Appendix D. Traffic Noise Analysis Report

Steese Expressway/Johansen Expressway Interchange

Program No. Z607320000
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Traffic Noise Analysis Report

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Prepared For:
Alaska Department of
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Public Facilities

Prepared By:
Kinney Engineering, LLC
3909 Arctic Blvd, Ste 400
Anchorage, AK 99503
907-346-2373
AECL1102

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Abbreviations

DOT&PF	Alaska Department of Transportation and Public Facilities
23 CFR 772	Title 23 of the Code of Federal Regulations Part 772
dBA	A-Weighted Decibel
DDI	Diverging Diamond Interchange
EI	Echelon Interchange
FHWA	Federal Highway Administration
KE	Kinney Engineering
L_{eq}	Equivalent Steady-State Sound Levels
$L_{eq}(h)$	Hourly Equivalent Steady-State Sound Levels
NAC	Noise Abatement Criteria
TDI	Tight Diamond Interchange
TNM	Federal Highway Administration Traffic Noise Model

Definition of Terms

Benefited Receptors: A receptor that receives an abatement measure that reduces noise at or above the minimum 5 dBA threshold.

Equivalent Sound Level (L_{eq}): One of many descriptors to describe sound and noise levels. L_{eq} is average sound energy over a certain period of time, in which A-weighted decibels are in a steady state and contain the same amount of acoustic energy. $L_{eq}(h)$ would be the equivalent sound level for an entire hour.

First Row Receivers: The closest residences or businesses that may be impacted by highway traffic noise.

Impacted Receptor: A receptor that has a traffic noise impact.

Noise Abatement Criteria (NAC): The maximum noise level within an activity category. Noise levels approaching or exceeding the NAC are considered traffic noise impacts.

Noise Reduction Design Goal: The desired noise reduction between future build noise levels with abatement and future build noise levels without abatement. DOT&PF has a noise reduction design goal of 7 dBA.

Receiver: A noise modeling location used to represent the measured or predicted noise level. The receiver may represent one or more receptors.

Receptor: A discrete or representative location of noise-sensitive areas for any land uses listed in Table 1.

Residence: A dwelling unit, which can either be one single-family residence or each dwelling unit in a multifamily dwelling.

Traffic Noise Impacts: Design year build condition noise levels that approach or exceed NAC for the activity category, or design year build conditions noise levels that have substantially increased from the existing noise levels.

Executive Summary

The Steese Expressway/Johansen Expressway Interchange project plans to reconstruct the Steese Expressway/Johansen Expressway intersection to improve the traffic operations, capacity, and safety. Three alternatives have been proposed to address the concerns at the intersection:

- Tight Diamond Interchange
- Diverging Diamond Interchange
- Echelon Interchange

Additionally, this study includes a proposed alignment of Farmers Loop Road Extension that follows the existing extension road alignment from Farmers Loop Road to the dead end to the south and continues this alignment to an intersection with Harold Bentley Avenue, north of Old Steese Highway.

The purpose of this Traffic Noise Analysis Report is to evaluate noise-sensitive areas that may be impacted by the project, to compare noise impacts between alternatives, and to evaluate noise abatement measures for noise impacted areas. 2018 traffic data was used to evaluate existing noise conditions. The noise study complies with the 2018 Alaska Department of Transportation and Public Facilities Noise Policy and Title 23 of the Federal Highway Administration Code of Federal Regulations Part 772 (23 CFR 772).

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM) version 2.5 was used to predict traffic noise levels for existing conditions. Noise levels were measured in the field at 15 monitor sites to validate the TNM. Two 15-minute noise measurements were collected at each location, as well as the concurrent traffic volumes and speeds.

Noise levels were predicted for 89 receivers. Predicted noise levels indicate that 22 receivers are expected to approach or exceed the noise abatement criteria (NAC) under the 2045 No-Build condition.

The noise analysis concluded that there are existing noise impacts at several receptors in the study area, namely in the southern end of the Lazelle Estates Subdivision in the south-east quadrant of the study area. The proposed designs would further impact this subdivision as well as cause impacts at the Fairhill Community Church of God and the Fairhill Christian School off City Lights Boulevard. The extent of these impacts varied between alternatives, with the tight diamond design creating the greatest impacts, followed by the diverging diamond. Lastly, the echelon design is predicted to create the lowest impacts, mainly due to the lower speed on the Steese Expressway associated with the design.

All of the alternatives would have the same impacts on undeveloped lots and the construction noise would likely be equal for each alternative as well apart from the echelon which may require a longer period of construction due to its larger bridge structure.

Noise abatement analysis for the Tight Diamond Interchange concluded that a continuous 10-foot-high noise wall was both feasible and reasonable along the western lot lines of the front row homes in the Lazelle Estates Subdivision. This wall is estimated to cost approximately $1,072,000. A continuous 12-foot-high noise barrier for the Diverging Diamond Interchange located along the lot lines of the front row homes in Lazelle Estates Subdivision would cost approximately $1,365,000. The Echelon Interchange would cause the least amount of noise impacts and the mitigations to the Lazelle Estates Subdivision would cost approximately $1,119,000 with a continuous 9-foot high noise wall along the edge of Steese Expressway.

All three interchange options should include a $150,000 barrier in front of the Fairhill school and church.

1 Introduction

The Alaska Department of Transportation and Public Facilities (DOT&PF) has retained Kinney Engineering, LLC (KE) to present this Traffic Noise Analysis Report to assess existing noise levels within the vicinity of the Steese Expressway/Johansen Expressway Interchange project, to evaluate noise impacts for project alternatives, and to propose and analyze the feasibility and reasonableness of noise abatement measures for noise impacted areas.

1.1 Project Background

The Steese Expressway/Johansen Expressway Interchange project proposes to reconstruct the Steese Expressway/Johansen Expressway (Steese-Jo) intersection to improve traffic operations, capacity, and safety. The project is a result of the *Planning and Environmental Linkages Study* (2015) of the Richardson Highway/Steese Expressway corridor.

The Steese-Jo intersection serves a variety of users, including commuters, retail users, and freight traffic. The Steese Expressway is a 4-lane, north-south roadway that connects the commercial and recreational traffic from Canada and Valdez to the city of Fairbanks and the North Slope. The Steese Expressway is the primary connection for the residential areas north of the Steese-Jo intersection. The Johansen Expressway is generally a 4-lane, east-west roadway through Fairbanks from University Avenue to the Steese Expressway, providing a high-speed connection between west and east Fairbanks.

A potential future traffic generator for the Steese-Jo intersection is the Fort Wainwright main gate relocation to Canal Road (accessed via Lazelle Road).

Figure 1 presents the project vicinity area and Figure 2 presents the project area.

1.2 Purpose of Study

The purpose of this study is to identify noise impacts caused by proposed build alternatives within the project area and to analyze abatement options if warranted. The study was conducted in compliance with the Federal Highway Administration (FHWA) Title 23 Part 772 of the Code of Federal Regulations (23 CFR 772) and the 2018 DOT&PF Noise Policy, a copy of which is included in Appendix E starting on page 106.

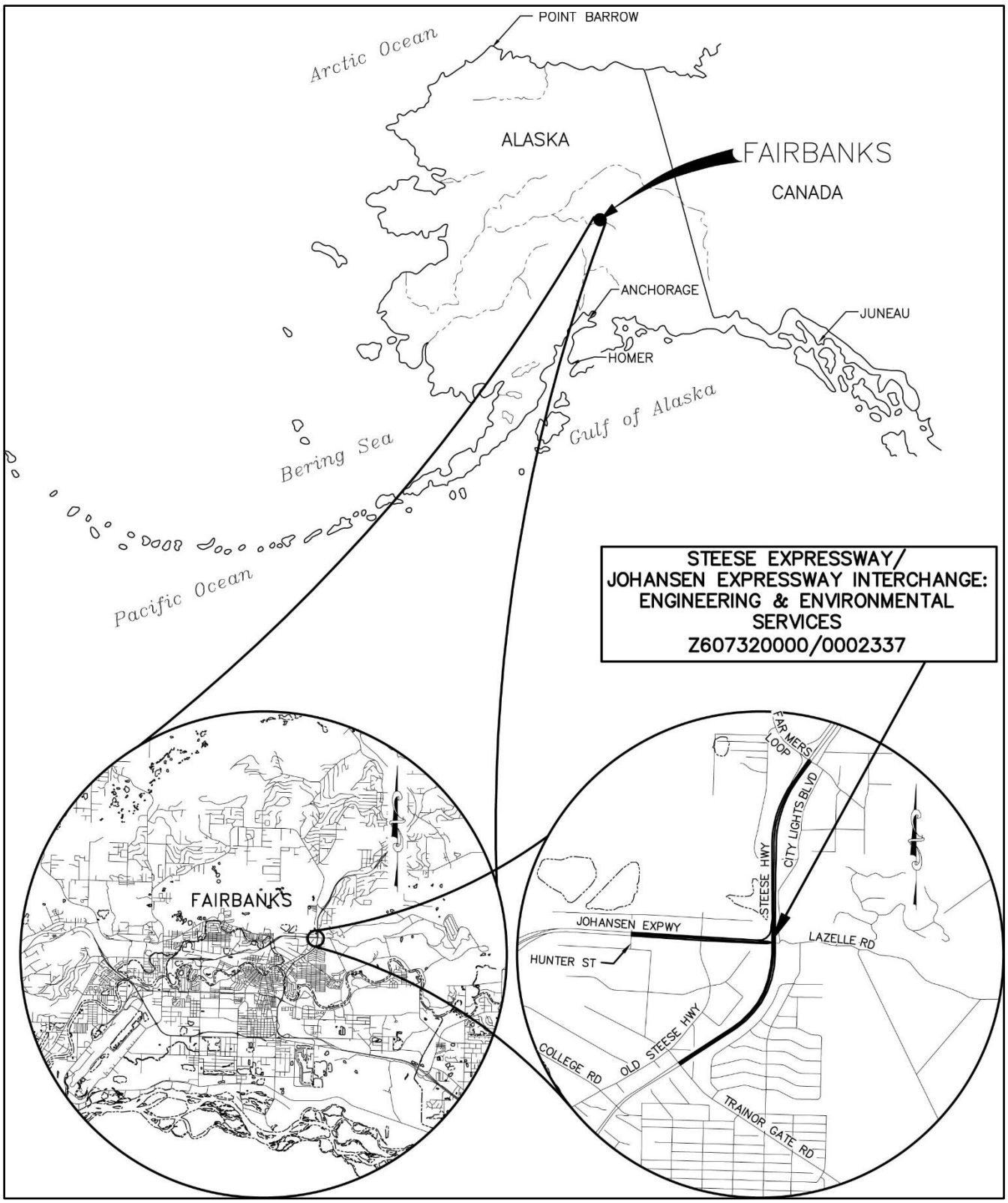

Figure 1: Project Vicinity Map

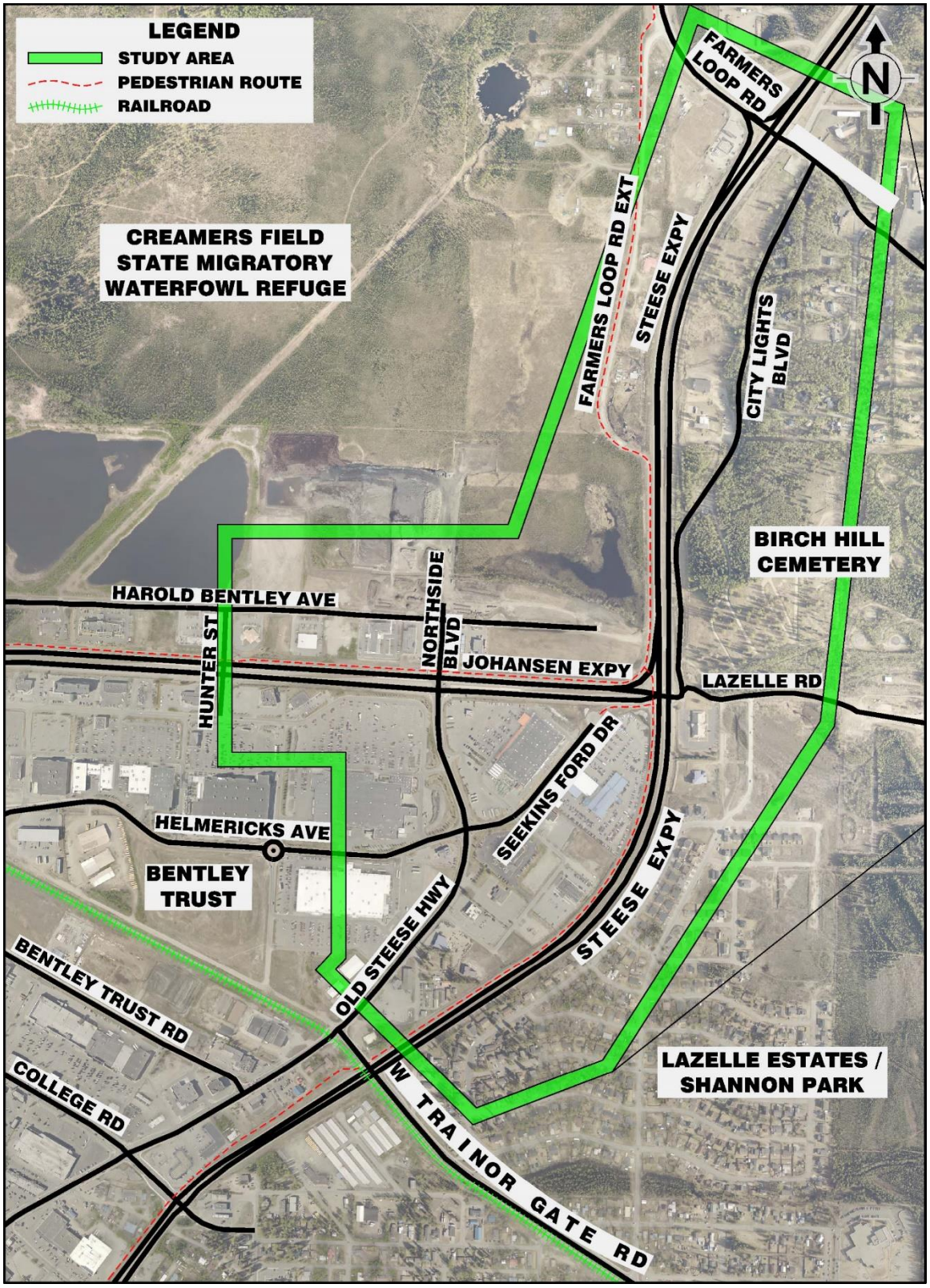

Figure 2: Project Area

1.3 Fundamentals of Noise

The definition of terms such as “noise” and “impact” tend to be subjective. Because of this, noise policies have determined objective definitions of these key components of analysis which will be discussed in this section.

