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FINAL NOISE STUDY
TECHNICAL MEMORANDUM

State Road 60

(From Courtney Campbell Causeway to Fish Creek)
Hillsborough County, Florida

Work Program Item Segment Number: 255630 1
State Project Number: 10140-1552
Federal Aid Project Number: To be Assigned

Prepared for:

Florida Department of Transportation
District 7
11201 North McKinley Drive
Tampa, Florida 33612-6456

April 1999
(Revised August 2000)

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11201 North McKinley Drive
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April 1999
(Revised August 2000)

EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT) is planning to implement improvements to S.R. 60 in the vicinity of the Veterans Expressway interchange with Courtney Campbell Causeway. The project, located in Hillsborough County, begins at the terminus of the Veterans Expressway and ends on S.R. 60 south of Fish Creek.

The objectives of the noise study are to identify noise sensitive sites adjacent to the proposed project, compare and evaluate traffic noise at these sites with and without the project, and evaluate the need for and effectiveness of noise abatement measures. Construction noise and predicted noise level isopleths for the build condition is also addressed.

Results for the design year (2025) Build Alternative indicate that 14 residences may experience outdoor traffic noise levels that approach the Federal Highway Administration Noise Abatement Criteria for Activity Category B. Noise levels at the sites are predicted to range from 65.8 to 66.7 dBA. Predicted increases above existing noise levels range from 1.3 to 6.9 dBA. No noise sensitive sites are predicted to experience interior noise levels that approach or exceed the FHWA Noise Abatement Criteria for Activity Category E.

Noise Abatement measures were evaluated for the affected noise sensitive sites. Abatement measures considered include traffic system management, alignment modifications, property acquisition, land use controls and noise barriers. Noise barriers were evaluated for heights ranging from 2.44 to 3.66 meters (m) [8 to 12 feet (ft)]. At a height of 3.36 m (11 ft), a noise barrier is predicted to provide at least a 5 dBA reduction to 25 first row residences. A noise barrier from 2.74 to 3.66 m (9 to 12 ft) in height was determined to be cost reasonable. However, recent constructability and safety issues regarding the height of noise barriers on retaining walls have been raised. A noise barrier limited in length to just the project limits and limited to a height of 2.44 m (8 ft) is predicted to provide at least a 5 dBA reduction to only 17 first row residences. Limiting the noise barrier height to 2.44 m (8 ft) also resulted in a cost that exceeds the criteria for cost reasonableness.

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1.0 INTRODUCTION

The Florida Department of Transportation (FDOT) is planning to implement improvements to Memorial Highway (S.R. 60) from the Veterans Expressway (S.R. 589) terminus (north of the Courtney Campbell interchange) to the I-275 interchange in Hillsborough County. The project segment addressed in this Final Noise Study Technical Memorandum is referred to as the Courtney Campbell interchange segment which begins at the terminus of the Veterans Expressway, includes a 1.28 km (0.8 mile) segment on the Courtney Campbell Causeway and ends on S.R. 60 south of Fish Creek in Hillsborough County (see Figure 1, Project Location Map).

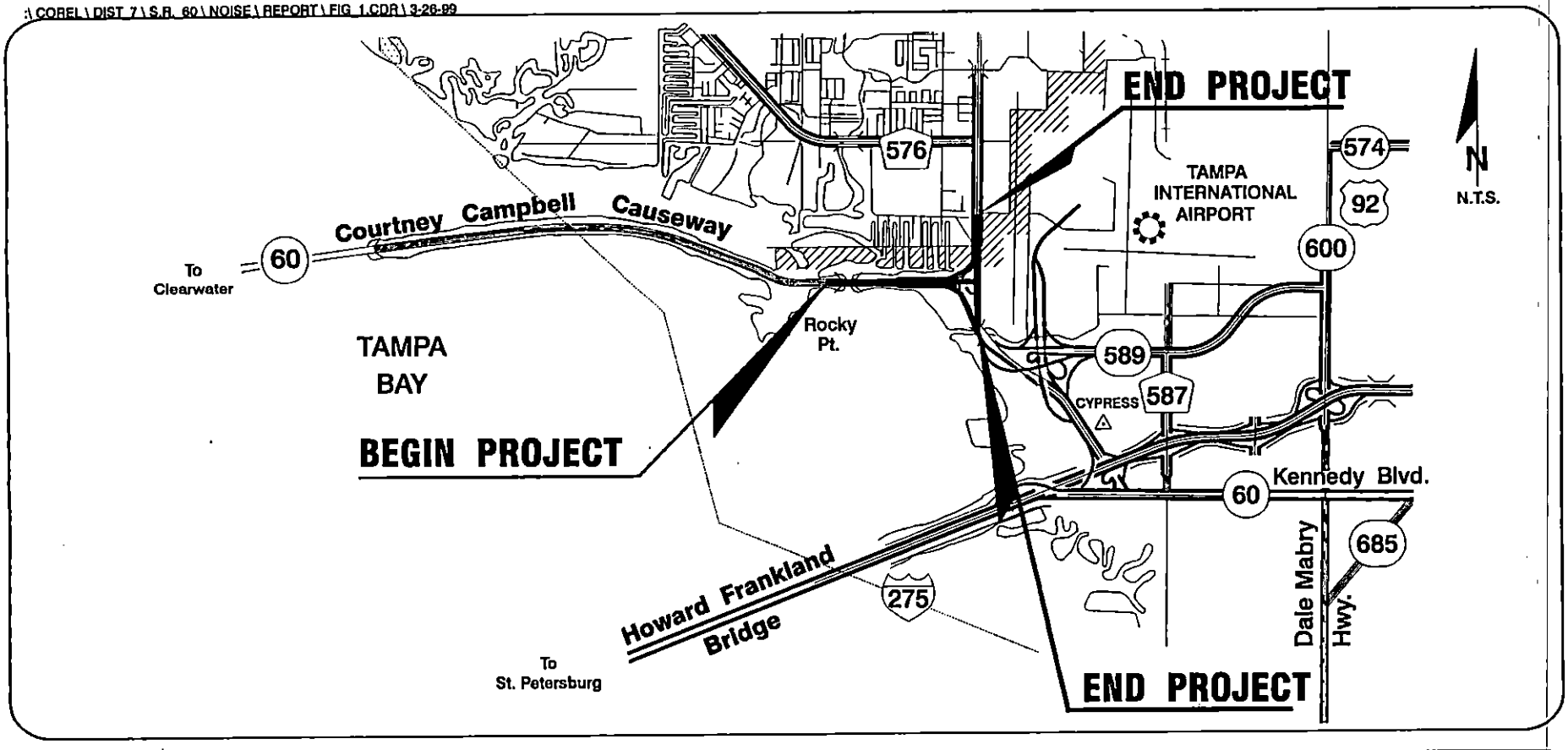
The purpose of this study is to predict and evaluate the noise level changes related to the proposed improvements. Specifically, this study addresses noise level changes and evaluates noise abatement considerations along S.R. 60 from the Courtney Campbell Causeway to Fish Creek. The study was prepared using the methodology established in Title 23 CFR, Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, and the FDOT Project Development and Environment (PD&E) Manual, Part 2, Chapter 17 (October 1998).

1.1 Existing Facility

At present, the Courtney Campbell interchange segment is predominately at grade with one overpass providing free flow movement in the southbound direction. Northbound travel is also free flow; however, travel to and from the Courtney Campbell Causeway is interrupted by two signalized intersections. In addition to the delays imposed by these signals, the interchange includes numerous operational and safety deficiencies. These deficiencies include an undesirable geometric design of the easternmost intersection with Memorial Highway and a causeway section that allows several uncontrolled left turn movements.

The Courtney Campbell Causeway in the vicinity of the interchange is currently a six-lane undivided facility. Within the vicinity of the interchange, commercial development is adjacent to both sides of the Courtney Campbell Causeway. A frontage road provides local

C:\COREL\DIST_7\S.R._60\NOISE\REPORT\FIG_1.CDR\3-26-99



COURTNEY CAMPBELL CAUSEWAY

FLORIDA DEPARTMENT OF TRANSPORTATION

S.R. 60
NOISE STUDY
TECHNICAL MEMORANDUM
Hillsborough County, Florida
PROJECT LOCATION MAP

W.P.I. Segment No. 2556301
S.P.N. 10140-1552
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FIGURE 1

access to businesses on the north side of the causeway. The hotel and office complex on the south side of the causeway are accessed by a service road, which is controlled by one of the traffic signals in the interchange area. The project site is also constrained on the east by Tampa International Airport (TIA). Proposed future runway construction limits the interchange height and affects ramp configuration.

1.2 Proposed Improvements

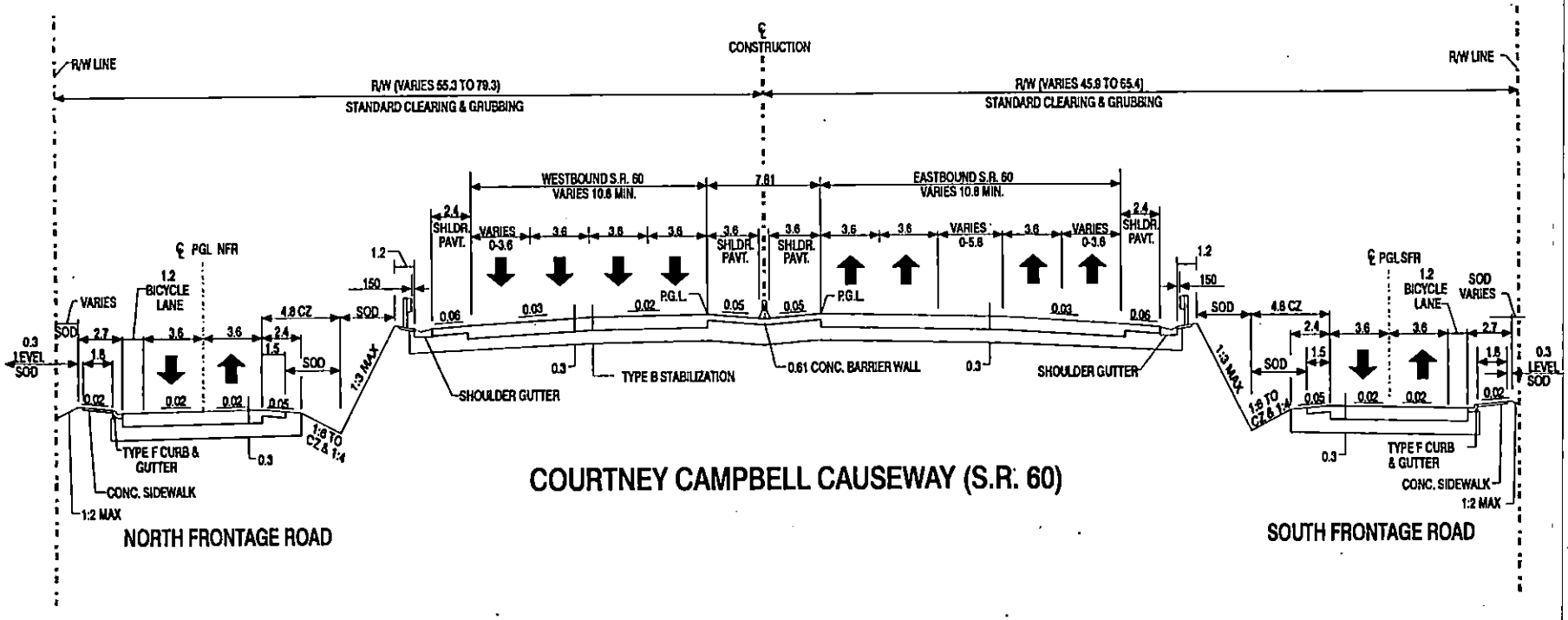
The project will include three eastbound and three westbound through lanes along S.R. 60, two-lane, undivided north and south frontage roads, and ramps to and from Memorial Highway. The proposed typical sections for the improvements with frontage roads are depicted in Figure 2, Courtney Campbell Causeway with Frontage Roads. The superelevated section of the interchange along with the typical section for S.R. 589 (Veterans Expressway) are shown in Figure 3, Mainline Express Lanes and C/D Lanes. Figure 4, Ramp Typical Sections, shows the proposed one-lane ramp (A3), the two-lane ramps (A1, A5 and A6) and the three-lane ramp (A4). The proposed improvement configuration is shown in Figure 5, Proposed Courtney Campbell Causeway Interchange.

