APPENDIX Q

APPENDIX Q

I-69 CORRIDOR TIER 2 STUDIES

Evansville to Indianapolis

REFINED PREFERRED ALTERATIVE 2

HIGHWAY NOISE IMPACT & ABATEMENT ANALSYIS

Section 4, US 231 to SR 37

June 2, 2011

Prepared for:

INDIANA DEPARTMENT OF TRANSPORTATION

Prepared by:

DLZ Indiana, LLC
3802 Industrial Blvd, Suite 2
Bloomington, Indiana 47403

CONTENTS

1.0 INTRODUCTION 1
2.0 LEGISLATION AND NOISE FUNDAMENTALS 1
2.1 Regulatory Requirements 1
2.2 Traffic Noise Descriptors 1
3.0 IMPACT CRITERIA 1
3.1 Noise Abatement Criteria 1
3.2 INDOT Definition of Traffic Noise Impacts 2
4.0 NOISE STUDY METHODOLOGY 3
4.1 Determination of Existing Noise Levels 3
4.2 Traffic Noise Model 7
4.2.1 Traffic Data 7
4.2.2 Alignment 7
4.2.3 Receptors 8
4.2.4 Tree Zones and Surface Objects 8
4.2.5 Terrain Lines 8
4.2.6 Barriers 8
4.3 TNM 2.5 Validation 8
5.0 PROPOSED ACTION 8
5.1 Project Description 8
5.2 Existing Roadways 9
5.3 Proposed Alignments 9
5.4 Receptors 9
5.5 Planned Development 11
5.6 Special Use Properties 13
6.0 PREDICTED NOISE LEVELS 13
6.1 TNM Validation and Existing Noise Levels 13
6.2 Future No-Build Noise Levels 13
6.3 Predicted Design Year Build Alternative Noise Levels 13
7.0 PREDICTED YEAR 2030 NOISE RESULTS COMPARATIVE ANALYSIS 18
7.1 Comparison of Predicted Year 2030 Noise Levels With Existing Conditions 18
7.2 Comparison of Predicted Year 2030 Traffic Noise Impacts by Alternative 19
8.0 NOISE ABATEMENT EVALUATION 21
8.1 INDOT Noise Abatement Policy 21
8.2 Noise Abatement Consideration 22
8.3 Noise Mitigation Assessment 23
9.0 CONSTRUCTION NOISE 33
10.0 NOISE COMPATIBILE PLANNING 33
11.0 SUMMARY 33
12.0 REFERENCES 34

APPENDICES

APPENDIX A: FIGURES

Figure 1: TNM Receptor Locations – Aerial Photos
Figure 2: Evaluated Noise Barriers

APPENDIX B: SUMMARY OF MODELING RESULTS

B-1: Initial Design Criteria
B-2: Low Cost Design Criteria

APPENDIX C: TNM OUTPUT TABLES – REFINED PREFERRED ALTERNATIVE 2 - 2030 FUTURE PROPOSED SOUND LEVELS – INITIAL DESIGN CRITERIA

APPENDIX D: TNM OUTPUT TABLES – REFINED PREFERRED ALTERNATIVE 2 - 2030 FUTURE PROPOSED SOUND LEVELS – LOW COST DESIGN CRITERIA

APPENDIX E: TNM OUTPUT TABLES – REFINED PREFERRED ALTERNATIVE 2 - 2030 FUTURE EVALUATED POTENTIAL BARRIER ANALYSES – INITIAL DESIGN CRITERIA

APPENDIX F: TNM OUTPUT TABLES – REFINED PREFERRED ALTERNATIVE 2 - 2030 FUTURE EVALUATED POTENTIAL BARRIER ANALYSES – LOW COST DESIGN CRITERIA

APPENDIX G PROPOSED NOISE WALL SURVEY FORMS

1.0 INTRODUCTION

Since the release of the DEIS, INDOT has finalized revisions to their Traffic Noise Policy, dated 2007 and has 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 incorporated all 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 the final rule, INDOT reviewed the finding presented in the DEIS and evaluated how the changes to 23 CFR 772 and the INDOT *Traffic Noise Analysis Procedure, dated 2011* would affect this project. It was determined that the Highway Noise Study performed for the four Section 4 Alternatives performed using the INDOT *Traffic Noise Policy, dated 2007* would not need to be re-evaluated under the new INDOT *Traffic Noise Analysis Procedure, dated 2011*. However, it was determined that the Refined Preferred Alternative 2 should be evaluated in accordance with the requirements of the INDOT *Traffic Noise Analysis Procedure, dated 2011*. As a result, this planning level study and barrier analysis was prepared for the Refined Preferred Alternative 2 utilizing both design criteria. The major objectives of this study are as follows:

- Identify areas of potential noise impacts associated with the Refined Preferred Alternative 2
- Evaluate measures to mitigate noise impacts, as necessary
- Compare the various mitigation alternatives on the basis of potential noise impact and the associated mitigation costs.

Only the portions of the Final Noise Report, dated May 15, 2011 that were affected by the changes made in new INDOT *Traffic Noise Analysis Procedure, dated 2011* were evaluated and discussed in this Addendum.

2.0 LEGISLATION AND NOISE FUNDAMENTALS

2.1 Regulatory Requirements

This study was prepared in accordance with the requirement of the INDOT *Traffic Noise Analysis Procedure, dated 2011 and 23 CFR 772*.

2.2 Traffic Noise Descriptors

There were no substantive changes made to this section, refer to Section 2.2 in the Final Noise Report.

