

**DRAFT
PRELIMINARY ALTERNATIVES**

**I-69 Tier 2 Evansville to Indianapolis Project
Section 4 (US 231 to SR 37)**

November 11, 2005

Key Community and Natural Resources

Section 4 contains a diverse range of social, economic, environmental and ecological resources. Of these, certain resources have attained a high level of Federal and State importance as demonstrated by their regulatory protection. As such, avoiding impacts to these “key” resources was established as a primary objective for the development of the Section 4 Preliminary Alternatives. The following community and natural resources located within the Section 4 corridor were identified as “key resources” for avoidance and minimization of impact during the development of the Preliminary Alternatives. Preliminary information on these key resources available for use in the development of the Preliminary Alternatives was obtained from the Tier 1 database, coordination with resource agencies, additional research, and technical field inventories. This information was then used in the Quantm¹ analysis as “constraints” for the development of the alternative mainline alignments.

Preliminary Alternatives Development Process

The development of the Preliminary Alternative mainline alignments was an iterative process that made significant use of Quantm, a computer-based alignment optimizing program. The Quantm program is designed to identify the least-costly route based on constraints defined by the user. The iterative process involves the consideration of route adjustments based on a range of possible constraints, such as avoidance of wetlands, historic properties, and residential developments. The interchange locations used in the Preliminary Alternatives analysis were based upon the Tier 1 study recommendations as well as input received during Tier 2 from the public involvement program.

Quantm was initially used to establish possible mainline alignments. These Quantm-generated alignments were then refined using conventional design practices to develop the alternative mainline alignments.

The combination of terrain and natural resource constraints in Section 4 are more pronounced than in other I-69 Tier 2 sections. Accordingly, Quantm software is applied differently than in

¹ Quantm is a relatively new computer aided tool that facilitates the development and analysis of alternative horizontal and vertical roadway alignments. It imitates the otherwise manual function of developing and assessing route alignments for transportation projects. Quantm has the capability to generate a set of alignments that minimize construction costs and negative impacts to important environmental resources. More detailed information regarding Quantm will be presented in the DEIS.

other Tier 2 Sections. The methodology described below would not be suitable for application in most other Tier 2 Sections.

Various Quantm scenarios were run to test different sets of inputs and constraints imposed by key resources. Generally, each scenario imposed progressively greater constraints. Each scenario was analyzed and compared to previous scenario results to identify changes in costs and “trends.” Trends were identified as possible mainline alignments, or areas that offered the least-costly, lowest impact alignments through the corridor. In other words, if 10 out of the 20 Quantm alignments were clustered along the same general path, then that route tends to be the least-costly. If no alignments were developed through a particular area of the corridor, it generally meant that there is some topographic constraint that increases the cost, or a key resource that should be avoided.

Following is a short description of the Quantm scenarios and how they were used to develop alternative mainline alignments.

Scenario 1

Scenario 1 generated mainline alignments using highway design criteria, topographic data from the corridor digital terrain model (at 2-foot contour intervals), and bridge clearances for major waterways based upon estimated flood elevations. No constraints for key resources were used. This scenario defined the least-costly² alignments and trends that minimize earthwork and structural quantities.

Scenario 2

Scenario 2 generated mainline alignments that avoided identified historic properties and cemeteries. The estimated costs were in the same range as Scenario 1. This scenario illustrated that avoiding a small, isolated community and natural resources will not substantially affect costs.

Scenario 3

Scenario 3 generated mainline alignments that avoided identified historic properties and cemeteries and also avoided (or minimized) impacts upon wetlands. While all wetlands could not be avoided, including the wetlands along Black Ankle Creek, this scenario demonstrated that costs are not substantially affected by avoiding and minimizing wetland impacts.

Scenarios 4 and 5

Quantm’s “stiffness” factor is a variable that controls the rate of change of horizontal and vertical curvature of the alignments. Scenarios 4 and 5 generated alignments with differing horizontal stiffness factors. When the stiffness parameters are close to 0, the alignments follow the natural surface as closely as geometric design criteria permit. When the stiffness parameters are close to 1, the alignments minimize changes in curvature as much as possible. Rerunning scenarios with varying stiffness factors illustrated that higher stiffness factors result in higher construction costs.

² Costs identified by Quantm are appropriate for comparing mainline construction cost components, but do not include all costs. Costs which Quantm does not estimate include interchanges, some drainage structures, local road improvements, right-of-way, design engineering, construction engineering, utility relocation, and environmental mitigation.

