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Section 1 – EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT) conducted a Project Development and Environment (PD&E) Study to evaluate alternative improvements for US 41 (SR 45) from 12th Street north to Kracker Avenue in southern Hillsborough County (**Figure 2-1)**. The total project length is approximately 6.2 miles. Study objectives included the following: determine proposed typical sections and develop preliminary conceptual design plans for proposed improvements, while minimizing impacts to the environment; consider agency and public comments; and ensure project compliance with all applicable federal and state laws. Improvement alternatives were identified which will improve safety and meet future transportation demand.

The objectives of this Noise Study Report (NSR) are to identify noise-sensitive sites adjacent to the project corridor, to evaluate the significance of existing and future traffic noise levels at the sites with the improvements, and to evaluate the need for and effectiveness of noise abatement measures. Additional objectives include the evaluation of construction noise impacts and the identification of noise level "contours" adjacent to the corridor.

The analysis was performed following FDOT procedures that comply with Title 23 Code of Federal Regulations (CFR), Part 772 (*Procedures for Abatement of Highway Traffic Noise and Construction Noise*). The prediction of future traffic noise levels with the proposed roadway improvements was performed using the Federal Highway Administration's (FHWA's) Traffic Noise Model (TNM Version 2.5). The TNM propagates sound energy, in one-third octave bands, between highways and nearby receivers, taking into account the intervening ground's acoustical characteristics and topography, and rows of buildings.

Seventy nine (79) receivers were modeled representing 122 noise sensitive sites. All but 2 sites are single family residences. Those 2 sites are the Calvary Evangelical Lutheran Church and A Child's Adventure child care facility. The results of the analysis indicate that existing (2007) exterior traffic noise levels are predicted to range from 50.6 dBA to

67.1 dBA with levels predicted to approach, meet, or exceed the NAC at 1 site. The no-build (2030) exterior traffic noise levels are predicted to range from 51.8 dBA to 69.1 dBA with levels predicted to approach, meet, or exceed the NAC at 3 of the sites. In the future (2030), with the proposed improvements to US 41, exterior traffic noise levels are predicted to range from 53.9 to 71.7 dBA, with levels predicted to approach, meet, or exceed the NAC at 5 of the sites.

When compared to the existing condition, exterior traffic noise levels are predicted to increase between 1.9 and 4.9 dBA with the improvements to US 41. When compared to the no-build condition, exterior traffic noise levels are predicted to increase between 1.2 and 3.5 dBA with the improvements to US 41. As such, none of the sites are predicted to experience a substantial increase (15 dBA or more) in traffic noise as a result of the project.

Noise abatement measures were evaluated for the noise sensitive areas predicted to be affected by the proposed improvements to US 41. The measures were traffic management, alignment modifications, property acquisition, land use controls, and noise barriers. Although feasible, traffic management, alignment modifications, property acquisitions, and land use controls were determined to be unreasonable methods to reduce the predicted traffic noise impacts for the affected sites.

Based on the results of the analysis, the construction of noise barriers for the 5 sites predicted to be affected by the project along US 41 is not a feasible and cost-reasonable method of reducing predicted traffic noise impacts. Barriers could not be designed to effectively reduce noise levels by at least 5 dBA and still meet cost criteria.

Section 2 – INTRODUCTION

2.1 Project Description

The Florida Department of Transportation (FDOT) conducted a Project Development and Environment (PD&E) Study to evaluate alternative improvements to US 41 (SR 45). This project involves a 6.2 mile segment of US 41 from 12th Street extending north to Kracker Avenue in Hillsborough County (**Figure 2-1**). The highway is to be improved from an existing, four-lane rural facility to an urban and suburban six-lane divided facility. There are no bridge structures located within this segment of US 41; however, bridge culvert widening or replacement is anticipated over Wildcat Creek and Newmans Branch. The proposed improvements will include construction of stormwater management facilities and various intersection improvements, in addition to bicycle and pedestrian facilities. The study area is located in Township 31, Range 19, and Sections 2, 3, 10, 11, 14, 15, 22, 27, 28, 32 and 33.