3.0 IMPACT CRITERIA

3.1 Noise Abatement Criteria

The *INDOT Traffic Noise Analysis Procedure, dated 2011* has adopted the noise abatement

criteria (NAC) that have been 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 1**.

The NAC sound levels are only to be used to determine a roadway noise impact. These are the absolute values where abatement must be considered.

Table 1
INDOT Noise Abatement Criteria (NAC)
Hourly A-Weighted Sound Levels in Decibels Table 1

Activity Category	L_{eq}(h)	Description of Activity Category
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

3.2 INDOT Definition of Traffic Noise Impacts

Traffic noise impacts occur if <u>either</u> of the following two conditions is met:

- The predicted traffic noise levels approach or exceed the NAC, as shown in **Table 1**. The *INDOT Traffic Noise Analysis Procedure, dated 2011* defines "approach or exceed" as meaning that future levels are higher than 1 dBA below the appropriate NAC activity category. For example, for a category B receptor, 66 dBA would be approaching 67 dBA and would be considered an impact.

- The predicted traffic noise levels substantially exceed the existing noise level. The *INDOT Traffic Noise Analysis Procedure, dated 2011* defines "substantially exceed" as meaning when predicted traffic noise levels exceed existing noise levels by 15 dBA or more. For

example, if a receptor's existing noise level is 50 dBA, and if the future noise level is 65 dBA, then it would be considered an impact.

4.0 NOISE STUDY METHODOLOGY

4.1 Determination of Existing Noise Levels

The Activity Category Classifications and the number of receptors represented by the Existing Condition Noise Measurement Site I.D. have been revised based on the changes in the INDOT *Traffic Noise Analysis Procedure, dated 2011* that redefined the Activity Category Classifications and set a maximum distance from the edge of the nearest travel lane to be included in the noise study area. **Table 2** provides 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**.**

Table 2
Existing Noise Level Readings

Site I.D.	Site Description and Land Use Category Classification	Time		Noise Meter Reading (dBA)		
		Start	End	L_{eq}	L_{min}	L_{max}
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	8:04 am	8:19 am	59.2	43.2	71.6
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	8:32 am	8:48 am	42.2	36.7	50.6
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	9:06 am	9:21 am	41.3	35.3	56.3
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	9:54 am	10:09 am	38.9	32.7	51.6
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	12:19 pm	12:34 pm	42.9	24.9	66.4
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	7:49 am	8:04 am	61.8	40.7	73.9
M-18	The front yard of a residence located approximately 60 feet from County Road 1250 E, and 150-200 feet from	8:21 am	8:36 am	49.5	31.7	67.3

Table 2
Existing Noise Level Readings

Site I.D.	Site Description and Land Use Category Classification	Time		Noise Meter Reading (dBA)		
		Start	End	L_{eq}	L_{min}	L_{max}
	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	7:15 am	7:30 am	57.3	34.7	71.3
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	9:15 am	9:30 am	39.7	32.4	53.4
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	12:59 pm	1:14 pm	46.5	32.4	67.7
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	9:56 am	10:11 am	40.9	32.2	60.5
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	1:39 pm	1:54 pm	39.3	25.0	54.2
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	2:05 pm	2:20 pm	50.1	32.9	65.4
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	2:12 pm	2:27 pm	37.5	27.0	57.4
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	2:46 pm	3:01 pm	44.3	29.3	63.3
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	5:56 pm	6:11 pm	49.6	33.6	62.2
M-36	The back yard of a residence located approximately 40 feet from Rockport Road, and is located inside the right-	4:02 pm	4:17 pm	49.7	35.7	68.6

Table 2
Existing Noise Level Readings

Site I.D.	Site Description and Land Use Category Classification	Time		Noise Meter Reading (dBA)		
		Start	End	L_{eq}	L_{min}	L_{max}
	of-way of Alternatives 1, 2, 3, and 4. 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 Alternatives 1, 2, 3, and 4. Land use category B: 6 residences	3:23 pm	3:38 pm	40.7	31.1	57.4
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	3:48 pm	4:03 pm	43.2	32.1	59.8
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	5:27 pm	5:42 pm	52.0	40.0	68.6
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	4:18 pm	4:33 pm	43.0	37.7	63.3
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	5:08 pm	5:23 pm	53.7	44.1	67.1
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	4:55 pm	5:10 pm	61.2	46.4	71.8
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	4:01 pm	4:16 pm	57.4	47.7	66.8
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	8:50 am	9:05 am	40.5	32.0	61.2
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	8:02 am	8:17 am	54.4	48.4	63.4
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	8:34 pm	8:49 pm	60.8	43.3	77.1
M-53	The back yard of a residence located approximately 100	10:54	11:24	39.0	32.1	57.0

Table 2
Existing Noise Level Readings

Site I.D.	Site Description and Land Use Category Classification	Time		Noise Meter Reading (dBA)		
		Start	End	L_{eq}	L_{min}	L_{max}
	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	am	am			
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	1:59 pm	2:29 pm	43.9	26.6	63.6
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.	3:47 pm	4:02 pm	40.0	35.3	50.7
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 Land use category C: 2 receptors Land use category E: 1 business	12:29 pm	12:59 pm	43.6	36.3	55.3
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	1:26 pm	1:41 pm	42.3	29.1	60.7
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	2:05 pm	2:20 pm	57.9	31.3	85.6
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	3:08 pm	3:23 pm	43.2	35.8	52.5
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	3:42 pm	3:57 pm	47.3	40.3	54.4
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	4:37 pm	4:52 pm	52.1	37.2	72.8
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	5:22 pm	5:37 pm	45.0	33.4	55.0

Table 2
Existing Noise Level Readings

Site I.D.	Site Description and Land Use Category Classification	Time		Noise Meter Reading (dBA)		
		Start	End	L_{eq}	L_{min}	L_{max}
	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	5:55 pm	6:10 pm	33.2	30.2	53.7
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	4:53 pm	5:08 pm	66.1	45.3	79.2
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	5:19 pm	5:34 pm	50.4	40.8	62.9
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	4:00 pm	4:15 pm	50.7	44.1	57.8
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	4:26 pm	4:41 pm	61.3	37.2	71.6

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 of the DEIS 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*.

