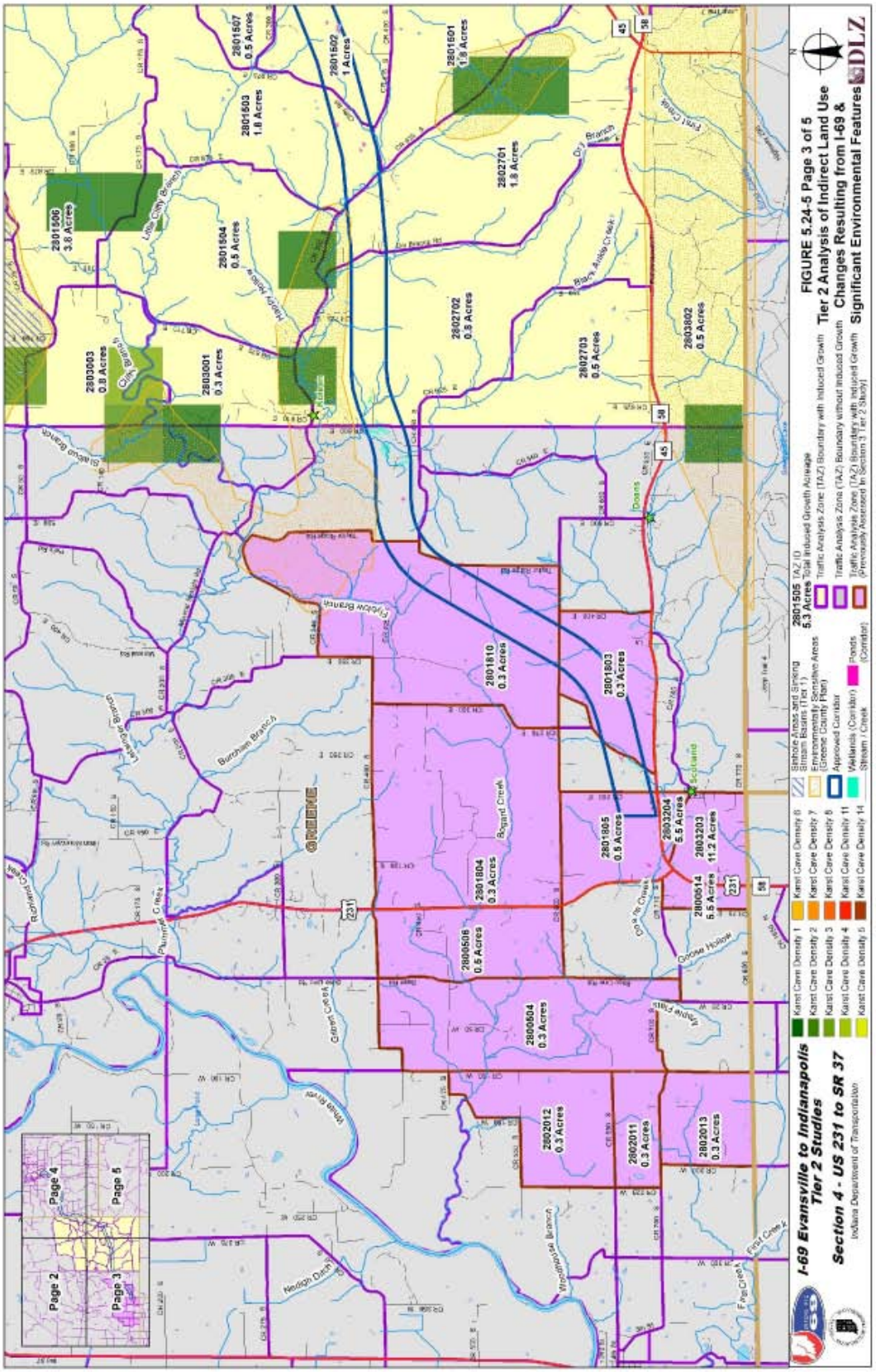
FIGURE 5.24-5 Page 3 of 5
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69 &
Significant Environmental Features
DLZ
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
2801505 5.3 Acres TAZ ID
Total Induced Growth Acreage
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed in Section 3 Tier 2 Study)
Sinkhole Areas and Sinking Stream Basins (Tier 1)
Environmentally Sensitive Areas (Tier 2 Study Area)
Approved Corridor
Wetlands (Corridor)
Stream / Creek
Ponds (Corridor)
Karst Cave Density 1
Karst Cave Density 2
Karst Cave Density 3
Karst Cave Density 4
Karst Cave Density 5
Karst Cave Density 6
Karst Cave Density 7
Karst Cave Density 8
Karst Cave Density 11
Karst Cave Density 14
Page 2
Page 3
Page 4
Page 5
Burcham Branch
Bogard Creek
Scotland
Doans
Dry Branch
Black Angle Creek
Little City Branch
Plummer Creek
Grove Hollow
Fish Creek
Neidigh Ditch
Woodwinds Branch
2801507 0.5 Acres
2801502 1 Acres
2801501 1.8 Acres
2801503 1.8 Acres
2801506 3.8 Acres
2801504 0.5 Acres
2802701 1.8 Acres
2802702 0.8 Acres
2802703 0.5 Acres
2803002 0.5 Acres
2803003 0.8 Acres
2803001 0.3 Acres
2801810 0.3 Acres
2801803 0.3 Acres
2801805 0.5 Acres
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2803203 11.2 Acres
2800514 5.5 Acres
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2800504 0.3 Acres
2802012 0.3 Acres
2802011 0.3 Acres
2802013 0.3 Acres