Figure 2-1 US 41 Project Location Map

F:\PROJECT\5079041\FileCabinet\C.DesignDocumentation\BaseReports\20080514Project_Location.pdf

Purpose and Need

The purpose of the proposed project is to provide a higher capacity and safer facility to better meet future transportation demand in this rapidly developing area of Hillsborough County. US 41 runs parallel to and west of I-75. US 41 is a major north-south urban principal arterial that connects numerous communities along the west coast of Florida, including Ruskin, Apollo Beach and Gibsonton. The anticipated traffic growth and existing high levels of congestion create a need to analyze the corridor for necessary improvements to ensure this facility does not continue to deteriorate resulting in unacceptable levels of service. The PD&E Study will also include the consideration of a No-Build Alternative.

US 41 is functionally classified as an "urban principal arterial – other". While US 41 is not on the Strategic Intermodal System (SIS), a short (0.92 miles) segment of US 41 between Pembroke Road and Big Bend Road (CR 672) is part of a SIS connector, which connects the Port of Tampa to I-75, both of which are SIS facilities. The Strategic Intermodal System (SIS) is a statewide network of highways, railways, waterways and transportation hubs that handle the bulk of Florida's passenger and freight traffic. This project is included in the Hillsborough County Metropolitan Planning Organization's (MPO) Year 2025 Long-Range Transportation Plan (LRTP) as an unfunded need. The West Central Florida MPO Chair's Coordinating Committee (CCC) has classified US 41 as a "regional road" and as an "unfunded need" on the "regionally significant road network" in west central Florida. This corridor is also designated as an emergency evacuation route.

A longer segment of US 41 was evaluated in the Programming Screen of the Efficient Transportation Decision Making (ETDM) process (project #9511) in 2007, from 19th Avenue NE to Gibsonton Drive. A longer segment of US 41 was evaluated in the Programming Screen of the Efficient Transportation Decision Making (ETDM) process (project # 9511) in 2008, for a larger area along US 41, from 19th Avenue NE to Gibsonton Drive. This process established the Class of Action as a State Environmental Impact Report (SEIR).

2.2 Purpose of Report

The objectives of the Noise Study Report (NSR) are:

- To identify noise-sensitive sites adjacent to the project corridor;
- To evaluate the significance of existing and future traffic noise levels at the sites with the improvements to US 41; and
- To evaluate the need for and effectiveness of noise abatement measures.

Additional objectives include the evaluation of construction noise impacts and the identification of noise "contours" adjacent to the corridor.

2.3 Existing Facility and Proposed Improvements

US 41 currently has a 4-lane divided rural typical section (**Figure 2-2**). The existing roadway has 11.5 to 12.0 ft travel lanes, 4-ft paved inside and outside shoulders, and a 40-ft grassed median. The posted speed limit is 55 miles per hour (mph) except for a short segment on either side of Big Bend Road, which is posted at 45 mph. The existing right-of-way typically varies from 182 ft to 227 ft.

Expected improvements include widening to six lanes as well as intersection improvements and construction of stormwater management facilities and bicycle and pedestrian facilities. In addition to six basic lanes, auxiliary lanes are also proposed in the vicinity of Apollo Beach Boulevard and Big Bend Road (CR 672). Preliminary recommended roadway typical sections are shown in **Figure 2-2**. A "No-Build" Alternative will also be considered. The proposed project is not funded in FDOT's current 5-year work program.

Figure 2-2: Existing And Proposed Build Alternative Typical Sections

Figure 2-2

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Section 3.0 – METHDOLOGY

3.1 Noise Methodology

The US 41 noise analysis was performed following FDOT procedures (*Project Development and Environment Manual*: Part II, Chapter 17: April 14, 2007). The FDOT procedures comply with Title 23 Code of Federal Regulations (CFR) Part 772 (*Procedures for Abatement of Highway Traffic Noise and Construction Noise*).

The prediction of future traffic noise levels with the roadway improvement was performed using the Federal Highway Administration's (FHWA) computer model for highway traffic noise prediction and analysis – the Traffic Noise Model (TNM – Version 2.5). The TNM propagates sound energy, in one-third octave bands, between highways and nearby receivers taking into account the intervening ground's acoustical characteristics and topography, and rows of buildings.