4.2 Traffic Noise Model

There were no substantive changes made to this section, refer to Section 4.2 in the Final Noise Report.

4.2.2 Traffic Data

There were no substantive changes made to this section, refer to Section 4.3.2 in the Final Noise Report.

4.2.2 Alignment

Based on changes made to the INDOT *Traffic Noise Analysis Procedure, dated 2011* the proposed I-69 northbound and southbound travel lanes were each modeled as a separate roadway feature in TNM and separate inner and outer roadways (no traffic volumes assigned)

were modeled to act as paved shoulders. Traffic volumes were split between the two directional travel lanes with 100% of the buses, medium, and heavy trucks assigned to the outermost travel lane and the autos were split 50/50 between the two travel lanes. There were no other substantive changes made to this section.

4.2.3 Receptors

A total of 313 receptors representing 313 dwelling units and other noise sensitive entities (i.e., cemeteries and commercial facilities) were modeled. INDOT defines a receptor as a discrete or representative location of a noise sensitive area(s), for any land uses listed in **Table 1**. The location of all the receptors modeled in TNM can be found on **Figure 1 (Appendix A).** There are 300 single family residences that have an Activity Category B NAC Classification. There are 2 units at Fern Hills Club and 5 cemeteries modeled that have an Activity Category C NAC Classification. There are 6 commercial operations modeled that have an Activity Category E NAC Classification. Specific receptor placement in the model is generally based on exterior areas where normal human occupation is expected to occur on the property. There were no changes made to the input data for the receptors utilized.

4.2.4 Tree Zones and Surface Objects

There were no substantive changes made to this section, refer to Section 4.2.4 in the Final Noise Report.

4.2.5 Terrain Lines

There were no substantive changes made to this section, refer to Section 4.2.5 in the Final Noise Report.

4.2.6 Barriers

There were no substantive changes made to this section, refer to Section 4.2.6 in the Final Noise Report.

4.3 TNM 2.5 Validation

There were no substantive changes made to this section, refer to Section 4.3 in the Final Noise Report.

5.0 PROPOSED ACTION

5.1 Project Description

The Proposed Action involves the selection of a Preferred Alternative from the four Alternatives. Alternative 2 is the Preferred Alternative for Section 4. Following the distribution of the DEIS, Alternative 2 was further refined into the Refined Preferred Alternative 2 in the FEIS.

The subsections used to construct the Refined Preferred Alternative 2 consist of the following:

- **Refined Preferred Alternative 2:** Refined Preferred 4A-2 + Refined Preferred 4B-1 + Refined Preferred 4C-2 + Refined Preferred 4D-1 + Refined Preferred Hybrid 4E-1/4E-2 with SR 45 Interchange + Refined Preferred 4F-3 with Greene/Monroe County Line Interchange (South Connector Road) + Refined Preferred 4G-2 + Refined Preferred 4H-2.

This alternative was evaluated using both the initial design criteria and the low-cost design criteria.

There were no other substantive changes made to this section, refer to Section 5.1 in the Final Noise Report for a description of the four Section 4 Alternatives.

5.2 Existing Roadways

There were no substantive changes made to this section, refer to Section 5.2 of the Final Noise Report.

5.3 Proposed Alignments

A summary of the alignments per subsection that were modeled are identified below in **Table 3**:

Table 3
Proposed Alignments

Subsection	Alignment	Alignment Length (feet)	Alternative
A	Refined Preferred 4A-2	8,746	Refined Preferred 2
B	Refined Preferred 4B-1	6,300	Refined Preferred 2
C	Refined Preferred 4C-2	13,202	Refined Preferred 2
D	Refined Preferred 4D-1	13,000	Refined Preferred 2
E	Refined Preferred Hybrid 4E-1/4E-2	26.099	Refined Preferred 2
F	Refined Preferred 4F-3	31,667	Refined Preferred 2
G	Refined Preferred 4G-2	22,199	Refined Preferred 2
H	Refined Preferred 4H-2	19,499	Refined Preferred 2
A description of the four Section 4 Alternative proposed alignments per subsection is contained in the Final Noise Report.			

5.4 Receptors

All receptors located within 500 feet of the edge of pavement of Refined Preferred Alternative 2 were assessed for potential noise impacts per the INDOT *Traffic Noise Analysis Procedure, dated 2011*. Based on an evaluation of the existing topography and the proposed horizontal

and vertical alignments of the Refined 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*, *dated 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. TNM receptor locations for modeling are located on **Figures 1 (Appendix A)** with 2008 aerials (courtesy of ISDP - NAIP program). Receptors are identified and categorized by subsection as follows:

Subsection 4A

Subsection 4A extends northeast from approximately 1,300 feet west of CR 200E to approximately 1,200 feet southwest of CR 600S. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 8970 feet (1.7 miles) in length and contains 8 receptors, which represent 7 residences with an Activity Category B NAC Classification and Hasler Cemetery (R-18.), which has an Activity Category C NAC Classification.