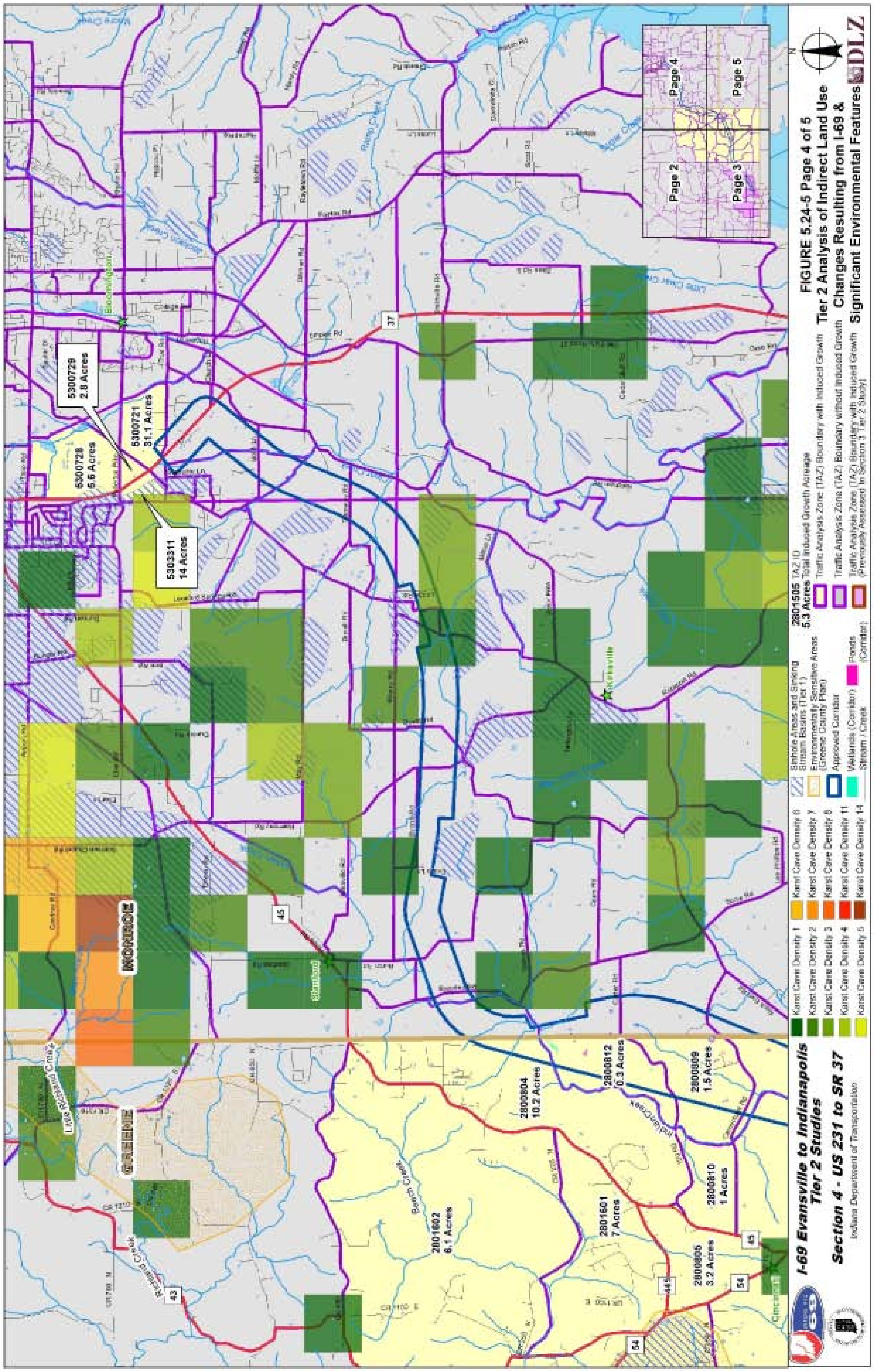
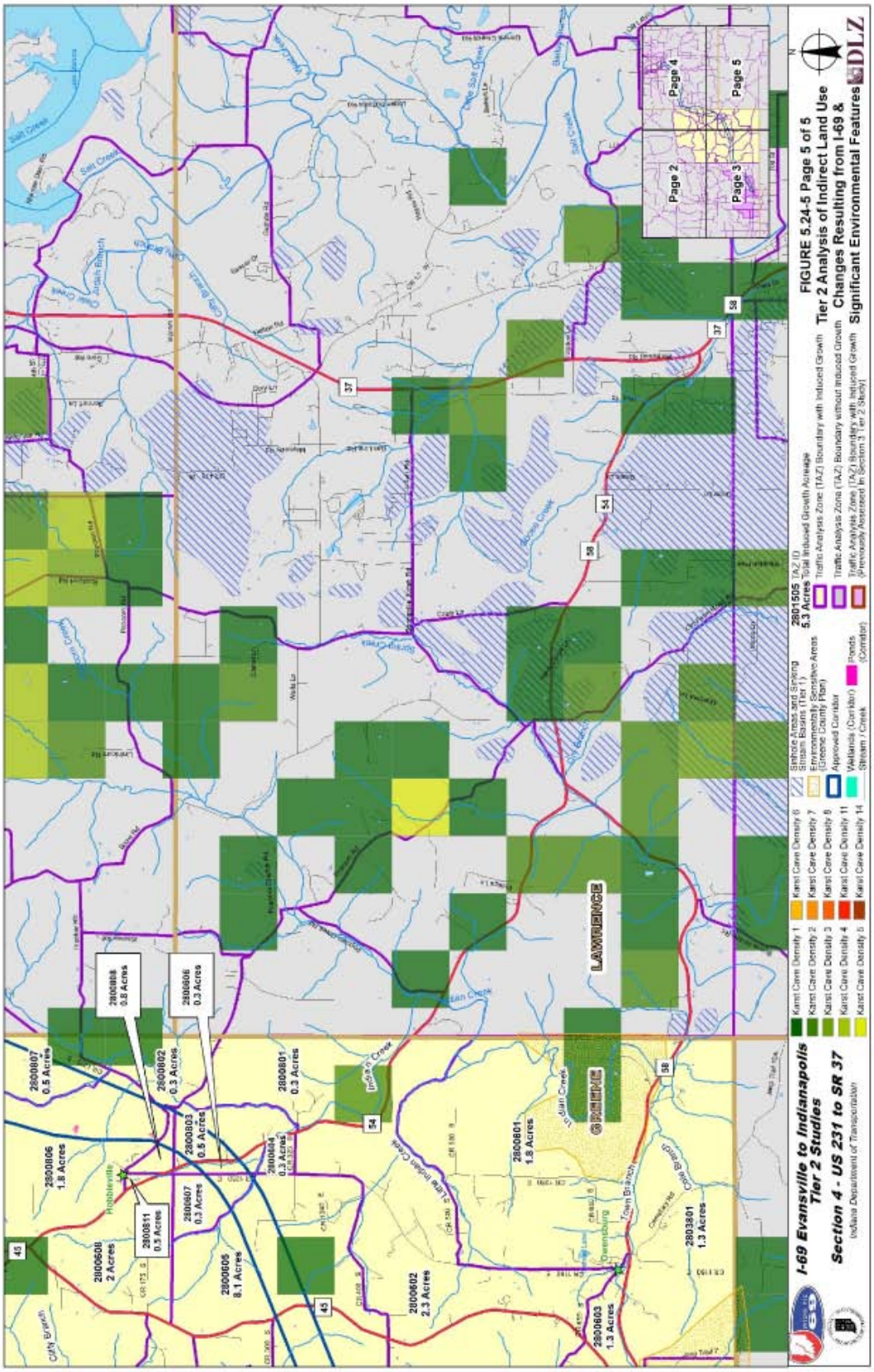
