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# SANTA ROSA COUNTY PD&E STUDY: WOODBINE ROAD / CHUMUCKLA HIGHWAY

Noise Study Report

Prepared for:  
Santa Rosa County

December 2006

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## Noise Study Report

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# **EXECUTIVE SUMMARY**

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Santa Rosa County is currently studying the feasibility of expanding Woodbine Road/Chumuckla Highway (CR 197) from US-90 (SR-10) north to Berryhill Road (CR 184), for a distance of approximately 3.6 miles. Also included in this study are modifications to intersecting portions of Berryhill Road, Chumuckla Highway, Quinette Road, and US-90. The proposed improvements include plans to expand Woodbine Road/Chumuckla Highway, to a four-lane divided arterial roadway. Also proposed are the relocation and widening (from two to four lanes) of both Berryhill Road and Quintette Road.

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 impact “contours” adjacent to the corridor.

The analysis was performed following Florida Department of Transportation (FDOT) procedures that comply with 23 Code of Federal Regulations (CFR), Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise). The prediction of existing and future traffic noise levels with the 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 the intervening ground’s acoustical characteristics, topography, and rows of buildings, into account.

The results of the analysis indicate that future (2025) exterior traffic noise levels are predicted to range from 52.5 to 69.6 dBA at the 337 noise sensitive sites evaluated. The results of the analysis also indicate that when compared to the existing condition, traffic noise levels are predicted to increase 0.1 to 19.5 dBA. With the proposed improvements, a total of 121 sites are predicted to be affected by the proposed improvements, either from predicted traffic noise levels approaching, meeting, or exceeding the FHWA’s Noise Abatement Criteria (NAC) or increasing substantially (15 dBA or more) when compared to the existing condition. The 121 sites are all residences.

Noise abatement measures were evaluated for the 121 noise sensitive sites predicted to be affected by the proposed improvements to Woodbine Road/Chumuckla Highway. The measures were traffic management, alternative roadway alignments, property acquisition, and noise barriers. Although feasible, traffic management, alternative roadway alignments, and property acquisition were determined to be unreasonable methods to reduce the predicted traffic noise impacts for the affected sites.

A noise barrier evaluation was also performed. Based on the results of the analysis, noise barriers appear to be a feasible method of reducing predicted traffic noise levels for 58 of the 121 affected sites. There does not appear to be any feasible and cost reasonable methods of reducing the predicted traffic noise impacts at the remaining sites.

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# ***Section 1.0***

## ***INTRODUCTION***

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Santa Rosa County is currently studying the feasibility of expanding Woodbine Road/Chumuckla Highway (CR 197) from US-90 (SR-10) north to Berryhill Road (CR 184) a two-lane facility, for a distance of approximately 4.28 miles (Figure 1-1). Also included in this study are modifications to intersecting portions of Berryhill Road, Chumuckla Highway, Quintette Road, and US-90. The proposed improvements include plans to expand Woodbine Road to a four-lane divided arterial roadway from US-90 to Berryhill Road. Additionally, minor modifications to US-90 in the form of acceleration and deceleration lanes are proposed while Berryhill Road will be expanded to a four-lane facility and be realigned north of its current location for a distance of 1.2 miles. Chumuckla Highway will also be expanded to four lanes both north and south of the intersection with Woodbine Road for a distance of 0.55 miles, and Quintette Road will be realigned to the north and the roadway expanded to four lanes for approximately 0.52 miles.

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 traffic noise levels and future traffic noise levels at the sites with the proposed 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 “contours” adjacent to the corridor.

### **1.1 Project Description and Need for Improvement**

The proposed improvement involves the widening of Woodbine Road (CR 197) in Santa Rosa County, from US-90 to north of Rolling Acres Road. Additionally, segments of Chumuckla Highway, Quintette Road, and Berryhill Road will also be improved to 4-lane roadways where they will intersect with Woodbine Road/Chumuckla Highway. The 4-lane improvements are consistent with the Santa Rosa County Adopted Comprehensive Plan. The need for the project is based on several factors, including:

- Need to provide additional capacity to meet forecast traffic demand in the future,
- With the anticipated traffic growth in the area, the number of congestion-related accidents can be expected to increase if no improvements are made to the roadway system, and
- The improvements will help meet the local and regional social/economic demand.

## 1.2 Proposed Alternative

The No-Build Alternative consists of not improving Woodbine Road/Chumuckla Highway (other than routine maintenance) through the year 2025, and remains a viable alternative throughout the duration of the PD&E Study.

The build alternative under consideration is to improve Woodbine Road/Chumuckla Highway to a 4-lane facility throughout the project corridor. The following provides a description of the build alternative. The proposed typical section for all roadways to be improved is provided on Figure 1-2.

Woodbine Road from the intersection with US-90 north to the Chumuckla Highway is proposed to be widened to a four-lane roadway with two 11 foot lanes in each direction, a 4 foot paved shoulder, and curb and gutters with a 6 foot sidewalk on both sides of the roadway (see Figure 1.2). Quintette Road will be realigned to intersect with Woodbine Road north of its current location and to intersect with a realigned Berryhill Road. From this intersection to north of Tunnel Road, Quintette Road will have the same typical section Woodbine Road and then transition back to a two-lane roadway. Chumuckla Highway from the intersection of Woodbine Road northward will become a four-lane roadway with 11 foot lanes to a point just north of Rolling Acres Road where it will transition back to a two-lane roadway. Chumuckla Highway from the intersection of Woodbine Road southward will also become a four-lane roadway with 11 foot lanes to a point just south of Stratford Lane where it will transition back to a two-lane roadway. The intersection of Berryhill Road and Woodbine Road will be relocated approximately 500 feet north. Berryhill Road will intersect with the Chumuckla Highway and the realigned Quintette Road and become a four-lane roadway with the same typical section as Woodbine Road. The realigned Berryhill Road will be four-lanes east of Twin Oaks Drive with a typical section identical to that of Woodbine Road. From that point eastward, Berryhill Road will transition back to a two-lane roadway.

## ***Section 2.0***

# ***METHODOLOGY***

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The Woodbine Road/Chumuckla Highway noise analysis was performed following Florida Department of Transportation (FDOT) procedures (Project Development and Environment Manual: Chapter 17: October 6, 2003). The FDOT procedures comply with 23 Code of Federal Regulations (CFR) Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise).

The prediction of existing and future traffic noise levels with the roadway improvement was performed using the Federal Highway Administration's (FHWA's) 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 the intervening ground's acoustical characteristics and topography, and rows of buildings, into account.

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 levels ( $L_{Aeq1h}$ ), values which contain the same amount of acoustic energy as an actual time-varying A-weighted sound level over a period of 1 hour.

The existing (2005) traffic data used in the TNM for the proposed Woodbine Road/Chumuckla Highway expansion is provided in Table 2-1. The forecast future year (2025) year no-build traffic data used in the TNM is provided in Table 2-2 and the future year (2025) build traffic data is shown in Table 2-3. The year 2025 is the design year for the project.

**Table 2-1  
Existing Traffic Data\***

Roadway	Roadway Segment	Direction	Total Peak Hour Volume	TNM Input					Speed (mph)
				Cars	MT <sup>a</sup>	HT <sup>b</sup>	Buses	Motorcycles	
Woodbine Road	US-90 to Berryhill Road	Peak	859	799	26	26	4	4	50
		Off-Peak	597	555	18	18	3	3	50
Berryhill Road	Woodbine Rd. to Twin Oaks Drive	Peak	729	677	22	22	4	4	50
		Off-Peak	729	677	22	22	4	4	50
Quintette Rd	Woodbine Rd. to South of Loop Road	Peak	561	521	17	17	3	3	50
		Off-Peak	561	521	17	17	3	3	50
Chumuckla Highway	Berryhill Rd. to North of Rolling Acres Road and from Woodbine Rd. South to Stratford Lane	Peak	848	790	25	25	4	4	50
		Off-Peak	591	549	18	18	3	3	50

\* Source: Baskerville-Donovan Inc. 11/05/06  
<sup>a</sup> Medium Trucks  
<sup>b</sup> Heavy Trucks

**Table 2-2  
Future (2025) No-Build Traffic Data\***

Roadway	Roadway Segment	Direction	Total Peak Hour Volume	TNM Input					Speed (mph)
				Cars	MT <sup>a</sup>	HT <sup>b</sup>	Buses	Motorcycles	
Woodbine Road	US-90 to Berryhill Road	Peak	501	475	10	10	3	3	50
		Off-Peak	409	389	8	8	2	2	50
Berryhill Road	Woodbine Rd. to Twin Oaks Drive	Peak	454	432	9	9	2	2	50
		Off-Peak	454	432	9	9	2	2	50
Quintette Road	Woodbine Rd. to south of Loop Road	Peak	454	432	9	9	2	2	50
		Off-Peak	454	432	9	9	2	2	50
Chumuckla Highway	Berryhill Rd. to north of Rolling Acres Road and from Woodbine Rd. south to Stratford Lane	Peak	500	475	10	10	3	3	50
		Off-Peak	409	389	8	8	2	2	50

\* Source: Baskerville-Donovan Inc. 11/05/06  
<sup>a</sup> Medium Trucks  
<sup>b</sup> Heavy Trucks

**Table 2-3  
Future (2025) Build Traffic Data\***

Roadway	Roadway Segment	Direction	Total Peak Hour Volume	TNM Input					Speed (mph)
				Cars	MT <sup>a</sup>	HT <sup>b</sup>	Buses	Motorcycles	
Woodbine Road	US-90 to Berryhill Road	Peak	1178	1118	24	24	6	6	50
		Off-Peak	963	915	19	19	5	5	50
Berryhill Road	Woodbine Rd. to Twin Oaks Drive	Peak	751	713	15	15	4	4	50
		Off-Peak	751	713	15	15	4	4	50
Quintette Road	Woodbine Rd. to south of Loop Road	Peak	1069	1017	21	21	5	5	50
		Off-Peak	1069	1017	21	21	5	5	50
Chumuckla Highway	Berryhill Rd. to north of Rolling Acres Road and from Woodbine Rd. south to Stratford Lane	Peak	826	784	17	17	4	4	50
		Off-Peak	675	641	14	14	3	3	50

\* Source: Baskerville-Donovan Inc. 11/05/06  
<sup>a</sup> Medium Trucks  
<sup>b</sup> Heavy Trucks

# Section 3.0

## NOISE ANALYSIS

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### 3.1 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 3-1, the criteria vary according to a property’s activity category.