Subsection 4B

Subsection 4B extends northeast from approximately 1,200 feet southwest of CR 600S to approximately 5,100 feet north east of CR 600S. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 6,300 feet (1.2 miles) in length, and contains 1 receptor, which represents one residence that has an Activity Category B NAC Classification.

Subsection 4C

Subsection 4C extends northeast from approximately 5,100 feet north east of CR 600S to approximately 720 feet east of CR 600E. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 2.6 miles in length (depending on alignment,) and contains 6 receptors, which represent 5 residences with an Activity Category B NAC Classification and Taylor Ridge Cemetery (R-16.), which has an Activity Category C NAC Classification.

Subsection 4D

Subsection 4D extends northeast from approximately 720 feet east of CR 600E to approximately 725 feet east of CR 360S. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 13,000 feet (2.5 miles) in length, and contains 3 receptors, which represent 3 residences that all have an Activity Category B NAC Classification.

Subsection 4E

Subsection 4E extends northeast from approximately 725 feet east of CR 360S to approximately 600 feet southwest of Hobbieville Road. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 26,099 feet (4.9 miles) in length, contains 42 receptors that represent 41 residences with an Activity Category B NAC Classification and Shoptaw Cemetery (R-70), which has an Activity Category C NAC Classification.

Subsection 4F

Subsection F extends north from approximately 600 feet southwest of Hobbieville Road to approximately 1000 feet east of Breeden Road. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 6.0 miles in length contains 98 receptors that are described as follows:

- There are 92 residences, including 4 subdivisions: Shady Meadows, Shea Estates, Whippoorwill, and Timber Trace. The residences all have an Activity Category B NAC Classification.
- There are two cemeteries located within this subsection that include Sparks Cemetery (R-125) and Adams Cemetery (R-451). Both cemeteries have an Activity Category C NAC Classification.
- There are 4 commercial operations including the Crossroads Cafe and Gas Station (R-262,) Crossroads Collectibles (R-256,) JM Electronics (R-246,) and Bloomfield State Bank (R-255) located within this subsection. These four commercial operations all have an Activity Category E NAC Classification.

Subsection 4G

Subsection 4G extends northeast from approximately 1000 feet east of Breeden Road to approximately 400 feet east of Lodge Road. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 22,199 feet (4.2 miles) in length, and contains 69 receptors that are described as follows:

- There are 65 receptors representing 65 residences located within this subsection. All of the residences have an Activity Category B NAC Classification.
- The Fern Hills Club contains 2 receptors that represent 2 residential locations that have an Activity Category C NAC Classification.
- Two commercial properties were located within this subsection and consist of the Pic-A-Chic Farms (R-183) and the lumberyard/mill (R-172) off Rockport Road. These two commercial properties have an Activity Category E NAC classification.

Subsection 4H

Subsection 4H extends northeast from approximately 400 feet east of Lodge Road to the SR 37 / That Road Intersection. Land use for this subsection includes developed land (residences), agricultural, and forest land. This subsection is approximately 3.7 miles in length and contains 86 receptors, which represent 86 residences throughout the subsection including 3 subdivisions: Rolling Glen Estates, Bailey West/Glenview and Victor Heights. All of the receptors in this subsection have an Activity Category B NAC Classification.

5.5 Planned Development

23 CFR 772.9 and the INDOT *Traffic Noise Analysis Procedure, dated 2011* require that a determination be made if undeveloped land is permitted for development. INDOT considers “permitted” to mean that there is a definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit. In areas where no building permit process is in place, land is considered undeveloped unless foundations for new buildings are in-place. If undeveloped land is determined to be “permitted”,

then appropriate Activity Category Classification will be assigned to that land and a predicted noise level will be developed and analyzed as part of the noise study. If undeveloped land is not "permitted" by the Date of Public Knowledge then the predicted future noise levels developed as part of the noise combatible planning process should be taken into consideration for any future development along I-69. INDOT considers the Date of Public Knowledge as the date that the final NEPA approval is made. In the case of I-69 Section 4, the date of the ROD will be considered the Date of Public Knowledge. Participation in noise abatement measures will not be considered for lands that are not permitted by the Date of Public Knowledge.

Subdivisions result from the division of land into two or more lots that are recorded and then made available for sale. Traditional, or modern, residential subdivisions are typically developed in accordance with a local zoning ordinance that implements a community's land use or comprehensive plan. Such subdivisions often include areas dedicated for public roads and utilities in addition to the platted lots. Prior to March 16, 2009, Greene County did not implement local planning jurisdiction, however, several large tracts of land have been subdivided into multiple lots with defined locations of identity (unrecorded subdivisions). In Monroe County, both major and minor subdivisions are regulated by a local subdivision ordinance. Ten subdivisions were identified within or adjacent to Section 4 Corridor.

Unrecorded subdivisions within or adjacent to the Refined Preferred Alternative 2 in Greene County (developed prior to March 1, 2011) are as follows.

- **Clifty Hills** is located in Subsection 4E, north of Plummer Creek between Koleen and SR 45. Two receptors were used to represent the two developed lots within this area that were located within the modeling limits for the Refined Preferred Alternative 2.

- **Whippoorwill** is located in Subsection 4F and consists of mobile and modular homes on 1 to 5 acre lots located along the north side of CR 35N (Carmichael Road). Five receptors were used to represent 5 residences located within the modeling limits for the Refined Preferred Alternative 2.