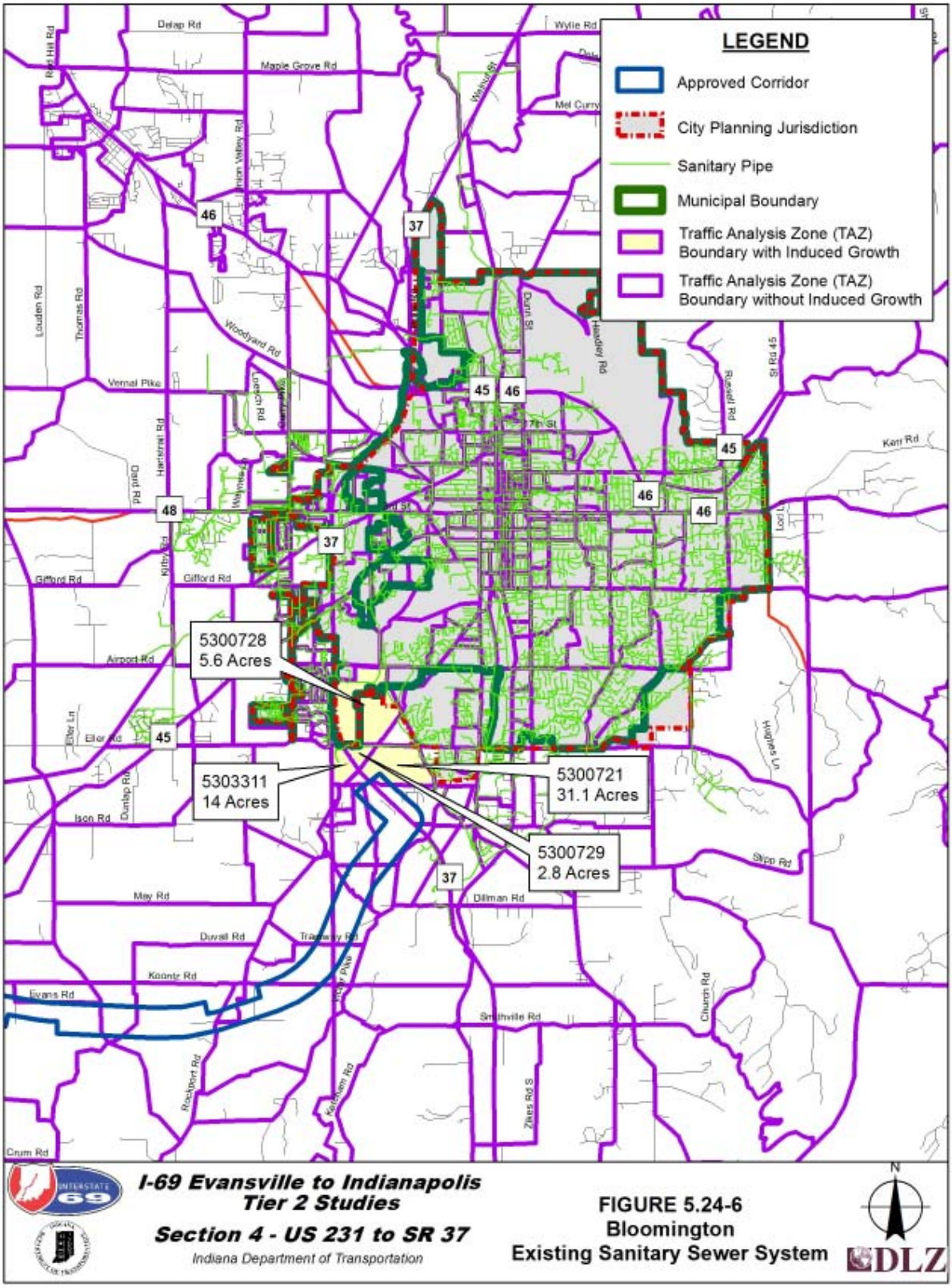