Sound is the pressure of waves transmitted from a vibrating object. This sound moves through the air, diminishing over time and distance until it is received by a listener. Noise is then defined as an unwanted sound. The determination of what is “unwanted” is therefore defined differently per listener and may depend on different factors pertaining to the noise source, the environment, and the listener. To adjust for these subjective differences in perception, noise levels are converted into A-weighted decibels (dBA), and different environment categories are given different limitations of concern.

A-weighted decibels convert the loudness of a sound source by giving the different weight of influence to the different frequencies of sound since an average human listener tends to perceive high-frequency sound as louder than low-frequency sound of the same decibel level. A-weighted decibels are measured on a logarithmic scale.

As sound is measured logarithmically, an increase of 10 dBA in sound is perceived as a doubling of the sound; similarly, a decrease of 10 dBA will be perceived as half the sound. A change of 3 dBA results in a barely perceivable change in sound, while a 5 dBA change in sound is clearly noticeable to the human ear. Many complex factors also affect the loudness of sound. Some factors include the distance between the sound source and receptor (sound levels are reduced as the distance increases) and environmental features such as vegetation, terrain, atmospheric effects, ground resistivity, and natural and man-made obstacles which may reflect or amplify sound.

An A-weighted decibel is an instantaneous measurement of sound. A single passing vehicle could produce a varying rise and fall of A-weighted decibels as it approaches and then passes a receiver. For the purpose of comparing various road designs for noise impacts, a series of A-weighted decibel measurements over a period of time are converted into equivalent sound levels (L_{eq}). This conversion to an L_{eq} results in a value that is representative of the constant sound level that would have to occur over the entire study period to produce the same amount of acoustic energy as the recorded period. For this analysis, an hourly equivalent sound level ($L_{eq}(h)$) was used to analyze existing noise conditions.

The vehicle noise on a road is estimated based on a few key factors:

- Volume of traffic
- Speed of traffic
- Number of trucks within the traffic flow
- Road surface type and condition

Heavy trucks are generally louder than passenger cars; thus, the higher the percentage of trucks in the traffic, the louder the traffic noise. Road surface conditions such as pavement type, pavement condition, wet or icy road cover or the type of tires being used can also affect the loudness of traffic noise.

Likewise, the grade of the road influences the sound of traffic, since vehicles driving up a steep incline will produce louder noise as their engine works hard to maintain a consistent speed, compared to vehicles on a level or declined roadway which will typically produce less noise. Similarly, vehicles accelerating will be louder than vehicles at cruising speed.

1.4 DOT&PF and FHWA Noise Level Criteria

The current DOT&PF Noise Policy and the FHWA 23 CFR 772 provide noise level criteria for different land uses and activities, which are divided into categories. These categories represent the different environments where users tend to expect different levels of noise. A noise level produced by a roadway which is higher than the level expected at the noise-sensitive location should be considered for abatement or mitigation. Table 1 presents the FHWA noise abatement criteria (NAC) for specific land uses (Source: FHWA 23 CFR 772 Table 1). The NAC is the maximum traffic noise level for a certain activity category.

Table 1: FHWA Noise Abatement Criteria

Activity Category	Activity Criteria[1] $L_{eq}(h)$, dBA	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

[1]Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.
[2]Includes undeveloped lands permitted in this category.

According to 23 CFR 772, traffic noise impacts are expected to occur if noise levels meet one of the two following criteria:

- When the predicted design-year-build noise levels approach or exceed the NAC.
    - DOT&PF defines the approach noise level as 1 dBA below the NAC. For example, the approach noise level for an Activity Category C land use is 66 dBA.
- When the predicted design-year-build noise levels substantially exceed the existing noise levels.
    - DOT&PF defines a substantial increase as a 15 dBA increase over existing noise levels. A substantial increase over existing noise levels will be considered an impact even if the predicted noise levels do not approach or exceed the NAC.

If the predicted noise levels are identified as traffic noise impacts, then noise abatement is required to be considered and evaluated for feasibility and reasonableness.

2 Methodology

2.1 Noise Measurement Procedure

Noise levels were measured using a Larson Davis SoundExpert LxT sound level meter and were calibrated using the Larson Davis CAL200 calibrator before and after each reading. Noise levels were monitored at 14 sites along the Steese Expressway and Johansen Expressway in August of 2018 and 1 site in August 2019. The locations of the monitor sites are shown on project maps in Figure 3 through Figure 6 starting on page 17.

The sound monitor recorded two 15-minute measurements per monitor site. Simultaneously, KE counted traffic by vehicle classification. The data collected in the field are shown in Appendix B starting on page 74. Table B-1 presents the measured noise levels and Table B-2 presents the observed traffic counts and adjusted 1-hour equivalent traffic data.

The sound monitor was set up on a tripod with weather protection and approved wind shielding, but readings were all conducted during periods of no to low winds. Some rain was present during the August 2018 counts, but no studies were conducted during active rain.

2.2 Traffic Noise Model

The existing Steese and Johansen Expressway alignments and surrounding study area were modeled. Traffic noise levels were modeled and predicted using the FHWA Traffic Noise Model (TNM) version 2.5 software. The output values were reported in $L_{eq}(h)$ with units of dBA.

The TNM predicts noise levels based on the following characteristics:

- Vehicle volume and classifications
    - Vehicles were classified into automobiles, medium trucks, heavy trucks, buses, and motorcycles
- Vehicle speeds
- Roadway geometry
- Receiver locations
- Buildings
- Ground cover types
- Natural or manmade features between roadway and receptors (such as terrain, trees, and barriers)

Additional receiver locations (89 sites) with potential noise impacts were included in the model.

2.3 Noise Model Validation

Noise levels measured in the field are used to validate the accuracy of the TNM model. When the actual measured noise level and model predicted noise level are within ±3 dBA, the model is considered acceptable and can be used to predict existing and future noise levels during the worst noise hour of the day. Note that a change of ±3 dBA is the lowest amount of change in noise that is noticeable to the human ear.

Vehicle speeds on Steese Expressway and Johansen Expressway are based on the 85th percentile speeds previously collected on the roadways, as well as observed speeds in the field. Speeds on Farmers Loop Road and Farmers Loop Extension were based on following vehicles on the roadways and comfortable driving speeds.

The observed vehicle volumes, classifications, and speeds were entered into the model and the results were compared to the measured noise. Table 2 presents the measured noise, predicted noise, and the difference between the two. All sites were within the acceptable 3.0 dBA range.

Table 2: Summary of Measured and Predicted Sound Levels

Monitor Site	Location	L_{eq}(h) (dBA)		
		Measured	Predicted	Difference
M-1	Jorgensen's Custard Corner (ROW)	65.1	65.4	-0.3
M-2	Fairhill Christian School	69.0	67.1	1.9
M-3	Fairhill Community Church of God	69.3	67.6	1.7
M-4	Undeveloped lot on Northside Business Park	61.4	63.2	-1.8
M-5	Birch Hill Cemetery	68.9	65.9	3.0
M-6	Near Walmart sign	67.3	67.7	-0.4
M-7	End of Seekins Drive	63.4	64.2	-0.8
M-8	Church of Jesus Christ of Latter-day Saints	53.1	52.9	0.2
M-9	Shannon Park Baptist Church (ROW)	70.2	70.2	0.0
M-10	Steese Medical Center	57.5	58.8	-1.3
M-11	Jeanne Drive and Joyce Drive intersection	55.6	54.5	1.1
M-12	1132 Joyce Drive	61.7	61.3	0.4
M-13	Flower and Garden Center	59.1	62.0	-2.9
M-14	1018 Joyce Drive	64.5	66.0	-1.5
M-15	Pathway near Farmers Loop Road Extension and Benson Street Intersection	52.9	51.7	1.2

3 Existing Land Use Categories

The land uses within the project area and for the 14 monitored sites include Category B (residential), Category C (places of worship, cemetery, medical centers, school), Category E (restaurant, commercial), Category F (industrial, utility sites), and Category G (undeveloped lots not permitted).

The southeast part of the project area are mostly residential properties, while the west side of Steese Expressway are comprised mostly of commercial businesses. Table 3 presents the land uses in the area and the number of modeled monitor or receiver sites representing the land use.

Table 3: Existing Land Uses for Modeled Monitor and Receiver Sites

Land Use	Category	Number of Receivers
Residential	B	58
Place of Worship	C	4
Medical Facilities	C	2
Cemetery	C	1
School	C	1
Offices	E	6
Restaurant	E	4
Retail	F	6
Industrial	F	3
Utility	F	2

Figure 3 through Figure 6 present the locations of the field monitored sites and the modeled receiver sites.