In general, higher stiffness results in higher construction costs because there is more earthwork (i.e. cut/fill) due the fact that the alignment cannot follow the natural terrain as closely when a higher stiffness factor is used.

Scenario 6

Scenario 6 generated alignments based on avoidance of identified historic properties, cemeteries, caves, major springs and most wetlands. Using the results of Scenarios 4 and 5, it was decided that a horizontal stiffness factor of 0.75 represents the optimal input for Quantm to provide a balance between mainline construction costs and flexibility to avoid key community and natural resources. A stiffness factor of 0.75 is also considered adequate to meet all travel speed and safety requirements for highway design. Conventional geometric design adjustments are then be made to meet design criteria or to further avoid and minimize impacts to key community and natural resources.

Alternative Mainline Alignments

Scenario 6 was the primary basis for developing preliminary alternative mainline alignments. Using the results of this scenario, alignments were chosen that followed the lowest cost routes and predominant trends. Two or three alignments were identified in each subsection of the corridor and were retained for further development of end-to-end alignments extending the full length of the corridor.

Conventional geometric design criteria (applying both the *Indiana Department of Transportation Design Manual* and the American Association of Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*) were applied to the Quantm mainline alignments. Additional minor adjustments were also made to add tangents (straight sections) and provide appropriate curve radii, while avoiding wetlands, ponds, and minor springs. Adjustments were also made to the termini approaches to coordinate with Section 3 to the south and Section 5 to the north.

- For the purposes of reference and analysis, the Section 4 Corridor was divided into eight subsections. A naming convention was established as follows: “4”, which represents Section 4 of the I-69 Tier 2 corridor
- “A, B, C” etc., which represents the subsections beginning with “A” at US 231 and ending with “H” at SR 37
- “1, 2, or 3” which represents alternative mainline alignments within the subsection

For example, the first sub-section of Section 4 beginning at US 231 has two alternative alignments, 4A-1 and 4A-2.

As stated earlier, the subsection termini were at locations where the mainline alignments converged. Alternative mainline alignments within one subsection may be connected to any of those in adjoining subsections to form alternatives extending the full length of the corridor.

Each subsection alignment is represented by the centerline of the mainline alignment. No right of way or construction limits are proposed for the preliminary alternative mainline alignments. It is anticipated that a minimum 300 foot right of way will be required to develop this rural freeway. The undulating terrain in much of Section 4 may require a right of way of up to 500 feet to accommodate earthwork cuts and fills. It is also likely that a wider median may be needed along portions of the Section 4 mainline alignment to further avoid and minimize community and natural resource impacts and/or to implement context sensitive design solutions.

The Section 4 Preliminary Mainline Alternative Alignments are presented in Table 1 and attached as Figure 1. Subsection 4A begins at US 231 north of the SR 58 junction in Greene County.

Table 1 Section 4 Preliminary Alternatives

Subsection and Alignment		Length (miles)	Subsection North (East) Terminus	Description
4A	1	1.69	0.27 miles East of Greene County Road 215 East	4A runs in an easterly direction, north of the unincorporated community of Scotland.
	2	1.67		
4B	1	2.28	0.25 miles North of Bogard Creek & 0.25 miles West of Greene County Road 440 East	4B curves northeast toward the unincorporated community of Koleen and includes a crossing of Dowden Branch Creek.
	2	2.45		
4C	1	1.86	0.13 miles West of Black Ankle Creek	4C curves back to the east crossing Flyblow Branch Creek with alignments north & south of Taylor Ridge Cemetery.
	2	1.72		
4D	1	2.86	300 ft. East of Greene County Road 360 South	Segment 4D runs in an easterly direction crossing Black Ankle Creek, Dry Branch Creek, & Plummer Creek with alignments north of Ashcraft & Shoptaw Cemeteries and south of Casper Cemetery & a major spring.
	2	2.88		
4E	1	4.58	800 ft. East of SR 54	4E runs in a northeasterly direction and begins to curve northward at the east end of the segment. Along its route it crosses the Little Clifty Branch, SR 45, the Mitchell Branch, & SR 54.
	2	4.08		
	3	4.64		
4F	1	7.61	0.8 miles East of Burch Road (Monroe County) & 300 ft. West of Evans Lane (Monroe County)	4F runs in a northerly direction, east of Hobbieville, along the Greene County/Monroe County line & turns easterly south of Stanford. It crosses the meandering Indian Creek 3 times with alignments running east of Carmichael Cemetery, Adams Cemetery, & Virginia Iron Works and on either side of Sparks Cemetery.
	2	7.45		
	3	7.50		
4G	1	3.12	150 ft. East of Lodge Road (Monroe County)	4G runs in an easterly direction between high density karst areas with alignments avoiding identified cave locations and major springs.
	2	3.13		
4H	1	3.22	SR 37 (Monroe County)	4H turns to the northeast, crossing two branches of Clear Creek & through a high density karst area with alignments running around several identified caves and springs.
	2	3.33		
	3	3.42		