**Table 3-1  
FHWA Noise Abatement Criteria**

Activity Category	Description	L <sub>Aeq1h</sub>
A	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.	57 (Exterior)
B	Picnic area, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.	67 (Exterior)
C	Developed lands, properties or activities not included in Categories A or B above.	72 (Exterior)
D	Undeveloped lands.	N/A
E	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.	52 (Interior)
Source: Code of Federal Regulations, Title 23, Part 772 L <sub>Aeq1h</sub> - values that contain the same amount of acoustic energy as a time-varying A-weighted sound level over a period of one hour.		

When predicted traffic 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 15 dBA or more as a direct result of a transportation improvement project.

Within the project limits, 341 noise sensitive sites were identified as having the potential to be affected by traffic noise. Of the 341 sites, 308 are single-family (SF) residences and 28 are multi-family (MF) residences. One (1) of the sites is considered recreational (the playground area located at A Touch of Love Daycare). The remaining 4 sites are religious facilities.

The location of each of the noise sensitive sites is provided on the aerials in Appendix A. The residential and recreational sites were considered Activity Category “B” as shown in Table 3-1. As such, exterior noise levels were evaluated for the sites and noise abatement measures were considered if the predicted exterior traffic noise level was 66.0 dBA or more, or if levels were

predicted to increase 15 dBA or more as a result of the improvements when compared to existing levels. Since a field review of the four religious facilities did not identify any areas of frequent exterior human use, they were evaluated as Activity Category “E” as shown in table 3-1. Interior traffic noise levels were predicted for those sites and abatement measures were considered if the future levels were predicted to be 51.0 dBA or more, or if levels were predicted to increase 15 dBA or more from the existing condition.

Various factors affect the transmission 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 (i.e., rows of buildings, barriers). The attenuation provided by a row of buildings (houses) depends on the height and actual length of the row occupied by the buildings.

### **3.2 MEASURED NOISE LEVELS**

As previously stated, existing and future traffic 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 data including motor vehicle volumes, vehicle mix, vehicle speeds, and meteorological conditions were recorded during each measurement period.

Since several portions of the Woodbine Road/Chumuckla Highway project are on new alignment where no roadway currently exists, sound level measurements were obtained to determine the existing noise level in the vicinity of the new alignment locations. Measurements were also taken along segments of the existing roadways. A total of 4 locations along the project corridor were used to gather existing noise levels. The monitoring locations are identified on the Project Aerials in Appendix A.

The field measurements for the project were generally conducted in accordance with the FHWA’s *Measurement of Highway-Related Noise* (1996). Each field measurement was obtained using a Larson Davis Dosimeter (Model 700). The Dosimeter was calibrated before and after each monitoring period with a Larson Davis Sound-Level Calibrator.

At each of the monitoring locations, three ten-minute samples were obtained during each monitoring session. The resultant  $L_{eq}$ ’s was then averaged to establish the existing condition along the project corridor. As previously stated, existing and future noise levels with and without the proposed improvements were modeled using the TNM.

The measured data were 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 levels with the existing roadway. Following FDOT guidelines, a noise prediction model is considered within the accepted level of accuracy if the measured and predicted noise levels are within a tolerance standard of 3 dBA.

Table 3-2 presents the field measurements and the validation results for the Woodbine Road/Chumuckla Highway project at Sites 1, 2, and 4. As shown, the ability of the model to predict noise levels within the FDOT limits of plus or minus 3 dBA for the project was confirmed. Documentation in support of the validation is provided in Appendix B of this report.

Table 3-2 also presents the data collected during the field measurements at Site 3, which is located within the proposed new alignment of Berryhill Road, and the level that was used in the analysis to represent the existing acoustical environment for Sites 138-166, and 170-177. As shown,  $L_{eq}$  values ranged from 48.5 to 53.5 dBA, with an average of 50.1 dBA.  $L_{99}$  values range from 42.0 to 44.5 dBA.  $L_{99}$  is the level that is exceeded 99 percent of the time during a given monitoring period. Documentation in support of the measurements is provided in Appendix B of this report.

**Table 3-2  
Existing Measurement Data\***

Site	Monitoring Session	Measurement Period	Measured Leq (dBA)	Measured $L_{99}$ (dBA)	Predicted Leq (dBA)	Difference (dBA)
1	8:28-9:02 AM	1	57.0	51.5		
		2	56.5	50.0		
		3	59.0	51.5		
2	10:06-10:40 AM	1	58.0	46.0		
		2	59.0	48.0		
		3	58.0	45.0		
3	11:07-11:40 AM	1	48.5	43.0	NA	
		2	51.0	44.5	NA	
		3	48.5	43.0	NA	
	12:55-1:27 PM	1	49.0	42.0	NA	
		2	53.5	42.5	NA	
		3	50.0	43.0	NA	
4	12:08-12:41 PM	1	57.0	45.5		
		2	59.0	47.5		
		3	59.5	50.0		

\* Measurements were obtained on November 16, 2006

### 3.3 RESULTS OF THE NOISE ANALYSIS

Table 3-3 presents the predicted future year (2025) traffic noise levels with the proposed expansion of the Woodbine Road/Chumuckla Highway project and the associated improvements. Documentation in support of the analysis is provided in Appendix C of this report.

**Table 3-3:  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
1	1	SF Residential	54.1	51.5	57.9	3.8		
2	1	SF Residential	56.7	54.2	59.6	2.9		
3	1	SF Residential	58.8	56.3	61.7	2.9		
4	1	SF Residential	60.6	58.0	63.8	3.2		
5	1	SF Residential	60.9	58.3	64.1	3.2		
6	1	SF Residential	56.9	54.4	59.3	2.4		
7	1	SF Residential	53.4	50.8	56.9	3.5		
8	2	SF Residential	54.2	51.6	57.2	3.0		
9	1	Pace Presbyterian Church (Interior)	37.7	35.2	39.5	1.8		
10	1	SF Residential	63.2	60.6	67.0	3.8	Yes	
11	1	SF Residential	63.7	61.1	67.6	3.9	Yes	
12	1	SF Residential	68.0	65.5	70.2	2.2	Yes	
13	1	SF Residential	61.8	59.2	65.3	3.5		
14	1	SF Residential	60.0	57.4	62.3	2.3		
15	1	SF Residential	61.5	58.8	64.8	3.3		
16	1	SF Residential	67.0	64.4	69.7	2.7	Yes	
17	1	SF Residential	63.1	60.5	67.0	3.9	Yes	
18	1	SF Residential	65.0	62.4	68.4	3.4	Yes	
19	1	SF Residential	62.2	59.7	65.0	2.8		
20	1	SF Residential	55.8	53.2	58.1	2.3		
21	1	SF Residential	63.6	61.0	67.2	3.6	Yes	
22	1	SF Residential	58.5	56.0	59.9	1.4		
23	1	SF Residential	54.0	51.3	56.8	2.8		
24	1	SF Residential	57.5	55.0	59.1	1.6		
25	1	SF Residential	58.3	55.7	59.7	1.4		
26	1	SF Residential	61.2	58.6	63.8	2.6		
27	1	SF Residential	63.5	60.9	67.0	3.5	Yes	
28	1	SF Residential	64.0	61.5	67.5	3.5	Yes	
29	1	SF Residential	63.2	60.6	66.5	3.3	Yes	
30	1	SF Residential	63.0	60.4	66.2	3.2	Yes	
31	1	SF Residential	64.1	61.5	67.6	3.5	Yes	
32	1	SF Residential	62.4	59.9	65.6	3.2		
33	1	SF Residential	63.6	61.0	67.4	3.8	Yes	
34	1	SF Residential	62.2	59.6	66.0	3.8	Yes	
35	6	SF Residential	54.3	51.7	57.4	3.1		
36	8	SF Residential	54.6	52.0	57.4	2.8		
37	1	SF Residential	63.2	60.6	67.5	4.3	Yes	

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
38	1	SF Residential	63.9	61.4	68.1	4.2	Yes	
39	1	SF Residential	62.4	59.8	66.8	4.4	Yes	
40	1	SF Residential	61.5	58.9	65.5	4.0		
41	1	SF Residential	62.0	59.4	66.0	4.0	Yes	
42	1	SF Residential	62.3	59.6	66.3	4.0	Yes	
43	1	SF Residential	63.2	60.6	67.2	4.0	Yes	
44	1	SF Residential	62.9	60.3	66.8	3.9	Yes	
45	1	SF Residential	62.9	60.3	66.7	3.8	Yes	
46	1	SF Residential	59.2	56.7	61.4	2.2		
47	1	SF Residential	55.0	52.5	57.7	2.7		
48	1	SF Residential	64.9	62.4	68.3	3.4	Yes	
49	1	SF Residential	65.9	63.3	68.9	3.0	Yes	
50	1	SF Residential	64.5	61.9	68.1	3.6	Yes	
51	1	SF Residential	61.7	59.2	64.3	2.6		
52	3	SF Residential	57.2	54.7	59.0	1.8		
53	1	SF Residential	61.0	58.5	62.5	1.5		
54	1	SF Residential	66.4	63.8	69.4	3.0	Yes	
55	1	SF Residential	68.8	66.2	70.7	1.9	Yes	
56	1	SF Residential	61.7	59.3	63.7	2.0		
57	1	SF Residential	57.7	55.2	59.4	1.7		
58	1	SF Residential	55.0	52.4	57.5	2.5		
59	1	SF Residential	65.5	63.0	68.7	3.2	Yes	
60	1	SF Residential	68.4	65.8	70.1	1.7	Yes	
61	3	SF Residential	57.0	54.4	59.3	2.3		
62	5	SF Residential	58.5	55.9	60.2	1.7		
63	4	SF Residential	59.1	56.4	58.9	-0.2		
64	1	SF Residential	63.7	61.3	67.2	3.5	Yes	
65	1	SF Residential	65.7	63.3	69.2	3.5	Yes	
66	1	SF Residential	63.2	60.7	66.2	3.0	Yes	
67	1	SF Residential	63.6	61.2	66.5	2.9	Yes	
68	1	MF Residential	57.2	54.5	60.1	2.9		
69	1	MF Residential	57.5	54.9	59.8	2.3		
70	1	MF Residential	54.8	52.0	58.3	3.5		
71	1	MF Residential	55.8	53.1	58.7	2.9		
72	1	MF Residential	62.4	60.0	64.7	2.3		
73	1	MF Residential	58.6	56.0	61.2	2.6		
74	1	MF Residential	66.5	64.0	69.5	3.0	Yes	
75	1	MF Residential	64.5	62.0	67.5	3.0	Yes	