The noise levels presented in this report are expressed in decibels (dB) on the A-weighted scale (dBA). This scale most closely approximates the response characteristics of the human ear to low level sound. All noise levels are reported as equivalent level (L_{aeq1h}), values which theoretically contain the same amount of acoustic energy as an actual time-varying A-weighted sound level over a period of 1 hour.

The existing (2007), no-build (2030) and forecast future year (2030) traffic data used in the TNM for the US 41 project are presented in Appendix C. All traffic data came from the project's *Design Traffic Technical Memorandum,* June 2008, by American Consulting Engineers of Florida.

Section 4.0 – Land Use

4.1 Existing Land Use

The study corridor, located in south Gibsonton, Apollo Beach and north Ruskin is primarily agricultural with commercial, residential and industrial areas. The industrial areas are located mainly in the northern portion of the study limits. The Florida Land Use, Cover and Forms Classification System (FLUCCS) from the Southwest Florida Water Management District (SWFWMD), together with aerial photographs and wetland data from the National Wetland Inventory (NWI), were utilized to determine current land use and habitat types within the corridor. These land uses and habitat types were subsequently ground-truthed for verification during field visits. **Figure 4-1** shows the existing land use within the corridor. Due to the large areas of agricultural land, commercial development, industrial sites and newer residential development, there is very little natural landscape found along the project corridor.

According to the 2004 existing FLUCCS land use data, the land use codes found along the corridor include: Residential medium density (120); Residential high density (130); Commercial and services (140); Industrial (150); Recreational (180); Cropland and pastureland (210); Row crops (214); Nurseries and vineyards (240); Hardwood conifer mixed (434); Pine flatwoods (411); Reservoirs (530); Wetland forested mixed (630); and Utilities (830).

Figure 4-1 Existing Land Use Map

4.2 Future Land Use

According to the Hillsborough County Future Land Use Map (2015), the entire project corridor is transitioning from a dominantly agricultural area with some residential and commercial development to a predominantly residential and commercial/mixed urban area with some industrial and natural preservation lands (**Figure 4-2**). This transformation is currently taking place as many of the existing agricultural areas along this stretch of US 41/SR 45 are being converted to residential subdivisions and retail/office development. Numerous Developments of Regional Impact (DRIs) are approved along or near the project corridor and include the following: Big Bend Terminal, Southbend, Apollo Beach, Wolf Creek Branch, Harbor Bay, and South Shore Corporate Park. These DRIs are illustrated in **Figure 4-3**. These approved DRIs will play a major role in the conversion of this area from its existing land uses to predominantly residential and commercial/urban mixed land uses.

Figure 4-2 Future Land Use Map 2015

Figure 4-3 DRI Map

Section 5.0 – NOISE ANALYSIS

5.1 Noise-Sensitive Sites

Noise sensitive sites are defined as properties where frequent human use occurs and where a lowered noise level would be of benefit. To evaluate traffic noise, the FHWA established Noise Abatement Criteria (NAC). As shown in **Table 5-1**, the criteria vary according to a property's activity category.

Table 5-1: FHWA Noise Abatement Criteria

Activity Category	Abatement Level (in L_{Aeq})	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)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, RV parks, day care centers, hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A and B above.
D		Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, auditoriums.

When predicted noise levels "approach" or exceed the NAC or, when predicted noise levels increase substantially, the FHWA requires that noise abatement measures be considered. The FDOT defines the word "approach" to mean within 1 dBA of the NAC and considers that a substantial increase will occur if traffic noise levels are predicted to increase by 15 or more dBA as a direct result of a transportation improvement project. Increases of 15 dBA or more are not likely adjacent to the project corridor as increases of this magnitude typically occur at sites where no roadway existed previously.