- **Shady Meadows** is located in Subsection 4F, adjacent to the east side of SR 45 in the vicinity of Cincinnati. This subdivision is located adjacent to the proposed South Connector Road corridor that is under consideration for connecting the proposed Green/Monroe County Line Interchange with SR 45 and contains mobile and/or modular homes situated on 1 to 2 acre lots. Twelve receptors were used to represent the twelve residences within the modeling limits for the proposed South Connector Road as part of the Refined Preferred Alternative 2.

- **Shea Estates** is located in Subsection 4F, adjacent to the east side of SR 45 in the vicinity of Cincinnati. This subdivision is located adjacent to the south connector road corridor that is under consideration for connecting the proposed Green/Monroe County Line Interchange with SR 45. Twelve receptors were used to represent the twelve residential homes that were located within the modeling limits for the proposed South Connector Road as part of Refined Preferred Alternative 2.

- **Timber Trace** is located in Subsection 4F between SR 45 and the Greene/Monroe County Line at CR 350N. Four receptors were used to represent 4 residences located within the modeling limits for the Refined Preferred Alternative 2.

Residential subdivisions within or adjacent to the Refined Preferred Alternative 2 in Monroe

County are as follows.

- **Farmers Field Acres** is located in Subsection 4H, on the north side of Bolin Lane between Rockport Road and Victor Pike. There are three undeveloped lots within this sub-division that are located within the modeling limits for the Refined Preferred Alternative 2. These lots were not "permitted" and therefore not included in this analysis. Predicted future noise impacts for these lots can be interpreted from the contour mapping developed as part of the noise compatible planning process.

- **Rolling Glen Estates** is located in Subsection 4H, just south of Bolin Lane and west of Victor Pike. Twelve receptors were used to represent the 12 residences located within the modeling limits of the modeling limits of the Refined Preferred Alternative 2. There are undeveloped lots located within the modeling limits for the Refined Preferred Alternative, but since the lots were not "permitted", they have not been included in this analysis. Predicted future noise impacts for these lots can be interpreted from the contour mapping developed as part of the noise compatible planning process.

- **Victor Heights** is located in Subsection 4H, on the west side of Victor Pike just north of Bolin Lane. There are eight homes in this subdivision located along Victor Heights Drive. Eight receptors were used to represent all eight of the homes located within this subdivision, which are located within the modeling limits for the Refined Preferred Alternative 2.

- **Bailey West/Glenview** is located Subsection 4H, on the south side of That Road between SR 37 and Victor Pike. There were 25 receptors used to represent 25 residences within these subdivisions that were located within the modeling limits for the Refined Preferred Alternative 2.

5.6 Special Use Properties

There were no substantive changes made to this section, refer to Section 5.6 in the Final Noise Report.

6.0 PREDICTED NOISE LEVELS

6.1 TNM Validation and Existing Noise Levels

There were no substantive changes made to this section, refer to Section 6.1 in the Final Noise Report.

6.2 Future No-Build Noise Levels

There were no substantive changes made to this section, refer to Section 6.2 in the Final Noise Report.

6.3 Predicted Design Year Build Alternative Noise Levels

A noise analysis was performed to determine the predicted noise levels for the receptors located within the modeling limits as defined in the INDOT *Traffic Noise Analysis Procedure, dated 2011* for the proposed Refined Preferred Alternative 2 alignment using the initial design

criteria and the low-cost design criteria. For the purpose of the following discussions, predicted design year noise levels associated with the initial design criteria are discussed first and then followed by the predicted design year noise levels for the low-cost design criteria in parentheses. Within a subsection, the total number of receptors modeled may vary between the two design criteria since the vertical alignments and the right-of-way limits are different. Since the two design criteria have different right-of-way-limits, the number of displacements may also be different.

Due to the physical limitations of the TNM, not all of the predicted future proposed sound levels were modeled in the same run. Fifteen runs were modeled per the initial design criteria (15 runs were modeled per the low-cost design criteria) to identify the predicted future proposed 2030 build noise levels for the Refined Preferred Alternative 2. A summary of the predicted modeling results for the year 2030 Alternatives and identification of the specific receptors experiencing traffic noise impacts are summarized in **Appendix B**. Copies of the TNM output tables for the initial design criteria are included in **Appendix C** and the TNM output tables for the low-cost design criteria are included in **Appendix D**.

Subsection 4A

This subsection contains two alignments that consist of Alignment Hybrid 4A-1/4A-2 and Alignment 4A-2. Following the distribution of the DEIS, Alignment 4A-2 was further refined into the Refined Preferred Alignment 4A-2. **Table 4** summarizes the range of anticipated future predicted sound levels and identifies the number of impacts for this alignment for each design criteria.

Table 4
Subsection 4A Results

Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred 4A-2	8	Low Cost	47.2-65.0	0	0	5	0	**5**
Refined Preferred 4A-2	8	Initial	47.4-65.9	0	0	6	0	**6**

The Refined Preferred Alignment 4A-2 will impact 6 (5) Activity Category B NAC sites. Hasler Cemetery (R-18), which has an Activity Category C NAC Classification is located within this subsection and will be impacted by the Refined Preferred Alternative 2 using both of the design criteria.

Subsection 4B

This subsection contains one alignment that consists of Alignment 4B-1. Following the distribution of the DEIS, Alignment 4B-1 was further refined into the Refined Preferred Alignment 4B-1. **Table 5** summarizes the predicted sound levels and impacts between the two design criteria for this alignment.