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
76	1	MF Residential	56.5	53.9	58.9	2.4		
77	1	MF Residential	54.3	51.6	56.9	2.6		
78	1	MF Residential	58.0	55.4	59.9	1.9		
79	1	MF Residential	56.4	53.8	58.7	2.3		
80	1	MF Residential	63.8	61.4	67.4	3.6	Yes	
81	1	MF Residential	59.0	56.6	61.1	2.1		
82	1	MF Residential	66.1	63.6	69.5	3.4	Yes	
83	1	MF Residential	62.2	59.7	65.6	3.4		
84	1	SF Residential	66.5	64.0	69.8	3.3	Yes	
85	1	SF Residential	60.8	58.2	61.6	0.8		
86	1	SF Residential	57.7	55.0	57.7	0.0		
87	1	Recreational (Playground at daycare center)	59.9	57.2	59.8	-0.1		
88	1	SF Residential	55.6	52.9	56.2	0.6		
89	1	SF Residential	63.8	61.2	66.0	2.2	Yes	
90	1	SF Residential	57.9	55.2	58.0	0.1		
91	1	SF Residential	64.0	61.4	66.9	2.9	Yes	
92	1	SF Residential	59.0	56.3	58.9	-0.1		
93	1	SF Residential	55.8	53.0	56.7	0.9		
94	1	SF Residential	54.5	51.7	55.7	1.2		
95	1	SF Residential	64.3	61.7	67.3	3.0	Yes	
96	1	SF Residential	62.2	59.6	64.7	2.5		
97	1	SF Residential	62.7	60.1	65.5	2.8		
98	1	SF Residential	64.4	61.8	67.4	3.0	Yes	
99	1	SF Residential	57.3	54.6	57.7	0.4		
100	1	SF Residential	58.0	55.3	58.2	0.2		
101	1	SF Residential	65.2	62.6	67.9	2.7	Yes	
102	1	SF Residential	62.6	60.0	63.9	1.3		
103	1	SF Residential	57.3	54.6	57.7	0.4		
104	1	SF Residential	65.4	62.9	67.6	2.2	Yes	
105	1	SF Residential	59.5	56.8	59.4	-0.1		
106	1	SF Residential	55.7	52.9	56.6	0.9		
107	1	SF Residential	59.3	56.7	59.2	-0.1		
108	1	SF Residential	55.7	52.9	56.5	0.8		
109	1	SF Residential	65.5	62.9	67.8	2.3	Yes	
110	2	SF Residential	55.5	52.7	56.5	1.0		
111	1	Berryhill Church of Christ (Interior)	44.5	41.9	46.5	2.0		
112	1	SF Residential	66.2	63.6	68.5	2.3	Yes	

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
113	1	SF Residential	57.6	54.9	57.7	0.1		
114	1	SF Residential	61.7	59.0	63.4	1.7		
115	1	SF Residential	66.5	63.9	68.7	2.2	Yes	
116	1	SF Residential	63.7	61.1	66.5	2.8	Yes	
117	1	SF Residential	64.0	61.4	66.8	2.8	Yes	
118	1	SF Residential	64.0	61.3	66.8	2.8	Yes	
119	1	SF Residential	64.8	62.2	67.5	2.7	Yes	
120	1	SF Residential	64.7	62.1	67.3	2.6	Yes	
121	1	SF Residential	64.1	61.4	66.8	2.7	Yes	
122	1	SF Residential	63.9	61.2	66.6	2.7	Yes	
123	1	SF Residential	65.9	63.3	68.2	2.3	Yes	
124	1	SF Residential	62.9	60.3	65.0	2.1		
125	1	SF Residential	59.2	56.5	59.7	0.5		
126	1	SF Residential	57.9	55.2	58.2	0.3		
127	1	SF Residential	58.3	55.6	58.4	0.1		
128	1	SF Residential	58.3	55.6	58.3	0.0		
129	1	SF Residential	58.3	55.6	58.2	-0.1		
130	1	SF Residential	66.4	63.9	68.5	2.1	Yes	
131	1	SF Residential	61.6	59.0	62.7	1.1		
132	1	SF Residential	57.1	54.4	58.2	1.1		
133	1	SF Residential	65.9	63.4	68.1	2.2	Yes	
134	1	SF Residential	60.0	57.3	61.4	1.4		
135	1	SF Residential	56.4	53.6	57.5	1.1		
136	1	SF Residential	63.2	60.5	62.7	-0.5		
137	1	SF Residential	63.4	60.8	59.5	-3.9		
138	1	SF Residential	50.1	62.9	67.7	17.6	Yes	Yes
139	1	SF Residential	50.1	57.6	61.6	11.5		
140	1	SF Residential	50.1	55.4	59.2	9.1		
141	1	SF Residential	50.1	54.4	58.7	8.6		
142	1	SF Residential	50.1	53.7	58.6	8.5		
143	1	SF Residential	50.1	52.9	58.4	8.3		
144	1	SF Residential	50.1	52.2	58.2	8.1		
145	1	SF Residential	50.1	51.5	58.1	8.0		
146	1	SF Residential	50.1	51.0	58.1	8.0		
147	1	SF Residential	50.1	50.7	58.2	8.1		
148	1	SF Residential	50.1	50.3	58.3	8.2		
149	1	SF Residential	50.1	64.3	69.6	19.5	Yes	Yes
150	1	SF Residential	50.1	61.2	68.1	18.0	Yes	Yes

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
151	1	SF Residential	50.1	59.9	68.0	17.9	Yes	Yes
152	1	SF Residential	50.1	58.6	69.1	19.0	Yes	Yes
153	1	SF Residential	50.1	56.5	67.9	17.8	Yes	Yes
154	1	SF Residential	50.1	54.1	66.0	15.9	Yes	Yes
155	1	SF Residential	50.1	53.9	67.1	17.0	Yes	Yes
156	1	SF Residential	50.1	52.4	66.6	16.5	Yes	Yes
157	1	SF Residential	50.1	52.3	67.8	17.7	Yes	Yes
158	1	SF Residential	50.1	51.8	67.3	17.2	Yes	Yes
159	1	SF Residential	50.1	51.7	67.4	17.3	Yes	Yes
160	1	SF Residential	50.1	51.5	66.2	16.1	Yes	Yes
161	1	SF Residential	50.1	52.0	68.0	17.9	Yes	Yes
162	1	SF Residential	50.1	52.5	67.7	17.6	Yes	Yes
163	1	SF Residential	50.1	53.5	66.2	16.1	Yes	Yes
164	1	SF Residential	50.1	53.8	62.0	11.9		
165	1	SF Residential	50.1	53.9	60.9	10.8		
166	1	SF Residential	50.1	53.0	59.6	9.5		
167	1	SF Residential	61.3	58.9	63.5	2.2		
168	1	SF Residential	57.6	55.0	60.3	2.7		
169	1	SF Residential	55.5	52.8	59.0	3.5		
170	1	SF Residential	50.1	50.6	57.8	7.7		
171	1	SF Residential	50.1	51.1	59.5	9.4		
172	1	SF Residential	50.1	50.4	59.1	9.0		
173	1	SF Residential	50.1	50.0	58.8	8.7		
174	1	SF Residential	50.1	49.7	58.5	8.4		
175	1	SF Residential	50.1	49.8	58.6	8.5		
176	1	SF Residential	50.1	49.8	58.4	8.3		
177	1	SF Residential	50.1	50.1	58.4	8.3		
178	1	SF Residential	57.5	54.9	60.0	2.5		
179	1	SF Residential	66.4	63.8	58.5	-7.9		
180	1	SF Residential	60.9	58.2	66.5	5.6	Yes	
181	1	SF Residential	65.6	63.1	61.4	-4.2		
182	4	SF Residential	57.2	54.5	57.5	0.3		
183	1	SF Residential	66.0	63.5	64.6	-1.4		
184	1	SF Residential	64.7	62.1	67.2	2.5	Yes	
185	1	SF Residential	62.5	59.9	69.3	6.8	Yes	
186	1	SF Residential	64.9	62.3	69.6	4.7	Yes	
187	2	MF Residential	58.6	55.8	61.5	2.9		
188	2	MF Residential	58.8	56.0	61.7	2.9		

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
189	2	MF Residential	57.3	54.5	60.1	2.8		
190	2	MF Residential	59.2	56.5	62.2	3.0		
191	2	MF Residential	61.7	59.0	65.3	3.6		
192	2	MF Residential	65.5	62.9	69.0	3.5	Yes	
193	1	SF Residential	64.8	62.4	68.4	3.6	Yes	
194	1	SF Residential	56.2	53.4	59.5	3.3		
195	1	SF Residential	57.4	54.6	60.7	3.3		
196	1	SF Residential	55.8	53.0	59.3	3.5		
197	1	SF Residential	57.0	54.1	60.4	3.4		
198	1	SF Residential	64.3	61.7	69.0	4.7	Yes	
199	1	SF Residential	66.7	64.1	70.9	4.2	Yes	
200	1	SF Residential	62.4	59.7	67.4	5.0	Yes	
201	1	SF Residential	55.5	52.7	59.1	3.6		
202	1	SF Residential	56.7	53.9	60.0	3.3		
203	1	SF Residential	55.5	52.6	58.9	3.4		
204	1	SF Residential	57.0	54.2	60.3	3.3		
205	1	SF Residential	60.4	57.7	64.7	4.3		
206	1	SF Residential	65.9	63.3	70.2	4.3	Yes	
207	1	SF Residential	65.6	63.0	70.0	4.4	Yes	
208	1	SF Residential	63.4	60.8	68.3	4.9	Yes	
209	1	SF Residential	63.9	61.2	68.6	4.7	Yes	
210	1	SF Residential	60.7	58.0	65.4	4.7		
211	1	SF Residential	64.0	61.4	67.7	3.7	Yes	
212	1	SF Residential	62.0	59.3	65.6	3.6		
213	1	SF Residential	64.8	62.1	69.7	4.9	Yes	
214	1	SF Residential	64.8	62.2	69.8	5.0	Yes	
215	1	SF Residential	63.4	60.8	68.7	5.3	Yes	
216	1	SF Residential	63.5	61.0	69.0	5.5	Yes	
217	1	SF Residential	63.3	60.7	68.7	5.4	Yes	
218	1	SF Residential	63.1	60.5	68.5	5.4	Yes	
219	1	SF Residential	62.6	60.1	68.2	5.6	Yes	
220	1	SF Residential	64.6	62.1	69.8	5.2	Yes	
221	1	SF Residential	55.9	53.2	59.2	3.3		
222	2	SF Residential	56.5	53.9	59.8	3.3		
223	1	SF Residential	56.4	53.8	59.8	3.4		
224	2	SF Residential	56.4	53.9	59.9	3.5		
225	1	SF Residential	56.3	53.8	59.8	3.5		
226	1	SF Residential	59.7	57.2	63.3	3.6		