One hundred and twenty two (122) noise-sensitive sites were identified along the project corridor. One hundred and twenty (120) sites are single-family (SF) residences. Areas of

frequent human use, usually the edge of the dwelling unit closest to US 41, were used in the TNM. Interior noise levels were predicted for 2 noise sensitive sites. One site was the Calvary Evangelical Lutheran Church and the other was A Child's Adventure, a child care facility. The location of each of the noise-sensitive sites is shown on **Figure 5-1**. The 120 residential sites were considered Activity Category "B" as shown in **Table 5-1**. As such, exterior noise levels will be evaluated for these sites, and noise abatement measures will be considered if the predicted exterior traffic noise level is 66.0 dBA or more, or if levels are predicted to increase by 15 dBA or more as a result of the proposed improvements. The other 2 sites were considered Activity Category "E" as shown in **Table 5-1**. As such, interior noise levels will be evaluated for these sites, and noise abatement measures will be considered if the predicted interior traffic noise level is 51.0 dBA or more, or if levels are predicted to increase by 15 dBA or more as a result of the proposed improvements.

Various factors affect the "transmittal" of sound from a source to a receiver. The factors include vegetation, intervening structures, elevation of the source and/or the receiver, surrounding topography and the type of ground surface between the source and the receiver. The attenuation (reduction) of sound levels due to intervening structures occurs when a receiver's view (line-of-sight) is obstructed or partially obstructed by dense objects (e.g. rows of buildings, or other barriers). The attenuation provided by a row of buildings (houses) depends on the actual length and density of the row occupied by the buildings.

5.2 Measured Noise Levels

As previously stated, future noise levels with the proposed improvements were modeled using the TNM. To insure that these predictions are as accurate as possible, the computer model was validated using measured noise levels at locations adjacent to the project corridor. Traffic and meteorological data, including traffic volumes, vehicle speeds, and atmospheric conditions were recorded during each measurement period.

Figure 5-1 Noise Sensitive Sites

next 8 pages

The field measurements for US 41 were conducted in accordance with the FHWA's *Measurement of Highway Related Noise*. Each field measurement was obtained using a Casella CEL-593 Type 1 Sound Level Meter. The meter was calibrated before and after the monitoring period with a Casella CEL-284 Type 1 Sound Level Calibrator.

The measured field data was used as input for the TNM to determine if, given the topography and actual site conditions of the area, the computer model could "re-create" the measured noise levels with the existing roadway. Following FDOT guidelines, a noise prediction model is considered valid for the use of predicting traffic noise levels if the measured and predicted noise levels are within a tolerance standard of 3 dBA. Initial field measurements were taken on December 3, 2008 on US 41 at one location. The location at which the measurement was taken can be seen in **Figure 5-1.** The sound level meter was placed approximately 98 feet from the centerline of the roadway at a height of 5 feet above ground. A 10-minute measurement was taken for both northbound and southbound traffic. Data collected in the field can be found in the Appendix.

Table 5-2 presents the field measurement and the computer validation results for US 41. As shown, the ability of the model to accurately predict noise levels for the project was confirmed. Notably, the computer predicted the noise level higher than the actual field measured level. Documentation in support of the validation is provided in the **Appendix B** of this report.

Table 5-2: Validation Data*

Location	Measurement Period	Modeled	Measured	Difference
6932 US 41	11:15 am - 11:25 am	62.2	61.4	0.8
*Measurement was obtained on December 3, 2008.				

5.3 Results of the Noise Analysis

Table 5-3 presents the calculated existing (2007), no-build (2007) and Build (2030) traffic noise levels for noise-sensitive sites adjacent to US 41. Documentation in support of the analysis is provided in **Appendix C** of this report. As shown in **Table 5-3**, the

results of the analysis indicate that existing (2007) exterior traffic noise levels are predicted to range from 50.6 dBA to 67.1 dBA with levels predicted to approach, meet, or exceed the NAC at 1 site. The no-build (2030) exterior traffic noise levels are predicted to range from 51.8 dBA to 69.1 dBA with levels predicted to approach, meet, or exceed the NAC at 3 of the sites. In the future (2030), with the proposed improvements to US 41, exterior traffic noise levels are predicted to range from 53.9 to 71.7 dBA, with levels predicted to approach, meet, or exceed the NAC at 5 of the sites.