The project also involves a northerly shift in alignment. This alignment would maintain the existing right-of-way (ROW) on the south side of the causeway and require complete acquisition of the parcels on the north side of the causeway. Consequently, the residential areas known as Dana Shores and Venetian Shores, which currently receive limited shielding from the traffic noise by the commercial buildings, would be more exposed to the roadway.

2.0 METHODOLOGY

All noise levels generated for this study were produced using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM), Version 1.0. All noise levels, measured and predicted, are expressed in decibels (dB) on the "A"-scale (dBA). This scale most closely approximates the response characteristics of the human ear for low level sound. All noise levels are reported as L_{Aeq1h} values, which theoretically contain the same amount of acoustic energy as the actual time-varying, A-weighted, sound level over a period of one hour.

C:\COREL\DIST_7\S.R._60\NOISE\REPORT\FIG_2.CDR\3-26-99



COURTNEY CAMPBELL CAUSEWAY WITH FRONTAGE ROADS

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Hillsborough County, Florida
TYPICAL SECTIONS

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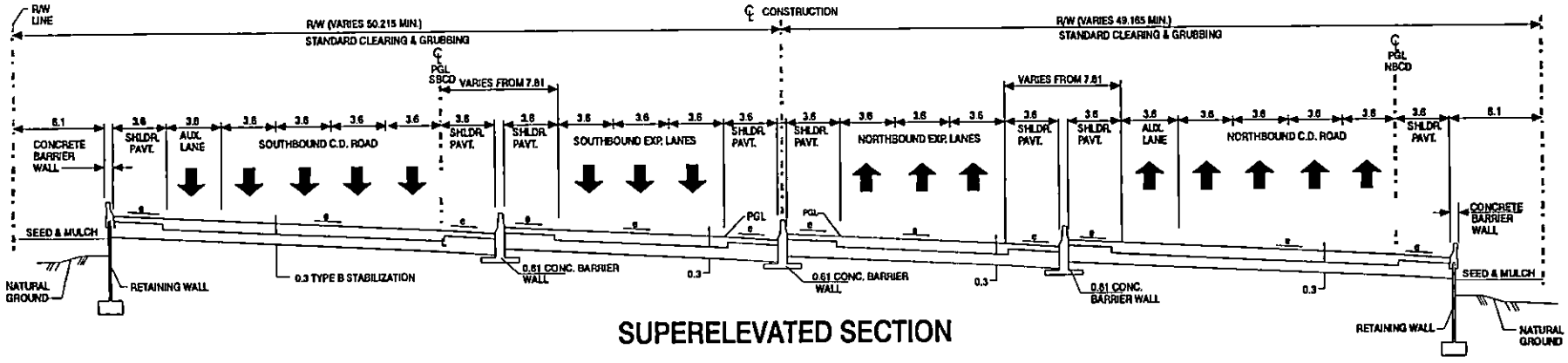
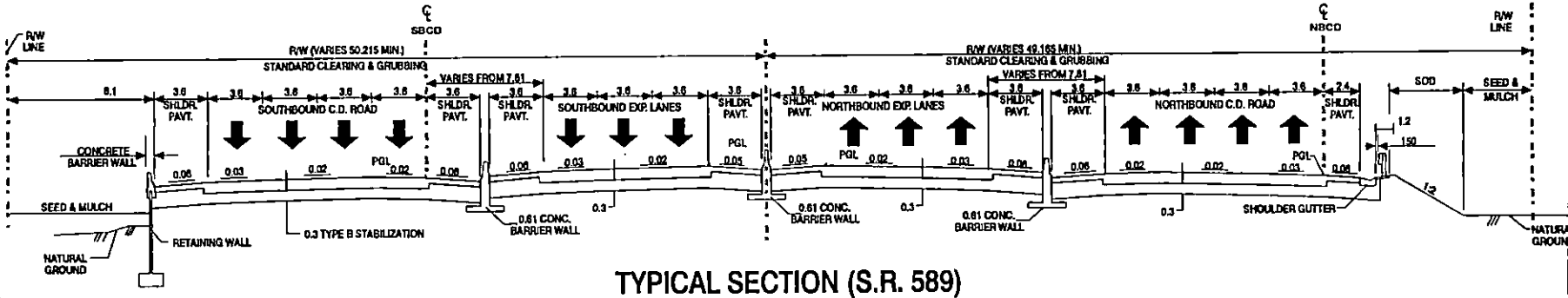
FIGURE 2

:\COREL\DIST_7\S.R._60\NOISE\REPORT\FIG_3.CDR\3-26-99



SUPERELEVATED SECTION



TYPICAL SECTION (S.R. 589)

MAINLINE EXPRESS LANES AND C/D LANES

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Hillsborough County, Florida
TYPICAL SECTIONS

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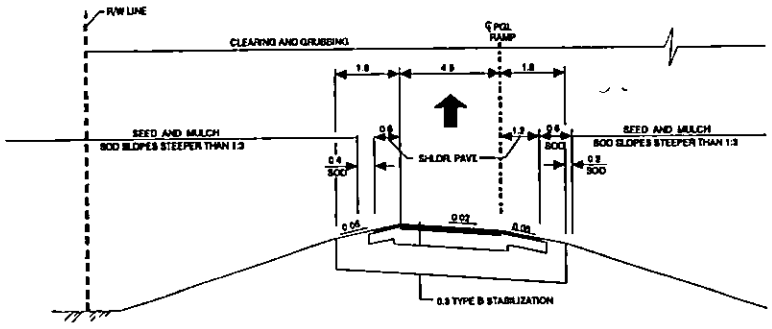
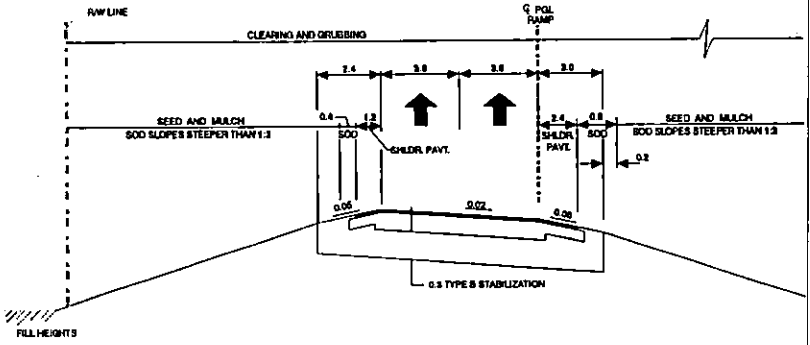
FIGURE 3

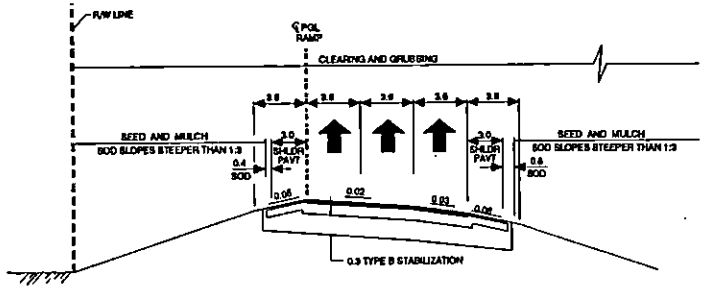
:\COREL\DIST_7\S.R._60\NOISE\REPORT\FIG_4.CDR\3-26-99



ONE-LANE RAMP (RAMP A3)



TWO-LANE RAMP (RAMPS A1, A5 & A6)



THREE-LANE RAMP (RAMP A4)

RAMP TYPICAL SECTIONS

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NOISE STUDY
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Hillsborough County, Florida
TYPICAL SECTIONS

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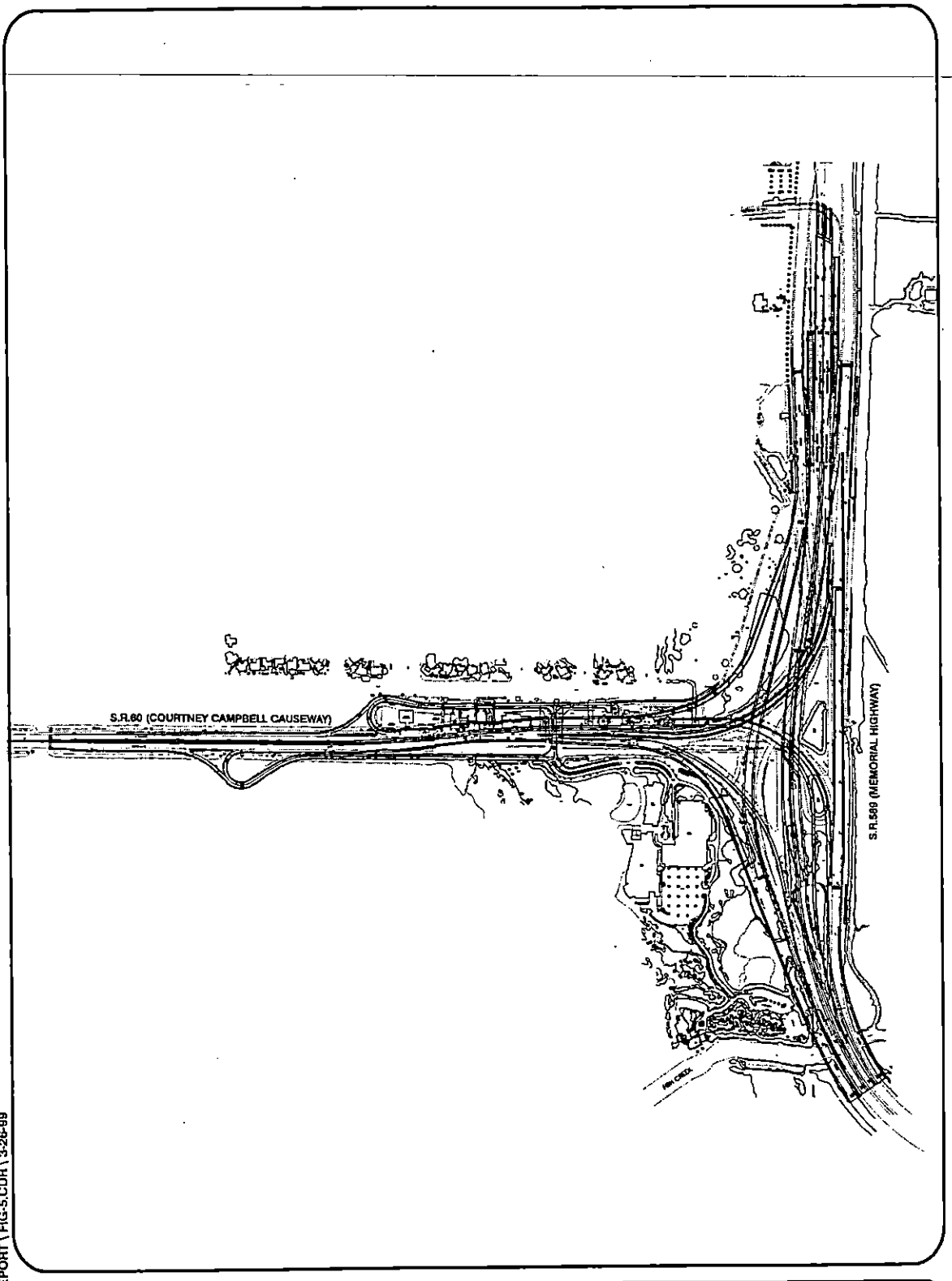
FIGURE 4



COREL \ DIST_7\ S.R. 60 \ NOISE \ REPORT \ FIG-5.CDR \ 3-26-99

PROPOSED COURTNEY CAMPBELL CAUSEWAY INTERCHANGE

FLORIDA DEPARTMENT OF TRANSPORTATION

S.R. 60

NOISE STUDY TECHNICAL MEMORANDUM

Hillsborough County, Florida

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FIGURE 5

The traffic volumes utilized for input into the TNM computer model were obtained from the FDOT, District 7, Planning Department. Speeds were assigned to the modeled roadways based on existing speed limits.

The traffic segments and applicable side roads and ramps are shown in Table 1 with the corresponding volumes and speeds. A peak hour factor (K) of 10.61 percent for Existing and Build Alternative traffic was used to determine hourly traffic volumes from Annual Average Daily Traffic (AADT) figures. A truck factor of 3 percent was divided evenly between medium and heavy trucks (i.e., 1.5 percent each). The directional factor (D) is 58.58 percent. Appendix A contains the Existing and Build Traffic Data provided by FDOT.