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
227	1	SF Residential	57.2	54.7	60.5	3.3		
228	1	SF Residential	62.4	59.8	68.3	5.9	Yes	
229	1	SF Residential	55.8	53.2	59.0	3.2		
230	1	SF Residential	63.0	60.5	69.0	6.0	Yes	
231	1	SF Residential	54.2	51.6	57.8	3.6		
232	1	SF Residential	61.0	58.5	66.1	5.1	Yes	
233	1	SF Residential	53.2	50.6	57.0	3.8		
234	1	SF Residential	60.7	58.2	65.5	4.8		
235	1	SF Residential	53.4	50.7	57.0	3.6		
236	1	SF Residential	60.6	58.1	65.5	4.9		
237	1	SF Residential	60.2	57.7	64.8	4.6		
238	1	SF Residential	56.6	54.0	59.3	2.7		
239	1	SF Residential	66.2	63.6	71.2	5.0	Yes	
240	1	SF Residential	68.1	65.6	72.6	4.5	Yes	
241	1	SF Residential	63.3	60.7	68.7	5.4	Yes	
242	1	SF Residential	69.6	67.1	73.5	3.9	Yes	
243	1	SF Residential	56.1	53.5	58.8	2.7		
244	1	SF Residential	66.7	64.2	71.3	4.6	Yes	
245	1	SF Residential	60.1	57.6	62.9	2.8		
246	1	SF Residential	61.9	59.3	66.4	4.5	Yes	
247	1	SF Residential	62.0	59.4	66.8	4.8	Yes	
248	1	Woodbine Baptist Church (Interior)	37.1	34.6	39.5	2.4		
249	1	SF Residential	59.8	57.2	63.6	3.8		
250	1	SF Residential	58.2	55.7	60.8	2.6		
251	1	SF Residential	60.0	57.5	63.6	3.6		
252	1	SF Residential	60.9	58.3	66.0	5.1	Yes	
253	1	SF Residential	60.2	57.7	64.6	4.4		
254	1	SF Residential	63.9	61.4	69.2	5.3	Yes	
255	1	SF Residential	60.3	57.7	65.0	4.7		
256	1	SF Residential	59.5	56.9	64.0	4.5		
257	1	SF Residential	60.1	57.6	65.4	5.3		
258	1	SF Residential	59.9	57.3	64.8	4.9		
259	1	SF Residential	60.9	58.3	66.3	5.4	Yes	
260	1	Woodbine Methodist Church (Interior)	36.9	34.4	40.0	3.1		
261	1	SF Residential	59.4	56.9	62.3	2.9		
262	1	SF Residential	61.7	59.2	65.6	3.9		
263	1	SF Residential	62.1	59.7	66.7	4.6	Yes	

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
264	1	SF Residential	57.1	54.6	59.7	2.6		
265	1	SF Residential	53.7	51.0	57.1	3.4		
266	3	SF Residential	55.5	52.9	58.3	2.8		
267	1	SF Residential	62.3	59.7	67.9	5.6	Yes	
268	1	SF Residential	62.3	59.7	67.9	5.6	Yes	
269	1	SF Residential	61.2	58.6	65.9	4.7		
270	1	SF Residential	62.0	59.4	67.2	5.2	Yes	
271	1	SF Residential	60.5	58.1	64.2	3.7		
272	1	SF Residential	62.2	59.7	67.1	4.9	Yes	
273	1	SF Residential	63.1	60.7	68.0	4.9	Yes	
274	1	SF Residential	60.8	58.3	64.2	3.4		
275	1	SF Residential	56.7	54.1	59.3	2.6		
276	1	SF Residential	54.3	51.7	57.5	3.2		
277	1	SF Residential	54.8	52.2	57.8	3.0		
278	1	SF Residential	55.9	53.3	58.6	2.7		
279	1	SF Residential	59.3	56.7	62.7	3.4		
280	1	SF Residential	62.8	60.1	68.0	5.2	Yes	
281	1	SF Residential	66.1	63.7	68.5	2.4	Yes	
282	1	SF Residential	58.2	55.6	59.9	1.7		
283	1	SF Residential	55.2	52.5	56.9	1.7		
284	1	SF Residential	62.2	59.8	65.1	2.9		
285	1	SF Residential	60.7	58.2	63.0	2.3		
286	1	SF Residential	59.7	57.1	61.5	1.8		
287	1	SF Residential	60.0	57.4	61.7	1.7		
288	1	SF Residential	58.1	55.5	59.0	0.9		
289	1	SF Residential	60.8	58.2	62.4	1.6		
290	1	SF Residential	63.9	61.4	66.2	2.3	Yes	
291	1	SF Residential	62.6	60.0	63.7	1.1		
292	1	SF Residential	61.0	58.3	60.5	-0.5		
293	1	SF Residential	59.1	56.3	58.5	-0.6		
294	1	SF Residential	57.2	54.4	57.4	0.2		
295	1	SF Residential	55.2	52.5	56.9	1.7		
296	1	SF Residential	54.8	52.1	56.5	1.7		
297	1	SF Residential	54.6	51.9	56.2	1.6		
298	1	SF Residential	54.9	52.1	56.3	1.4		
299	1	SF Residential	54.6	51.8	56.1	1.5		
300	1	SF Residential	58.2	55.6	59.6	1.4		
301	1	SF Residential	62.7	60.1	67.9	5.2	Yes	

**Table 3-3 (Continued):  
Predicted Traffic Noise Levels**

Site ID *	# of Units	Description	L <sub>Aeq1h</sub> (dBA)				Approaches, Meets or Exceeds NAC?	Substantial Increase?
			Existing (2005)	Future No-Build (2025)	Future Build (2025)	Increase from Existing to Build		
302	1	SF Residential	63.4	60.9	68.9	5.5	Yes	
303	1	SF Residential	62.7	60.2	68.3	5.6	Yes	

\* Site locations can be found on the Project Aerials in Appendix A.

As shown in Table 3-3, existing (2005) exterior traffic noise levels are predicted to range from 52.5 to 69.6 dBA. In the future (2025) without the proposed improvements (Future No-Build), exterior traffic noise levels are predicted to range from 49.5 to 67.1 dBA. With the proposed improvements (Future Build), exterior traffic noise levels are predicted to range from 55.7 to 73.5 dBA, with 121 sites predicted to experience noise levels that approach, meet, or exceed the NAC. Of the 121 sites, 115 are SF residences and 6 are MF residences. When compared to the existing condition, exterior traffic noise levels are predicted to increase 0.1 to 19.5 dBA, with 16 sites predicted to experience a substantial increase (15 dBA or more) in traffic noise. It should be noted that these 16 sites are also predicted to experience future traffic noise levels that approach, meet, or exceed the NAC.

As also shown in Table 3-3, the results of the analysis indicate that existing interior traffic noise levels are predicted to range from 36.9 to 44.5 dBA at the four religious facilities evaluated. In the future without the proposed improvements (Future No-Build), interior traffic noise levels are predicted to range from 34.4 to 41.9 dBA. Finally, with the proposed improvements (Future Build), interior traffic noise levels are predicted to range from 39.5 to 46.5 dBA, with none of the sites predicted to experience levels that approach, meet, or exceed the NAC. When compared to the existing condition, interior traffic noise levels are predicted to increase 1.8 to 3.1 dBA. As such, none of the sites are predicted to experience a substantial increase as a result of the proposed improvements.

Noise abatement measures were evaluated for the 121 noise sensitive sites predicted to be affected by the proposed expansion of Woodbine Road/Chumuckla Highway and the associated improvements. The results of the evaluation are presented in Section 4.0 of this report.

## **Section 4.0**

# **EVALUATION OF ABATEMENT ALTERNATIVES**

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Santa Rosa County considers abatement alternatives when predicted traffic noise levels approach or exceed the NAC, or when levels are predicted to increase 15 dBA or more as a direct result of the proposed improvements. The measures considered for the Woodbine Road/Chumuckla Highway expansion and associated improvements 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.

### **4.1 TRAFFIC MANAGEMENT**

Traffic management measures that limit motor vehicle speeds and reduce volumes can be effective noise mitigation measures. However, these measures also negate a project's ability to accommodate forecast traffic volumes. For example, if the proposed posted speed on Woodbine Road/Chumuckla Highway and the associated roadways was reduced, the capacity of the roadway to handle the forecast motor vehicle 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.

### **4.2 ALTERNATIVE ROADWAY ALIGNMENT**

The proposed alignment is within the right-of-way reserved for the project and seeks to minimize the need for additional right-of-way (ROW) within the project corridor. A shift in the roadway alignment would result in a need for additional right-of-way. Additionally, a shift in the roadway alignment would not provide a positive benefit, since noise sensitive sites are located both east and west of the proposed alignment.

### **4.3 PROPERTY ACQUISITIONS**

To be considered reasonable, Santa Rosa County has determined that the amount of public funds to be used for noise abatement should not exceed \$35,000 per benefited receiver (noise-sensitive site). Property and homes within this area far exceed this value; therefore, property acquisition is not considered a reasonable abatement measure.

## **4.4 NOISE BARRIERS**

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 in traffic noise with a design goal of 10 dBA or more desired.
- The barrier should not cost more than \$35,000 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 \$25.00 per square foot (ft<sup>2</sup>).

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.

Other 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.

Other 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.

### **4.4.1 NOISE BARRIER ANALYSIS**

As previously stated, during the year 2025 with the proposed expansion of Woodbine Road/Chumuckla Highway and the associated improvements, traffic noise levels are predicted to approach, meet, or exceed the NAC, increase substantially, or both, at a total of 121 noise sensitive sites adjacent to the project corridor, all of which are residences.