FIGURE 5.24-5 Page 4 of 5
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69 &
Significant Environmental Features
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
MONROE
GREENE


I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-5 Page 5 of 5
Tier 2 Analysis of Indirect Land Use
Changes Resulting from I-69 &
Significant Environmental Features
DLZ
Page 2
Page 3
Page 4
Page 5
LAWRENCE
GREENE
Hobbieville
Greenburg
2800807 0.5 Acres
2800806 1.8 Acres
2800808 0.5 Acres
2800806 0.3 Acres
2800802 0.3 Acres
2800803 0.5 Acres
2800811 0.5 Acres
2800807 0.3 Acres
2800608 2 Acres
2800605 8.1 Acres
2800601 0.3 Acres
2800604 0.3 Acres
2800602 2.3 Acres
2800601 1.8 Acres
2803601 1.3 Acres
2800603 1.3 Acres
2801505 5.3 Acres
Karst Cave Density 1
Karst Cave Density 2
Karst Cave Density 3
Karst Cave Density 4
Karst Cave Density 5
Karst Cave Density 6
Karst Cave Density 7
Karst Cave Density 8
Karst Cave Density 11
Karst Cave Density 14
Sinkhole Areas and Spring Stream Basins (Tier 1)
Environmentally Sensitive Areas (Greene County Plan)
Approved Corridor
Wetlands (Corridor)
Stream / Creek
Ponds (Corridor)
TAZ ID
Total Induced Growth Acreage
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
Traffic Analysis Zone (TAZ) Boundary with Induced Growth (Previously Assessed in Section 3.1 Tier 2 Study)