Table 1
Traffic Data

Segment	Existing 1998	KM/H (MPH)	Build 2025	KM/H (MPH)
Ramp A1	1425[1]	55 km/h (35 mph)	2175[1]	55 km/h (35 mph)
Ramp A3	N/A	N/A	1698[1]	55 km/h (35 mph)
Ramp A4	2583[1]	55 km/h (35 mph)	1379[2]	55 km/h (35 mph)
Ramp A5	N/A	N/A	1167[1]	55 km/h (35 mph)
Ramp A6	600[1]	55 km/h (35 mph)	825[1]	55 km/h (35 mph)
Courtney Campbell Causeway (Westbound)	3183[1]	80 km/h (50 mph)	4244[1]	80 km/h (50 mph)
Courtney Campbell Causeway (Eastbound)	2251[1]	80 km/h (50 mph)	3001[1]	80 km/h (50 mph)
Northbound C/D-Segment 1	N/A	N/A	3426[2]	80 km/h (50 mph)
Northbound C/D-Segment 2	N/A	N/A	2784[2]	70 km/h (45 mph)
Southbound C/D	N/A	N/A	4200[2]	80 km/h (50 mph)
Northbound Mainline	N/A	N/A	2700[2]	88 km/h (55 mph)

[1] Denotes peak-hour demand volume.
[2] Denotes level of service "C" (LOS C) volume.
Source: Florida Department of Transportation, District 7, December 1998.

3.0 TRAFFIC NOISE ANALYSIS

3.1 Noise Sensitive Receivers

Noise sensitive receivers are any property (owner occupied, rented, or leased) where frequent exterior human use occurs and where a lowered noise level would be of benefit. The FHWA has established noise levels at which noise abatement must be considered. These noise levels are referred to as the Noise Abatement Criteria (NAC). As shown in Table 2, the NAC vary according to the activity category. When future predicted traffic noise levels "approach" or exceed the NAC, the FHWA requires that noise abatement measures be considered. The FDOT considers the term "approach" to mean within 2 dBA of the FHWA criteria.

Table 2
FHWA Noise Abatement Criteria

Activity Category	Leq(h)	Description of Land Use 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, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, Federal Highway Administration, U.S. Department of Transportation, as amended.

The existing land uses in the project area are primarily commercial, consisting of restaurants and hotels. The project would require acquisition of commercial properties to the north of the Courtney Campbell Causeway. Behind the commercial properties, residential properties abut a waterway, which would be adjacent to the proposed roadway. Noise sensitive sites identified along the waterway are part of the Dana Shores and Venetian Shores subdivisions. These noise sensitive sites are in Activity Category B of the NAC.

The southern portion of Skyway Park is also located in the vicinity of the project. The park, located west of the Veterans Expressway and north of the Courtney Campbell Causeway, was surveyed for outdoor use. The portions of the park developed for regular recreational use are located over 500 m (1,640 ft) north of the Courtney Campbell Causeway. Only a bicycle/jogging path exists within the vicinity of the Courtney Campbell Causeway and there were signs of only sporadic activity along the bicycle path (two runners and one bicyclist were observed). Use of the path is infrequent. Additionally, the park is within the 65 dBA day-night noise level (DNL) contour for existing and future aircraft operational conditions at Tampa International Airport (TIA). For these reasons, the portion of Skyway Park in the vicinity of the project was not considered sensitive to traffic noise.

Residences were represented by receiver points. The receivers were located in accordance with the PD&E Manual, Part 2, Chapter 17, (revised 10-9-98) as follows:

1. Unless the area of exterior frequent use was identified elsewhere, residential receptor sites were placed at the edge of the dwelling unit closest to the major traffic noise source or as dictated by professional judgement.

2. Where more than one unit was clustered together, single sites were analyzed as representative of the group.

3. Receptor heights for first floor receivers were always assumed to be 1.5 m (5 feet) above ground and second story receivers at 4.6 m (15 feet) above ground level.

3.2 Measured Noise Levels

Field measurements were taken in accordance with the FHWA Measurement of Highway Related Noise. Field measurements were obtained using a Metrosonics 308-dBA Dosimeter. The dosimeter is calibrated before and after each monitoring period using a Metrosonics Sound Level Calibrator. Both the dosimeter and the calibrator are professionally calibrated by Metrosonics once a year. Speeds were recorded with an MPH, Model K-15, K-band, hand held, radar gun.

To validate the TNM computer model, a field measurement was taken within the project area. Site selection for the field measurement was based on a location where a representative sampling of free-flow traffic could be obtained. Vehicle counts, vehicle classifications, and vehicle speeds were also recorded. The field measurement and the validation results using the TNM computer model are shown in Table 3. The computer model is predicting noise levels at an accepted level of accuracy if the difference between the measured and predicted noise levels are within the FDOT tolerance standard of 3 dBA. As shown in Table 3, the ability of the TNM computer model to accurately predict noise levels for this project segment was not confirmed, as the levels are not within the FDOT tolerance standard.

Table 3
Validation*

Location	Time/ Date		Field Measure		Computer Validation*		Decibel Difference	
3901 West Eden Rock Circle	1/29/99	4:30 P.M.	64.7	dBA	60.5	dBA	4.2	dBA

* Computer output is provided in Appendix B.
Source: PBS&J, Inc., January 1999.

The reason the model did not validate was because of aircraft noise generated by takeoff operations at Tampa International Airport (TIA). Five aircraft departed during the noise monitoring event with maximum noise levels ranging from 67 to 79 dBA (average of 73 dBA). Aircraft noise was noticeable for at least 30 seconds for each aircraft takeoff. Therefore, aircraft were a significant noise source for at least 25 percent of the 10-minute noise monitoring period.

Aircraft noise is expressed as a day-night noise level (DNL). The DNL metric is similar to that used for expressing traffic noise (L_{Aeq1h}) with an averaging time of 24 hours rather than 1 hour. Additionally, the DNL accounts for increased sensitivity to noise during nighttime hours by adding an additional 10 dBA to measured noise levels between the hours of 10 PM and 7 AM. Noise sensitive areas are considered to be affected by aircraft noise when the predicted DNL is 65 dBA or greater. Data provided by the Hillsborough County Aviation

Authority (HCAA) shows the two eastern most residences as being located within the 65 dBA DNL contour for existing conditions. For year 2003, the 65 dBA DNL contour passes close to the eastern most residences, but none of the residences are within the 65 dBA contour.

Based on the noise data provided by HCAA and the noise monitoring performed for validation, aircraft operations are a significant noise source at the Dana Shores and Venetian Shores subdivisions with the amount of noise attributable to aircraft varying widely within a given 1-hour averaging period. Although the model did not validate, it is close to the accepted level of accuracy and should be a good indicator of noise attributable to motor vehicle traffic.

3.3 Predicted Noise Levels

Noise level isopleths associated with the Build Alternative were determined using the TNM computer model and traffic volumes and speed data provided by FDOT. Isopleths, or points of equal noise level, are identified for two specific noise levels. The 65 dBA isopleth distance is included in order to identify those receptors for which noise abatement considerations are warranted. The 67 dBA isopleth distance is included for use by local officials in planning noise compatible future land uses adjacent to the proposed facility.

The isopleth distances are indicated in Table 4. All reported distances are measured from the proposed centerline of the Courtney Campbell Causeway.

Table 4
Distance to Noise Level Isopleths*

Noise Level	End of Versailles Drive	End of Fountainbleu Drive	Southeast Corner of Venetian Shores	Southeast Corner of Nature Trail
65 dBA	154 meters (m) 505 feet (ft)	130 m 427 ft	120 m 394 ft	125 m 410 ft
67 dBA	120 m 394 ft	105 m 344 ft	101 m 331 ft	110 m 361 ft

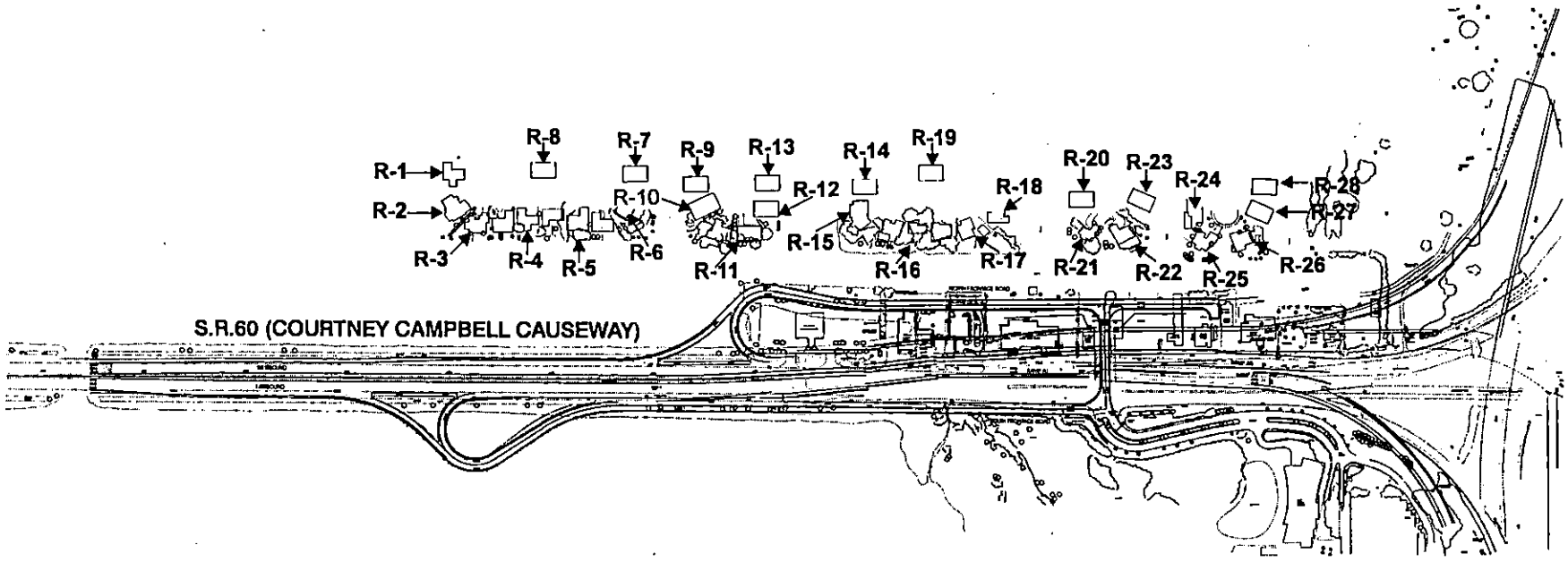
* All distances are measured from the proposed centerline of the Courtney Campbell Causeway.
Source: PBS&J, Inc., January 1999.

3.4 Noise Analysis

Based on the isopleth distance data, a review of land use data, proximity of noise sensitive sites to the Courtney Campbell Causeway and its proposed interchange with S.R. 60, and field verification of noise sensitive site locations, a total of 28 receivers were evaluated for the Build Alternative. All the evaluated receivers are residences. The locations of the receivers are shown in Figure 6. As indicated, the receivers are labeled from 1 to 28 beginning at the western end of the project. Predicted noise levels are summarized in Table 5. All predictions are for exterior uses.

For the Build Alternative, a total of 14 residences are predicted to approach the NAC for the build condition. These residences are located in the first-row of residences abutting the waterway.