Based on a field survey of the project area and the results from the analysis of Barriers 1, 2, and 11 below, noise barriers were determined not to be a feasible noise abatement measure at some of the affected locations due to access requirements (driveways/cross streets) to/from the adjacent roadways. These constraints would not allow a noise barrier of sufficient continuous length to be constructed so that a barrier would reduce traffic noise levels at least 5 dBA. Also, noise barriers were not evaluated for all isolated residences. Based on the analysis of these representative samples it was determined that it is highly improbable that a cost reasonable barrier could be designed for a single affected residence. The locations where noise barriers were not evaluated for these reasons are Sites 48-50, 60, 84, 89, 91, 95, 98, 101, 104, 109, 112, 180, 184-186, 192, 193, 208, 209, 211, 228, 230, 232, 239-242, 244, 246, 247, 252, 254, 259, 280, and 281. It does not appear that there are any other feasible and cost reasonable abatement measures for these affected sites.

The following discusses the feasibility and reasonableness of providing noise barriers as an abatement measure for the remaining affected sites. Documentation in support of the noise barrier analysis is provided in Appendix C.

## Barrier 1

Barrier 1 was evaluated for the 6 residences (Sites 10-12 and 16-18) located on the west side of Woodbine Road, north of Melvin Drive, that are predicted to experience traffic noise levels that approach, meet, or exceed the NAC, ranging from 67.0 to 70.2 dBA.

The barrier was evaluated at the back edge of the proposed sidewalk. In order to maintain access to the properties via driveways, the barrier was evaluated in six segments. The height of the barrier was evaluated from 8 to 22 feet in two-foot increments. When reasonable, the length of the barrier was optimized at each height to maintain at least a 5 dBA reduction to those affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-1. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could not be achieved for any of the affected residences at any of the heights evaluated. As also shown, the barrier could provide 3 of the 6 affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 12 to 22 feet. At heights ranging from 12 to 22 feet, the total estimated cost to construct the barrier ranges from \$236,950 to \$343,750. The cost per benefited residence ranges from \$78,984 to \$114,584 – costs that exceed the cost reasonable guideline. As such, although the barrier is predicted to provide some of the affected residences with a reduction in traffic noise of at least 5 dBA, since the cost to construct the barrier exceeds the cost reasonable guideline, the barrier is not considered a reasonable noise abatement measure.

**Table 4-1: Barrier 1**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	*	Total			
8/881	0	0	0	0	0	0	0	0	0	--	--	--
10/881	1	0	0	0	0	0	1	0	1	\$220,250	\$220,250	No
12/881	3	0	0	0	0	0	3	0	3	\$264,300	\$88,100	No
14/677	3	0	0	0	0	0	3	0	3	\$236,950	\$78,984	No
16/657	3	0	0	0	0	0	3	0	3	\$262,800	\$87,600	No
18/625	3	0	0	0	0	0	3	0	3	\$281,250	\$93,750	No
20/625	3	0	0	0	0	0	3	0	3	\$312,500	\$104,167	No
22/625	3	0	0	0	0	0	3	0	3	\$343,750	\$114,584	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

## Barrier 2

Barrier 2 was evaluated for the single residence (Site 21) located on the west side of Woodbine Road, just south of Abel Avenue, which is predicted to experience a future traffic noise level of 67.2 dBA, a level that exceeds the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk. The northern terminus of the barrier would be limited due to the intersection of Woodbine Road and Abel Avenue. The southern terminus of the barrier was optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected site.

The results of the evaluation are provided in Table 4-2. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could not be achieved for the affected residence at any of the heights evaluated. As also shown, the barrier could provide the affected residence with a reduction in traffic noise of at least 5 dBA at heights ranging from 12 to 22 feet. At heights ranging from 12 to 22 feet, the total estimated cost to construct the barrier and the cost per benefited receiver range from \$91,800 to \$146,300 – costs that exceed the cost reasonable guideline. As such, although the barrier is predicted to provide the affected residence with a reduction in traffic noise of at least 5 dBA, since the cost to construct the barrier exceeds the cost reasonable guideline, the barrier is not considered a reasonable noise abatement measure.

**Table 4-2: Barrier 2**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/326	0	0	0	0	0	0	0	0	0	--	--	--
10/326	0	0	0	0	0	0	0	0	0	--	--	--
12/306	1	0	0	0	0	0	1	0	1	\$91,800	\$91,800	No
14/286	1	0	0	0	0	0	1	0	1	\$100,100	\$100,100	No
16/266	1	0	0	0	0	0	1	0	1	\$106,400	\$106,400	No
18/266	1	0	0	0	0	0	1	0	1	\$119,700	\$119,700	No
20/266	1	0	0	0	0	0	1	0	1	\$133,000	\$133,000	No
22/266	1	0	0	0	0	0	1	0	1	\$146,300	\$146,300	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

### Barrier 3

Barrier 3 was evaluated for the 15 residences (Sites 27-31, 33, 34, 37-39, and 41-45) located on the west side of Woodbine Road, both north and south of Dunning Drive, that are predicted to experience future traffic noise levels ranging from 66.0 to 68.1 dBA, levels that approach and exceed the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk, and was evaluated in two segments to maintain access to the properties via Dunning Drive. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-3. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could be achieved for 3 to 9 of the affected residences at heights ranging from 12 to 22 feet. As also shown, the barrier could provide all 15 of the affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 12 to 22 feet. Based on the results of the evaluation, a barrier 12 feet in height appears to be the most reasonable, since additional heights above 12 feet would not provide any additional residences with a reduction of at least 5 dBA. At a height of 12 feet and a length of 1,939 feet, the total estimated cost to construct the barrier is \$581,700, and the cost per benefited residence is \$18,765 – a cost that is below the cost reasonable guideline.

**Table 4-3: Barrier 3**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/2,032	2	7	4	0	0	0	13	2	15	\$406,400	\$27,094	Yes
10/1,976	3	0	7	3	1	0	14	2	16	\$494,000	\$30,875	Yes
<b>12/1,939</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>15</b>	<b>16</b>	<b>31</b>	<b>\$581,700</b>	<b>\$18,765</b>	<b>Yes</b>
14/1,923	2	2	0	2	3	6	15	16	31	\$673,050	\$21,712	Yes
16/1,923	2	2	0	2	1	8	15	16	31	\$769,200	\$24,813	Yes
18/1,923	2	2	0	1	2	8	15	16	31	\$865,350	\$27,915	Yes
20/1,923	2	2	0	0	2	9	15	16	31	\$961,500	\$31,017	Yes
22/1,923	2	2	0	0	2	9	15	16	31	\$1,057,650	\$34,118	Yes

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

Since the evaluation has determined that Barrier 3 could provide the at least the minimum required reduction in traffic noise at a cost below the cost reasonable guideline, the barrier was evaluated further. The results of the evaluation are provided in Table 4-4.

**Table 4-4  
Additional Considerations: Barrier 3**

<b>Evaluation Criteria</b>	<b>Comment</b>
1. Relationship of future levels to the abatement criteria	With the proposed improvements, the 15 affected sites that would be benefited by the barrier are predicted to experience traffic noise levels ranging from 66.0 to 68.1 dBA, levels that approach and exceed the NAC.
2. Amount of noise reduction	Traffic noise from Woodbine Road would be reduced a minimum of 5 dBA at all 15 affected sites. (An average reduction of 8.4 dBA). An additional sixteen (16) sites, not predicted to be affected by the proposed improvements, would also benefit from the noise barrier.
3. Safety	Safety considerations will be evaluated in greater detail during the design phase of the proposed improvements.
4. Community desires	Community desires will be solicited as part of the public involvement process during the design phase of the proposed improvements.
5. Accessibility	There does not appear to be any accessibility issues with the barrier at the evaluated location.
6. Land use stability	Land use in the area is residential. It is expected that this land use will remain in the future.
7. Local controls	Santa Rosa County does not have an active noise control program
8. Views of local officials with jurisdiction	The views of local officials will be solicited as part of the ongoing public involvement process.
9. Antiquity	The residences currently exist.
10. Constructability	Constructability issues will be reviewed in greater detail during the design phase of the proposed improvements.
11. Maintainability	Maintenance issues will be reviewed in greater detail during the design phase of the proposed improvements.
12. Aesthetics	The aesthetics of the barrier would be determined during the design phase of the proposed improvements, in conjunction with Santa Rosa County and the adjacent property owners.
13. ROW needs including access rights, easements for construction and/or maintenance, and additional land	ROW requirements will be assessed in greater detail during the design phase of the proposed improvements, although the need for additional ROW is not anticipated.
14. Cost	At a total length of 1,939 feet and a height of 12 feet, the total estimated cost to construct the barrier is \$581,700. The cost per benefited receiver is \$18,765 – a cost below the FDOT cost reasonable guideline.
15. Utilities	Potential utility conflicts will be assessed in greater detail during the design phase of the proposed improvements.
16. Drainage	Potential drainage conflicts will be assessed in greater detail during the design phase of the proposed improvements.
17. Special land use considerations	None known.
18. Other environmental considerations	None known.

As shown in Table 4-4, conditions in favor of Barrier 3 as a potential noise abatement measure include:

- All 15 of the affected residences would be benefited by the barrier (An average reduction of 8.4 dBA).
- The barrier is predicted to reduce traffic noise levels at least 5 dBA at a total of 31 noise sensitive sites.
- The cost to construct the barrier is below the cost reasonable guideline.
- The land use is expected to remain noise sensitive in the future.

## Barrier 4

Barrier 4 was evaluated for the 3 residences (Sites 54, 55, and 59) located on the west side of Woodbine Road, both north and south of Joanna Drive, that are predicted to experience future traffic noise levels ranging from 68.7 to 70.7 dBA, levels that exceed the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk, and was evaluated in two segments to maintain access to the properties via Joanna Drive. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-5. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could not be achieved for any of the affected residences at any of the heights evaluated. As also shown, the barrier could provide 2 of the 3 affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 8 to 22 feet. At heights ranging from 8 to 22 feet, the total estimated cost to construct the barrier ranges from \$87,750 to \$174,350, and the cost per benefited residence ranges from \$43,875 to \$87,175 – costs that exceed the cost reasonable guideline. As such, although the barrier could provide 2 of the 3 affected residences with a reduction in traffic noise of at least 5 dBA, since the cost to construct the barrier exceeds the cost reasonable guideline, the barrier is not considered a reasonable noise abatement measure.