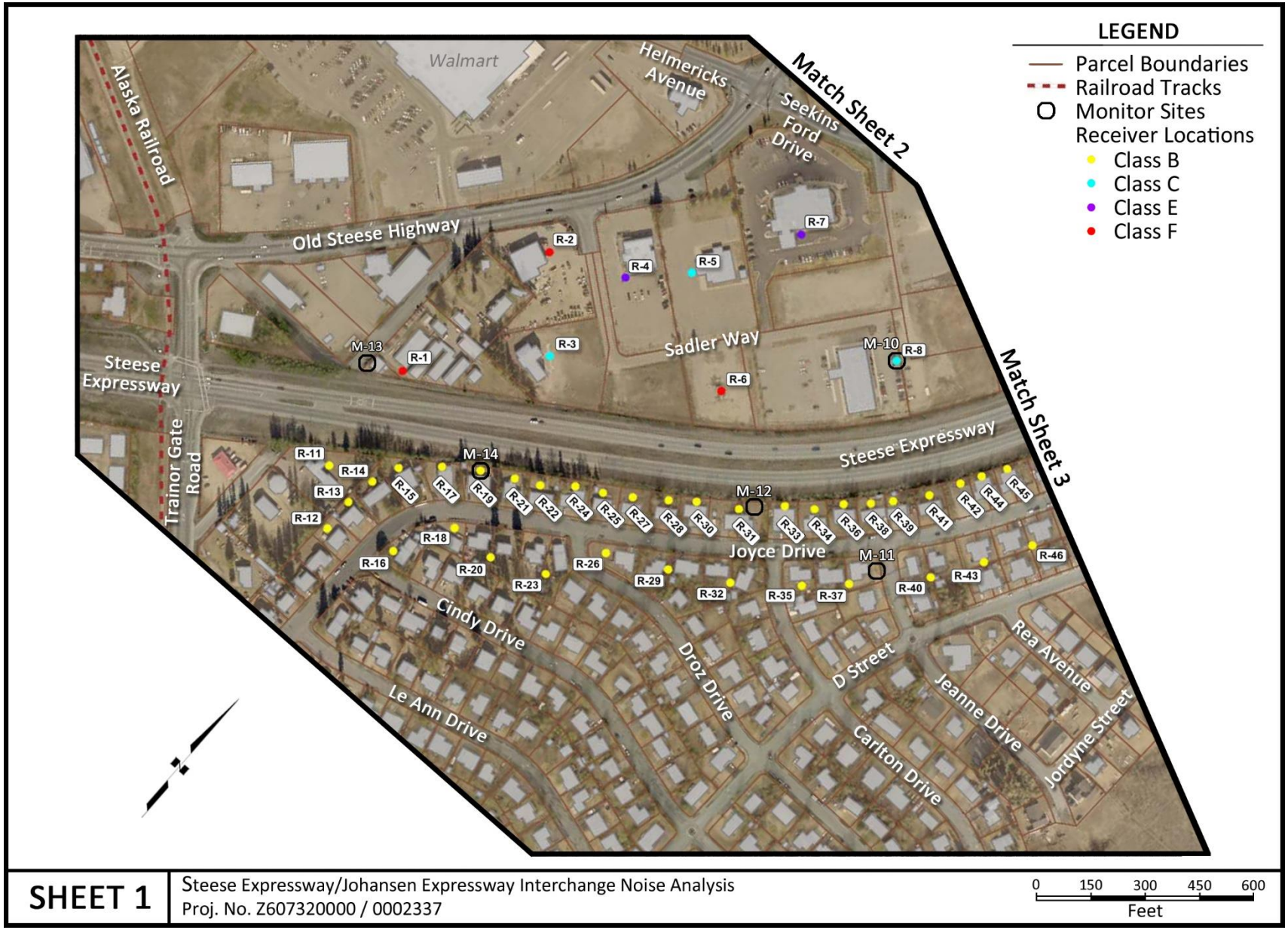

Figure 3: Monitor and Receiver Sites, Sheet 1

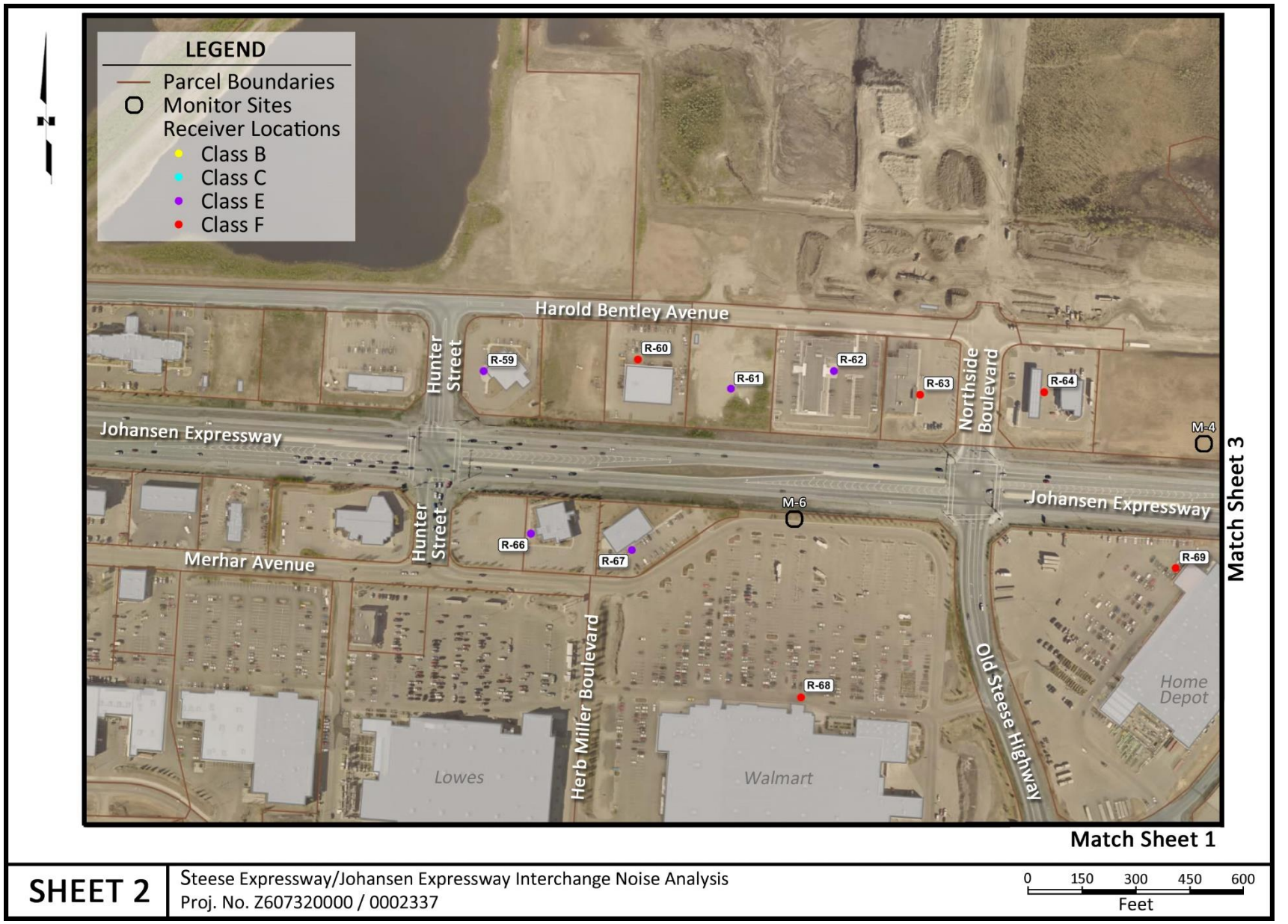

Figure 4: Monitor and Receiver Sites, Sheet 2

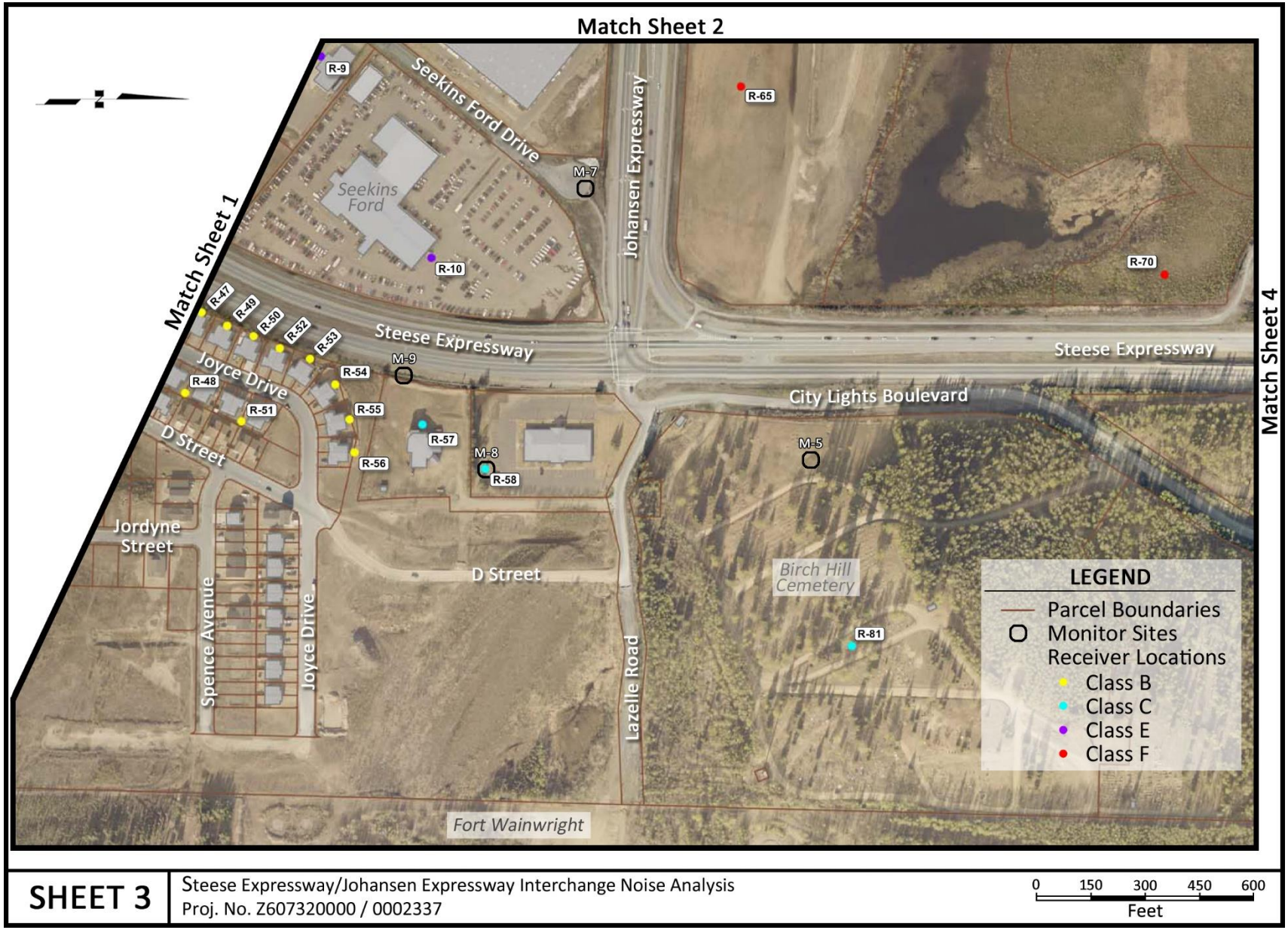

Figure 5: Monitor and Receiver Sites, Sheet 3

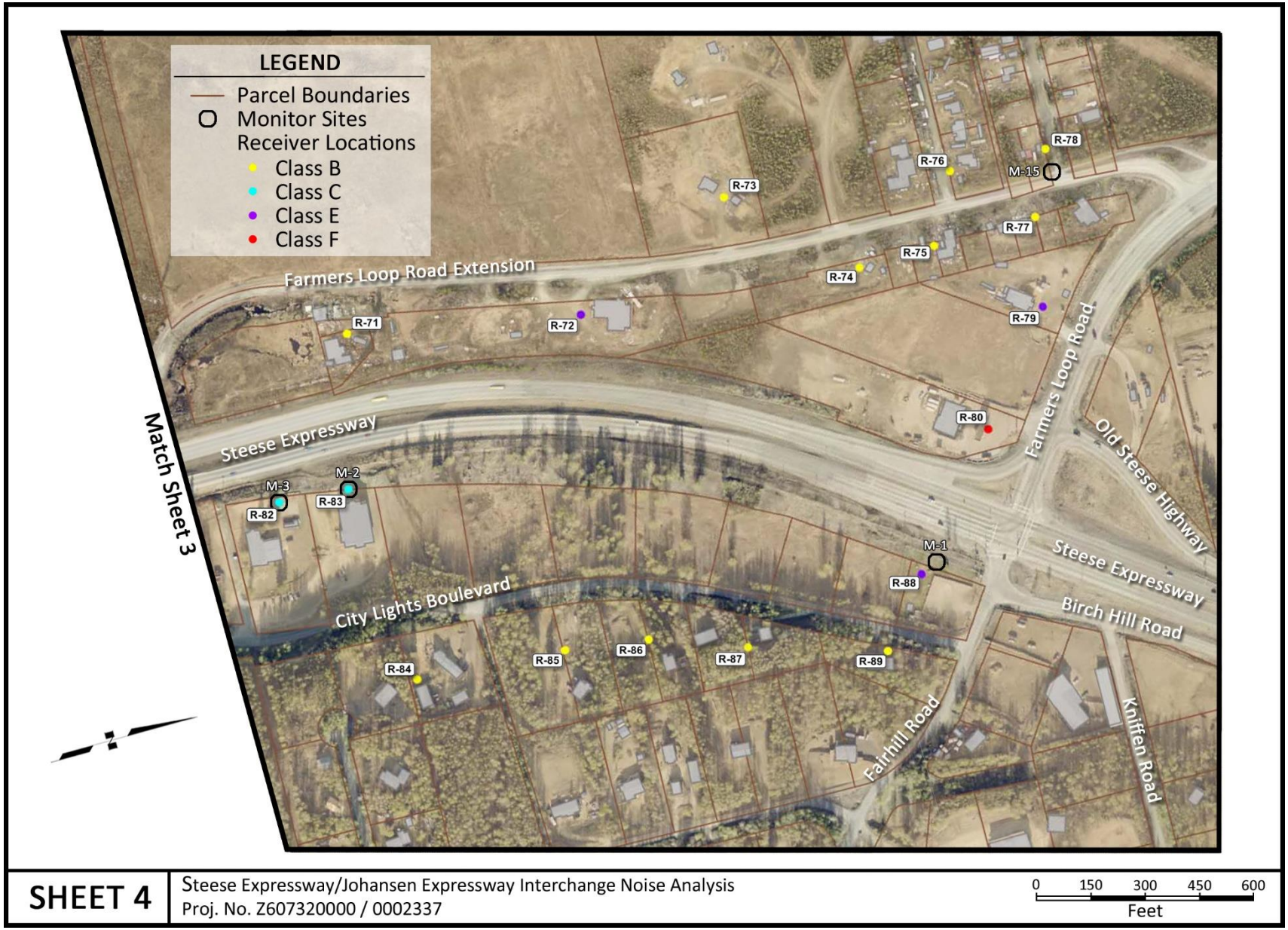

Figure 6: Monitor and Receiver Sites, Sheet 4

4 Existing and No-Build Noise Level Results

Noise levels were predicted for 89 locations in the project area where there is potential for noise impacts due to the proposed project. Figure 3 through Figure 6 starting on page 17 present the locations of these sites.

The selected sites were modeled in TNM with existing 2018 PM peak hour traffic volumes and 85th-percentile speeds on the roadways. A 12-hour noise collection on Steese Expressway indicated that the noise in the area stays at a relatively constant noise level, with little variation throughout the day. The PM peak was selected as the worst noise hour because there is directionally more northbound traffic, which results in more vehicles near the noise-sensitive Category B residential sites on the east side of Steese Expressway. Volumes used in the model are shown in Table A-1 in Appendix A on page 68.