Table 5 Subsection 4B Results								
Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred 4B-1	1	Low-Cost	61.9	0	0	1	0	**1**
Refined Preferred 4B-1	1	Initial	62.5	0	0	1	0	**1**

The Refined Preferred Alignment 4B-1 will impact 1 (1) residential site with an Activity Category B NAC Classification.

Subsection 4C

This subsection contains two alignments that consist of Alignment 4C-1 and Alignment 4C-2. Following the distribution of the DEIS, Alignment 4C-2 was further refined into the Refined Preferred Alignment 4C-2. **Table 6** summarizes the predicted sound levels and the impacts for this alignment using the different design criteria.

Table 6 Subsection 4C Results								
Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred 4C-2	6	Low-Cost	54.9-61.3	1	0	5	0	**5**
Refined Preferred 4C-2	6	Initial	52.4-60.0	1	0	4	0	**4**

The Refined Preferred Alignment 4C-2 will impact 3 (4) Activity Category B NAC sites. Taylor Ridge Cemetery (R-16), which has an Activity Category C NAC Classification is located within the subsection and will be impacted by this alignment using both of the design criteria.

Subsection 4D

This subsection contains one alignment consisting of Alignment 4D-1. Following the distribution of the DEIS, Alignment 4D-1 was further refined into the Refined Preferred Alignment 4D-1. **Table 7** summarizes a comparison of the predicted sound levels and impacts between these design criteria.

Table 7 Subsection 4D Results								
Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred 4D-1	3	Low-Cost	58.2	2	0	1	0	**1**
Refined Preferred 4D-1	3	Initial	58.9	2	0	1	0	**1**

The Refined Preferred Alignment 4D-1 will impact 1 (1) site with a Category B NAC classification.

Subsection 4E

This subsection contains one alignment consisting of Alignment Hybrid 4E-1/4E-2. Following the distribution of the DEIS, Alignment Hybrid 4E-1/4E-2 was further refined into the Refined Preferred Alignment Hybrid 4E-1/4E-2. **Table 8** shows a comparison of the predicted sound levels and impacts for this alignment using both alignments.

Table 8 Subsection 4E Results								
Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred Hybrid 4E-1/ 4E-2	42	Low-Cost	52.2-65.0	10	0	6	0	**6**
Refined Preferred Hybrid 4E-1/ 4E-2	42	Initial	52.1-65.1	10	0	5	0	**5**

The Refined Preferred Hybrid 4E-1/4E-2 will impact 4 (5) residential sites with an Activity Category B NAC Classification. Shoptaw Cemetery (R-70), which has an Activity Category C NAC Classification is impacted using both design criteria.

Subsection 4F

This subsection contains four alignments that consist of Alignment 4F-1, Alignment 4F-3, Alignment 4F-4 and Alignment 4F-5. Following the distribution of the DEIS, Alignment 4F-3 was further refined into the Refined Preferred Alignment 4F-3. **Table 9** summarizes the predicted sound levels and the noise impacts for this alignment using the different design criteria.

Table 9 Subsection 4F Results								
Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred 4F-3	98	Low	45.9-67.5	24	0	19	1	**20**
Refined Preferred 4F-3	98	Initial	45.9-66.7	25	0	20	1	**21**

The Refined Preferred 4F-3 will impact 20 (19) residential sites with an Activity Category B NAC Classification. Sparks Cemetery (R-125), which has an Activity Category C NAC Classification is impacted using both design criteria.

Subsection 4G

This subsection contains one alignment that consists of Alignment Hybrid 4G-2. Following the distribution of the DEIS, Alignment 4G-2 was further refined into the Refined Preferred Alignment 4G-2. **Table 10** summarizes the future predicted sound levels and the noise impacts using different design criteria.

Table 10 Subsection 4G Results								
Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred 4G-2	69	Low	50.6-68.0	24	0	21	3	**24**
Refined Preferred 4G-2	69	Initial	51.1-68.1	26	0	20	3	**23**

Alignment 4G-2 will impact 23 (24) modeled receptors. Twenty (21) of the impacted sites have an Activity Category B NAC Classification. Two (2) of the impacted sites have an Activity Category C NAC Classification and 1 (1) of the impacted sites have an Activity Category E NAC Classification.

Subsection 4H

This subsection contains three alignments that consist of Alignment 4H-1, Alignment 4H-2, and Alignment 4H-3. Following the distribution of the DEIS, Alignment 4H-2 was further refined into the Refined Preferred Alignment 4H-2. **Table 11** summarizes the future predicted sound levels and the noise impacts using the different design criteria.

Table 11 Subsection 4H Results								
Alignment	Number of Receptors Evaluated	Design Criteria	Range of Predicted Levels (dBA)	Displacements	Impacts			
					NAC Only	Substantial Criteria Only	NAC and Substantial (Both)	Total
Refined Preferred 4H-2	86	Low-Cost	46.4-67.5	15	0	26	2	**28**
Refined Preferred 4H-2	86	Initial	46.5-67.4	16	0	25	2	**27**

Refined Preferred Alignment 4H-2 will impact 27 (28) residential sites. All of the impacted receptors have an Activity Category B NAC Classification.

7.0 PREDICTED YEAR 2030 NOISE RESULTS COMPARITIVE ANALYSIS

7.1 Comparison of Predicted Year 2030 Noise Levels With Existing Conditions

For the purpose of the following discussions, 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.