:\COREL\DIST_7\S.R._60\NOISE\REPORT\FIG_6.CDR\3-26-99



R-# Receiver Number

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S.R. 60

NOISE STUDY
TECHNICAL MEMORANDUM
Hillsborough County, Florida

RECEIVER LOCATIONS

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FIGURE 6

Table 5
Existing and Future Noise Levels

Receiver ID	Traffic Segment	Location	Dwelling Units Represented	1999 Existing	2025 Build	Difference[1] dBA
1	CCC[2]	3902 Versailles Drive	1	58.6	59.9	1.3
2	CCC	3901 Versailles Drive	1	61.4	63.9	2.5
3	CCC	3903 Versailles Drive	2	64.6	66.0	1.4
4	CCC	3907 Versailles Drive	2	64.6	66.0	1.4
5	CCC	3911 Versailles Drive	2	64.6	65.8	1.2
6	CCC	3915 Versailles Drive	1	62.0	64.3	2.3
7	CCC	3917 Versailles Drive	1	58.5	60.7	2.2
8	CCC	3908 Versailles Drive	5	55.8	57.7	1.9
9	CCC	3908 Fontainebleau Drive	1	58.1	60.8	2.7
10	CCC	3906 Fontainebleau Drive	1	60.7	62.7	2.0
11	CCC	3904 Fontainebleau Drive	2	63.4	64.8	1.4
12	CCC	3905 Fontainebleau Drive	1	60.8	63.4	2.6
13	CCC	3907 Fontainebleau Drive	1	57.5	61.5	4.0
14	CCC	3908 West Eden Rock Circle	1	57.4	60.9	3.5
15	CCC	3906 West Eden Rock Circle	1	61.5	64.3	2.8
16	CCC	3902 West Eden Rock Circle	4	60.5	65.8	5.3
17	CCC	3905 East Eden Rock Circle	1	60.2	63.9	3.7
18	CCC	3909 East Eden Rock Circle	1	56.5	62.4	5.9
19	CCC	3908 East Eden Rock Circle	2	55.0	60.0	5.0
20	CCC	3904 Venetian Way	1	59.0	64.5	5.5
21	CCC	3902 Venetian Way	1	59.9	66.6	6.7
22	CCC	3901 Venetian Way	1	60.2	66.7	6.5
23	CCC	3903 Venetian Way	1	57.0	63.1	6.1
24	CCC	3904 Doral Street	1	58.3	62.7	4.4
25	CCC	3902 Doral Drive	1	59.7	66.6	6.9
26	CCC	3901 Doral Street	1	59.2	66.1	6.9
27	CCC	3903 Doral Street	1	57.4	63.5	6.1
28	CCC	3905 Doral Street	1	57.3	63.4	6.1

[1] Difference between Build and Existing.
[2] CCC stands for Courtney Campbell Causeway
Source: PBS&J, Inc., January 1999.

In addition to approaching or exceeding the NAC, sensitive sites are considered affected if the Build Alternative is predicted to cause a substantial increase in the noise level. The FDOT defines the term "substantial increase" as 15 or more dBA above the existing noise

level as a direct result of the transportation improvement project. Comparing the existing to the build condition, the range of increase for the predicted noise levels is from 1.2 to 6.9 dBA. The largest increases occur in the eastern portions of the project where the Courtney Campbell Causeway alignment is shifted to the north. The TNM computer model output tables for Predicted Existing and Predicted Build Noise Levels are provided in Appendix C and Appendix D, respectively.

3.5 Noise Abatement Techniques

As stipulated by 23 CFR Part 772, the FHWA requires that noise abatement measures be evaluated if noise levels at sensitive sites approach or exceed the NAC. Therefore, abatement was evaluated for the 14 first-row residences affected by traffic noise. Abatement measures considered include traffic system management, alignment modifications, property acquisition, land use controls and noise barriers.

3.5.1 Traffic System Management Measures

Traffic system management measures which limit motor vehicle speeds and reduce traffic volumes can be used as mitigation measures. However, these measures also negate the purpose of providing a facility that can accommodate forecasted traffic volumes. For example, a substantial speed reduction on S.R. 60 would lower traffic noise levels; however, the capacity of the roadway to handle traffic would also be reduced. As one of the few routes in the area traversing Tampa Bay and connecting Hillsborough and Pinellas Counties, reducing traffic volumes or prohibiting truck traffic is not a viable mitigation measure. Therefore, traffic system management is not considered a feasible abatement measure.

3.5.2 Alignment Modifications

Alignment modification generally involves orientating and/or siting the roadway at sufficient distances from noise sensitive areas so as to minimize traffic noise. Since the existing roadway is built on a man-made causeway with water on both sides, alignment alternatives are limited to those that use the existing causeway and provide for a connection using the

existing interchange ROW. There is not sufficient room to shift the alignment in order to abate traffic noise.

3.5.3 Property Acquisition

Property acquisition programs to provide noise buffer zones or space for noise barrier construction are not feasible due to the limited availability of vacant land along the man-made causeway or near the noise sensitive sites.

3.5.4 Land Use Controls

Another noise abatement measure is the use of proper land use controls to minimize noise sensitive sites that may be affected by traffic noise. This area is currently fully developed and is expected to remain as residential use; therefore, land use controls are not feasible.

3.5.5 Noise Barriers

Noise barriers reduce noise levels by blocking the sound path between a roadway and noise sensitive sites. To be effective in reducing traffic noise, a noise barrier must be relatively long, continuous (with no intermittent openings) and sufficiently high enough to provide the necessary reduction in noise levels. Barriers are most often used on high speed, limited access facilities where noise levels are high and there is adequate space for continuously long and sufficiently high barriers.

In order for a barrier to be considered feasible and economically reasonable it must meet the following minimum conditions:

1. Provide a minimum insertion loss (I. L.) (noise reduction) of at least 5 dBA with a design goal of 8 to 12 dBA being desirable.

2. Cost must not exceed $30,000 per benefited receiver unless a higher level of expenditure can be justified by other circumstances.

However, other important factors such as community desires, adjacent land uses, safety and barrier constructability and maintenance also play important roles. These criteria are evaluated more closely during the engineering design phase of the project.

3.6 Noise Barrier Analysis

In order to analyze the effectiveness of noise barriers, the TNM computer program was utilized. The following discusses the feasibility and reasonableness of providing noise barriers at the affected noise sensitive sites and describes the modeling results where applicable.

A thorough examination was conducted to determine the placement of barrier walls. Engineering and safety criteria were considered. Because many portions of the proposed improvements are elevated, noise barriers were located along the shoulder of the proposed roadway.

In order to provide abatement to all of the front-row residences within the project limits, two noise walls would be required. The first noise wall would begin along the off-ramp from southbound Veterans Expressway to westbound Courtney Campbell Causeway and terminate along the off-ramp from westbound Courtney Campbell Causeway to the proposed northern frontage road. The second noise wall would begin along the northern frontage road and continue west along the Courtney Campbell Causeway (see Appendix E for Modeled Noise Barrier Locations and Results). The location of the western end of the second barrier would be influenced by the barrier height; however, the noise barrier length was always restricted to the project limits (i.e., the western end of the second barrier did not cross the bridge structure at the western project limit).

A summary of the noise barrier evaluation is provided in Table 6. As shown, wall heights from 2.74 m (9 ft) to 3.66 m (12 ft) meet the minimum insertion loss of 5 dBA for most of the first row residences and are below the cost reasonable criteria of $30,000 per benefited residence. However, recent constructability and safety issues regarding the height of noise

barriers on retaining walls have been raised. A noise barrier limited in length to just the project limits and limited to a height of 2.44 m (8 ft) is predicted to provide at least a 5 dBA reduction to only 17 first row residences. Limiting the noise barrier height to 2.44 m (8 ft) also resulted in a cost that exceeds the criteria for cost reasonableness. Noise barrier height limitations will need to be fully addressed during the final design reevaluation. Table 7 presents the evaluation of the 21 Traffic Noise Abatement Considerations to be utilized in assessing the feasibility and reasonableness of providing a noise wall at this location.

Table 6
Noise Barrier Analysis

Wall Height	#/Rec 5 dBA	#/Rec 6 dBA	#/Rec 7 dBA	#/Rec 8 dBA	Wall Length	Total Cost*	Total Benefited Rec	Cost per Residence**
2.44 m (8 ft)	9	8	0	0	1036 m (3399 ft)	$544,200	17	$32,012
2.74 m (9 ft)	14	6	2	0	1052 m (3451 ft)	$623,800	22	$28,355
3.05 m (10 ft)	11	6	6	0	977 m (3205 ft)	$641,900	23	$27,909
3.36 m (11 ft)	13	5	6	1	947 m (3107 ft)	$685,400	25	$27,416
3.66 m (12 ft)	13	5	2	5	902 m (2959 ft)	$711,000	25	$28,440

* Cost is calculated based on $215.28 per square meter ($20.00 sq. ft.)
**Residences counted in cost analysis are those receiving at least 5 dBA I.L.
Source: PBS&J, Inc., July 2000.

Table 7
Traffic Noise Abatement Considerations
For a Noise Wall at the Dana Shores and Venetian Shores Subdivisions

EVALUATION CRITERIA	EXPLANATION
1. Relationship of future levels to the abatement	Receivers approach the NAC.
2. Insertion Loss	At least 22 receivers would achieve a minimum of 5 dBA I.L.
3. Safety	Sight distance and clear recovery were considered.
4. Community desires	No documented comments to date. Public coordination is on-going.
5. Accessibility	The wall does not affect accessibility.
6. Land use stability	Land use in the area is expected to remain stable.
7. Local controls	Hillsborough County has an ordinance limiting residential fences to 6 feet high. However, the ordinance is not applicable to noise barriers on FDOT ROW.
8. Views of local officials with jurisdiction	The finalized Noise Study will be distributed to local agencies upon approval.
9. Relative noise level increases resulting from project	The Build Alternative is expected to increase noise levels from 1.2 to 6.9 dBA above existing conditions.
10. The difference in noise levels between build and no-build alternatives	No-Build traffic volumes were not available. Based on a comparison of existing, build and LOS C volumes, levels for the No-Build Alternative would be nearly the same as existing noise levels.
11. Antiquity	The area has been used as residential for at least 25 years.
12. Constructability	Noise barrier height limitations will need to be fully addressed during the final design reevaluation.
13. Maintainability	The wall was placed within the proposed ROW at the roadway shoulder.
14. Aesthetics	Careful consideration should be given to the nature of the surrounding area and the function of the roadway to determine the aesthetic compatibility of the noise walls.
15. ROW needs including access rights, easements for construction and/or maintenance, and additional land	No additional ROW should be required.
16. Cost	Meets cost criteria.
17. Utilities	The current design does not show any conflict between the noise wall location and utilities.
18. Drainage	The current design shows a guardrail in the location of the noise wall. Some modifications to the drainage would be needed to accommodate a noise wall.
19. Special land use considerations	None
20. Other environmental considerations	None
21. Additional considerations	None

Source: PBS&J, Inc., January 1999.

3.7 Conclusions

The noise barriers can provide at least a 5 dBA insertion loss to about 17 to 25 residences. Depending on the wall height, noise barriers can provide at least a 5 dBA insertion loss to about 17 to 25 residences located in the Dana Shores and Venetian Shores subdivisions. For noise barriers from 2.74 to 3.66 m (9 to 12 ft) high, this includes the 14 residences predicted to approach the NAC of 67 dBA. Additionally, noise barriers from 2.74 to 3.66 m (9 to 12 ft) are below the cost reasonable criteria of $30,000 per benefited residence.

However, constructability and safety issues regarding the height limitation of noise barriers on retaining walls must be addressed. If the height of the noise barrier is limited to 2.44 m (8 ft), some residences will achieve a 5 dBA insertion loss. However, the cost per benefited residence will exceed the cost reasonable criteria.

The FDOT is committed to construct feasible noise abatement measures at the affected locations identified in Table 5 contingent upon the following conditions:

- Detailed noise analysis performed for any substantial revision to the current design supports the need for abatement;
- Reasonable cost analyses indicates that the economic cost of the barriers will not exceed the guidelines at the time of construction;
- Community input regarding desires, types, heights, and locations of barriers has been solicited by the District Office;
- Preferences regarding compatibility with adjacent land uses, particularly as addressed by officials having jurisdiction over such land uses, has been noted;
- Safety and engineering aspects, as related to the roadway user and the adjacent property owners, have been reviewed; and
- Any other mitigating circumstances found in Section 17-4.6.1 of the PD&E Manual have been analyzed.

4.0 CONSTRUCTION NOISE

During the construction phase of the proposed project, short-term noise may occur as a result of both stationary and mobile construction equipment. The construction noise will be temporary at any one location.

Construction noise will be controlled by adherence to the controls listed in the most recent edition of the FDOT Standard Specifications for Road and Bridge Construction (1999).

Specific noise problems that may arise during construction of the project will be addressed by the Construction Engineer in cooperation with the appropriate FDOT District Environmental Specialist.

5.0 PUBLIC INVOLVEMENT

An ongoing public involvement process is being carried out during the design phase of this project. During future public involvement, FDOT will provide details and solicit comments from the public regarding the results of the noise study. The results of the public involvement phase will be included in the reevaluation carried out for the construction authorization.

Coordination with local agencies and officials is also ongoing. Once finalized, a copy of this report will be provided to appropriate local planning authorities.

6.0 REFERENCES

1. Title 23 CFR, Part 772, Federal Highway Administration, U.S. Department of Transportation, Procedures for Abatement of Highway Traffic Noise and Construction Noise, April 1, 1998 Edition.

2. Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, 1999.