LEGEND
Approved Corridor
City Planning Jurisdiction
Sanitary Pipe
Municipal Boundary
Traffic Analysis Zone (TAZ) Boundary with Induced Growth
Traffic Analysis Zone (TAZ) Boundary without Induced Growth
5300728
5.6 Acres
5303311
14 Acres
5300721
31.1 Acres
5300729
2.8 Acres
I-69 Evansville to Indianapolis
Tier 2 Studies
Section 4 - US 231 to SR 37
Indiana Department of Transportation
FIGURE 5.24-6
Bloomington
Existing Sanitary Sewer System
N
DLZ

5.25 Energy Impacts

No substantive changes have been made to this section since publication of the Draft Environmental Impact Statement (DEIS).

5.25.1 Introduction

Transportation accounts for a major portion of energy consumption in the United States. Energy is directly consumed by vehicles traveling on roadways, and is indirectly consumed by vehicle manufacture and maintenance, and during the construction and maintenance of roadways. Energy consumption for vehicle operation and roadway facility maintenance represents long-term energy impacts; whereas, energy consumption in new road construction is a substantial, short-term energy impact.

Studies show that 42% of the energy for transportation is consumed in the manufacture and maintenance of transportation vehicles (Hatano et al., July 1983). Most of the remainder of the energy consumed by transportation projects involves ongoing vehicle operation, in contrast to the transportation facility construction and maintenance. Therefore, the energy impacts analysis focuses on direct energy consumption associated with vehicle travel.

5.25.2 Methodology

In the evaluation of the Future No-Build Condition and the Build Condition (Alternatives 1, 2, 3, and 4), a "postprocessor" program was used to analyze the travel characteristics forecasted by the I-69 Corridor Travel Demand Model. The Travel Demand Model replicates travel patterns for the No-Build Condition and Alternatives; and reports daily auto and truck volumes, daily vehicles-miles of travel, and typical vehicle speeds for each link in the highway system. The "postprocessor" program converts these travel characteristics into gallons of gasoline and diesel fuel consumed in the year 2030. Factors were then used to convert gallons of fuel to BTUs to assess energy impacts. One million BTUs are approximately equal to 8.007 gallons of gasoline or 7.201 gallons of diesel fuel. For the purposes of this analysis, it was assumed that passenger cars and light-duty trucks consume gasoline and that heavy-duty trucks consume diesel fuel.