Note that undeveloped lands that are permitted for development are treated according to their permitted status. One undeveloped lot (R-61) has been permitted to be a hotel and therefore treated as Category E land use. There is no information on other active permits for undeveloped lots within the project area.

Table 4 presents the predicted existing and No-Build conditions noise levels. Noise model results indicate that NAC thresholds are exceeded for their respective activity category at 15 receiver sites under existing conditions and 22 receiver sites under the No-Build condition.

Table 4: Noise Level Results – Existing and No-Build

Receiver ID	Category and Land Use	Approach NAC (dBA)	Predicted L_{eq}(h) (dBA)		Existing to No-Build Change (dBA)	No-Build Exceeds NAC?
			Existing	No-Build		
R-1	F Commercial	-	66	67	1	No
R-2	F Industrial	-	56	57	1	No
R-3	C Medical	66	61	62	1	No
R-4	E Restaurant	71	58	59	1	No
R-5	C Place of Worship	66	59	60	1	No
R-6	F Utility	-	65	66	1	No
R-7	E Commercial	71	57	58	1	No
R-8	C Medical	66	62	63	1	No
R-9	E Commercial	71	55	56	1	No
R-10	E Commercial	71	65	66	1	No
R-11	B Residential	66	**66**	**67**	1	**Yes**
R-12	B Residential	66	58	59	1	No
R-13	B Residential	66	62	63	1	No
R-14	B Residential	66	**66**	**67**	1	**Yes**
R-15	B Residential	66	**68**	**69**	1	**Yes**
R-16	B Residential	66	56	57	1	No
R-17	B Residential	66	**70**	**71**	1	**Yes**

Receiver ID	Category and Land Use	Approach NAC (dBA)	Predicted L_{eq}(h) (dBA)		Existing to No-Build Change (dBA)	No-Build Exceeds NAC?
			Existing	No-Build		
R-18	B Residential	66	62	63	1	No
R-19	B Residential	66	**70**	**71**	1	**Yes**
R-20	B Residential	66	55	56	1	No
R-21	B Residential	66	**69**	**70**	1	**Yes**
R-22	B Residential	66	**68**	**69**	1	**Yes**
R-23	B Residential	66	55	56	1	No
R-24	B Residential	66	**66**	**67**	1	**Yes**
R-25	B Residential	66	**66**	**67**	1	**Yes**
R-26	B Residential	66	58	59	1	No
R-27	B Residential	66	65	**66**	1	**Yes**
R-28	B Residential	66	65	**66**	1	**Yes**
R-29	B Residential	66	55	56	1	No
R-30	B Residential	66	65	**66**	1	**Yes**
R-31	B Residential	66	64	65	1	No
R-32	B Residential	66	55	56	1	No
R-33	B Residential	66	64	65	1	No
R-34	B Residential	66	60	61	1	No
R-35	B Residential	66	54	55	1	No
R-36	B Residential	66	64	65	1	No
R-37	B Residential	66	53	54	1	No
R-38	B Residential	66	64	65	1	No
R-39	B Residential	66	64	65	1	No
R-40	B Residential	66	54	55	1	No
R-41	B Residential	66	64	65	1	No
R-42	B Residential	66	65	**66**	1	**Yes**
R-43	B Residential	66	54	55	1	No
R-44	B Residential	66	65	**66**	1	**Yes**
R-45	B Residential	66	65	**66**	1	**Yes**
R-46	B Residential	66	53	54	1	No
R-47	B Residential	66	**66**	**66**	1	**Yes**
R-48	B Residential	66	53	54	1	No
R-49	B Residential	66	**66**	**67**	1	**Yes**
R-50	B Residential	66	**66**	**67**	1	**Yes**
R-51	B Residential	66	54	55	1	No
R-52	B Residential	66	**66**	**67**	1	**Yes**
R-53	B Residential	66	65	**66**	1	**Yes**
R-54	B Residential	66	63	64	1	No
R-55	B Residential	66	60	61	1	No

Receiver ID	Category and Land Use	Approach NAC (dBA)	Predicted L_{eq}(h) (dBA)		Existing to No-Build Change (dBA)	No-Build Exceeds NAC?
			Existing	No-Build		
R-56	B Residential	66	56	57	1	No
R-57	C Place of Worship	66	61	62	1	No
R-58	C Place of Worship	66	59	60	1	No
R-59	E Commercial	71	61	63	2	No
R-60	F Maintenance	-	52	54	2	No
R-61	E Hotel	71	63	65	2	No
R-62	E Hotel	71	59	61	2	No
R-63	F Commercial	-	60	62	2	No
R-64	F Commercial	-	62	64	2	No
R-65	F Industrial/Utility	-	62	63	1	No
R-66	E Commercial	71	62	64	2	No
R-67	E Commercial	71	59	61	2	No
R-68	F Commercial	71	58	60	2	No
R-69	F Commercial	71	66	68	2	No
R-70	F Industrial/Utility	-	61	62	1	No
R-71	B Residential	66	60	61	1	No
R-72	E Commercial	71	59	61	1	No
R-73	B Residential	66	54	56	2	No
R-74	B Residential	66	55	56	1	No
R-75	B Residential	66	55	56	1	No
R-76	B Residential	66	52	53	2	No
R-77	B Residential	66	56	56	1	No
R-78	B Residential	66	52	53	1	No
R-79	E Commercial	71	63	64	1	No
R-80	F Commercial	71	65	67	1	No
R-81	C Cemetery	66	59	60	1	No
R-82	C Place of Worship	66	**71**	**72**	1	**Yes**
R-83	C School	66	**70**	**72**	2	**Yes**
R-84	B Residential	66	57	58	1	No
R-85	B Residential	66	56	58	2	No
R-86	B Residential	66	58	59	2	No
R-87	B Residential	66	59	60	2	No
R-88	E Restaurant	71	67	68	1	No
R-89	B Residential	66	60	61	2	No

5 Identification of 2045 No-Build Noise Impacts

The TNM indicates that 22 receivers are predicted to have noise levels approaching or exceeding the NAC by the 2045 design year under No-Build conditions. Table 5 presents the impacted receivers and the number of receptors each receiver represents.

Table 5: Identified Noise Impacted Receivers – No-Build

Receiver ID	Category and Land Use	Equivalent Number of Residential Units
R-11	B Residential	1
R-14	B Residential	1
R-15	B Residential	1
R-17	B Residential	1
R-19	B Residential	1
R-21	B Residential	1
R-22	B Residential	1
R-24	B Residential	1
R-25	B Residential	1
R-27	B Residential	1
R-28	B Residential	1
R-30	B Residential	1
R-42	B Residential	1
R-44	B Residential	2
R-45	B Residential	2
R-47	B Residential	2
R-49	B Residential	2
R-50	B Residential	2
R-52	B Residential	2
R-53	B Residential	2
R-82	C Place of Worship	2
R-83	C School	2

6 Alternative Analysis

The following section presents the modeled impacts and recommended noise barrier mitigations for each of the alternatives analyzed in this study. The study includes a noise analysis of the Farmers Loop Road Extension which is presented separately from the interchange alternatives. The interchange alternatives all assume that the Farmers Loop Road Extension is not constructed, which is the conservative condition for noise along the Steese Expressway.

6.1 Farmers Loop Road Extension

The Farmers Loop Road Extension project would continue the extension of Farmers Loop Road from its current termination point to an intersection with Harold Bentley Avenue, north of the Old Steese Hwy.

6.1.1 Noise Level Results

Table 6 presents the predicted noise levels for a condition with a completed alignment of Farmers Loop Road Extension with a design speed of 40mph and 2045 traffic volumes as modeled using the FMAT travel demand model. Noise model results indicate that NAC thresholds are not exceeded for any of the receivers in the vicinity of the road connection. Note that not all receivers are included in this analysis since they are outside the study area for this connection.

Table 6: Noise Level Results – Farmers Loop Road Extension

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Exceeds NAC?
			Existing	No-Build	Build			
R-63	F Retail	-	60	62	62	2	2	No
R-64	F Retail	-	62	64	63	2	1	No
R-65	F Utilities	-	62	63	63	1	1	No
R-70	F Industrial	-	61	62	62	1	1	No
R-71	B Residential	66	60	61	61	1	1	No
R-72	E Commercial	71	59	61	61	2	2	No
R-73	B Residential	66	54	56	57	2	3	No
R-74	B Residential	66	55	56	59	1	4	No
R-75	B Residential	66	55	56	62	1	7	No
R-76	B Residential	66	52	53	57	1	5	No
R-77	B Residential	66	56	56	62	0	6	No
R-78	B Residential	66	52	53	56	1	4	No
R-79	E Restaurant	71	63	64	64	1	1	No
R-80	F Retail	-	65	67	66	2	1	No

There are no predicted impacts associated with the Farmers Loop Extension Project and therefore no abatements are recommended as a result of this project.

Figure 7 and Figure 8 on the following pages, show the location of the modeled receivers and the proposed road design. Note that receivers R-82 and R-83 shown as “Impacted” in Figure 8 are impacted in a No-Build case and are not recommended for mitigation since they are outside the study area of the Farmers Loop Road Extension.