3. FHWA Measurement of Highway-Related Noise, May 1996.

4. Florida Department of Transportation, Florida Project Development and Environment Manual, Volumes 1 and 2.

APPENDICES

Appendix A **Existing and Build Traffic Data**
Appendix B **Validation**
Appendix C **Predicted Existing Noise Levels**
Appendix D **Predicted Build Noise Levels**
Appendix E **Modeled Noise Barrier Locations and Results**

Appendix A
Existing and Build Traffic Data

MEMORANDUM

Department of Transportation
District Seven Planning MS 7-340

DATE: February 28, 1997

TO: Irwin Prescott, Project Management

FROM: Fawzi Bitar, Systems Planning Coordinator FB

COPIES: K. Coughlin, File

SUBJECT: **W.P.I. # : 7113871**
State Proj. # : 10140-1552
State Road : Courtney Campbell Cswy /Memorial Interchange
County : Hillsborough

Per Mr. Coughlin's request dated December 31, 1996, enclosed are:

1) A location map.
2) A table showing: a) Location Numbers.
   b) Location Description.
   c) Number of Lanes.
   e) The 2005, 2015, and 2025 projected traffic.
   d) Truck Percent.
3) The 18 KIP Equivalent Single Axle Load Accumulation.
4) K = 10.61 % D = 58.58 %

The 2025 traffic forecast was developed after reviewing:

A) The Historical count trend analyses.
B) The Tampa Bay Regional Transportation Analyses Model output.

I have followed The Design Traffic Procedure adopted by FDOT.

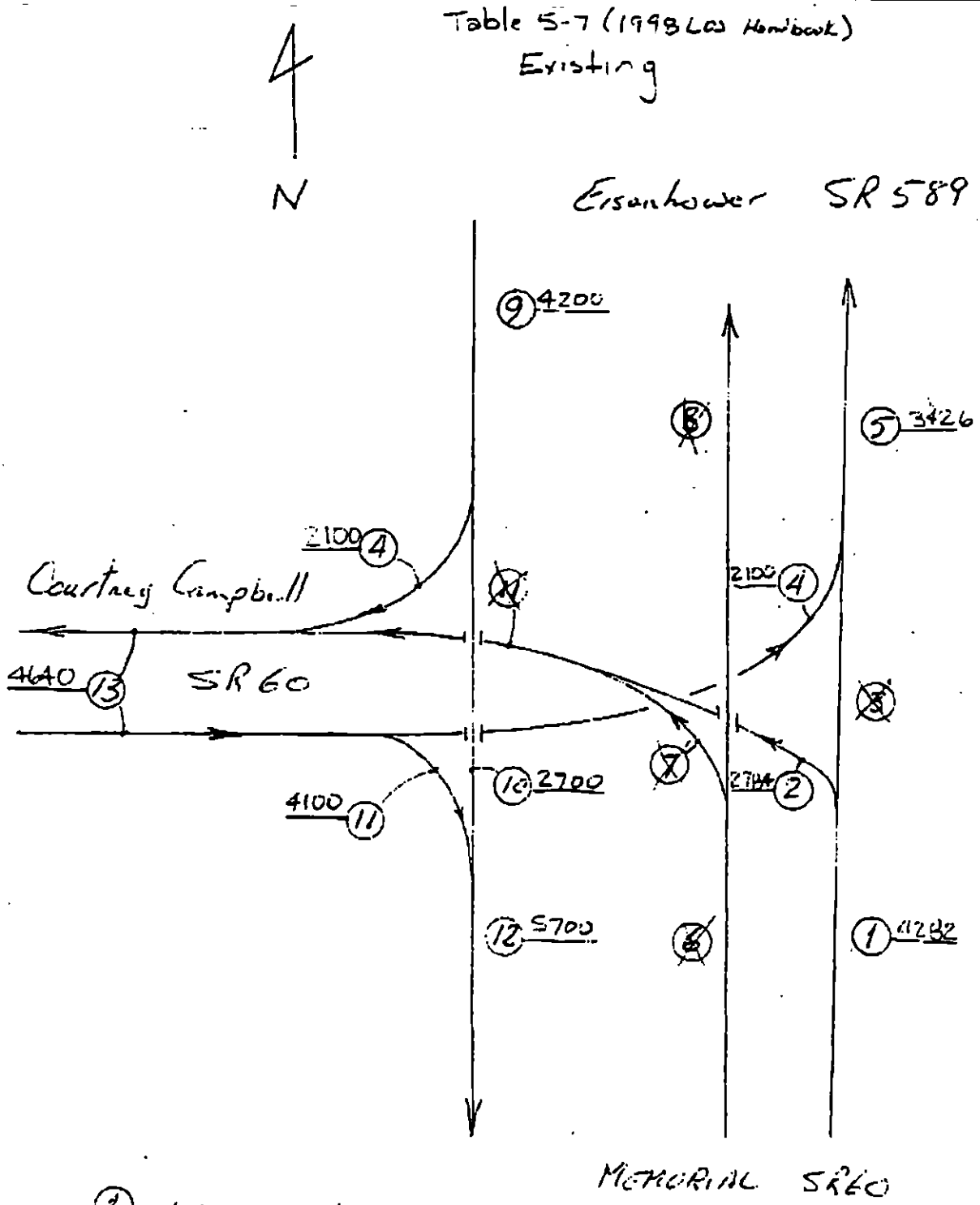
/FKB
Enclosure

LOS C (vph)

From General & Tables

Table 5-7 (1998 LOS Handbook)

Existing



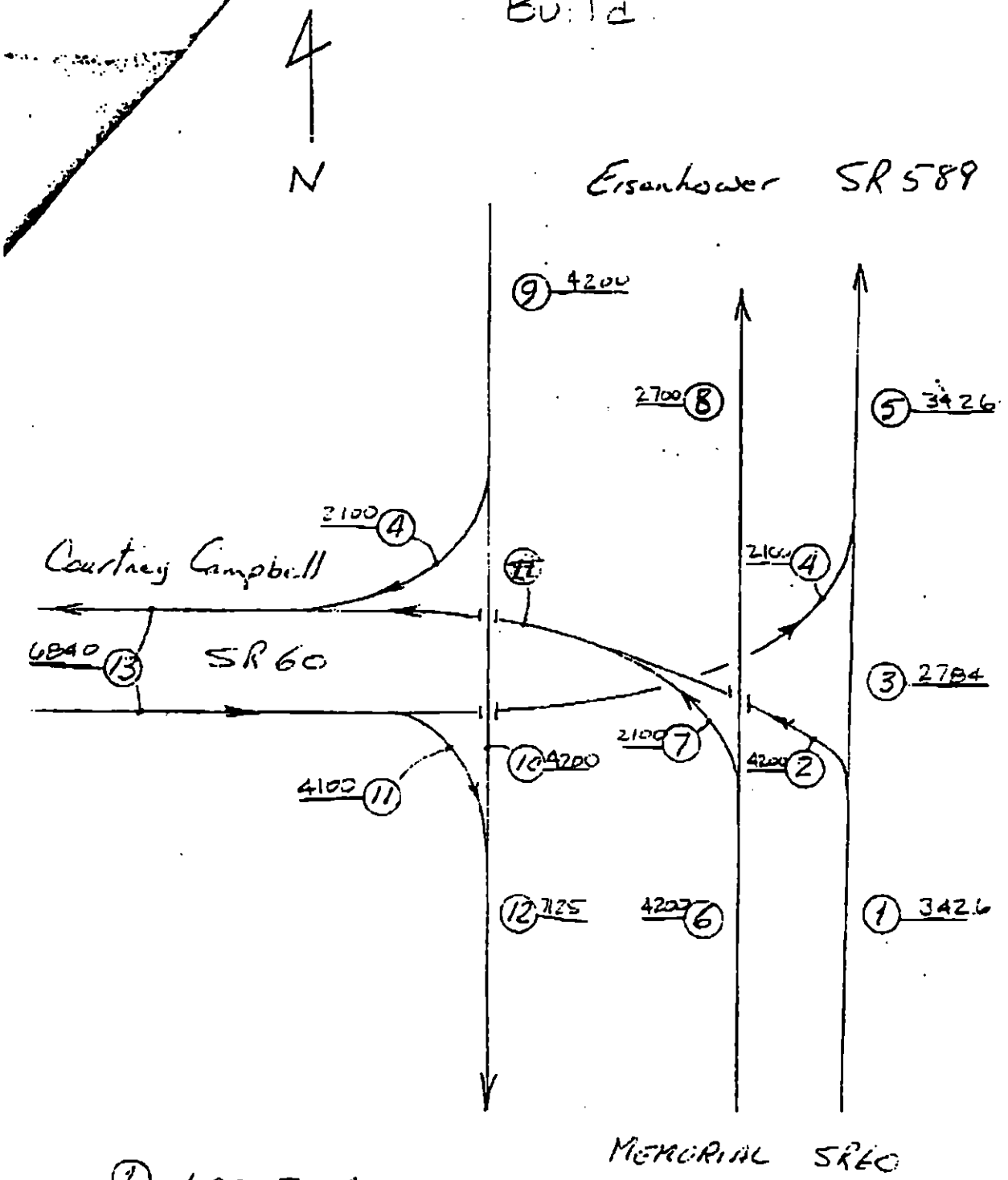
(1) LOCATION

2/28/97

LOS C (vph)

From Generalized Tables
Table 5 of (1998 LOS Handbook)