**Table 4-5: Barrier 4**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/462	1	1	0	0	0	0	2	0	2	\$92,400	\$46,200	No
10/351	1	0	1	0	0	0	2	0	2	\$87,750	\$43,875	No
12/334	1	0	1	0	0	0	2	0	2	\$100,200	\$50,100	No
14/334	1	0	1	0	0	0	2	0	2	\$116,900	\$58,450	No
16/317	1	0	1	0	0	0	2	0	2	\$126,800	\$63,400	No
18/317	1	0	1	0	0	0	2	0	2	\$142,650	\$71,325	No
20/317	1	0	1	0	0	0	2	0	2	\$158,500	\$79,250	No
22/317	1	0	1	0	0	0	2	0	2	\$174,350	\$87,175	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

## Barrier 5

Barrier 5 was evaluated for the 8 residences (Sites 64-67, 74, 75, 80, and 82) located on the west side of Chumuckla Highway, north of the proposed Quintette Road realignment, that are predicted to experience future traffic noise levels ranging from 66.2 to 69.5 dBA, levels that approach and exceed the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk, and was evaluated in five segments to maintain access to the properties via driveways as well as Lodging Circle. The barrier was evaluated from 8 to 22 feet in two-foot increments.

The results of the evaluation are provided in Table 4-6. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could not be achieved for any of the affected residences at any of the heights evaluated. As also shown, the barrier could provide 2 of the affected residences with a reduction in traffic noise of at least 5 dBA at a height of 16 feet. At that height and at a length of 16 feet, the total estimated cost to construct the barrier is \$231,600, and the cost per benefited residence is \$77,200 – a cost that exceeds the cost reasonable guideline. As such, although the barrier could provide 2 of the affected residences with a reduction in traffic noise of at least 5 dBA, since the cost to construct the barrier exceeds the cost reasonable guideline, the barrier is not considered a reasonable noise abatement measure.

**Table 4-6: Barrier 5**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	*	Total			
8/579	1	0	0	0	0	0	1	0	1	\$115,800	\$115,800	No
10/579	1	0	0	0	0	0	1	0	1	\$144,750	\$144,750	No
12/579	0	1	0	0	0	0	1	0	1	\$173,700	\$173,700	No
14/579	0	1	0	0	0	0	1	0	1	\$202,650	\$202,650	No
16/579	1	1	0	0	0	0	2	1	3	\$231,600	\$77,200	No
18/579	1	1	0	0	0	0	2	1	3	\$260,550	\$86,850	No
20/579	1	1	0	0	0	0	2	1	3	\$289,500	\$96,500	No
22/579	1	1	0	0	0	0	2	1	3	\$318,450	\$106,150	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

## Barrier 6

Barrier 6 was evaluated for the 11 residences (Sites 115-123, 130, and 133) located on the south side of the proposed Berryhill Road realignment, between Ashmore Lane and Windrun Place. The sites are predicted to experience future traffic noise levels ranging from 66.5 to 68.7 dBA, levels that approach and exceed the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk in three segments to maintain access to the properties via Stratford Lane and Berrybrook Circle. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-7. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could be achieved for 1 to 2 of the affected residences at heights ranging from 10 to 22 feet. As also shown, the barrier could provide 9 to 11 of the affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 8 to 22 feet. Based on the results of the evaluation, a barrier 12 feet in height with a length of 1,118 feet appears to be the most reasonable, as additional heights above 12 feet would only provide a benefit to sites that are not predicted to be affected by the proposed improvements. At a height of 12 feet and a length of 1,118 feet, the total estimated cost to construct the barrier is \$335,400, and the cost per benefited residence is \$27,950 – a cost that is below the cost reasonable guideline.

**Table 4-7: Barrier 6**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/1,152	4	4	0	1	0	0	9	1	10	\$230,400	\$23,040	Yes
10/1,148	1	3	4	0	0	1	9	1	10	\$287,000	\$28,700	Yes
<b>12/1,118</b>	<b>4</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>11</b>	<b>1</b>	<b>12</b>	<b>\$335,400</b>	<b>\$27,950</b>	<b>Yes</b>
14/1,118	4	0	2	3	1	1	11	1	12	\$391,300	\$32,609	Yes
16/1,118	4	0	2	2	1	2	11	2	13	\$447,200	\$34,400	Yes
18/1,118	4	0	1	3	1	2	11	3	14	\$503,100	\$35,936	No
20/1,118	4	0	1	3	1	2	11	3	14	\$559,000	\$39,929	No
22/1,118	4	0	1	2	2	2	11	3	14	\$614,900	\$43,922	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

Since the evaluation has determined that Barrier 6 could provide some of the affected residences with a reduction in traffic noise of at least 5 dBA at a cost below the cost reasonable guideline, the barrier was evaluated further. The results of the evaluation are provided in Table 4-8.

**Table 4-8  
Additional Considerations: Barrier 6**

<b>Evaluation Criteria</b>	<b>Comment</b>
1. Relationship of future levels to the abatement criteria	With the proposed improvements, the 11 affected sites that would be benefited by the barrier are predicted to experience traffic noise levels ranging from 66.5 to 68.7 dBA, levels that approach and exceed the NAC.
2. Amount of noise reduction	Traffic noise from the proposed Berryhill Road realignment would be reduced a minimum of 5 dBA at all 11 affected sites. (An average reduction of 7.2 dBA).
3. Safety	Safety considerations will be evaluated in greater detail during the design phase of the proposed improvements.
4. Community desires	Community desires will be solicited as part of the public involvement process during the design phase of the proposed improvements.
5. Accessibility	There does not appear to be any accessibility issues with the barrier at the evaluated location.
6. Land use stability	Land use in the area is residential. It is expected that this land use will remain in the future.
7. Local controls	Santa Rosa County does not have an active noise control program.
8. Views of local officials with jurisdiction	The views of local officials will be solicited as part of the ongoing public involvement process.
9. Antiquity	The residences currently exist.
10. Constructability	Constructability issues will be reviewed in greater detail during the design phase of the proposed improvements.
11. Maintainability	Maintenance issues will be reviewed in greater detail during the design phase of the proposed improvements.
12. Aesthetics	The aesthetics of the barrier would be determined during the design phase of the proposed improvements, in conjunction with Santa Rosa County and the adjacent property owners.
13. ROW needs including access rights, easements for construction and/or maintenance, and additional land	ROW requirements will be assessed in greater detail during the design phase of the proposed improvements, although the need for additional ROW is not anticipated.
14. Cost	At a total length of 1,118 feet and a height of 12 feet, the total estimated cost to construct the barrier is \$335,400. The cost per benefited receiver is \$27,950 – a cost below the FDOT cost reasonable guideline.
15. Utilities	Potential utility conflicts will be assessed in greater detail during the design phase of the proposed improvements.
16. Drainage	Potential drainage conflicts will be assessed in greater detail during the design phase of the proposed improvements.
17. Special land use considerations	None known.
18. Other environmental considerations	None known.

As shown in Table 4-8, conditions in favor of Barrier 6 as a potential noise abatement measure include:

- All 11 of the affected residences would be benefited by the barrier (An average reduction of 7.2 dBA).
- The barrier is predicted to reduce traffic noise levels at least 5 dBA at a total of 12 noise sensitive sites.
- The cost to construct the barrier is below the cost reasonable guideline.
- The land use is expected to remain noise sensitive in the future.

## Barrier 7

Barrier 7 was evaluated for the 16 residences (Sites 138, and 149-163) located on the north side of the proposed Berryhill Road realignment, and east of Chumuckla Highway (along Ashmore Lane). The sites are predicted to experience future traffic noise levels ranging from 66.0 to 69.6 dBA, levels that approach and exceed the NAC, and substantial increases (15.0 dBA or more) in traffic noise ranging from 15.9 to 19.5 dBA.

The barrier was evaluated at the back edge of the proposed sidewalk in two segments to maintain access to the properties at the intersection of the proposed Berryhill Road realignment and Ashmore Lane. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-9. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could be achieved for 3 to 13 of the affected residences at barrier heights ranging from 10 to 22 feet. As also shown, the barrier could provide all 15 of the affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 8 to 22 feet. Based on the results of the evaluation, a barrier 8 feet in height with a length of 1,592 feet appears to be the most reasonable. Increasing the height of the barrier would only benefit residences that are not predicted to be affected by the proposed improvements. At a height of 8 feet and a length of 1,592 feet, the total estimated cost to construct the barrier is \$318,400, and the cost per benefited residence is \$21,277 – a cost that is below the cost reasonable guideline.

**Table 4-9: Barrier 7**

Barrier Height/ Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
<b>8/1,592</b>	<b>2</b>	<b>0</b>	<b>11</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>0</b>	<b>15</b>	<b>\$318,400</b>	<b>\$21,227</b>	<b>Yes</b>
10/1,534	2	0	1	4	5	3	15	0	15	\$383,500	\$25,567	Yes
12/1,515	2	0	0	1	2	10	15	8	23	\$454,500	\$19,761	Yes
14/1,496	2	0	0	0	2	11	15	10	25	\$523,600	\$20,944	Yes
16/1,496	1	1	0	0	2	11	15	10	25	\$598,400	\$23,936	Yes
18/1,496	1	1	0	0	1	12	15	10	25	\$673,200	\$26,928	Yes
20/1,496	1	1	0	0	1	12	15	11	26	\$748,000	\$28,770	Yes
22/1,496	1	1	0	0	0	13	15	11	26	\$822,800	\$31,647	Yes

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

Since the evaluation has determined that Barrier 7 could provide all of the affected residences with a reduction in traffic noise of at least 5 dBA at a cost below the cost reasonable guideline, the barrier was evaluated further. The results of the evaluation are provided in Table 4-10.