When compared to the existing condition, exterior traffic noise levels are predicted to increase between 1.9 and 4.9 dBA with the improvements to US 41. When compared to the no-build condition, exterior traffic noise levels are predicted to increase between 1.2 and 3.4 dBA with the improvements to US 41. As such, none of the sites are predicted to experience a substantial increase (15 dBA or more) in traffic noise levels as a result of the proposed improvements. Noise abatement measures were evaluated for the 5 noise-sensitive sites predicted to be affected by the proposed improvements to US 41.

Table 5-3: Predicted Traffic Noise Levels

Site ID#	# of Units	Land Use*	L_{Aeq1h} (dBA)					Approaches, Meets, or Exceeds NAC?
			Existing (2007)	No Build (2030)	Build (2030)	Difference between Build and Existing	Difference between Build and No-Build	
1-1	1	SF	54.5	55.7	57.3	2.8	1.6	No
1-2	1	SF	54.0	55.2	56.9	2.9	1.7	No
1-3	6	SF	54.2	55.4	56.7	2.5	1.3	No
1-4	6	SF	54.3	55.5	56.8	2.5	1.3	No
1-5	1	SF	54.9	56.1	57.4	2.5	1.3	No
1-6	1	SF	54.9	56.2	57.4	2.5	1.2	No
1-7	1	SF	53.6	54.8	56.2	2.6	1.4	No
1-8	1	SF	52.9	54.1	55.6	2.7	1.5	No
1-9	1	SF	52.0	53.2	54.7	2.7	1.5	No
1-10	1	SF	51.1	52.4	54.0	2.9	1.6	No
1-11	1	SF	51.9	53.1	54.6	2.7	1.5	No
1-12	1	SF	53.9	55.1	56.5	2.6	1.4	No
1-13	1	SF	53.7	54.9	56.3	2.6	1.4	No
1-14	1	SF	53.1	54.4	55.8	2.7	1.4	No
1-15	1	SF	52.8	54.0	55.5	2.7	1.5	No
1-16	1	SF	52.3	53.5	55.0	2.7	1.5	No
1-17	5	SF	52.1	53.3	54.9	2.8	1.6	No
1-18	6	SF	52.2	53.4	55.3	3.1	1.9	No
1-19	1	RF	37.0	38.2	41.4	4.4	3.2	No
1-20	1	SF	50.6	51.8	53.9	3.3	2.1	No
1-21	1	SF	50.8	52.0	54.2	3.4	2.2	No
1-22	3	SF	50.9	52.2	54.5	3.6	2.3	No
1-23	1	SF	55.8	57.0	59.9	4.1	2.9	No
1-24	5	SF	55.7	56.9	59.9	4.2	3	No
1-25	1	SF	55.1	56.3	59.6	4.5	3.3	No
1-26	4	SF	52.6	53.8	57.2	4.6	3.4	No
1-27	2	SF	50.6	51.8	54.5	3.9	2.7	No
1-28	2	SF	56.8	58.0	60.6	3.8	2.6	No
1-29	2	SF	59.5	60.7	63.4	3.9	2.7	No