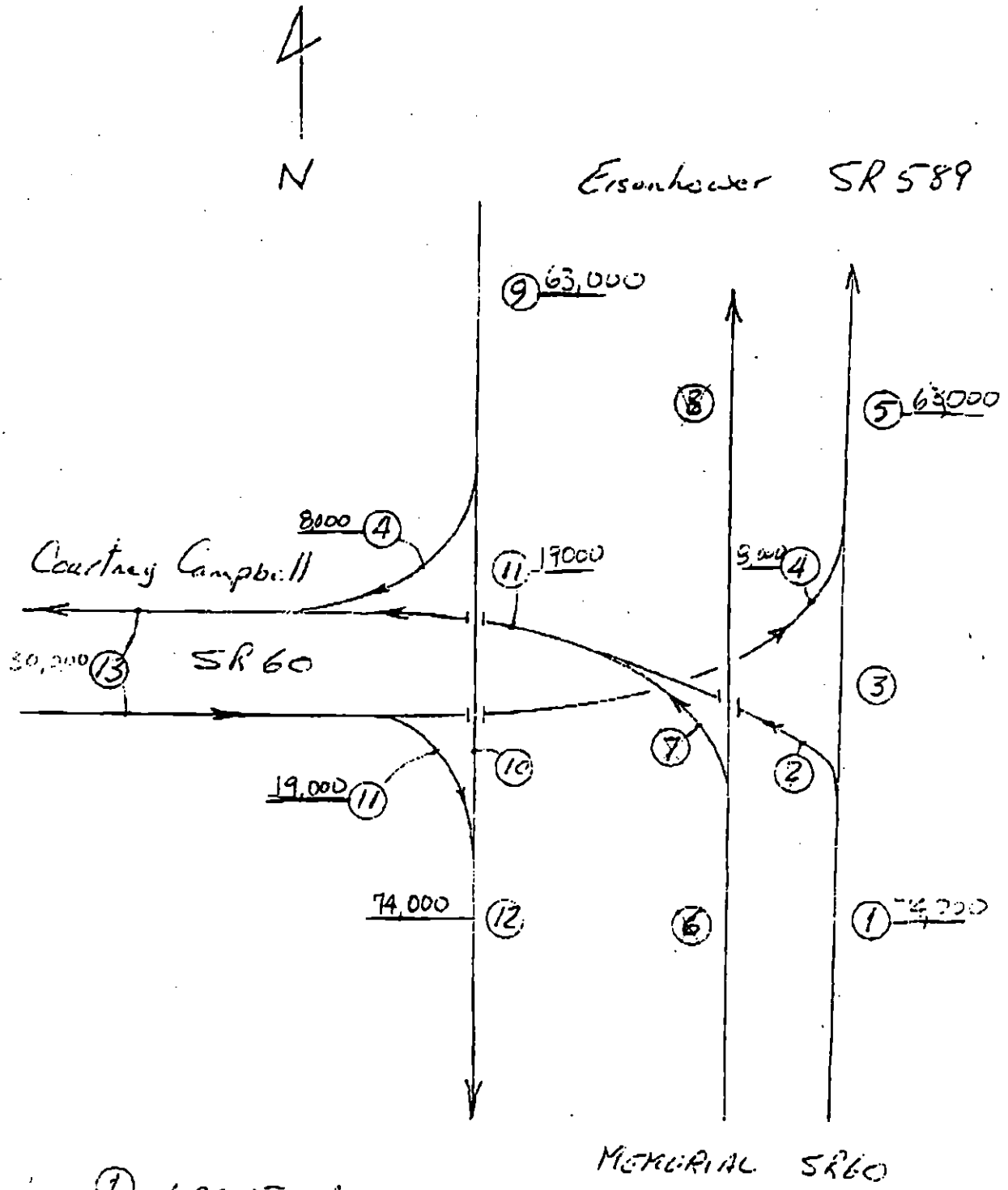
Build



(1) LOCATION

2/28/97

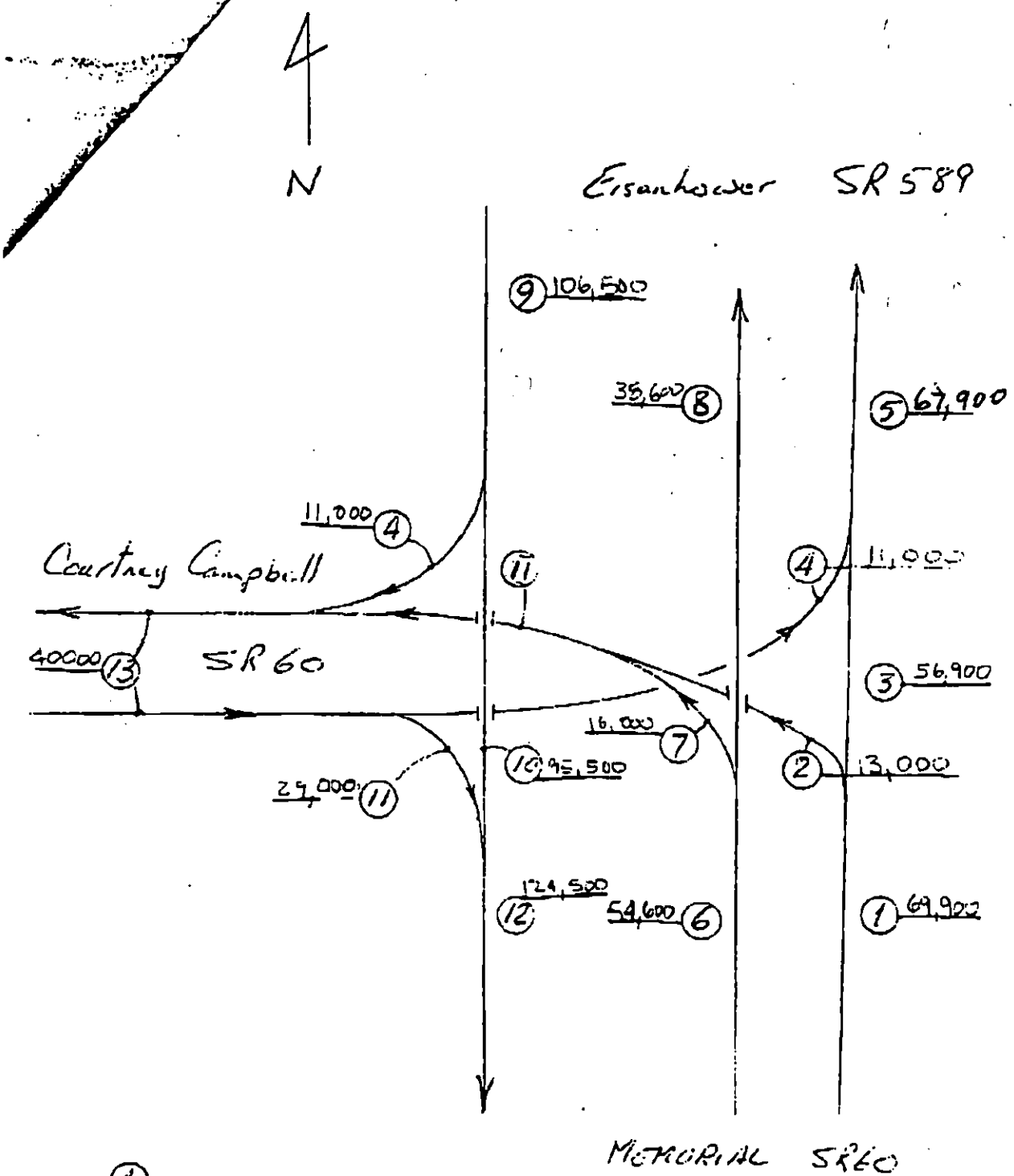
Existing AADT



(1) LOCATION

2/26/97

2025 AADT



(1) LOCATION

2/26/97

Appendix B
Validation

PBS&J

Doebler/Fentriss 52721

04-Feb-99
TNM 1.0

Results: Sound Levels
Project/Contract: 60458.01/FDOT 7
Run: Validation
Barrier Design: Input Heights

Atmospherics: deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver			No Barrier					With Barrier			
			LAeq1h		Increase over Existing			Noise Reduction			
Name	Dwelling Units	Existing LAeq1h	Calculated	Criterion	Calculated	Substantial Increase	Type Impact	Calculated LAeq1h	Calculated	Goal	Calculated Minus Goal
		dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
3901 E EDEN ROCK CIRCLE	1	0.0	60.5	65.0	60.5	15	—	60.5	0.00	5	-5.00

Appendix C
Predicted Existing Noise Levels

PBSJ

25-Mar-99
TNM 1.0

Doebler/Fentriss 52721

Results: Sound Levels
Project/Contract: 60458.01/FDOT 7
Run: 1999 Existing Scenario
Barrier Design: Input Heights

Atmospherics: deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver			No Barrier					With Barrier			
			LAeq1h		Increase over Existing			Noise Reduction			
Name	Dwelling Units	Existing LAeq1h	Calculated	Criterion	Calculated	Substantial Increase	Type Impact	Calculated LAeq1h	Calculated	Goal	Calculated Minus Goal
		dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver 1	1	0.0	58.6	65.0	58.6	10	—	58.6	0.00	8	-8.00
Receiver 2	1	0.0	61.4	65.0	61.4	10	—	61.4	0.00	8	-8.00
Receiver 3	2	0.0	64.6	65.0	64.6	10	—	64.6	0.00	8	-8.00
Receiver 4	2	0.0	64.6	65.0	64.6	10	—	64.6	0.00	8	-8.00
Receiver 5	2	0.0	64.6	65.0	64.6	10	—	64.6	0.00	8	-8.00
Receiver 6	1	0.0	62.0	65.0	62.0	10	—	62.0	0.00	8	-8.00
Receiver 7	1	0.0	58.5	65.0	58.5	10	—	58.5	0.00	8	-8.00
Receiver 8	5	0.0	55.8	65.0	55.8	10	—	55.8	0.00	8	-8.00
Receiver 9	1	0.0	58.1	65.0	58.1	10	—	58.1	0.00	8	-8.00
Receiver 10	1	0.0	60.7	65.0	60.7	10	—	60.7	0.00	8	-8.00
Receiver 11	2	0.0	63.4	65.0	63.4	10	—	63.4	0.00	8	-8.00
Receiver 12	1	0.0	60.8	65.0	60.8	10	—	60.8	0.00	8	-8.00
Receiver 13	1	0.0	57.5	65.0	57.5	10	—	57.5	0.00	8	-8.00
Receiver 14	1	0.0	57.4	65.0	57.4	10	—	57.4	0.00	8	-8.00
Receiver 15	1	0.0	61.5	65.0	61.5	10	—	61.5	0.00	8	-8.00
Receiver 16	4	0.0	60.5	65.0	60.5	10	—	60.5	0.00	8	-8.00
Receiver 17	1	0.0	60.2	65.0	60.2	10	—	60.2	0.00	8	-8.00
Receiver 18	1	0.0	56.5	65.0	56.5	10	—	56.5	0.00	8	-8.00
Receiver 19	2	0.0	55.0	65.0	55.0	10	—	55.0	0.00	8	-8.00
Receiver 20	1	0.0	59.0	65.0	59.0	10	—	59.0	0.00	8	-8.00
Receiver 21	1	0.0	59.9	65.0	59.9	10	—	59.9	0.00	8	-8.00
Receiver 22	1	0.0	60.2	65.0	60.2	10	—	60.2	0.00	8	-8.00
Receiver 23	1	0.0	57.0	65.0	57.0	10	—	57.0	0.00	8	-8.00
Receiver 24	1	0.0	58.3	65.0	58.3	10	—	58.3	0.00	8	-8.00
Receiver 25	1	0.0	59.7	65.0	59.7	10	—	59.7	0.00	8	-8.00
Receiver 26	1	0.0	59.2	65.0	59.2	10	—	59.2	0.00	8	-8.00
Receiver 27	1	0.0	57.4	65.0	57.4	10	—	57.4	0.00	8	-8.00
Receiver 28	1	0.0	57.3	65.0	57.3	10	—	57.3	0.00	8	-8.00

Appendix D
Predicted Build Noise Levels

PBSJ

30-Mar-99
TNM 1.0

Doebler/Fentriss 52721

Results: Sound Levels
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Input Heights