**Table 4-10  
Additional Considerations: Barrier 7**

Evaluation Criteria	Comment
1. Relationship of future levels to the abatement criteria	With the proposed improvements, the 15 affected sites that would be benefited by the barrier are predicted to experience traffic noise levels ranging from 66.0 to 69.6 dBA, levels that approach and exceed the NAC, and substantial increases ranging from 15.9 to 19.5 dBA.
2. Amount of noise reduction	Traffic noise from the proposed Berryhill Road realignment would be reduced a minimum of 5 dBA at all 15 affected sites. (An average reduction of 7.4 dBA).
3. Safety	Safety considerations will be evaluated in greater detail during the design phase of the proposed improvements.
4. Community desires	Community desires will be solicited as part of the public involvement process during the design phase of the proposed improvements.
5. Accessibility	There does not appear to be any accessibility issues with the barrier at the evaluated location.
6. Land use stability	Land use in the area is residential. It is expected that this land use will remain in the future.
7. Local controls	Santa Rosa County does not have an active noise control program.
8. Views of local officials with jurisdiction	The views of local officials will be solicited as part of the ongoing public involvement process.
9. Antiquity	The residences currently exist.
10. Constructability	Constructability issues will be reviewed in greater detail during the design phase of the proposed improvements.
11. Maintainability	Maintenance issues will be reviewed in greater detail during the design phase of the proposed improvements.
12. Aesthetics	The aesthetics of the barrier would be determined during the design phase of the proposed improvements, in conjunction with Santa Rosa County and the adjacent property owners.
13. ROW needs including access rights, easements for construction and/or maintenance, and additional land	ROW requirements will be assessed in greater detail during the design phase of the proposed improvements, although the need for additional ROW is not anticipated.
14. Cost	At a total length of 1,592 feet and a height of 8 feet, the total estimated cost to construct the barrier is \$318,400. The cost per benefited receiver is \$21,227 – a cost below the FDOT cost reasonable guideline.
15. Utilities	Potential utility conflicts will be assessed in greater detail during the design phase of the proposed improvements.
16. Drainage	Potential drainage conflicts will be assessed in greater detail during the design phase of the proposed improvements.
17. Special land use considerations	None known.
18. Other environmental considerations	None known.

As shown in Table 4-10, conditions in favor of Barrier 7 as a potential noise abatement measure include:

- All 15 of the affected residences would be benefited by the barrier (An average reduction of 7.4 dBA).
- The barrier is predicted to reduce traffic noise levels at least 5 dBA at a total of 15 noise sensitive sites.
- The cost to construct the barrier is below the cost reasonable guideline.
- The land use is expected to remain noise sensitive in the future.

## Barrier 8

Barrier 8 was evaluated for the 5 residences (Sites 198-200, 206, and 207) located on the west side of Quintette Road, both north and south of Meghan’s Way. The sites are predicted to experience future traffic noise levels ranging from 67.4 to 70.9 dBA, levels that exceed the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk in two segments to maintain access to the properties via Meghan’s Way. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-11. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could not be achieved for any of the affected residences at any of the barrier heights evaluated. As also shown, the barrier could provide 3 of the affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 8 to 22 feet. Based on the results of the evaluation, a barrier 8 feet in height with a length of 324 feet appears to be the most reasonable. Increasing the height of the barrier would not provide any additional residences with a reduction in traffic noise. At a height of 8 feet and a length of 324 feet, the total estimated cost to construct the barrier is \$64,800, and the cost per benefited residence is \$21,600 – a cost that is below the cost reasonable guideline.

**Table 4-11: Barrier 8**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/324	1	2	0	0	0	0	3	0	3	\$64,800	\$21,600	Yes
10/305	1	1	1	0	0	0	3	0	3	\$76,250	\$25,417	Yes
12/286	1	1	0	1	0	0	3	0	3	\$85,800	\$28,600	Yes
14/286	1	1	0	1	0	0	3	0	3	\$100,100	\$33,367	Yes
16/286	1	1	0	1	0	0	3	0	3	\$114,400	\$38,134	No
18/286	1	1	0	1	0	0	3	0	3	\$128,700	\$42,900	No
20/286	1	1	0	1	0	0	3	0	3	\$143,000	\$47,667	No
22/286	1	1	0	1	0	0	3	0	3	\$157,300	\$52,434	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

Since the evaluation has determined that Barrier 8 could provide 3 of the affected residences with a reduction in traffic noise of at least 5 dBA at a cost below the cost reasonable guideline, the barrier was evaluated further. The results of the evaluation are provided in Table 4-12.

**Table 4-12  
Additional Considerations: Barrier 8**

Evaluation Criteria	Comment
1. Relationship of future levels to the abatement criteria	With the proposed improvements, the 3 affected sites that would be benefited by the barrier are predicted to experience traffic noise levels ranging from 67.4 to 70.9 dBA, levels that exceed the NAC.
2. Amount of noise reduction	Traffic noise from Quintette Road would be reduced a minimum of 5 dBA at 3 affected sites. (An average reduction of 5.6 dBA).
3. Safety	Safety considerations will be evaluated in greater detail during the design phase of the proposed improvements.
4. Community desires	Community desires will be solicited as part of the public involvement process during the design phase of the proposed improvements.
5. Accessibility	There does not appear to be any accessibility issues with the barrier at the evaluated location.
6. Land use stability	Land use in the area is residential. It is expected that this land use will remain in the future.
7. Local controls	Santa Rosa County does not have an active noise control program.
8. Views of local officials with jurisdiction	The views of local officials will be solicited as part of the ongoing public involvement process.
9. Antiquity	The residences currently exist.
10. Constructability	Constructability issues will be reviewed in greater detail during the design phase of the proposed improvements.
11. Maintainability	Maintenance issues will be reviewed in greater detail during the design phase of the proposed improvements.
12. Aesthetics	The aesthetics of the barrier would be determined during the design phase of the proposed improvements, in conjunction with Santa Rosa County and the adjacent property owners.
13. ROW needs including access rights, easements for construction and/or maintenance, and additional land	ROW requirements will be assessed in greater detail during the design phase of the proposed improvements, although the need for additional ROW is not anticipated.
14. Cost	At a total length of 1,592 feet and a height of 8 feet, the total estimated cost to construct the barrier is \$318,400. The cost per benefited receiver is \$21,227 – a cost below the FDOT cost reasonable guideline.
15. Utilities	Potential utility conflicts will be assessed in greater detail during the design phase of the proposed improvements.
16. Drainage	Potential drainage conflicts will be assessed in greater detail during the design phase of the proposed improvements.
17. Special land use considerations	None known.
18. Other environmental considerations	None known.

As shown in Table 4-12, conditions in favor of Barrier 8 as a potential noise abatement measure include:

- 3 of the affected residences would be benefited by the barrier (An average reduction of 5.6 dBA).
- The barrier is predicted to reduce traffic noise levels at least 5 dBA at a total of 3 noise sensitive sites.
- The cost to construct the barrier is below the cost reasonable guideline.
- The land use is expected to remain noise sensitive in the future.

## Barrier 9

Barrier 9 was evaluated for the 8 residences (Sites 213-220) located on the east side of Woodbine Road, in the vicinity of Bayou Ridge Drive. The sites are predicted to experience future traffic noise levels ranging from 68.2 to 69.8 dBA, levels that exceed the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk in two segments to maintain access to the properties via Bayou Ridge Drive. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-13. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could be achieved for 1 to 4 of the affected residences at barrier heights ranging from 12 to 22 feet. As also shown, the barrier could provide 6 of the affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 8 to 22 feet. Based on the results of the evaluation, a barrier 8 feet in height with a length of 617 feet appears to be the most reasonable. Increasing the height of the barrier would not provide any additional affected residences with a reduction in traffic noise of at least 5 dBA. At a height of 8 feet and a length of 617 feet, the total estimated cost to construct the barrier is \$123,400, and the cost per benefited residence is \$20,567 – a cost that is below the cost reasonable guideline.

**Table 4-13: Barrier 9**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/617	1	1	4	0	0	0	6	0	6	\$123,400	\$20,567	Yes
10/617	0	1	1	0	4	0	6	0	6	\$154,250	\$25,709	Yes
12/617	0	1	1	0	3	1	6	0	6	\$185,100	\$30,850	Yes
14/617	0	1	0	1	0	4	6	1	7	\$215,950	\$30,850	Yes
16/617	0	1	0	1	0	4	6	3	9	\$246,800	\$27,423	Yes
18/617	0	1	0	1	0	4	6	3	9	\$277,650	\$30,850	Yes
20/617	0	1	0	1	0	4	6	3	9	\$308,500	\$34,278	Yes
22/617	0	1	0	1	0	4	6	3	9	\$339,350	\$37,706	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

Since the evaluation has determined that Barrier 8 could provide 3 of the affected residences with a reduction in traffic noise of at least 5 dBA at a cost below the cost reasonable guideline, the barrier was evaluated further. The results of the evaluation are provided in Table 4-14.

**Table 4-14  
Additional Considerations: Barrier 9**

<b>Evaluation Criteria</b>	<b>Comment</b>
1. Relationship of future levels to the abatement criteria	With the proposed improvements, the 6 affected sites that would be benefited by the barrier are predicted to experience traffic noise levels ranging from 68.2 to 69.8 dBA, levels that exceed the NAC.
2. Amount of noise reduction	Traffic noise from Woodbine Road would be reduced a minimum of 5 dBA at 6 affected sites. (An average reduction of 7.0 dBA).
3. Safety	Safety considerations will be evaluated in greater detail during the design phase of the proposed improvements.
4. Community desires	Community desires will be solicited as part of the public involvement process during the design phase of the proposed improvements.
5. Accessibility	There does not appear to be any accessibility issues with the barrier at the evaluated location.
6. Land use stability	Land use in the area is residential. It is expected that this land use will remain in the future.
7. Local controls	Santa Rosa County does not have an active noise control program.
8. Views of local officials with jurisdiction	The views of local officials will be solicited as part of the ongoing public involvement process.
9. Antiquity	The residences currently exist.
10. Constructability	Constructability issues will be reviewed in greater detail during the design phase of the proposed improvements.
11. Maintainability	Maintenance issues will be reviewed in greater detail during the design phase of the proposed improvements.
12. Aesthetics	The aesthetics of the barrier would be determined during the design phase of the proposed improvements, in conjunction with Santa Rosa County and the adjacent property owners.
13. ROW needs including access rights, easements for construction and/or maintenance, and additional land	ROW requirements will be assessed in greater detail during the design phase of the proposed improvements, although the need for additional ROW is not anticipated.
14. Cost	At a total length of 617 feet and a height of 8 feet, the total estimated cost to construct the barrier is \$123,400. The cost per benefited receiver is \$20,567 – a cost below the FDOT cost reasonable guideline.
15. Utilities	Potential utility conflicts will be assessed in greater detail during the design phase of the proposed improvements.
16. Drainage	Potential drainage conflicts will be assessed in greater detail during the design phase of the proposed improvements.
17. Special land use considerations	None known.
18. Other environmental considerations	None known.

As shown in Table 4-14, conditions in favor of Barrier 9 as a potential noise abatement measure include:

- 6 of the affected residences would be benefited by the barrier (An average reduction of 7.0 dBA).
- The barrier is predicted to reduce traffic noise levels at least 5 dBA at a total of 6 noise sensitive sites.
- The cost to construct the barrier is below the cost reasonable guideline.
- The land use is expected to remain noise sensitive in the future.