The shortest preliminary alternative mainline alignment from the south terminus at US 231 to the north terminus at SR 37 is 26.40 miles. This alignment consists of Subsections 4A-2, 4B-1, 4C-2, 4D-1, 4E-2, 4F-2, 4G-1 and 4H-1. The longest preliminary alternative mainline alignment, consisting of Subsections 4A-1, 4B-2, 4C-1, 4D-2, 4E-3, 4F-1, 4G-2 and 4H-3, is 27.68 miles.

These alternative mainline alignments are preliminary. Minor shifts in the alignments are anticipated as the alternative development process continues. Shifts of up to approximately 200 feet to either side of the current alignment centerlines may be considered to further avoid and minimize impacts upon community and natural resources, to optimize connections between alignment subsections, or for the connections with Section 3 and Section 5.

Grade separations are also a component of the Preliminary Alternatives. Potential locations for grade separations of local roads crossing the corridor are proposed at the following locations in Greene County:

- County Road 215 East (CR 625 South)
- County Road 600 South
- County Road 475 East (Taylor Ridge Road)
- County Road 600 East
- County Road 750 East (Dry Branch Road)
- County Road 360 South (Koleen Road)
- County Road 920 East/County Road 975 East (Old Clifty Road)
- County Road 1250 East
- County Road 1260 East/County Road 190 South (Hobbieville Road)
- County Road 35 North (Carmichael Road)
- County Road 150 North (Carter Road)

Potential grade separations in Monroe County are proposed at the following local roads:

- Breeden Road
- Burch Road
- Harmony Road
- Rockport Road
- Lodge Road
- Tramway Road
- Bolin Lane

Potential grade separations at CR 920 East/CR 975 East (Old Clifty Road), CR 1250 East, and Lodge Road were not included in the Tier 1 FEIS Environmental Atlas. These potential grade separations were added during Tier 2 based upon field review of travel patterns, accessibility considerations, and/or input from local government officials, the Section 4 CAC, and the general public. No final decisions have been made regarding grade separations, interchanges, or other access issues; a range of access-control options are being considered as part of the alternatives analysis during Tier 2.

Alternative Interchange Locations

Potential interchanges shown the Tier 1 FEIS Environmental Atlas and retained for further study during the Tier 2 project development are at US 231, SR 45, and SR 54 in Greene County and SR 37 in Monroe County. An additional potential interchange has been added as a Preliminary Alternative along the Greene County/Monroe County line. Per commitments made in Tier 1, this interchange will be entirely located within Greene County.³ The interchange would include an access-controlled connector road that will intersect SR 45 in Center Township (Greene County). This potential interchange was added to the list of potential interchanges that will be further evaluated during the project development at the request of representatives from Greene County, Monroe County, the Section 4 CAC, and the general public. Coordination with USFWS has identified significant concerns relative to this interchange and secondary development that may result. Consultation is ongoing regarding this issue.

Seven combinations of potential interchanges will be studied during the Alternatives Analysis phase of the project. No configurations for these potential interchanges are proposed during the Preliminary Alternatives phase. There will be no scenario where SR 45, SR 54, and the County Line will all be included. The potential combinations of interchanges are:

- US 231 and SR 37
- US 231, SR 45, and SR 37
- US 231, SR 54, and SR 37
- US 231, SR 45, SR 54, and SR 37
- US 231, County Line, and SR 37
- US 231, SR 45, County Line, and SR 37
- US 231, SR 54, County Line, and SR 37

Should interchanges not be developed at SR 45 and/or SR 54, grade separations will be developed at these state highway crossings of I-69. The potential interchange along the Greene County/Monroe County line would be located in the vicinity of Carmichael Road and Carter Road; however, no direct access to these two local roads will be provided from the potential interchange or the connector road to SR 45. Carmichael Road and Carter Road will each be considered for a grade separation at the I-69 mainline alignment.

³ The Tier 1 FEIS, in the context of minimizing and mitigating for water quality impacts, states on p. 7-18, “No interchange will be provided in Monroe County where I-69 is on new alignment.”