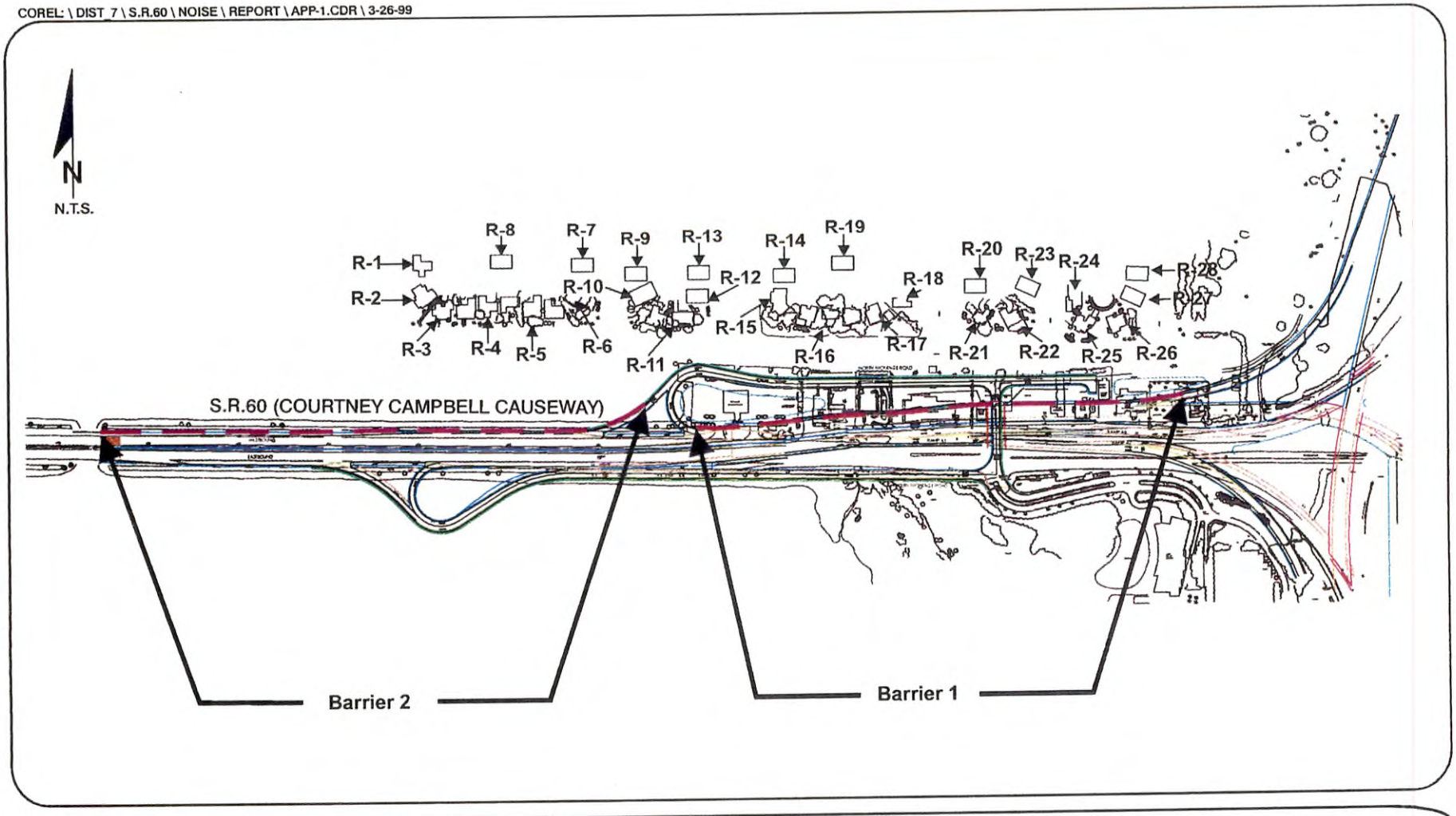
Atmospherics: deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver			No Barrier					With Barrier			
			LAeq1h		Increase over Existing			Noise Reduction			
Name	Dwelling Units	Existing LAeq1h	Calculated	Criterion	Calculated	Substantial Increase	Type Impact	Calculated LAeq1h	Calculated	Goal	Calculated Minus Goal
		dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver 1	1	58.6	59.9	65.0	1.3	15	----	59.9	0.00	5	-5.00
Receiver 2	1	61.4	63.9	65.0	2.5	15	----	63.9	0.00	5	-5.00
Receiver 3	2	64.6	66.0	65.0	1.4	15	Snd Lvl	66.0	0.00	5	-5.00
Receiver 4	2	64.6	66.0	65.0	1.4	15	Snd Lvl	66.0	0.00	5	-5.00
Receiver 5	2	64.6	65.8	65.0	1.2	15	Snd Lvl	65.8	0.00	5	-5.00
Receiver 6	1	62.0	64.3	65.0	2.3	15	----	64.3	0.00	5	-5.00
Receiver 7	1	58.5	60.7	65.0	2.2	15	----	60.7	0.00	5	-5.00
Receiver 8	5	55.8	57.7	65.0	1.9	15	----	57.7	0.00	5	-5.00
Receiver 9	1	58.1	60.8	65.0	2.7	15	----	60.8	0.00	5	-5.00
Receiver 10	1	60.7	62.7	65.0	2.0	15	----	62.7	0.00	5	-5.00
Receiver 11	2	63.4	64.8	65.0	1.4	15	----	64.8	0.00	5	-5.00
Receiver 12	1	60.8	63.4	65.0	2.6	15	----	63.4	0.00	5	-5.00
Receiver 13	1	57.5	61.5	65.0	4.0	15	----	61.5	0.00	5	-5.00
Receiver 14	1	57.4	60.9	65.0	3.5	15	----	60.9	0.00	5	-5.00
Receiver 15	1	61.5	64.3	65.0	3.0	15	----	64.3	0.00	5	-5.00
Receiver 16	4	60.5	65.8	65.0	5.3	15	Snd Lvl	65.8	0.00	5	-5.00
Receiver 17	1	60.2	63.9	65.0	3.7	15	----	63.9	0.00	5	-5.00
Receiver 18	1	56.5	62.4	65.0	5.9	15	----	62.4	0.00	5	-5.00
Receiver 19	2	55.0	60.0	65.0	5.0	15	----	60.0	0.00	5	-5.00
Receiver 20	1	59.0	64.5	65.0	5.5	15	----	64.5	0.00	5	-5.00
Receiver 21	1	59.9	66.6	65.0	6.7	15	Snd Lvl	66.6	0.00	5	-5.00
Receiver 22	1	60.2	66.7	65.0	6.5	15	Snd Lvl	66.7	0.00	5	-5.00
Receiver 23	1	57.0	63.1	65.0	6.1	15	----	63.1	0.00	5	-5.00
Receiver 24	1	58.3	62.7	65.0	4.4	15	----	62.7	0.00	5	-5.00
Receiver 25	1	59.7	66.6	65.0	6.9	15	Snd Lvl	66.6	0.00	5	-5.00
Receiver 26	1	59.2	66.1	65.0	6.9	15	Snd Lvl	66.1	0.00	5	-5.00
Receiver 27	1	57.4	63.5	65.0	6.1	15	----	63.5	0.00	5	-5.00
Receiver 28	1	57.3	63.4	65.0	6.1	15	----	63.4	0.00	5	-5.00

Appendix E
Modeled Noise Barrier Locations and Results

COREL: \ DIST_7 \ S.R.60 \ NOISE \ REPORT \ APP-1.CDR \ 3-26-99



RECEIVER AND BARRIER LOCATIONS

— — — **Barrier Location (11-foot high barrier)**

R-# **Receiver Number**

PBS&J
DOEBLER/FENTRISS 52721

3 August 2000
TNM 1.0a

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60458.01/FDOT 7
RUN: 2025 BUILD SCENARIO
BARRIER DESIGN: 8ft adjusted barrier
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	58.6	59.9	65	1.3	15	----	58.3	1.6	5	-3.4
Receiver2	2	1	61.4	63.9	65	2.5	15	----	61.4	2.5	5	-2.5
Receiver3	3	2	64.6	66.0	65	1.4	15	Snd Lvl	61.9	4.1	5	-0.9
Receiver4	4	2	64.6	66.0	65	1.4	15	Snd Lvl	61.5	4.5	5	-0.5
Receiver5	5	2	64.6	65.9	65	1.3	15	Snd Lvl	60.9	5.0	5	0.0
Receiver6	6	1	62.0	64.4	65	2.4	15	----	60.3	4.1	5	-0.9
Receiver7	7	1	58.5	61.0	65	2.5	15	----	57.8	3.2	5	-1.8
Receiver8	9	5	55.8	57.8	65	2.0	15	----	55.6	2.2	5	-2.8
Receiver9	11	1	58.1	60.9	65	2.8	15	----	57.3	3.6	5	-1.4
Receiver10	12	1	60.7	62.8	65	2.1	15	----	58.8	4.0	5	-1.0
Receiver11	13	2	63.4	64.7	65	1.3	15	----	59.6	5.1	5	0.1
Receiver12	14	1	60.8	63.4	65	2.6	15	----	58.3	5.1	5	0.1
Receiver13	15	1	57.5	61.2	65	3.7	15	----	58.3	2.9	5	-2.1
Receiver14	18	1	57.4	61.0	65	3.6	15	----	57.8	3.2	5	-1.8
Receiver15	19	1	61.5	64.6	65	3.1	15	----	59.3	5.3	5	0.3
Receiver16	20	4	60.5	65.8	65	5.3	15	Snd Lvl	59.5	6.3	5	1.3
Receiver17	21	1	60.2	64.0	65	3.8	15	----	58.5	5.5	5	0.5
Receiver18	22	1	56.5	62.3	65	5.8	15	----	57.6	4.7	5	-0.3
Receiver19	24	2	55.0	60.0	65	5.0	15	----	55.3	4.7	5	-0.3
Receiver20	26	1	59.0	64.5	65	5.5	15	----	58.2	6.3	5	1.3
Receiver21	27	1	59.9	66.4	65	6.5	15	Snd Lvl	59.5	6.9	5	1.9
Receiver22	28	1	60.2	66.7	65	6.5	15	Snd Lvl	60.1	6.6	5	1.6
Receiver23	38	1	57.0	63.0	65	6.0	15	----	57.9	5.1	5	0.1

Receiver24	41	1	58.3	63.1	65	4.8	15	----	58.6	4.5	5	-0.5
Receiver25	42	1	59.7	66.3	65	6.6	15	Snd Lvl	59.9	6.4	5	1.4
Receiver26	43	1	59.2	65.9	65	6.7	15	Snd Lvl	60.9	5.0	5	0.0
Receiver27	44	1	57.4	63.4	65	6.0	15	----	60.7	2.7	5	-2.3
Receiver28	45	1	57.3	63.2	65	5.9	15	----	60.7	2.5	5	-2.5
Receiver29	46	1	59.1	67.6	65	8.5	15	Snd Lvl	67.4	0.2	5	-4.8

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	41	0.2	4.3	6.9
All Impacted	15	0.2	5.0	6.9
All that meet NR Goal	17	5.0	5.7	6.9

PBS&J **3 August 2000**
DOEBLER/FENTRISS 52721 **TNM 1.0a**

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: **60458.01/FDOT 7**
RUN: **2025 BUILD SCENARIO**
BARRIER DESIGN: **8ft adjusted barrier**

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		m	m	m	m	sq m	cu m	m	m:m	$
Barrier2	W	2.44	2.44	2.44	472	1151				247700
Barrier1	W	2.44	2.44	2.44	564	1377				296500
									Total Cost	544200

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25-Mar-99
TNM 1.0

Doebler/Fentriss 52721
Results: Sound Levels
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 9-foot

Atmospheric deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver			No Barrier					With Barrier			
			LAeq1h		Increase over Existing			Noise Reduction			
Name	Dwelling Units	Existing LAeq1h	Calculated	Criterion	Calculated	Substantial Increase	Type Impact	Calculated LAeq1h	Calculated	Goal	Calculated Minus Goal
		dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver 1	1	58.6	59.9	65.0	1.3	15	---	57.7	2.20	5	-2.80
Receiver 2	1	61.4	63.9	65.0	2.5	15	---	60.7	3.20	5	-1.80
Receiver 3	2	64.6	65.9	65.0	1.3	15	Snd Lvl	60.9	5.00	5	0.00
Receiver 4	2	64.6	66.0	65.0	1.4	15	Snd Lvl	60.6	5.40	5	0.40
Receiver 5	2	64.6	65.9	65.0	1.3	15	Snd Lvl	60.2	5.70	5	0.70
Receiver 6	1	62.0	64.5	65.0	2.5	15	---	59.9	4.60	5	-0.40
Receiver 7	1	58.5	61.0	65.0	2.5	15	---	57.4	3.60	5	-1.40
Receiver 8	5	55.8	57.8	65.0	2.0	15	---	55.0	2.80	5	-2.20
Receiver 9	1	58.1	60.9	65.0	2.8	15	---	56.9	4.00	5	-1.00
Receiver 10	1	60.7	62.8	65.0	2.1	15	---	58.4	4.40	5	-0.60
Receiver 11	2	63.4	64.7	65.0	1.3	15	---	59.4	5.30	5	0.30
Receiver 12	1	60.8	63.4	65.0	2.6	15	---	58.4	5.00	5	0.00
Receiver 13	1	57.5	61.2	65.0	3.7	15	---	57.8	3.40	5	-1.60
Receiver 14	1	57.4	61.0	65.0	3.6	15	---	57.4	3.60	5	-1.40
Receiver 15	1	61.5	64.6	65.0	3.1	15	---	58.9	5.70	5	0.70
Receiver 16	4	60.5	65.8	65.0	5.3	15	Snd Lvl	58.9	6.90	5	1.90
Receiver 17	1	60.2	63.9	65.0	3.7	15	---	58.1	5.80	5	0.80
Receiver 18	1	56.5	62.3	65.0	5.8	15	---	57.2	5.10	5	0.10
Receiver 19	2	55.0	59.9	65.0	4.9	15	---	55.0	4.90	5	-0.10
Receiver 20	1	59.0	64.5	65.0	5.5	15	---	57.8	6.70	5	1.70
Receiver 21	1	59.9	66.5	65.0	6.6	15	Snd Lvl	59.1	7.40	5	2.40
Receiver 22	1	60.2	66.7	65.0	6.5	15	Snd Lvl	59.6	7.10	5	2.10
Receiver 23	1	57.0	63.0	65.0	6.0	15	---	57.8	5.20	5	0.20
Receiver 24	1	58.3	63.1	65.0	4.8	15	---	58.4	4.70	5	-0.30
Receiver 25	1	59.7	66.3	65.0	6.6	15	Snd Lvl	59.6	6.70	5	1.70
Receiver 26	1	59.2	65.9	65.0	6.7	15	Snd Lvl	60.7	5.20	5	0.20
Receiver 27	1	57.4	63.3	65.0	5.9	15	---	60.6	2.70	5	-2.30
Receiver 28	1	57.3	63.2	65.0	5.9	15	---	60.8	2.40	5	-2.60

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25-Mar-99
TNM 1.0

Doebler/Fentriss 52721

Results: Barrier Descriptions
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 9-foot

Barriers										
Name	Type	Heights Along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Widt	Run:Rise	
		m	m	m	m	sq m	cu m	m	m:m	$
Barrier 1	W	2.74	2.74	2.74	564	1,547				$332,900
Barrier 2	W	2.74	2.74	2.74	493	1,351				$290,900
Total for 9-foot					1,057	2,898				$623,800

Total Benefited Receivers for 9-foot barrier **22** **Cost/Receiver** **$28,355**