			L_{Aeq1h} (dBA)					
Site ID#	**# of Units**	**Land Use***	**Existing (2007)**	**No Build (2030)**	**Build (2030)**	**Difference between Build and Existing**	**Difference between Build and No-Build**	**Approaches, Meets, or Exceeds NAC?**
1-30	2	SF	56.6	57.8	59.3	2.7	1.5	No
1-31	2	SF	61.7	63.0	65.8	4.1	2.8	No
1-32	2	SF	56.1	57.3	59.9	3.8	2.6	No
1-33	2	SF	56.3	57.5	60.1	3.8	2.6	No
1-34	2	SF	57.8	59.0	61.6	3.8	2.6	No
1-35	2	SF	53.3	53.3	55.2	1.9	1.9	No
1-36	1	SF	54.4	55.6	57.4	3.0	1.8	No
1-37	1	SF	57.5	58.8	60.8	3.3	2.0	No
1-38	1	SF	60.9	62.1	64.4	3.5	2.3	No
1-39	1	SF	57.9	59.1	60.9	3.0	1.8	No
1-40	6	SF	58.1	59.3	60.7	2.6	1.4	No
1-41	1	SF	59.9	61.1	63.3	3.4	2.2	No
1-42	1	SF	62.4	63.6	66.0	3.6	2.4	Yes
1-43	2	SF	55.6	56.8	58.8	3.2	2.0	No
1-44	2	SF	55.5	56.7	59.1	3.6	2.4	No
1-45	1	SF	55.3	56.5	59.1	3.8	2.6	No
1-46	1	SF	56.4	57.6	60.0	3.6	2.4	No
1-47	1	SF	59.8	61.1	63.6	3.8	2.5	No
1-48	1	SF	59.6	60.8	63.5	3.9	2.7	No
1-49	1	SF	56.8	58.0	60.0	3.2	2.0	No
1-50	1	SF	56.6	57.8	60.1	3.5	2.3	No
1-51	1	SF	54.9	56.1	58.5	3.6	2.4	No
1-52	1	SF	53.6	54.9	57.2	3.6	2.3	No
2-1	1	CC	36.8	38.0	40.5	3.7	2.5	No
2-2	1	SF	57.7	58.9	61.6	3.9	2.7	No
2-3	1	SF	55.7	56.9	59.2	3.5	2.3	No
2-4	1	SF	55.9	57.1	59.5	3.6	2.4	No
2-5	1	SF	56.4	57.6	60.1	3.7	2.5	No
2-6	1	SF	56.4	57.6	60.2	3.8	2.6	No
2-7	1	SF	56.7	57.9	60.5	3.8	2.6	No

			L_{Aeq1h} (dBA)					
Site ID#	**# of Units**	**Land Use***	**Existing (2007)**	**No Build (2030)**	**Site ID#**	**# of Units**	**Land Use***	**Existing (2007)**
2-8	1	SF	56.9	58.2	60.8	3.9	2.6	No
2-9	1	SF	57.4	58.6	61.3	3.9	2.7	No
2-10	1	SF	57.9	59.1	61.9	4.0	2.8	No
2-11	1	SF	58.4	59.6	62.4	4.0	2.8	No
3-1	1	SF	56.0	57.0	59.7	3.7	2.7	No
3-2	1	SF	57.8	58.8	61.7	3.9	2.9	No
3-3	1	SF	61.1	62.1	65.5	4.4	3.4	No
3-4	1	SF	61.5	62.5	66.0	4.5	3.5	Yes
3-5	1	SF	60.9	61.9	65.3	4.4	3.4	No
3-6	1	SF	57.3	58.3	61.2	3.9	2.9	No
3-7	1	SF	56.0	57.0	59.7	3.5	2.5	No
4-1	1	SF	64.5	66.5	69.3	4.8	2.8	Yes
4-2	1	SF	58.1	60.1	62.3	4.2	2.2	No
4-3	1	SF	58.5	60.5	62.7	4.2	2.2	No
4-4	1	SF	61.2	63.2	65.8	4.6	2.6	No
4-5	1	SF	64.5	66.5	69.4	4.9	2.9	Yes
4-6	1	SF	67.1	69.1	71.7	4.6	2.6	Yes
4-7	1	SF	58.1	60.1	62.3	4.2	2.2	No
4-8	1	SF	55.5	57.5	59.2	3.7	1.7	No
4-9	1	SF	54.9	56.9	58.4	3.5	1.5	No

*SF = Single Family Residential(exterior noise level), CC = Child Care Facility (interior noise level) , RF = Religious Facility (interior noise level)

Section 6.0 – EVALUATION OF ABATEMENT ALTERNATIVES

The FDOT considers abatement alternatives when predicted traffic noise levels approach, meet, or exceed the NAC. The measures considered for US 41 were traffic management, alternative roadway alignment, property acquisition, and noise barriers. The following discusses the feasibility (engineering considerations) and reasonableness (amount of noise reduction provided, number of noise-sensitive sites benefited, absolute noise levels, cost, etc.) of the measures.

6.1 Traffic Management Measures

The improvements to US 41 are meant to help alleviate future traffic congestion and aid in regional connectivity. Traffic management measures that limit motor vehicle speeds and reduce volumes can be effective noise mitigation measures. However, these measures can also negate a project's ability to accommodate forecast traffic volumes.