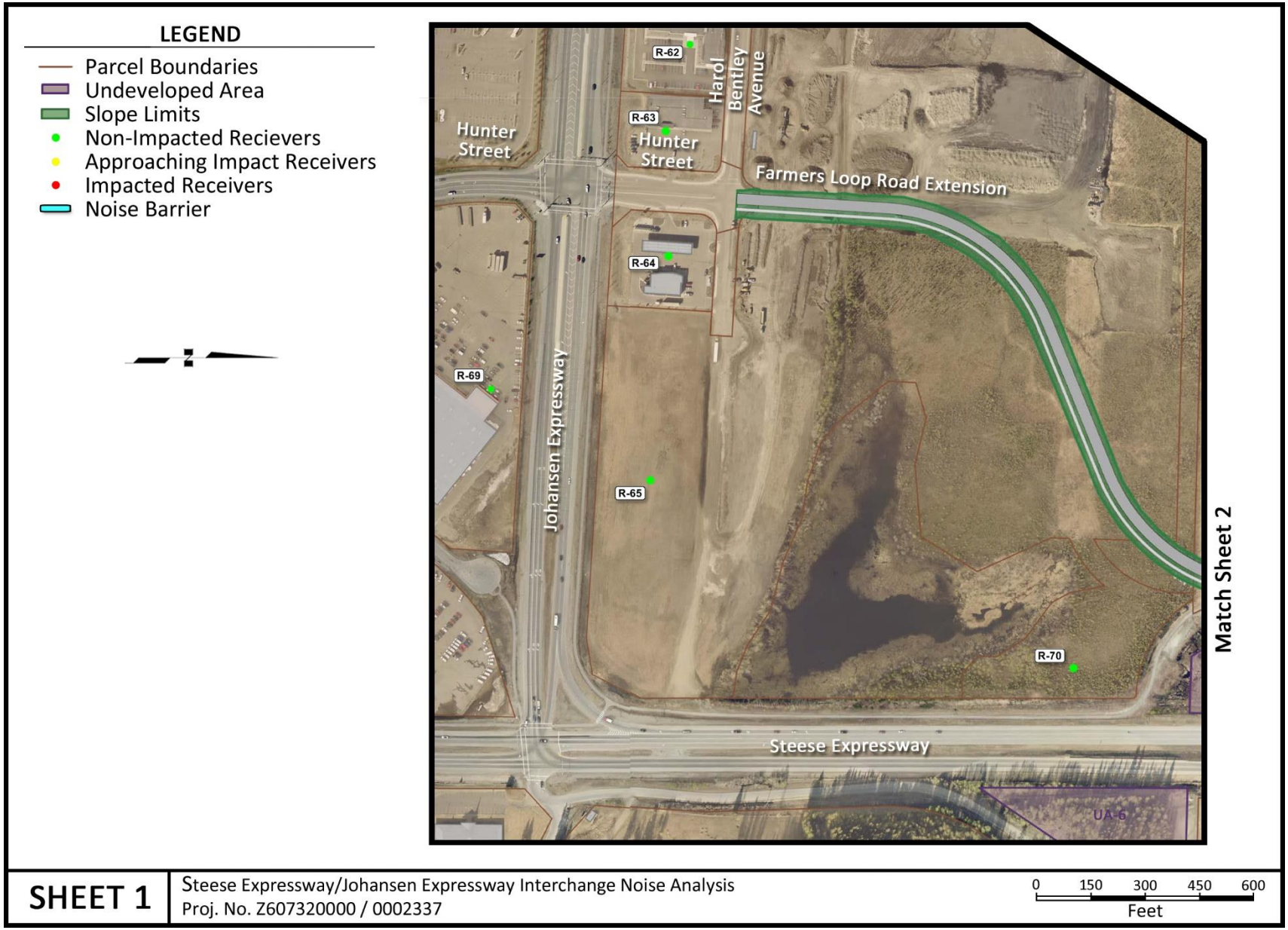

Figure 7: Farmers Loop Road Extension Noise Impacts, Sheet 1

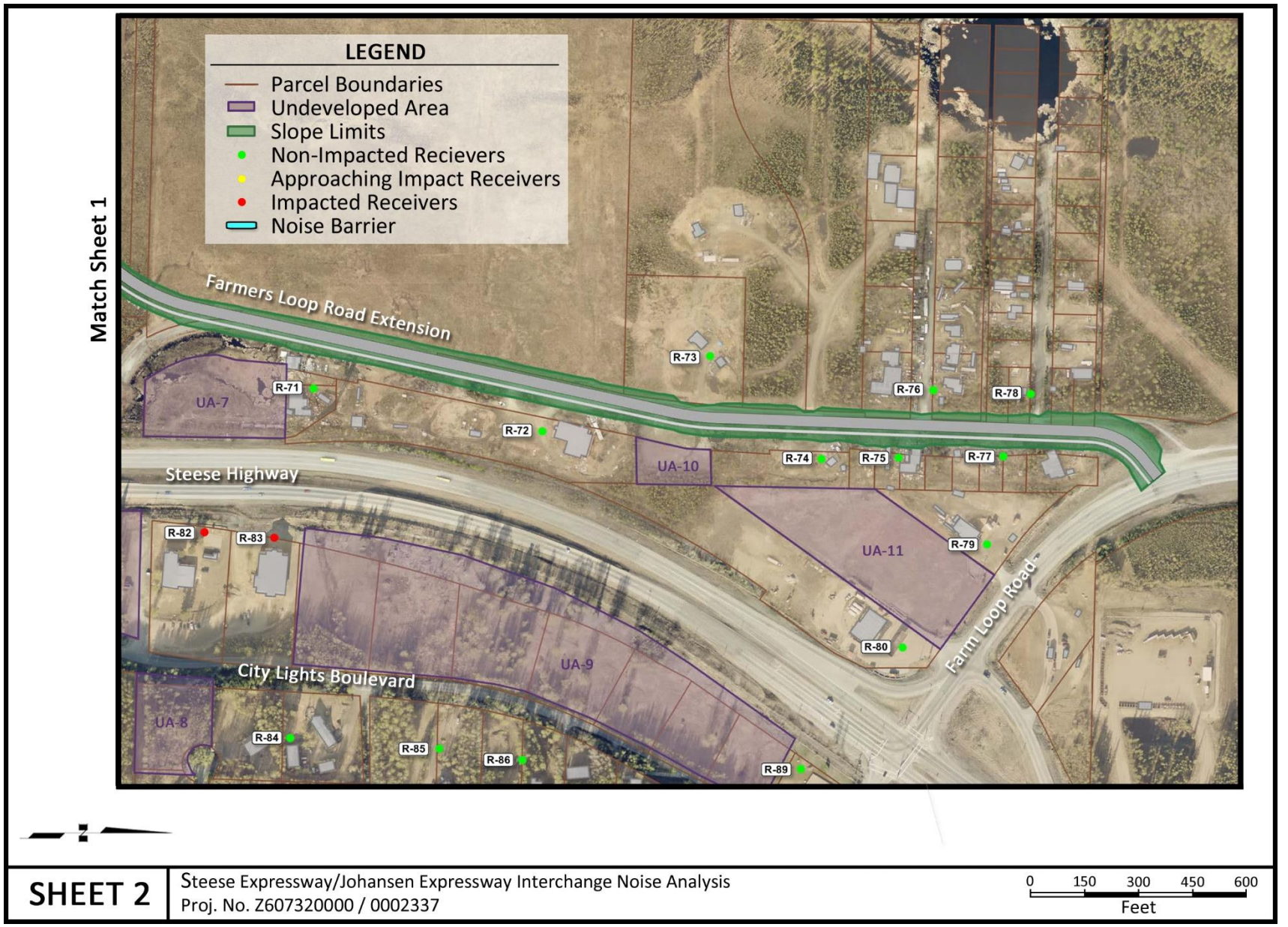

Figure 8: Farmers Loop Road Extension Noise Impacts, Sheet 2

6.2 Tight Diamond Interchange

A tight diamond interchange concept was designed and modeled in TNM. The design would have a free-flowing overpass for the north-south portion of the Steese Expressway with entry and exit ramps and signalized intersections at the base of the ramps on the Johansen Expressway.

In general, the volumes for each build alternative were the same, except for the ramps and turn lanes through the interchange which were each modeled based on volume distributions included in the previous traffic analysis study. The generalized segment volumes used in the analysis are included in the appendix of this report in Table A-2 on page 68.

6.2.1 Noise Level Results

Table 7 presents the predicted noise levels for the TDI design concept. Note that build noise levels for receiver R-58 (Church of Jesus Christ of Latter-day Saints) are not applicable because the church building will be impacted under this alternative.

Table 7: Noise Level Results – Tight Diamond Interchange

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-1	F Retail	-	66	67	68	1	2	No
R-2	F Industrial	-	56	57	58	1	2	No
R-3	C Medical Facilities	66	61	62	62	1	1	No
R-4	E Restaurant	71	58	59	61	1	3	No
R-5	C Place of Worship	66	59	60	61	1	2	No
R-6	F Utilities	-	65	66	66	1	1	No
R-7	E Offices	71	57	58	60	1	3	No
R-8	C Medical Facilities	66	62	63	64	1	2	No
R-9	E Restaurant	71	55	56	58	1	3	No
R-10	E Offices	71	65	66	64	1	-1	No
R-11	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-12	B Residential	66	58	59	58	1	0	No
R-13	B Residential	66	62	63	62	1	0	No
R-14	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-15	B Residential	66	**68**	**69**	**69**	1	1	**Impacted**
R-16	B Residential	66	56	57	55	1	-1	No
R-17	B Residential	66	**70**	**71**	**70**	1	0	**Impacted**
R-18	B Residential	66	62	63	62	1	0	No
R-19	B Residential	66	**70**	**71**	**71**	1	1	**Impacted**

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-20	B Residential	66	55	56	55	1	0	No
R-21	B Residential	66	**69**	**70**	**70**	1	1	**Impacted**
R-22	B Residential	66	**68**	**69**	**70**	1	2	**Impacted**
R-23	B Residential	66	55	56	56	1	1	No
R-24	B Residential	66	**66**	**67**	**69**	1	3	**Impacted**
R-25	B Residential	66	**66**	**67**	**70**	1	4	**Impacted**
R-26	B Residential	66	58	59	59	1	1	No
R-27	B Residential	66	65	**66**	**66**	1	1	**Approaching**
R-28	B Residential	66	65	**66**	**68**	1	3	**Impacted**
R-29	B Residential	66	55	56	56	1	1	No
R-30	B Residential	66	65	**66**	**68**	1	3	**Impacted**
R-31	B Residential	66	64	65	**68**	1	4	**Impacted**
R-32	B Residential	66	55	56	57	1	2	No
R-33	B Residential	66	64	65	**66**	1	2	**Approaching**
R-34	B Residential	66	60	61	63	1	3	No
R-35	B Residential	66	54	55	56	1	2	No
R-36	B Residential	66	64	65	65	1	1	No
R-37	B Residential	66	53	54	55	1	2	No
R-38	B Residential	66	64	65	**66**	1	2	**Approaching**
R-39	B Residential	66	64	65	**67**	1	3	**Impacted**
R-40	B Residential	66	54	55	57	1	3	No
R-41	B Residential	66	64	65	**67**	1	3	**Impacted**
R-42	B Residential	66	65	**66**	**69**	1	4	**Impacted**
R-43	B Residential	66	54	55	57	1	3	No
R-44	B Residential	66	65	**66**	**70**	1	5	**Impacted**
R-45	B Residential	66	65	**66**	**70**	1	5	**Impacted**
R-46	B Residential	66	53	54	56	1	3	No
R-47	B Residential	66	**66**	**66**	**70**	0	4	**Impacted**
R-48	B Residential	66	53	54	56	1	3	No
R-49	B Residential	66	**66**	**67**	**70**	1	4	**Impacted**
R-50	B Residential	66	**66**	**67**	**70**	1	4	**Impacted**
R-51	B Residential	66	54	55	57	1	3	No
R-52	B Residential	66	**66**	**67**	**67**	1	1	**Impacted**
R-53	B Residential	66	65	**66**	64	1	-1	No
R-54	B Residential	66	63	64	64	1	1	No
R-55	B Residential	66	60	61	62	1	2	No
R-56	B Residential	66	56	57	59	1	3	No

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-57	C Place of worship	66	61	62	61	1	0	No
R-58	C Place of worship	66	59	60	N/A	1	N/A	N/A
R-59	E Offices	71	61	63	63	2	2	No
R-60	F Industrial	-	52	54	54	2	2	No
R-61	E Hotel	71	63	65	65	2	2	No
R-62	E Hotel	71	59	61	61	2	2	No
R-63	F Retail	-	60	62	62	2	2	No
R-64	F Retail	-	62	64	63	2	1	No
R-65	F Utilities	-	62	63	63	1	1	No
R-66	E Offices	71	62	64	64	2	2	No
R-67	E Offices	71	59	61	61	2	2	No
R-68	F Retail	-	58	60	60	2	2	No
R-69	F Retail	-	66	68	68	2	2	No
R-70	F Industrial	-	61	62	63	1	2	No
R-71	B Residential	66	60	61	61	1	1	No
R-72	E Commercial	71	59	61	60	2	1	No
R-73	B Residential	66	54	56	56	2	2	No
R-74	B Residential	66	55	56	56	1	1	No
R-75	B Residential	66	55	56	56	1	1	No
R-76	B Residential	66	52	53	53	1	1	No
R-77	B Residential	66	56	56	56	0	0	No
R-78	B Residential	66	52	53	53	1	1	No
R-79	E Restaurant	71	63	64	64	1	1	No
R-80	F Retail	-	65	67	67	2	2	No
R-81	C Cemetery	66	59	60	60	1	1	No
R-82	C School	66	**71**	**72**	**72**	1	1	**Impacted**
R-83	C Place of Worship	66	**70**	**72**	**71**	2	1	**Impacted**
R-84	B Residential	66	57	58	59	1	2	No
R-85	B Residential	66	56	58	58	2	2	No
R-86	B Residential	66	58	59	59	1	2	No
R-87	B Residential	66	59	60	60	1	2	No
R-88	E Restaurant	71	67	68	68	1	1	No
R-89	B Residential	66	60	61	61	1	2	No

The analysis indicates that the tight diamond interchange design in 2045 will impact 21 receivers with another 5 approaching impacts. The noise impacts are in the front row lots of the Lazelle Estates Subdivision in the south-east quadrant of the intersection from Trainor Gate Road to the interchange at Johansen Expressway, and in front of the Fairhill Community Church of God and the Fairhill Christian school off City Lights Boulevard.

Figure 9 through Figure 12 on the following pages, shows the location of the impacted receivers and the proposed noise barriers that were considered to mitigate the noise impacts.