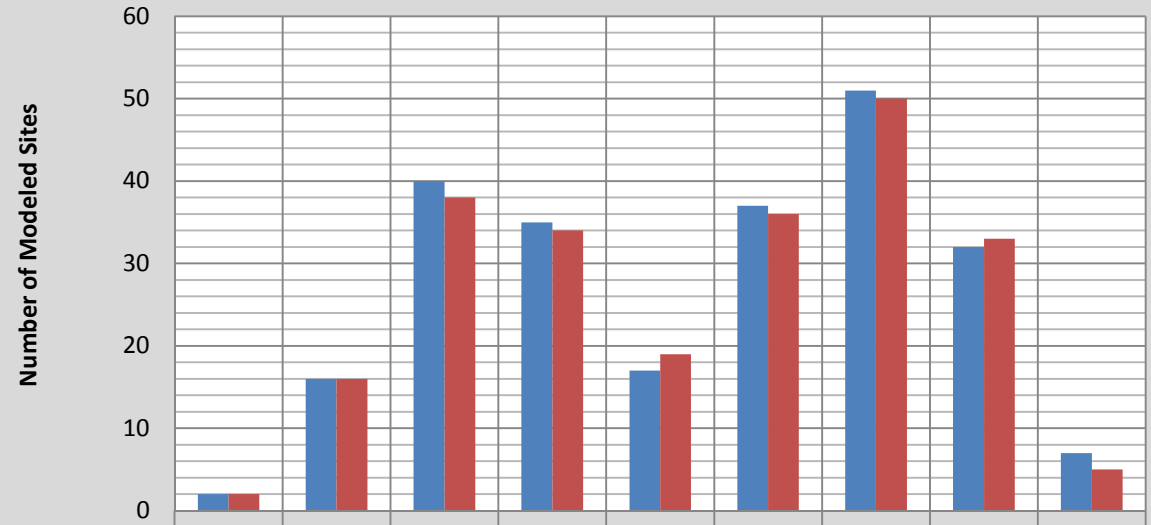
Refined Preferred Alternative 2

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} for 233 modeled receptors (45.9 dBA L_{eq} to 68.0 dBA $L_{eq.}$for 237 modeled receptors). 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}). **Chart 7.1-1** summarizes the number of receptors that are expected to experience increases and decreases from existing noise levels in 5 dBA increments. The maximum -11.8 dBA (-12 dBA) decrease is predicted at site R-2, which is located along SR45/SR 58 near CR 200E in Greene County. The decrease in the noise level being predicted at this location is believed to be a result of several factors: (1) The existing noise level at R-2 being lower than what was recorded at this sites representative existing measurement location (M-2), which may be attributed to differences in the distance from the roadway, topography differences, and differences in the roadway geometry between the two sites, (2) A decrease in the future traffic volumes predicted for SR 45/58, and (3) The proposed I-69 alignment being significantly elevated above the elevation of this receptor, which is likely causing a shadow effect at this location. The 28.4 dBA increase predicted to occur using the initial design criteria was identified at R-189A, which represents a residence located just north of Pic-A-Chick Farms in Subsection G. The 28.5 dBA increase predicted to occur using the low-cost design criteria was identified at R-125, which is Sparks Cemetery and it is located in Subsection F.

There was not a significant change in the predicted noise levels for the Refined Preferred Alternative 2 using the INDOT *Traffic Noise Analysis Procedure, 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 change in the methodology, 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.

Chart 7.1-1 Summary of Preferred Refined Alternative 2 Predicted Noise Levels Compared to Existing Noise Levels (dBA), (INDOT Noise Policy, 2011)



	-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	40	35	17	37	51	32	7
Initial Standard	2	16	38	34	19	36	50	33	5

7.2 Comparison of Predicted Year 2030 Traffic Noise Impacts by Alternative

For the purpose of the following discussions, predicted noise levels associated with the initial design criteria are discussed first and then followed by the predicted noise levels for the low-cost design criteria in parentheses.

Table 12 contains a summary of the number of predicted year 2030 impacts associated with each of the alignments that comprise the Refined Preferred Alignment.

Table 12: Refined Preferred Alternative 2 Subsection Alignment Impact Summary		
	Refined Preferred Alt 2	
	Low Cost Design Criteria	Initial Design Criteria
Refined Preferred 4A-2	5	6
Refined Preferred 4B-1	1	1
Refined Preferred 4C-2	5	4
Refined Preferred 4D-1	1	1
Refined Preferred Hybrid 4E-1/4E-2	6	5
Refined Preferred 4F-3	20	21
Refined Preferred 4G-2	24	23
Refined Preferred 4H-2	28	27
Total	**90**	**88**

Table 13 contains a summary of the impacted receptor types for Refined Preferred Alternative 2.

Table 13: Summary of Impacts -Refined Preferred Alternative 2		
Receptor Type		
	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
Total	**90**	**88**

Table 14 contains a summary of the impacted receptors that have predicted noise levels that are expected to exceed the NAC and are expected to have both NAC and substantial increase impacts.

Table 14: Summary of NAC and NAC & Substantial Increase Impacts for Refined Preferred Alternative 2			
Receptor ID	2030 Predicted Noise Levels (dBA)		
	Subsection	Refined Preferred Alt 2	
		Low Cost Design Criteria	Initial Design Criteria
R-125	Subsection F	67.5	66.7
R-186	Subsection G	67.7	67.0
R-189A	Subsection G	68.0	68.1
R-456	Subsection G	66.7	66.0
R-308	Subsection H	67.5	-
R-316	Subsection H	66.7	67.4
R-328	Subsection H	-	66.6
Total NAC Impacts		6	6

Refined Preferred Alternative 2

The Refined Preferred Alternative 2 will result in 88 (90) traffic noise impacts. Of these, 82 (84) are substantial increase impacts only and 6 (6) are both NAC and substantial increase 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. 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.