For example, if the posted speed limit on US 41 were reduced, the capacity of the roadway to handle the forecast traffic demand would also be reduced. Therefore, reducing traffic speeds and/or traffic volumes is inconsistent with the goal of improving the ability of the roadway to handle the forecast volumes. As such, although feasible, traffic management measures are not considered a reasonable noise mitigation measure for the project.

6.2 Alignment Modification

The proposed alignment seeks to minimize the need for additional right-of-way (ROW) within the project corridor. A shift in the roadway alignment would result in the need for additional ROW. As such, an alternative roadway alignment is not considered a reasonable noise mitigation measure for the project.

6.3 Property Acquisition

The acquisition of property to provide noise buffers is not feasible due to the high cost and/or the unavailability of vacant land in proximity to noise-sensitive sites.

6.4 Land Use Controls

Land use controls can be used to minimize traffic noise in future developments or areas where redevelopment occurs. Land uses such as residences, motels, schools, churches, recreation areas and parks are considered incompatible with highway noise levels above 66 dBA. In order to reduce the possibility of additional noise related impacts, noise level contours were developed for the future improved roadway. These noise contours delineate the minimum distance from the improved roadway's edge of pavement where the FHWA Activity Category B land use should occur in 2030. Local planning officials can use the noise contour information to avoid development of noise sensitive land uses.

As shown in **Table 6-1,** the extent of the 66 dBA noise level on US 41 extends approximately 160 feet from the roadway's edge of pavement.

Table 6-1: Noise Contour for US 41

Roadway	Distance to 66 dBA Isopleth from Edge-of-Pavement
12th St to Kracker Ave	160 feet
[a] Distances do not reflect any reduction in noise levels that would result from existing structures (shielding) and should be used for planning purposes only.	

6.5 Noise Barrier Analysis

Noise barriers reduce noise levels by blocking the sound path between the source and the receiver. In order to effectively reduce traffic noise, a noise barrier must be relatively long, continuous (without intermittent openings), and sufficiently tall to provide a reduction in noise levels. Following FDOT procedures, the minimum requirements for a noise barrier to be considered both feasible and economically reasonable are:

- The barrier must provide at least a 5 dBA reduction at the noise sensitive sites with with a design goal of 10 dBA or more is desired.
- The barrier should not cost more than $42,000 per benefited receiver (a benefited receiver is a site that receives at least a 5 dBA reduction in noise from the barrier), unless a higher level of expenditure can be justified by other circumstances. The current estimated cost to construct a noise barrier (materials and labor) is $30.00 per square foot.

Other factors considered when evaluating noise barriers as a potential noise abatement measure address both the feasibility of the barriers (given site-specific details, can a barrier actually be constructed) and the reasonableness of the barriers.

Feasibility factors that relate to noise barriers include driver/pedestrian sight distance (safety), ingress and egress requirements to and from affected properties, ROW requirements including access rights and easements for construction and/or maintenance, impacts on existing/planned utilities, and drainage.

Reasonableness factors include:

- The relationship of the predicted future noise levels to the NAC (do the predicted levels approach, meet, or far surpass the NAC);
- Land use stability (are the noise-sensitive land uses likely to remain for an indefinite period of time);
- Antiquity (the amount of development that has occurred before and after the initial construction of a roadway);
- The desires of the affected property owners to have a noise barrier adjacent to their property; and
- Aesthetics.

6.5.1 Results of Noise Barrier Analysis

As previously stated, in year 2030, with the proposed improvements to US 41, noise levels are predicted to approach, meet, or exceed the NAC at 5 noise-sensitive sites along the project corridor. The following section discusses the feasibility and reasonableness of providing noise barriers as an abatement measure for the affected sites. Documentation in support of the noise barrier analysis is provided in the Appendix.

TNM accounts for the shielding effect of a noise barrier, the diffraction of sound over a noise barrier, and the effects of the ground between a barrier and a receiver (i.e. sound absorption). The net effect of the barrier shielding is referred to as "insertion loss". In other words, insertion loss is the difference in sound level before and after the installation of the barrier.