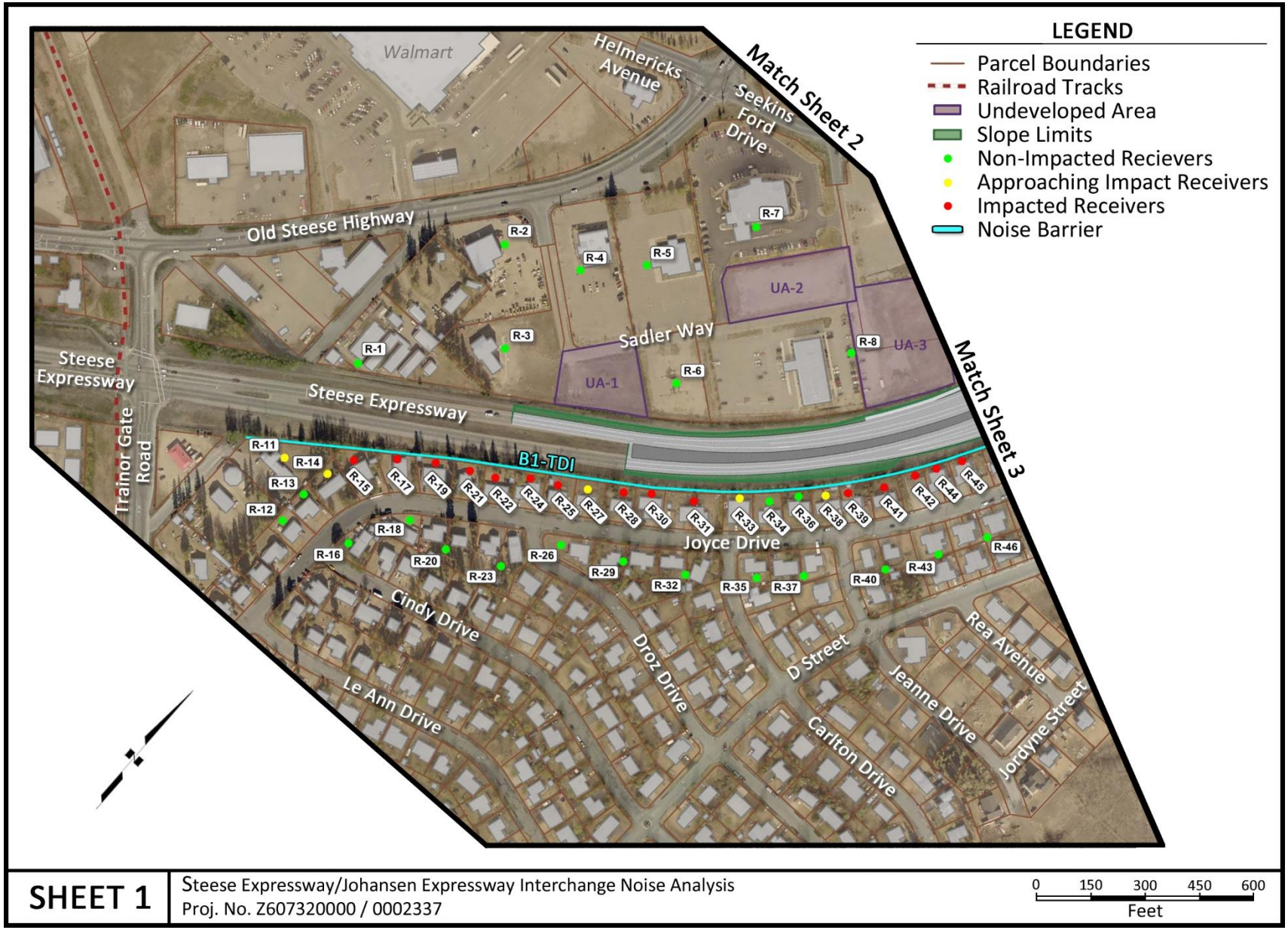

Figure 9: Tight Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 1

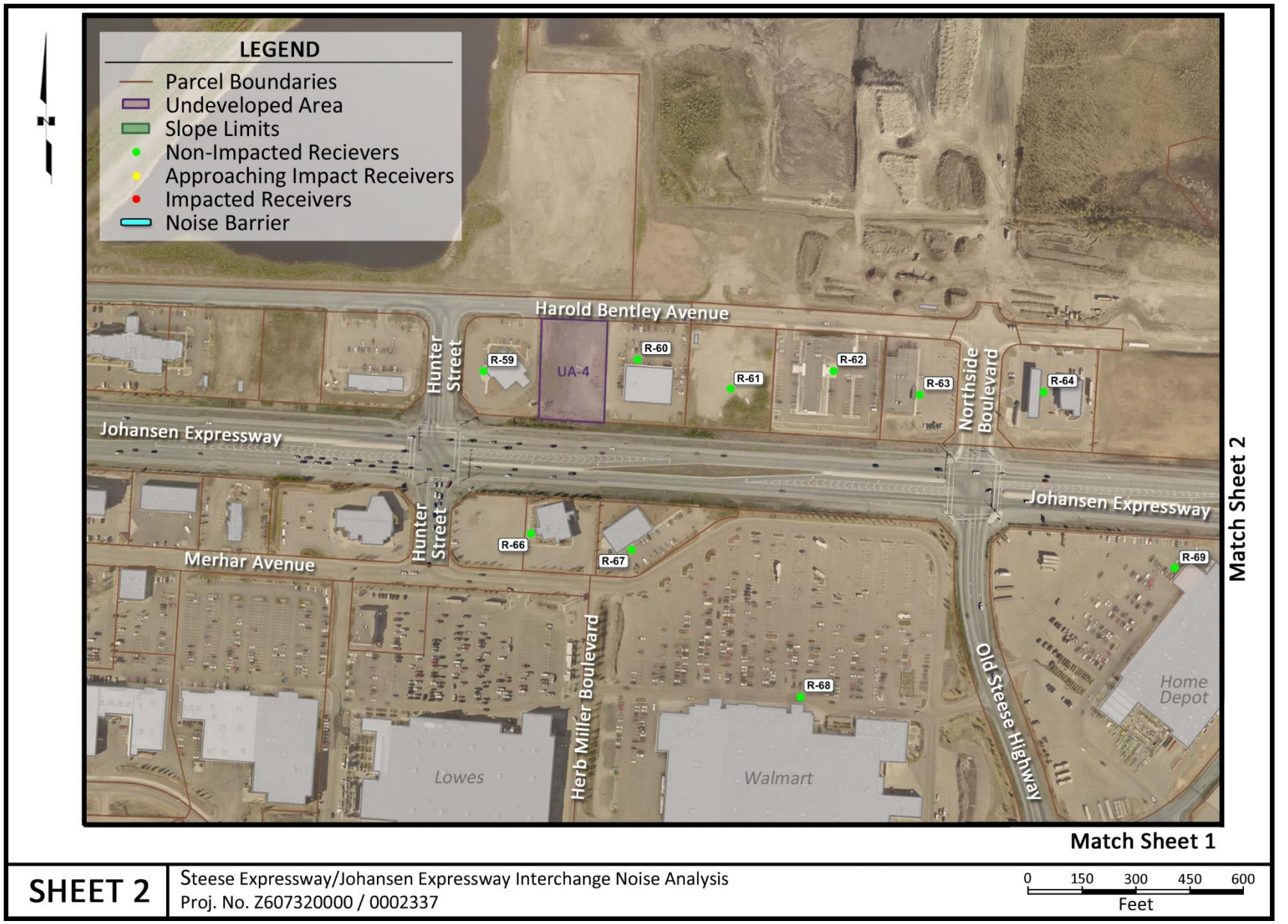

Figure 10: Tight Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 2

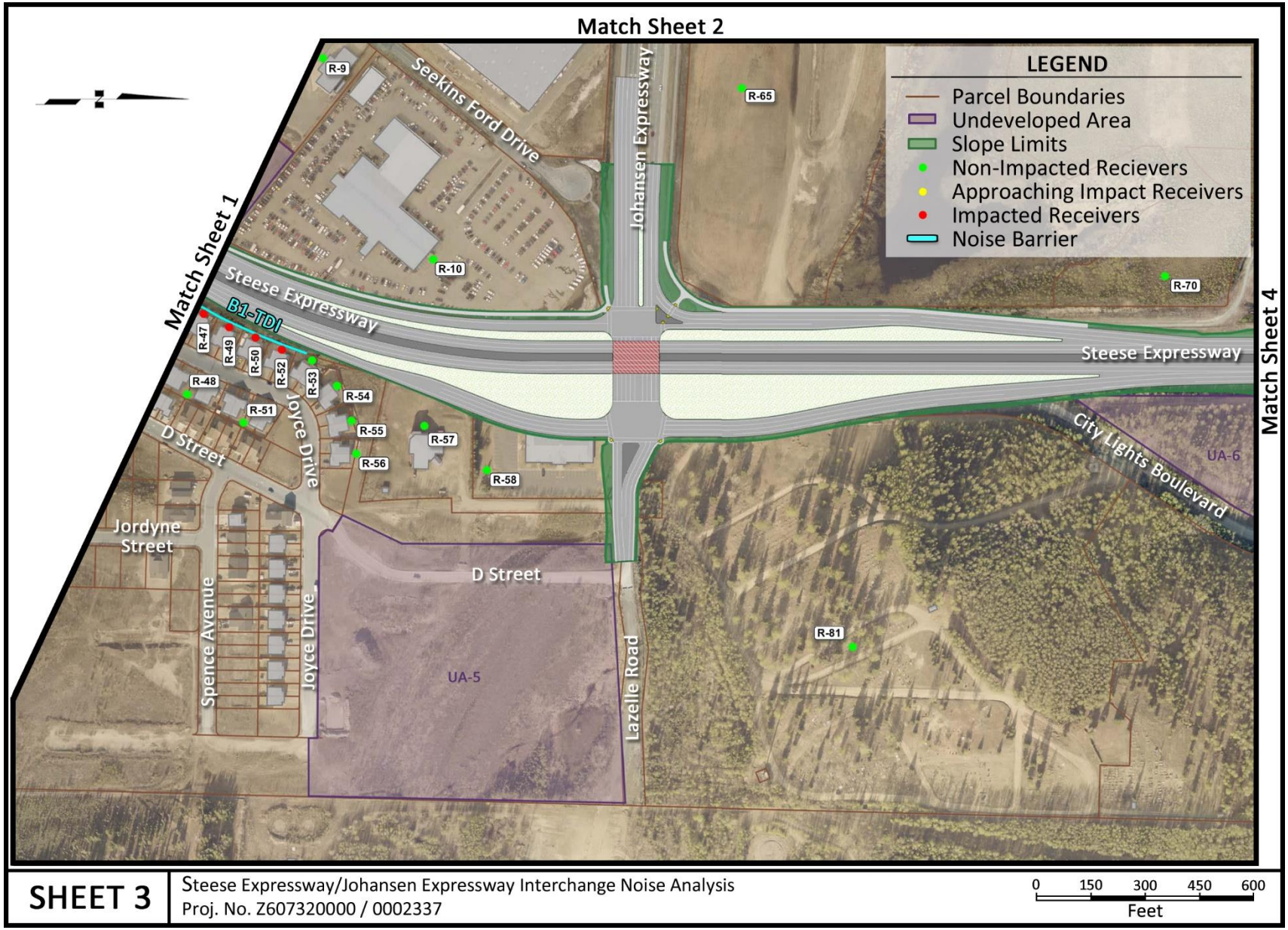

Figure 11: Tight Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 3

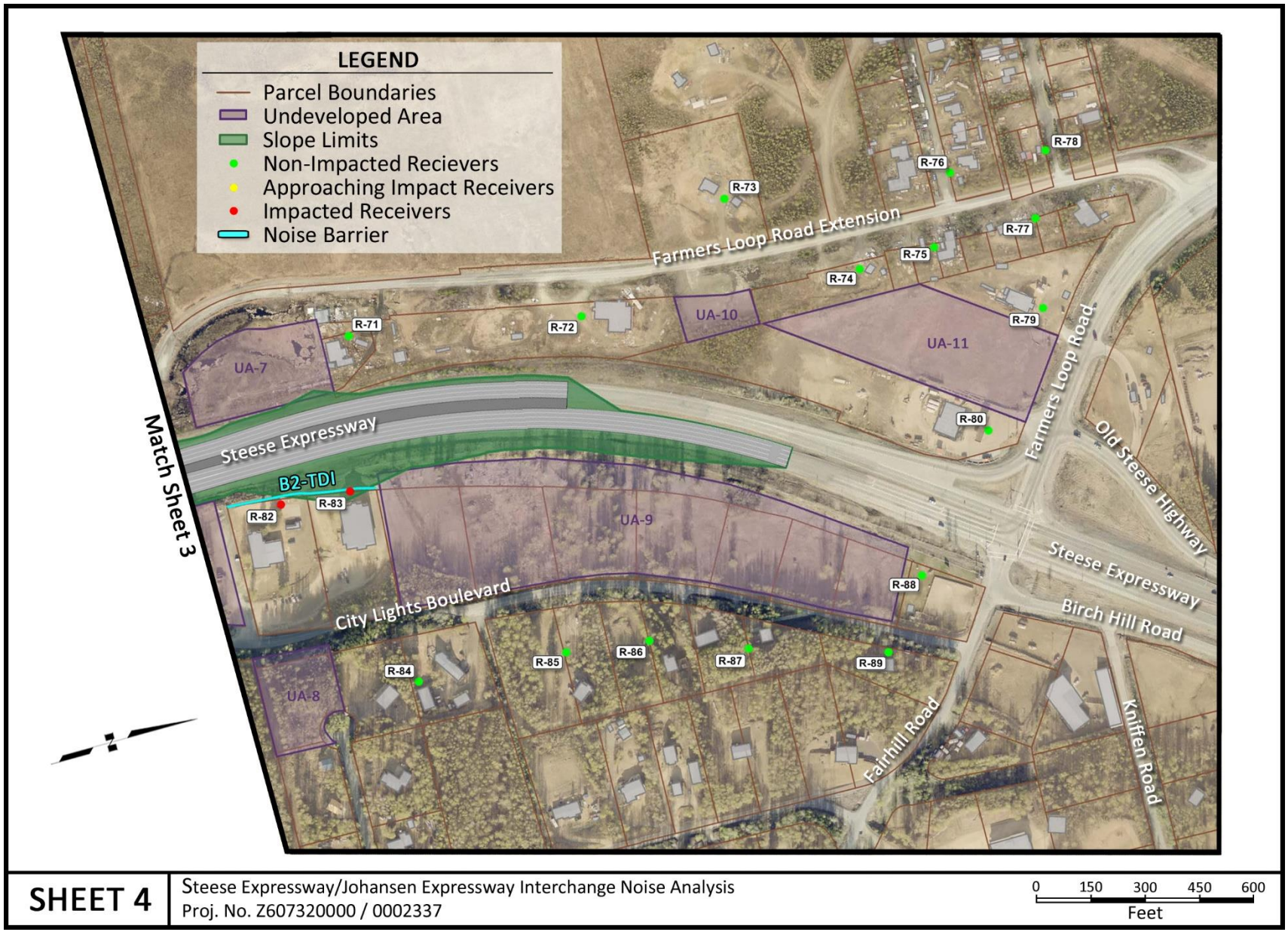

Figure 12: Tight Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 4

6.2.2 Noise Abatement Analysis

Noise abatement measures must be considered at receiver locations where predicted noise levels either approach or exceed the applicable NAC or where there is a substantial increase between existing and design year noise levels. The analysis evaluates the feasibility and reasonableness of noise abatement. The abatement measure must be determined as both feasible and reasonable in order to be recommended in a project.