Also for purposes of analysis, fuel consumption efficiency rates by vehicle and travel type were held constant due to the difficulties inherent in attempting to predict changes in efficiency. It is expected that efficiency rates would improve over time, however.

All of the alternatives, including Refined Preferred Alternative 2, follow the same mainline alignments along Alternative Alignments B-1, D-1, Hybrid 4E-1/4E-2, and G-2 and each of the alternatives also use one or more of the same mainline alignments along Subsections 4A, 4C, 4F, and 4H. The total end-to-end distances of the four alternatives for Section 4 vary from 26.7 miles to 26.8 miles. It was decided that a difference of 0.1 mile between the end-to-end distances for the alternatives and similar terrain that would be traversed by the alternatives along common or adjacent alignments within the 2000-foot corridor will have a negligible effect upon energy consumption when considering the millions of vehicle miles of travel and gallons of fuel that are consumed annually within the five-county study area. Thus, the Travel Demand Model

used one mainline alignment following near the center of the Section 4 corridor to replicate travel along the new highway for all Section 4 alternatives.

5.25.3 Analysis

Table 5.25-1 reports the results of the energy analysis for the Future No-Build Condition and the end-to-end Alternatives 1, 2, 3, and 4 under the build condition. The alternatives result in additional miles of roadway; therefore, they all result in an increase in annual vehicle-miles of travel (VMT) over the Future No-Build Condition. Because the alternatives also divert through traffic from other interstates and principal arterials outside the five counties reported, the final alternatives result in even greater vehicle-miles of travel than the Future No-Build Condition.

Because the alternatives, including the Refined Preferred Alternative, have nearly identical total end-to-end distances, all four alternatives will have nearly identical results for annual VMT, daily fuel consumption, annual BTUs, and BTUs per vehicle mile. Overall, the alternatives will have about 2,205 million annual VMT, 477,027 gallons of daily fuel consumption, 20,767,063 million annual BTUs, and 9,417 BTUs per vehicle mile.

Table 5.25.1: Energy Consumption in the Year 2030 by Alternative

Alternatives		County	Annual Vehicle Miles of Travel (in millions)	Daily Fuel Consumption (in gallons)	Annual BTUs (in millions)	BTUs / Vehicle-Mile
No-Build Condition		Greene	267	49,981	2,170,717	8,116
		Lawrence	295	62,228	2,709,058	9,197
		Martin	140	32,413	1,419,462	10,114
		Monroe	933	154,962	6,642,232	7,123
		Owen	213	37,507	1,621,106	7,604
		Total	**1,848**	**337,091**	**14,562,574**	**7,880**
Alternatives 1, 2, 3, and 4 (Build Condition)		Greene	416	106,459	4,676,462	11,230
		Lawrence	291	64,702	2,824,302	9,698
		Martin	151	40,330	1,776,311	11,775
		Monroe	1,137	227,669	9,851,051	8,665
		Owen	210	37,867	1,638,938	7,813
		Total	**2,205**	**477,027**	**20,767,063**	**9,417**
	% Change Over No-Build	Greene	55.7%	113.0%	115.4%	38.4%
		Lawrence	-1.1%	4.0%	4.3%	5.4%
		Martin	7.5%	24.4%	25.1%	16.4%
		Monroe	21.9%	46.9%	48.3%	21.7%
		Owen	-1.6%	1.0%	1.1%	2.7%

The Refined Preferred Alternative is a variation of Alternative 2 from the DEIS

5.25.4 Summary

Because of the increase in roadway miles and diversion of through traffic from outside the I-69 corridor, all of the final alternatives for the Build Condition, including the Refined Preferred Alternative, will result in greater total vehicle-miles of travel than the No-Build Condition. The more effective an alternative is in attracting travel in a particular county, the greater the energy consumption. The predictions for the four Build Alternatives indicates that they will have nearly identical results for annual VMT, daily fuel consumption, annual BTUs, and BTUs per vehicle mile making them virtually equal in the amount of energy consumption.