Residences at Shell Falls Drive

A residence on the west side of US 41 (site 1-42) was predicted to be affected by traffic noise. This site was predicted to experience a future traffic noise level of 66.0 dBA with the proposed US 41 improvements. A noise barrier for this single residence could meet the minimum 5 dBA noise reduction but was not within the Department's cost criteria. Therefore, a noise barrier in this area is not considered cost feasible and a barrier is not recommended for further consideration.

Residences near North Saint George Circle

A residence on the west side of US 41 (site 3-4) is predicted to be affected by traffic noise. This site was predicted to experience future traffic noise levels of 66.0 dBA with the proposed improvements to US 41. A noise barrier for this single residence could meet the minimum 5 dBA noise reduction and still be within the Department's cost criteria. Therefore, a noise barrier in this area is not considered cost feasible and a barrier is not recommended for further consideration.

Residences near Adamsville Road

Three (3) residences on the west side of US 41 (represented by sites 4-1, 4-5 and 4-6) are predicted to be affected by traffic noise. These sites are predicted to experience future traffic noise level of 69.3, 69.4 and 71.7 dBA, respectively, with the proposed improvements to US 41. A noise barrier for these three residences could not meet the minimum 5 dBA noise reduction and still be within the Department's cost criteria. Therefore, a noise barrier in this area is not considered cost feasible and a barrier is not recommended for further consideration.

6.6 Summary

Noise abatement measures were evaluated for the noise-sensitive sites predicted to be affected by the proposed improvements to US 41. The measures were traffic management, alignment modifications, property acquisition, land use controls and noise barriers. Although feasible, traffic management, alignment modification, land use controls, and property acquisition were determined to be unreasonable methods to reduce the predicted traffic noise levels for the affected sites.

Based on the results of the analysis, it appears that the construction noise barriers along US 41 are not a feasible and cost-reasonable method of reducing predicted traffic noise levels for the 5 affected noise-sensitive sites.

At the future public hearing, the noise study results will be presented and the community will be allowed to discuss and respond to the findings. After the public hearing and once the Location and Design Concept Acceptance occurs, copies of this final NSR will be furnished to the local government and planning officials to assist them in establishing compatible land uses for future development.

Section 7.0 – CONSTRUCTION NOISE & VIBRATION

During the construction phase of the proposed project, short-term noise may be generated by stationary and mobile construction equipment. Construction of roadway improvements will have a temporary impact on noise-sensitive sites adjacent to the project corridor. Construction noise will be controlled by the adherence to the most recent edition of the FDOT's Standard Specifications for Road and Bridge Construction.

Using FDOT's listing of vibration sensitive sites, residences were identified as potentially sensitive to vibration caused during construction. If during final design it is determined that provisions to control vibration are necessary, the project's construction provisions can include the necessary provisions as needed.

Section 8.0 – NOISE CONTOURS

As previously stated, land uses such as residences, motels, schools, churches, recreation areas and parks are considered *incompatible* with highway noise levels above 66 dBA. In order to reduce the possibility of additional noise sensitive sites being located within an area with traffic noise of this level, a noise contour was developed for the future improved roadway facility. This noise contour delineates the distance from the improved roadway's edge of pavement where the FHWA's NAC would be approached (within 1 dBA of the NAC). Based on the results of the analysis, a level of 66 dBA would extend approximately 160 feet from the closest travel lane. Local officials should not approve construction of any new noise sensitive sites (e.g., residences, parks, churches, etc.) within this area unless noise abatement is considered as part of the planned structures.

Section 9.0 – REFERENCES

Federal Highway Administration, Traffic Noise Model, Version 2.5, February 2004.

Federal Highway Administration, Title 23 CFR, Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, April 1, 1992 Edition.

Florida Department of Transportation, Project Development and Environment Manual, Chapter 17 (Noise), April 18, 2007.

Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, 2007.

Federal Highway Administration, Measurement of Highway-Related Noise: Final Report, October 2003.

APPENDIX A

FDOT Traffic Data Sheets

APPENDIX B

Validation Documentation

APPENDIX C

TNM Input/Output

APPENDIX D

TNM Barrier Analysis