Feasibility is determined when:

1. The noise abatement measure provides a reduction of at least 5 dBA for at least 3 impacted first row receptors.
2. The noise abatement measure is not a safety hazard for drivers, receptors, or maintenance personnel.

Reasonableness is determined when:

1. At least 60% of the benefited receptors are in support of the noise abatement measure.
2. The cost of the noise abatement measure is no more than $38,000 per benefited receptor.
3. The noise abatement measure meets the design reduction goal of 7 dBA for at least 50% of the benefited first row receptors.

Noise abatement measures in the form of noise barriers were considered for the receivers in the study area that were either impacted or approaching impacts. A unit cost of $46 per square foot was assumed to calculate the cost-effectiveness of the barriers. This unit cost is the product of a cost study that looked at central region projects with a similar design and size. The study averaged the low bidder unit costs for the noise walls along the Seward Highway from Dowling to Tudor Road, West Dowling Phase II, and O'Malley Road Reconstruction Phase I. The average low bidder cost was $30 per square foot. This was added to a collection of general project unit costs for bid items such as Design Engineering, Construction Engineering, ICAP, and installation costs, which brought the average up to $46 per square foot. Unit cost calculations are presented in Appendix C on page 81.

The noise abatement walls are assumed to be a minimum of 2-inch thick solid lumber that reaches the ground and does not have any gaps between slats. The abatement wall analysis conducted for this study optimizes the height and location of the wall to meet the standards of effectiveness at the minimum cost.

Table 8 starting on page 38 presents the noise barrier optimization for walls B1-TDI and B2-TDI.

Table 8: Tight Diamond Interchange Noise Barrier Height Design Optimization

Barrier	Receiver	Decibel Level at Modeled Noise Barrier Height **NL** = Noise Level; **NR** = Noise Reduction (from No Barrier Condition)																Height for 5 dBA NR	Height for >50% 7 dBA NR
		No Barrier	5 ft		6 ft		7 ft		8 ft		9 ft		10 ft		11 ft		12 ft		
			NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	
B1-TDI	R-11	66	-	-	-	-	62	4	62	4	60	6	59	7	58	8	57	9	9 ft	**10 ft**
	R-14	66	-	-	-	-	63	3	62	4	61	5	61	5	59	7	58	8		
	R-15	69	-	-	-	-	66	3	64	5	63	6	61	8	60	9	59	10		
	R-17	70	-	-	-	-	66	4	64	6	62	8	60	10	59	11	59	11		
	R-19	71	-	-	-	-	66	5	64	7	62	9	61	10	60	11	59	12		
	R-21	70	-	-	-	-	66	4	64	6	63	7	61	9	60	10	59	11		
	R-22	70	-	-	-	-	67	3	65	5	64	6	63	7	61	9	60	10		
	R-24	69	-	-	-	-	66	3	65	4	63	6	61	8	60	9	60	9		
	R-25	70	-	-	-	-	68	2	66	4	65	5	63	7	62	8	61	9		
	R-27	66	-	-	-	-	66	0	64	2	63	3	61	5	60	6	59	7		
	R-28	68	-	-	-	-	65	3	63	5	62	6	61	7	60	8	59	9		
	R-30	68	-	-	-	-	64	4	62	6	61	7	60	8	59	9	58	10		
	R-31	68	-	-	-	-	65	3	64	4	62	6	61	7	60	8	59	9		
	R-33	66	-	-	-	-	63	3	61	5	60	6	59	7	58	8	58	8		
	R-34	63	-	-	-	-	58	5	56	10	55	11	54	12	54	12	53	10		
	R-36	65	-	-	-	-	61	4	61	5	60	6	59	7	58	8	57	8		
	R-38	66	-	-	-	-	63	3	61	5	60	6	60	6	59	7	58	8		
	R-39	67	-	-	-	-	65	2	64	3	62	5	61	6	60	7	59	8		
	R-41	67	-	-	-	-	64	3	63	4	62	5	61	6	60	7	59	8		
	R-42	69	-	-	-	-	62	7	61	8	60	9	59	10	58	11	57	12		
	R-44	70	-	-	-	-	66	4	65	5	62	8	61	9	60	10	59	11		
	R-45	70	-	-	-	-	66	4	64	6	62	8	61	9	60	10	59	11		
	R-47	70	-	-	-	-	66	4	63	7	62	8	61	9	59	11	58	12		
	R-49	70	-	-	-	-	70	0	67	3	65	5	63	7	61	9	60	10		
	R-50	70	-	-	-	-	64	6	62	8	61	9	60	10	58	12	58	12		

Barrier	Receiver	Decibel Level at Modeled Noise Barrier Height **NL** = Noise Level; **NR** = Noise Reduction (from No Barrier Condition)																Height for 5 dBA NR	Height for >50% 7 dBA NR
		No Barrier	5 ft		6 ft		7 ft		8 ft		9 ft		10 ft		11 ft		12 ft		
			NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	NL	NR	
	R-52	67	-	-	-	-	61	6	60	7	59	8	59	8	58	9	57	10	
B2-TDI	R-82	72	70	2	68	4	66	6	65	7	64	8	63	9	62	10	62	10	6 ft to 7 ft	**6 ft to 9 ft**
	R-83	71	69	2	64	7	62	9	61	10	60	11	59	12	59	12	58	13	

Table 9 presents the results of the cost benefit analysis for the proposed noise walls. Both walls meet the reasonableness requirements for noise walls using the Alaska State Noise Analysis Policy.

Table 9: Tight Diamond Interchange Noise Barrier Analysis Summary

Barrier	Receiver	Potential Noise Reduction (dBA)	Height (ft)	Barrier Length (ft)	Barrier Area (sq ft)	Cost of Barrier	Number of Benefited Receptors	Cost per Benefited Receptor	Feasible AND Reasonable?
B1-TDI	R-11	7	9 - 10	2,390	23,310	$1,072,000	33	$32,485	YES
	R-14	5							
	R-15	8							
	R-17	10							
	R-19	10							
	R-21	9							
	R-22	7							
	R-24	8							
	R-25	7							
	R-27	5							
	R-28	7							
	R-30	8							
	R-31	7							
	R-33	7							
	R-34	12							
	R-36	7							
	R-38	6							
	R-39	6							
	R-41	6							
	R-42	9							
	R-44	8							
	R-45	8							
	R-47	8							
	R-49	5							
	R-50	9							
	R-52	8							
B2-TDI	R-82	8	6 - 9	410	2,950	$146,500	4	$36,625	YES
	R-83	7							

6.2.3 Abatement Recommendations

Two barriers are found to be feasible and reasonable, pending the survey of benefited residents and property owners' viewpoints. Benefited residents and property owners must be surveyed regarding the interest of the proposed noise barriers, and at least 60% of the benefited receptors must be in support of

the barrier for it to be reasonable. Benefited receptors were not surveyed at the time this report was written.

6.2.3.1 Barrier B1-TDI

TDI Barrier 1 (B1-TDI) is a 2,390-foot long barrier on the east side of Steese Expressway, south of Johansen Expressway. Barrier height varies from 10-feet on the south end to 9-feet on the north end (changing at the southern lot line of receiver R-42). The noise barrier protects impacted receivers R-11, R-14, R-15, R-17, R-19, R-21, R-22, R-24, R-25, R-27, R-28, R-30, R-31, R-33, R-38, R-39, R-41, R-42, R-44, R-45, R-47, R-49, R-50, R-52 and non-impacted receivers R-34 and R-36. The receivers represent residential single-family and multi-family housing (33 receptors) along Joyce Drive. A noise reduction ranging from 7 dBA to 12 dBA is predicted for 29 benefited receptors. The cost of the barrier is $32,485 per benefited receptor.

6.2.3.2 Barrier B2-TDI

TDI Barrier 2 (B2-TDI) is a 410-foot barrier on the east side of Steese Expressway. The height of the barrier varies between 9-feet on the south end to 6 feet on the north end (changing at the lot line between the church and school). The barrier mitigates the noise for impacted receivers R-82 and R-83, representing the Fairhill Community Church of God and the Fairhill Christian School (4 receptors). A noise reduction of 7 dBA to 8 dBA is predicted for all 4 benefited receptors. The cost of the barrier is $36,625 per benefited receptor.

6.3 Diverging Diamond Interchange

A diverging diamond interchange concept was designed and modeled in TNM. The design would have a free-flowing overpass for the north-south portion of the Steese Expressway with entry and exit ramps and a diverging diamond design for the underpass with two-phase signalized intersections at the ramp junctions.

6.3.1 Noise Level Results

Table 10 presents the predicted noise levels for the DDI design concept.

Table 10: Noise Level Results – Diverging Diamond Interchange

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-1	F Retail	-	66	67	67	1	1	No
R-2	F Industrial	-	56	57	57	1	1	No
R-3	C Medical Facilities	66	61	62	61	1	0	No
R-4	E Restaurant	71	58	59	60	1	2	No
R-5	C Place of Worship	66	59	60	60	1	1	No
R-6	F Utilities	-	65	66	65	1	0	No

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-7	E Offices	71	57	58	59	1	2	No
R-8	C Medical Facilities	66	62	63	64	1	2	No
R-9	E Restaurant	71	55	56	57	1	2	No
R-10	E Offices	71	65	66	65	1	0	No
R-11	B Residential	66	**66**	**67**	**67**	1	1	**Impacted**
R-12	B Residential	66	58	59	58	1	0	No
R-13	B Residential	66	62	63	62	1	0	No
R-14	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-15	B Residential	66	**68**	**69**	**69**	1	1	**Impacted**
R-16	B Residential	66	56	57	56	1	0	No
R-17	B Residential	66	**70**	**71**	**70**	1	0	**Impacted**
R-18	B Residential	66	62	63	62	1	0	No
R-19	B Residential	66	**70**	**71**	**71**	1	1	**Impacted**
R-20	B Residential	66	55	56	55	1	0	No
R-21	B Residential	66	**69**	**70**	**69**	1	0	**Impacted**
R-22	B Residential	66	**68**	**69**	**69**	1	1	**Impacted**
R-23	B Residential	66	55	56	55	1	0	No
R-24	B Residential	66	**66**	**67**	**68**	1	2	**Impacted**
R-25	B Residential	66	**66**	**67**	**68**	1	2	**Impacted**
R-26	B Residential	66	58	59	58	1	0	No
R-27	B Residential	66	65	**66**	65	1	0	No
R-28	B Residential	66	65	**66**	65	1	0	No
R-29	B Residential	66	55	56	56	1	1	No
R-30	B Residential	66	65	**66**	65	1	0	No
R-31	B Residential	66	64	65	65	1	1	No
R-32	B Residential	66	55	56	56	1	1	No
R-33	B Residential	66	64	65	**66**	1	2	**Approaching**
R-34	B Residential	66	60	61	61	1	1	No
R-35	B Residential	66	54	55	55	1	1	No
R-36	B Residential	66	64	65	**66**	1	2	**Approaching**
R-37	B Residential	66	53	54	55	1	2	No
R-38	B Residential	66	64	65	**66**	1	2	**Approaching**
R-39	B Residential	66	64	65	**66**	1	2	**Approaching**
R-40	B Residential	66	54	55	56	1	2	No
R-41	B Residential	66	64	65	65	1	1	No
R-42	B Residential	66	65	**66**	**66**	1	1	**Approaching**

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-43	B Residential	66	54	55	56	1	2	No
R-44	B Residential	66	65	**66**	**67**	1	2	**Impacted**
R-45	B Residential	66	65	**66**	**68**	1	3	**Impacted**
R-46	B Residential	66	53	54	55	1	2	No
R-47	B Residential	66	**66**	**66**	**69**	0	3	**Impacted**
R-48	B Residential	66	53	54	55	1	2	No
R-49	B Residential	66	**66**	**67**	**70**	1	4	**Impacted**
R-50	B Residential	66	**66**	**67**	**69**	1	3	**Impacted**
R-51	B Residential	66	54	55	56	1	2	No
R-52	B Residential	66	**66**	**67**	**68**	1	2	**Impacted**
R-53	B Residential	66	65	**66**	**66**	1	1	**Approaching**
R-54	B Residential	66	63	64	65	1	2	No
R-55	B Residential	66	60	61	63	1	3	No
R-56	B Residential	66	56	57	60	1	4	No
R-57	C Place of worship	66	61	62	62	1	1	No
R-58	C Place of worship	66	59	60	59	1	0	No
R-59	E Offices	71	61	63	63	2	2	No
R-60	F Industrial	-	52	54	54	2	2	No
R-61	E Hotel	71	63	65	65	2	2	No
R-62	E Hotel	71	59	61	61	2	2	No
R-63	F Retail	-	60	62	62	2	2	No
R-64	F Retail	-	62	64	63	2	1	No
R-65	F Utilities	-	62	63	64	1	2	No
R-66	E Offices	71	62	64	64	2	2	No
R-67	E Offices	71	59	61	61	2	2	No
R-68	F Retail	-	58	60	60	2	2	No
R-69	F Retail	-	66	68	67	2	1	No
R-70	F Industrial	-	61	62	64	1	3	No
R-71	B Residential	66	60	61	61	1	1	No
R-72	E Commercial	71	59	61	61	2	2	No
R-73	B Residential	66	54	56	56	2	2	No
R-74	B Residential	66	55	56	56	1	1	No
R-75	B Residential	66	55	56	56	1	1	No
R-76	B Residential	66	52	53	53	1	1	No
R-77	B Residential	66	56	56	56	0	0	No

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-78	B Residential	66	52	53	53	1	1	No
R-79	E Restaurant	71	63	64	64	1	1	No
R-80	F Retail	-	65	67	67	2	2	No
R-81	C Cemetery	66	59	60	61	1	2	No
R-82	C School	66	**71**	**72**	**72**	1	1	**Impacted**
R-83	C Place of Worship	66	**70**	**72**	**72**	2	2	**Impacted**
R-84	B Residential	66	57	58	59	1	2	No
R-85	B Residential	66	56	58	58	2	2	No
R-86	B Residential	66	58	59	60	1	2	No
R-87	B Residential	66	59	60	60	1	1	No
R-88	E Restaurant	71	67	68	68	1	1	No
R-89	B Residential	66	60	61	61	1	1	No

The analysis indicates that the diverging diamond interchange design in 2045 will impact 16 receivers with another 7 approaching impacts. Similar to the TDI concept, the noise impacts are in the front row lots of the Lazelle Estates Subdivision in the south-east quadrant of the intersection from Trainor Gate to the interchange at Johansen, and in front of the Fairhill Community Church of God and the Fairhill Christian school off City Lights Boulevard.