5.26 Short-Term Uses Versus Long-Term Productivity

Since the Draft Environmental Impact Statement (DEIS), the following substantive changes have been made to this section:

- Updated the areas of total right-of-way and agricultural land taken by Refined Preferred Alternative 2.
- Update of relocations for the alternatives, including the Refined Preferred Alternative 2

The short-term uses associated with construction of I-69 are typical of highway construction and would be very similar among all of the Section 4 end-to-end alternatives. There would potentially be temporary adverse impacts on air, water, and the natural landscape. Highway construction involves noise, air pollution (especially dust), erosion, sedimentation, and local degradations in water quality. The appearance of construction machinery and the disturbed landscape created during construction would be aesthetically displeasing to persons in the area. Individuals would be displaced from the right-of-way, and businesses depending on drive-by traffic on local roads could lose customers as traffic diverts to the interstate. In addition, demand for raw materials for highway construction could lead to increased costs of those materials in the short-term.

As noted in previous sections, Best Management Practices (BMPs) would be employed during construction to minimize impacts to the environment, and relocation assistance would be available to those being displaced.

Regarding long-term productivity, loss of agricultural land to right-of-way would be a permanent loss of agricultural production on that land. Refined Preferred Alternative 2 using the low-cost design criteria and the initial design criteria will acquire between 1,456 acres to 1,809 acres of land for right-of-way, of which between 239 acres to 310 acres would be land used for agricultural production (row crop and hayfields). This represents about 0.18% to 0.23% of the total amount of agricultural cropland in the two counties in the Section 4 Study Area. Preferred Alternative 2 using the low-cost design criteria and the initial design criteria will result in between approximately 62 to 67 residential displacements. Refined Preferred Alternative 2 using the low-cost design criteria and the initial design criteria will result in 71 to 75 residential displacements, respectively. Most, if not all, displaced residents would be able to locate in the general area from which they are being displaced. In the long run, new residents would be expected to locate in the communities served by the new roadway, as a result of an improved transportation network and jobs created from anticipated economic development. Long-term benefits of the project would be expected to include a reduction in the costs of production and shipping due to the improved transportation network.

Transportation improvements are based on state and local comprehensive plans that consider present and future traffic requirements within the context of present and future land use development. The local short-term impacts and use of resources by the project are consistent

with the maintenance and enhancement of long-term productivity for the local area, the state, and—in the project's capacity as a link in the I-69 National Corridor—the region.

The chief long-term benefits of the project are defined by the project's Purpose and Need, as described in Chapter 2.

5.27 Irreversible or Irretrievable Commitment of Resources

No substantive changes have been made to this section since publication of the Draft Environmental Impact Statement (DEIS).

Implementing the project involves a commitment of a range of natural, physical, human, and fiscal resources. Land used in the construction of a new highway facility is considered an irreversible commitment during the time period that the land is used for that facility. However, if a greater need arises for use of the land or if the highway facility is no longer needed, the land can be converted to another use. At present, there is no reason to believe such a conversion will ever be necessary or desirable.

Considerable amounts of fossil fuels, labor, and highway construction materials such as cement, aggregate, and bituminous material will be expended. Additionally, large amounts of labor and natural resources will be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, they are not in short supply and their use will not have an adverse effect upon continued availability of these resources. Any construction will also require a substantial one-time expenditure of both state and federal funds, which are not retrievable.

It is not only the overlaying roadways that will make these resources irretrievable, but also a host of indirect impacts subsequent to construction of the highway. Indirect impacts in Section 4 include the conversion of farmland and forest land to business, residential and other uses in the vicinity of the project, especially near the new interchanges proposed on SR 45, County Line, and SR 37. Development in the vicinity of the road would likely result in increased non-point source discharges from lawns, parking lots, roads, and other sources that can degrade the quality of irretrievable water resources. Water quality degradation is reversible and preventable and therefore would not result in the commitment of an irretrievable resource.

These resources will be committed because residents in the immediate area, state, and region will benefit from the improved quality of the transportation system. Benefits will consist of improved accessibility and safety, savings in time, and greater availability of quality services. Realized benefits are anticipated to outweigh the commitment of these resources.

The alignment for the Section 4 Refined Preferred Alternative 2 will be developed using the initial design criteria and consideration will be given during the subsequent design phase for use of certain low-cost design criteria as a measure to possibly reduce direct impacts and/or construction costs (See Section 5.1, *Introduction and Methodology*). Potential impacts upon the irreversible or irretrievable commitment of resources were determined per the right of way and development of the Refined Preferred Alternative per the initial design criteria. Implementation of some or all of the low-cost design criteria will not change the impacts identified within this chapter.

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