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25-Mar-99
TNM 1.0

Doebler/Fentriss 52721
Results: Sound Levels
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 10-foot

Atmospheric deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver											
			No Barrier					With Barrier			
			LAeq1h		Increase over Existing			Noise Reduction			
Name	Dwelling Units	Existing LAeq1h	Calculated	Criterion	Calculated	Substantial Increase	Type Impact	Calculated LAeq1h	Calculated	Goal	Calculated Minus Goal
		dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver 1	1	58.6	59.9	65.0	1.3	15	----	57.8	2.10	5	-2.90
Receiver 2	1	61.4	63.9	65.0	2.5	15	----	60.5	3.40	5	-1.60
Receiver 3	2	64.6	66.0	65.0	1.4	15	Snd Lvl	61.0	5.00	5	0.00
Receiver 4	2	64.6	66.0	65.0	1.4	15	Snd Lvl	60.5	5.50	5	0.50
Receiver 5	2	64.6	65.9	65.0	1.3	15	Snd Lvl	59.9	6.00	5	1.00
Receiver 6	1	62.0	64.4	65.0	2.4	15	----	59.4	5.00	5	0.00
Receiver 7	1	58.5	61.0	65.0	2.5	15	----	56.9	4.10	5	-0.90
Receiver 8	5	55.8	57.8	65.0	2.0	15	----	54.8	3.00	5	-2.00
Receiver 9	1	58.1	60.9	65.0	2.8	15	----	56.7	4.20	5	-0.80
Receiver 10	1	60.7	62.8	65.0	2.1	15	----	58.3	4.50	5	-0.50
Receiver 11	2	63.4	64.7	65.0	1.3	15	----	59.7	5.00	5	0.00
Receiver 12	1	60.8	63.4	65.0	2.6	15	----	58.4	5.00	5	0.00
Receiver 13	1	57.5	61.2	65.0	3.7	15	----	57.2	4.00	5	-1.00
Receiver 14	1	57.4	61.0	65.0	3.6	15	----	57.3	3.70	5	-1.30
Receiver 15	1	61.5	64.6	65.0	3.1	15	----	58.6	6.00	5	1.00
Receiver 16	4	60.5	65.8	65.0	5.3	15	Snd Lvl	58.5	7.30	5	2.30
Receiver 17	1	60.2	63.9	65.0	3.7	15	----	57.8	6.10	5	1.10
Receiver 18	1	56.5	62.3	65.0	5.8	15	----	57.1	5.20	5	0.20
Receiver 19	2	55.0	59.9	65.0	4.9	15	----	55.3	4.60	5	-0.40
Receiver 20	1	59.0	64.5	65.0	5.5	15	----	57.7	6.80	5	1.80
Receiver 21	1	59.9	66.4	65.0	6.5	15	Snd Lvl	58.7	7.70	5	2.70
Receiver 22	1	60.2	66.7	65.0	6.5	15	Snd Lvl	59.3	7.40	5	2.40
Receiver 23	1	57.0	63.0	65.0	6.0	15	----	57.6	5.40	5	0.40
Receiver 24	1	58.3	63.1	65.0	4.8	15	----	58.2	4.90	5	-0.10
Receiver 25	1	59.7	66.3	65.0	6.6	15	Snd Lvl	59.4	6.90	5	1.90
Receiver 26	1	59.2	65.9	65.0	6.7	15	Snd Lvl	60.6	5.30	5	0.30
Receiver 27	1	57.4	63.4	65.0	6.0	15	----	60.4	3.00	5	-2.00
Receiver 28	1	57.3	63.2	65.0	5.9	15	----	60.7	2.50	5	-2.50

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25-Mar-99
TNM 1.0

Doebler/Fentriss 52721

Results: Barrier Descriptions
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 10-foot

Barriers										
Name	Type	Heights Along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Widt	Run:Rise	
		m	m	m	m	sq m	cu m	m	m:m	$
Barrier 1	W	3.05	3.05	3.05	554	1,691				$364,000
Barrier 2	W	3.05	3.05	3.05	423	1,291				$277,900
Total for 10-foot					977	2,982				$641,900

Total Benefited Receivers for 10-foot barrier **23** **Cost/Receiver** **$27,909**

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25-Mar-99
TNM 1.0

Doebler/Fentriss 52721
Results: Sound Levels
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 11-foot

Atmospheri deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver											
			No Barrier					With Barrier			
			LAeq1h		Increase over Existing			Noise Reduction			
Name	Dwelling Units	Existing LAeq1h	Calculated	Criterion	Calculated	Substantial Increase	Type Impact	Calculated LAeq1h	Calculated	Goal	Calculated Minus Goal
		dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver 1	1	58.6	59.9	65.0	1.3	15	----	57.5	2.40	5	-2.60
Receiver 2	1	61.4	63.9	65.0	2.5	15	----	60.3	3.60	5	-1.40
Receiver 3	2	64.6	66.0	65.0	1.4	15	Snd Lvl	61.0	5.00	5	0.00
Receiver 4	2	64.6	66.0	65.0	1.4	15	Snd Lvl	60.2	5.80	5	0.80
Receiver 5	2	64.6	65.9	65.0	1.3	15	Snd Lvl	59.6	6.30	5	1.30
Receiver 6	1	62.0	64.4	65.0	2.4	15	----	58.9	5.50	5	0.50
Receiver 7	1	58.5	61.0	65.0	2.5	15	----	56.2	4.80	5	-0.20
Receiver 8	5	55.8	57.8	65.0	2.0	15	----	53.9	3.90	5	-1.10
Receiver 9	1	58.1	60.9	65.0	2.8	15	----	55.8	5.10	5	0.10
Receiver 10	1	60.7	62.8	65.0	2.1	15	----	57.9	4.90	5	-0.10
Receiver 11	2	63.4	64.7	65.0	1.3	15	----	59.5	5.20	5	0.20
Receiver 12	1	60.8	63.4	65.0	2.6	15	----	58.2	5.20	5	0.20
Receiver 13	1	57.5	61.2	65.0	3.7	15	----	56.8	4.40	5	-0.60
Receiver 14	1	57.4	61.0	65.0	3.6	15	----	57.0	4.00	5	-1.00
Receiver 15	1	61.5	64.6	65.0	3.1	15	----	58.2	6.40	5	1.40
Receiver 16	4	60.5	65.8	65.0	5.3	15	Snd Lvl	58.1	7.70	5	2.70
Receiver 17	1	60.2	63.9	65.0	3.7	15	----	57.7	6.20	5	1.20
Receiver 18	1	56.5	62.3	65.0	5.8	15	----	56.9	5.40	5	0.40
Receiver 19	2	55.0	59.9	65.0	4.9	15	----	55.4	4.50	5	-0.50
Receiver 20	1	59.0	64.5	65.0	5.5	15	----	57.8	6.70	5	1.70
Receiver 21	1	59.9	66.4	65.0	6.5	15	Snd Lvl	58.4	8.00	5	3.00
Receiver 22	1	60.2	66.7	65.0	6.5	15	Snd Lvl	59.0	7.70	5	2.70
Receiver 23	1	57.0	63.0	65.0	6.0	15	----	57.4	5.60	5	0.60
Receiver 24	1	58.3	63.1	65.0	4.8	15	----	57.9	5.20	5	0.20
Receiver 25	1	59.7	66.3	65.0	6.6	15	Snd Lvl	59.2	7.10	5	2.10
Receiver 26	1	59.2	65.9	65.0	6.7	15	Snd Lvl	60.4	5.50	5	0.50
Receiver 27	1	57.4	63.3	65.0	5.9	15	----	60.3	3.00	5	-2.00
Receiver 28	1	57.3	63.2	65.0	5.9	15	----	60.5	2.70	5	-2.30

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25-Mar-99
TNM 1.0

Doebler/Fentriss 52721

Results: Barrier Descriptions
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 11-foot

Barriers										
Name	Type	Heights Along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Widt	Run:Rise	
		m	m	m	m	sq m	cu m	m	m:m	$
Barrier 1	W	3.36	3.36	3.36	554	1,863				$401,000
Barrier 2	W	3.36	3.36	3.36	393	1,321				$284,400
Total for 11-foot					947	3,184				$685,400

Total Benefited Receivers for 11-foot barrier **25** **Cost/Receiver** **$27,416**

PBSJ

25-Mar-99
TNM 1.0

Doebler/Fentriss 52721
Results: Sound Levels
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 12-foot

Atmospherics: deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver			No Barrier					With Barrier			
			LAeq1h		Increase over Existing			Noise Reduction			
Name	Dwelling Units	Existing LAeq1h	Calculated	Criterion	Calculated	Substantial Increase	Type Impact	Calculated LAeq1h	Calculated	Goal	Calculated Minus Goal
		dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver 1	1	58.6	59.9	65.0	1.3	15	---	57.5	2.40	5	-2.60
Receiver 2	1	61.4	63.9	65.0	2.5	15	---	60.2	3.70	5	-1.30
Receiver 3	2	64.6	66.0	65.0	1.4	15	Snd Lvl	61.0	5.00	5	0.00
Receiver 4	2	64.6	66.0	65.0	1.4	15	Snd Lvl	60.1	5.90	5	0.90
Receiver 5	2	64.6	65.9	65.0	1.3	15	Snd Lvl	59.4	6.50	5	1.50
Receiver 6	1	62.0	64.4	65.0	2.4	15	---	58.6	5.80	5	0.80
Receiver 7	1	58.5	61.0	65.0	2.5	15	---	55.9	5.10	5	0.10
Receiver 8	5	55.8	57.8	65.0	2.0	15	---	54.0	3.80	5	-1.20
Receiver 9	1	58.1	60.9	65.0	2.8	15	---	55.9	5.00	5	0.00
Receiver 10	1	60.7	62.8	65.0	2.1	15	---	58.3	4.50	5	-0.50
Receiver 11	2	63.4	64.7	65.0	1.3	15	---	59.5	5.20	5	0.20
Receiver 12	1	60.8	63.4	65.0	2.6	15	---	58.3	5.10	5	0.10
Receiver 13	1	57.5	61.2	65.0	3.7	15	---	56.6	4.60	5	-0.40
Receiver 14	1	57.4	61.0	65.0	3.6	15	---	56.8	4.20	5	-0.80
Receiver 15	1	61.5	64.6	65.0	3.1	15	---	57.9	6.70	5	1.70
Receiver 16	4	60.5	65.8	65.0	5.3	15	Snd Lvl	57.7	8.10	5	3.10
Receiver 17	1	60.2	63.9	65.0	3.7	15	---	57.6	6.30	5	1.30
Receiver 18	1	56.5	62.3	65.0	5.8	15	---	56.7	5.60	5	0.60
Receiver 19	2	55.0	59.9	65.0	4.9	15	---	55.3	4.60	5	-0.40
Receiver 20	1	59.0	64.5	65.0	5.5	15	---	57.8	6.70	5	1.70
Receiver 21	1	59.9	66.4	65.0	6.5	15	Snd Lvl	58.2	8.20	5	3.20
Receiver 22	1	60.2	66.7	65.0	6.5	15	Snd Lvl	58.9	7.80	5	2.80
Receiver 23	1	57.0	63.0	65.0	6.0	15	---	57.4	5.60	5	0.60
Receiver 24	1	58.3	63.1	65.0	4.8	15	---	57.8	5.30	5	0.30
Receiver 25	1	59.7	66.3	65.0	6.6	15	Snd Lvl	59.1	7.20	5	2.20
Receiver 26	1	59.2	65.9	65.0	6.7	15	Snd Lvl	61.0	4.90	5	-0.10
Receiver 27	1	57.4	63.3	65.0	5.9	15	---	60.7	2.60	5	-2.40
Receiver 28	1	57.3	63.2	65.0	5.9	15	---	60.6	2.60	5	-2.40

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25-Mar-99
TNM 1.0

Doebler/Fentriss 52721

Results: Barrier Descriptions
Project/Contract: 60458.01/FDOT 7
Run: 2025 Build Scenario
Barrier Design: Case 2 - Adjusted 12-foot

Barriers										
Name	Type	Heights Along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Widt	Run:Rise	
		m	m	m	m	sq m	cu m	m	m:m	$
Barrier 1	W	3.66	3.66	3.66	539	1,975				$425,100
Barrier 2	W	3.66	3.66	3.66	363	1,328				$285,900
Total for 12-foot					902	3,303				$711,000

Total Benefitted Receivers for 12-foot barrier **25** **Cost/Receiver** **$28,440**