8.0 NOISE ABATEMENT EVALUATION

8.1 INDOT Noise Abatement Policy

In accordance with the *INDOT Traffic Noise Analysis Procedure, dated 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, “feasible” means that it is structurally and acoustically possible to reduce noise occurring at a majority (greater than 50%) of the impacted receptors. In order to determine “reasonableness”, INDOT has established three criteria to be evaluated for each “feasible” form of noise abatement. If any of the three “reasonableness” criteria are 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 benefited 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 in place prior to this study, a cost effectiveness criteria of $30,000 per benefited receptor will be used.

8.2 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 will be provided in the Final EIS for this project. 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, dated 2011.*

8.3 Noise Mitigation Assessment

Using INDOT's *Highway Traffic Noise Analysis Procedure*, *dated 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 (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 on **Figure 2- Appendix A.** Copies of the TNM output tables for the initial design criteria are included in **Appendix E** and the TNM output tables for the low-cost design criteria are included in **Appendix F**.

Feasibility Determination

A barrier analysis was performed at the 36 (36) 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 determination for the proposed noise barriers is contained in **Table 15**.

Table 15:Noise Barrier Feasibility Summary– Refined Preferred Alternative 2		
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
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 noise barriers that are determined to be feasible. Based on the feasibility determination, 31 (32) noise barriers were determined to be feasible and required 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 with 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 survey's were returned from the benefited residents from 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 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 16.**

Table 16 - Benefited Residents Survey Summary– Refined Preferred Alternative 2

Barrier ID	Refined Preferred Alternative 2 – Low Cost Design Criteria				Refined Preferred Alternative No. 2 Initial Design Criteria			
	No. Benefitted Receptors	No. of Survey's Received	Total % of Survey's Received	Benefited Receptors Opinion(1)	No. Benefitted Receptors	No. of Survey's Received	Total % of Survey's Received	Benefited Receptors Opinion(1)
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	0%	Yes	1	1	0%	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%	No
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 16 - Benefited Residents Survey Summary– Refined Preferred Alternative 2

Barrier ID	Refined Preferred Alternative 2 – Low Cost Design Criteria				Refined Preferred Alternative No. 2 Initial Design Criteria			
	No. Benefitted Receptors	No. of Survey's Received	Total % of Survey's Received	Benefited Receptors Opinion(1)	No. Benefitted Receptors	No. of Survey's Received	Total % of Survey's Received	Benefited Receptors Opinion(1)
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

* Represents proposed noise barriers that did not met INDOT's feasibility requirement.
(1) 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.

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 17.**

Table 17 : INDOT Design Goal Noise Reduction Summary Refined Preferred Alternative 2

Barrier ID	Refined Preferred Alternative 2	
	Low-Cost Design Criteria	Initial Design Criteria
	7 dBA Reduction Achieved?	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 INDOT's 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 for the proposed noise barriers ranged from $99,194 to $3,320,208 ($103,588 to $2,210,718). None of the 31 (32) proposed noise barriers analyzed meet the cost per benefited receptor cost of $30,000.00 established by INDOT. A summary of the cost per benefited receptor for each of the proposed noise barriers is contained in **Table 18.** 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.

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 19**. 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.

The viewpoints of the benefited residents and the property owners are a major consideration in determining the reasonableness of highway traffic noise abatement measures for the proposed highway construction projects. The viewpoints have been determined and addressed during the environmental phase of project development. The will and desires of the public are an important factor in dealing with the overall problems of highway traffic noise. INDOT will incorporate highway traffic noise consideration in on-going activities for public involvement in the highway program and will reexamine the residents' and property owners' views on the desirability and acceptability of abatement during the project development.

Table 18: Noise Barrier Analysis Cost Effectiveness Determination – Refined Preferred Alternative 2

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 INDOT's feasibility requirement

Table 19 Noise Abatement Assessment Summary– Refined Preferred Alternative 2

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
F-7	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No

Table 19 Noise Abatement Assessment Summary– Refined Preferred Alternative 2

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-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.

9.0 CONSTRUCTION NOISE

There no was no substantive changes made to this section, refer to Section 9 in the Final Noise Report.

10.0 NOISE COMPATIBLE PLANNING

There no was no substantive changes made to this section, refer to Section 10 in the Final Noise Report.

11.0 SUMMARY

A Noise Analysis was performed for the Refined Preferred Alternative 2 to determine the traffic noise impacts per 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.

The results of the noise analysis indicate that the year 2030 proposed noise levels for the Refined Preferred Alternative 2 would range from 45.9 dBA L_{eq} to 68.1 dBA L_{eq} for 233 modeled receptors (45.9 dBA L_{eq} to 68.0 dBA $L_{eq.}$for 237 modeled receptors). 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 $L_{eq.}$ There were 88 (90) predicted traffic noise impacts identified. Of these, 82 (84) are substantial increase impacts only and 6 (6) are both NAC and substantial increase 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. 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 predicted 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.

12.0 REFERENCES

Environmental Protection Agency Publication EPAPB 206717, December 1971, *Noise from Construction Equipment and Operations.*

Federal Highway Program Manual, Volume 7, Section 3, August 9, 1982.

23 CFR Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, August 11, 1997.

FHWA Policy Memorandum *Highway Traffic Noise Analysis and Abatement - Policy and Guidance*, June 12, 1995.

Indiana Department of Transportation Highway Traffic Noise Policy, February, 2007.

Indiana Department of Transportation Highway Traffic Noise Analysis Procedure, 2011.