## Barrier 10

Barrier 10 was evaluated for the 9 residences (Sites 263, 267, 268, 270, 272, 273, and 301-303) located on the east side of Woodbine Road, in the vicinity of Argyle Drive. The sites are predicted to experience future traffic noise levels ranging from 66.7 to 68.9 dBA, levels that approach and exceed the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk in two segments to maintain access to the properties via Argyle Drive. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected sites that could be effectively benefited by the barrier.

The results of the evaluation are provided in Table 4-15. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could be achieved for 2 to 4 of the affected residences at barrier heights ranging from 12 to 22 feet. As also shown, the barrier could provide 7 to 8 of the affected residences with a reduction in traffic noise of at least 5 dBA at heights ranging from 8 to 22 feet. Based on the results of the evaluation, a barrier 10 feet in height with a length of 1,136 feet appears to be the most reasonable. Increasing the height of the barrier would not provide any additional affected residences with a reduction in traffic noise of at least 5 dBA. At a height of 10 feet and a length of 1,136 feet, the total estimated cost to construct the barrier is \$284,000, and the cost per benefited residence is \$28,400 – a cost that is below the cost reasonable guideline.

**Table 4-15: Barrier 10**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/1,067	1	2	4	0	0	0	7	2	9	\$231,400	\$25,712	Yes
<b>10/1,136</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>2</b>	<b>10</b>	<b>\$284,000</b>	<b>\$28,400</b>	<b>Yes</b>
12/1,060	2	0	1	1	2	2	8	2	10	\$318,000	\$31,800	Yes
14/1,060	2	0	1	0	1	4	8	3	11	\$371,000	\$33,728	Yes
16/1,060	2	0	0	1	1	4	8	3	11	\$424,000	\$38,546	No
18/1,024	2	0	0	1	1	4	8	3	11	\$460,800	\$41,891	No
20/1,024	2	0	0	1	1	4	8	3	11	\$512,000	\$46,546	No
22/1,024	2	0	0	1	1	4	8	3	11	\$563,200	\$51,200	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

Since the evaluation has determined that Barrier 10 could provide 8 of the affected residences with a reduction in traffic noise of at least 5 dBA at a cost below the cost reasonable guideline, the barrier was evaluated further. The results of the evaluation are provided in Table 4-16.

**Table 4-16  
Additional Considerations: Barrier 10**

<b>Evaluation Criteria</b>	<b>Comment</b>
1. Relationship of future levels to the abatement criteria	With the proposed improvements, the 8 affected sites that would be benefited by the barrier are predicted to experience traffic noise levels ranging from 67.1 to 68.9 dBA, levels that exceed the NAC.
2. Amount of noise reduction	Traffic noise from Woodbine Road would be reduced a minimum of 5 dBA at 8 affected sites. (An average reduction of 7.3 dBA). An additional two (92) residences, not predicted to be affected by the proposed improvements, would also benefit from the barrier.
3. Safety	Safety considerations will be evaluated in greater detail during the design phase of the proposed improvements.
4. Community desires	Community desires will be solicited as part of the public involvement process during the design phase of the proposed improvements.
5. Accessibility	There does not appear to be any accessibility issues with the barrier at the evaluated location.
6. Land use stability	Land use in the area is residential. It is expected that this land use will remain in the future.
7. Local controls	Santa Rosa County does not have an active noise control program.
8. Views of local officials with jurisdiction	The views of local officials will be solicited as part of the ongoing public involvement process.
9. Antiquity	The residences currently exist.
10. Constructability	Constructability issues will be reviewed in greater detail during the design phase of the proposed improvements.
11. Maintainability	Maintenance issues will be reviewed in greater detail during the design phase of the proposed improvements.
12. Aesthetics	The aesthetics of the barrier would be determined during the design phase of the proposed improvements, in conjunction with Santa Rosa County and the adjacent property owners.
13. ROW needs including access rights, easements for construction and/or maintenance, and additional land	ROW requirements will be assessed in greater detail during the design phase of the proposed improvements, although the need for additional ROW is not anticipated.
14. Cost	At a total length of 1,136 feet and a height of 10 feet, the total estimated cost to construct the barrier is \$284,000. The cost per benefited receiver is \$28,400 – a cost below the FDOT cost reasonable guideline.
15. Utilities	Potential utility conflicts will be assessed in greater detail during the design phase of the proposed improvements.
16. Drainage	Potential drainage conflicts will be assessed in greater detail during the design phase of the proposed improvements.
17. Special land use considerations	None known.
18. Other environmental considerations	None known.

As shown in Table 4-16, conditions in favor of Barrier 10 as a potential noise abatement measure include:

- 8 of the affected residences would be benefited by the barrier (An average reduction of 7.3 dBA).
- The barrier is predicted to reduce traffic noise levels at least 5 dBA at a total of 10 noise sensitive sites.
- The cost to construct the barrier is below the cost reasonable guideline.
- The land use is expected to remain noise sensitive in the future.

## Barrier 11

Barrier 11 was evaluated for the single residence (Site 290) located on the east side of Chumuckla Highway, in the vicinity of Stratford Lane. The site is predicted to experience a future traffic noise level of 66.2 dBA, a level that approaches the NAC.

The barrier was evaluated at the back edge of the proposed sidewalk. The northern and southern termini of the barrier were optimized for each height evaluated, from 8 to 22 feet in two-foot increments, to maintain at least a 5 dBA reduction to the affected site.

The results of the evaluation are provided in Table 4-17. As shown, the goal of reducing predicted traffic noise levels 10 dBA or more could not be achieved for the affected residence at any of the barrier heights evaluated. As also shown, the barrier could provide the affected residence with a reduction in traffic noise of at least 5 dBA at heights ranging from 8 to 22 feet. At heights ranging from 8 to 22 feet, the total estimated cost to construct the barrier and the cost per benefited receiver range from \$66,250 to \$129,800 – costs that exceed the cost reasonable guideline. As such, although Barrier 11 is predicted to provide the affected residence with a reduction in traffic noise of at least 5 dBA, since the cost per benefited residence exceeds the cost reasonable guideline, the barrier is not considered a reasonable noise abatement measure.

**Table 4-17: Barrier 11**

Barrier Height/Length (ft)	Affected Receivers With Insertion Loss of (dBA)						Number of Benefited Receivers			Total Estimated Cost	Cost Per Benefited Receiver	Cost Reasonable Yes/No
	5	6	7	8	9	10 or >	Affected	* Other	Total			
8/360	1	0	0	0	0	0	1	0	1	\$72,000	\$72,000	No
10/273	1	0	0	0	0	0	1	0	1	\$66,250	\$66,250	No
12/254	1	0	0	0	0	0	1	0	1	\$76,200	\$76,200	No
14/238	1	0	0	0	0	0	1	0	1	\$83,300	\$83,300	No
16/238	1	0	0	0	0	0	1	0	1	\$95,200	\$95,200	No
18/236	1	0	0	0	0	0	1	0	1	\$106,200	\$106,200	No
20/236	1	0	0	0	0	0	1	0	1	\$118,000	\$118,000	No
22/236	1	0	0	0	0	0	1	0	1	\$129,800	\$129,800	No

\* Other = Receivers determined to be unaffected by the project (traffic noise levels less than 66 dBA, or increase in traffic noise less than 15 dBA) but benefited by the noise barrier.

## 4.5 SUMMARY

Noise abatement measures were evaluated for the 121 noise sensitive sites predicted to be affected by the proposed improvements to Woodbine Road/Chumuckla Highway. The measures were traffic management, alternative roadway alignments, property acquisition, and noise barriers. Although feasible, traffic management, alternative roadway alignments, and property acquisition were determined to be unreasonable methods to reduce the predicted traffic noise impacts for the affected sites.

A noise barrier evaluation was also performed. Based on the results of the analysis, noise barriers appear to be a potentially feasible and cost reasonable method of reducing predicted traffic noise levels for 58 of the 121 affected sites. A summary of the recommended potentially feasible and cost reasonable barriers is provided in table 4-18. The barriers shown on the Project Aerials in Appendix A depict the recommended locations.

**Table 4-18  
Summary of Recommended Potentially Feasible and Cost Reasonable Noise Barriers**

Barrier #	Barrier Length (ft.)	Barrier Height (ft.)	Barrier Stationing	# of Benefited Residences			Average Noise Reduction**	Total Estimated Cost	Cost Per Benefited Receiver
				Affected	Other	Total			
3	1,939	12		15	16	31	8.4 dBA	\$581,700	\$18,765
6	1,118	12		11	1	12	7.2 dBA	\$335,400	\$27,950
7	1,592	8		15	0	15	7.4 dBA	\$318,400	\$21,227
8	324	8		3	0	3	5.6 dBA	\$64,800	\$21,600
9	617	8		6	0	6	7.0 dBA	\$123,400	\$20,567
10	1,136	10		8	2	10	7.3 dBA	\$284,000	\$28,400

\* Other refers to receivers that are not affected by the project (predicted traffic noise levels less than 66.0 dBA, or increases in traffic noise less than 15.0 dBA) but benefited by the noise barrier.  
 \*\* Average noise reduction only includes affected residences that would be benefited by the noise barrier.

## **Section 5.0**

# **CONSTRUCTION NOISE AND VIBRATION**

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Construction of roadway improvements will have a temporary impact on noise-sensitive sites adjacent to the project corridor. Trucks, earth moving equipment, pumps, and generators are sources of construction noise and vibration. Construction noise and vibration impacts will be minimized by adherence to the FDOT Standard Specifications for Road and Bridge Construction.

## Section 6.0

# NOISE CONTOURS

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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, a noise level 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 FDOT and FHWA Activity Category B land use is expected to occur in the year 2025 with the expansion of Woodbine Road/Chumuckla Highway.

As shown in Table 6-1, from U.S. Highway 90 to north of Quintette Road, the extent of the 66 dBA noise level extends approximately 115 feet from the roadway's edge-of-pavement (EOP). Figure 6-1 illustrates the noise impact contours.

**Table 6-1  
Noise Contours**

<b>Woodbine Road/Chumuckla Highway Segment</b>	<b>Distance to 66 dBA From Edge-of-Pavement<sup>a</sup></b>
U.S. Highway 90 to north of Quintette Road	115 feet
<sup>a</sup> Distances do not reflect any reduction in noise levels that would result from existing structures (shielding) and should be used for planning purposes only.	