Figure 13 through Figure 16 on the following pages, shows the location of the impacted receivers and the proposed noise barriers that were considered to mitigate the noise impacts.

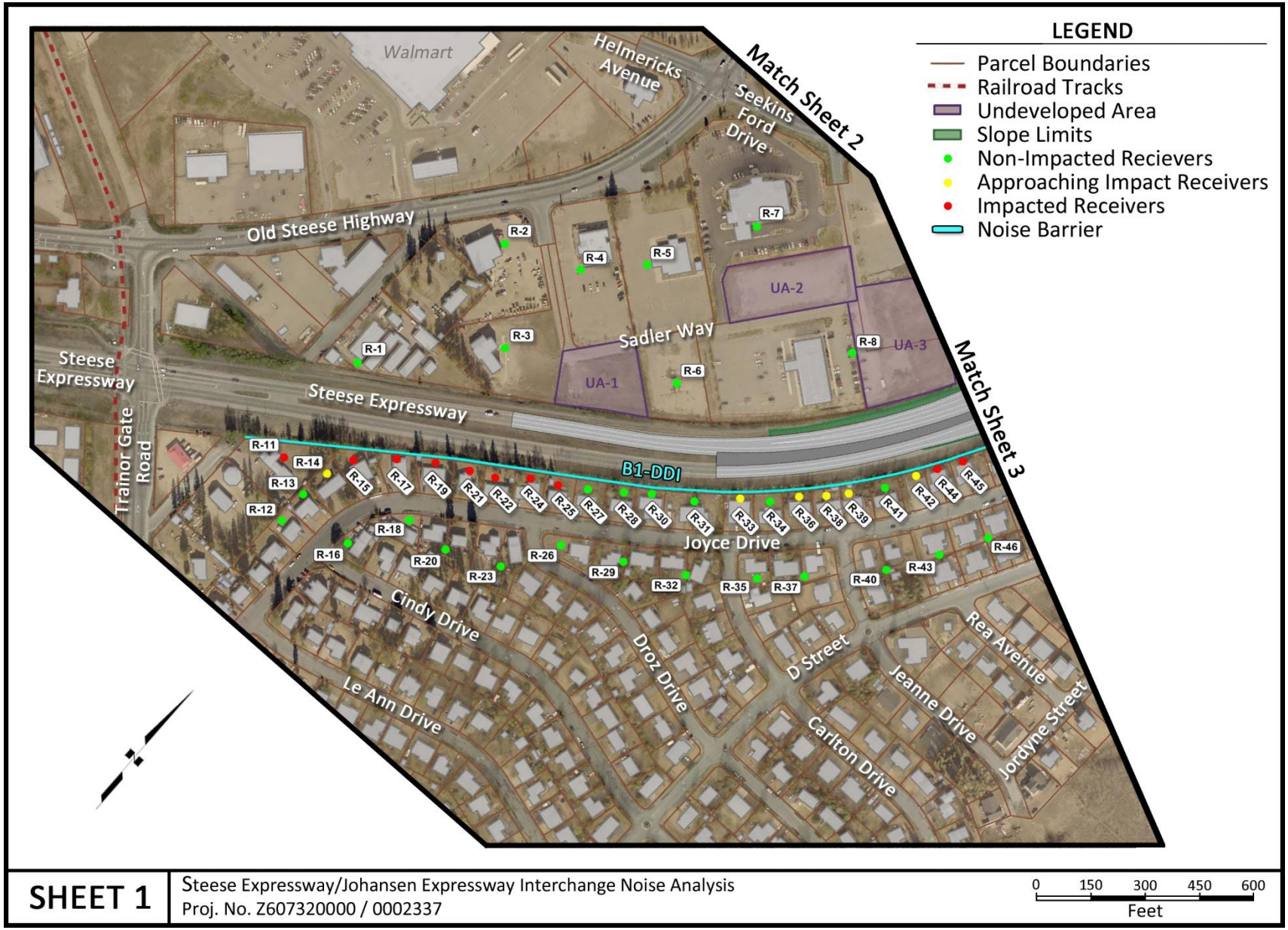

Figure 13: Diverging Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 1

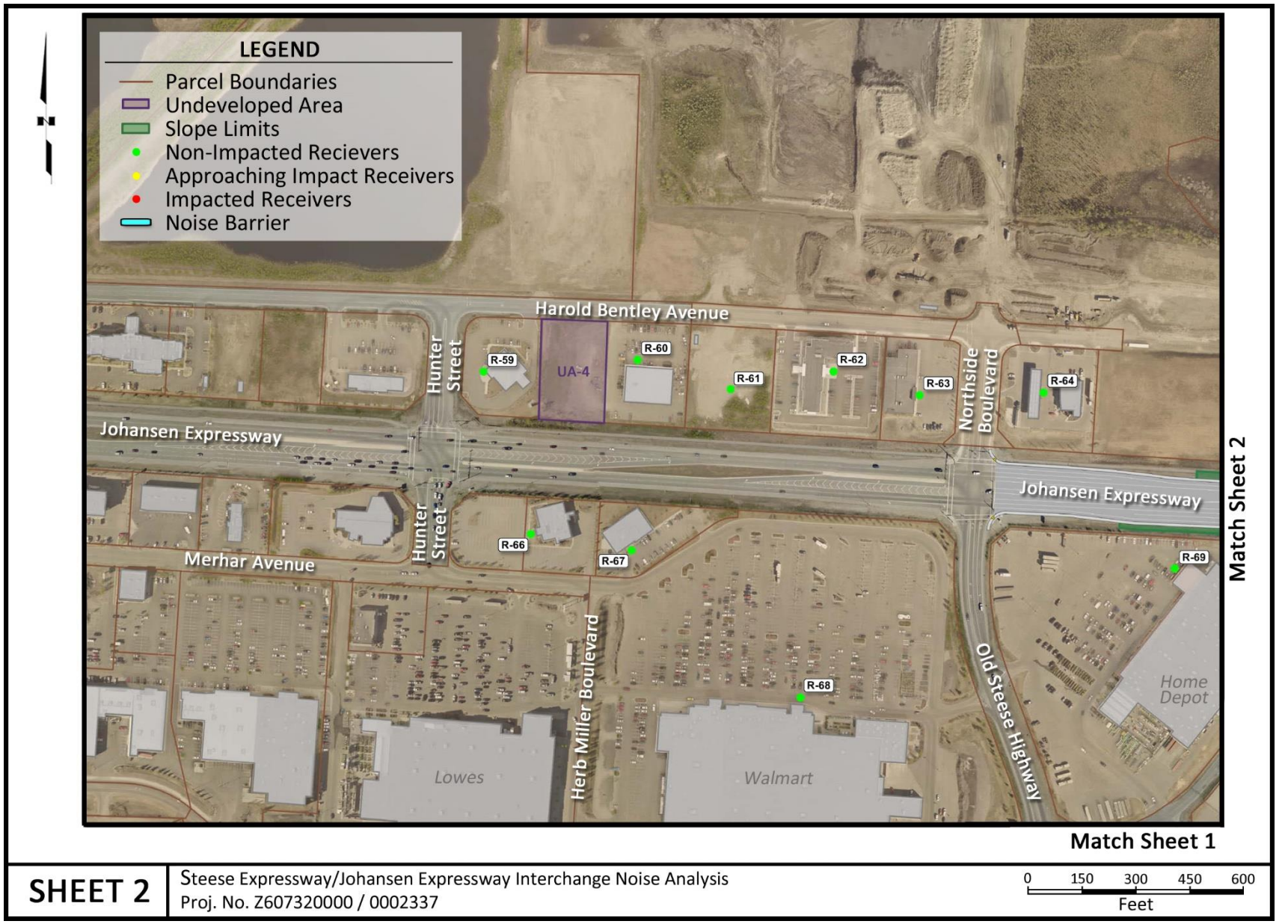

Figure 14: Diverging Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 2

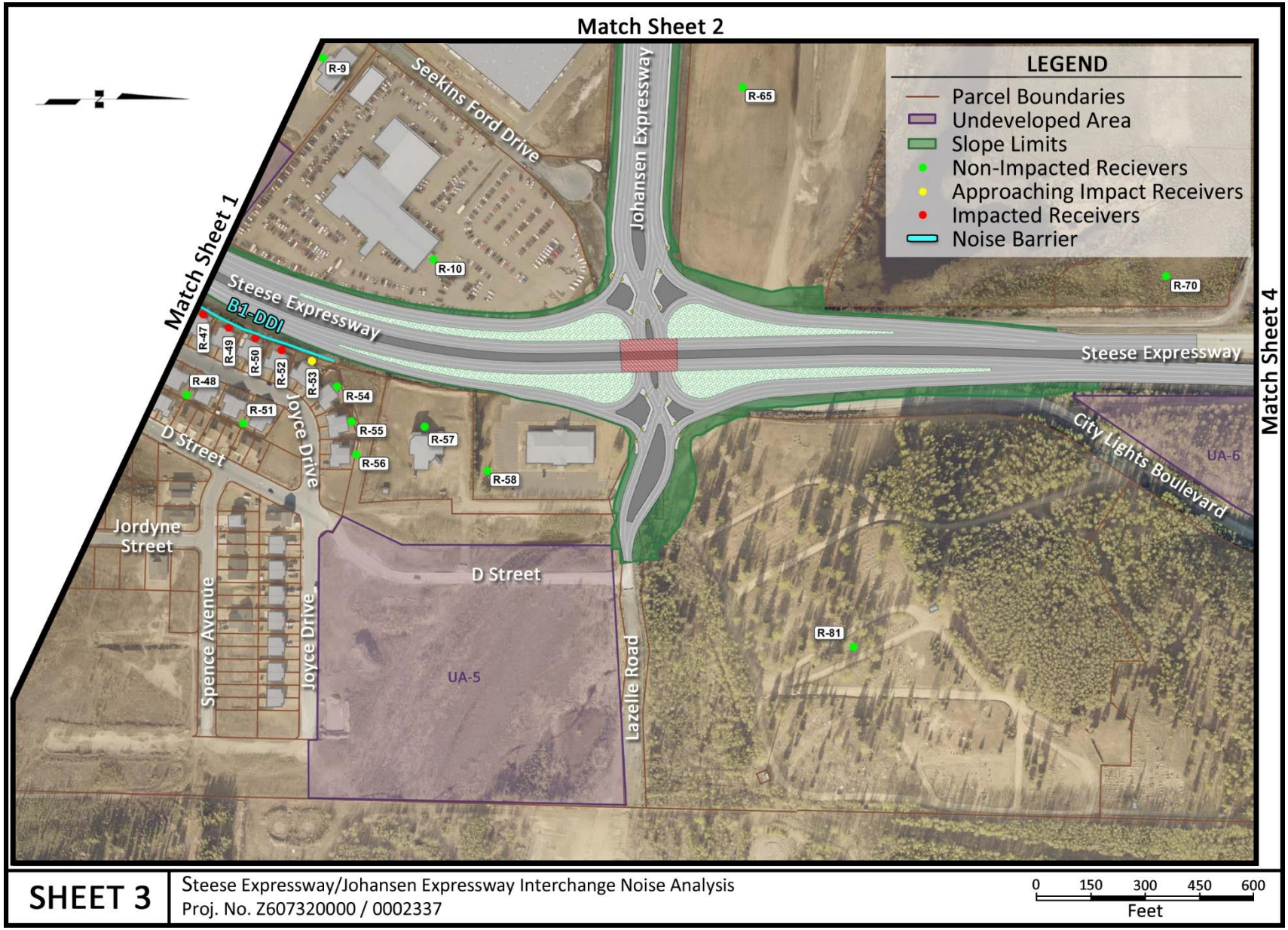

Figure 15: Diverging Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 3

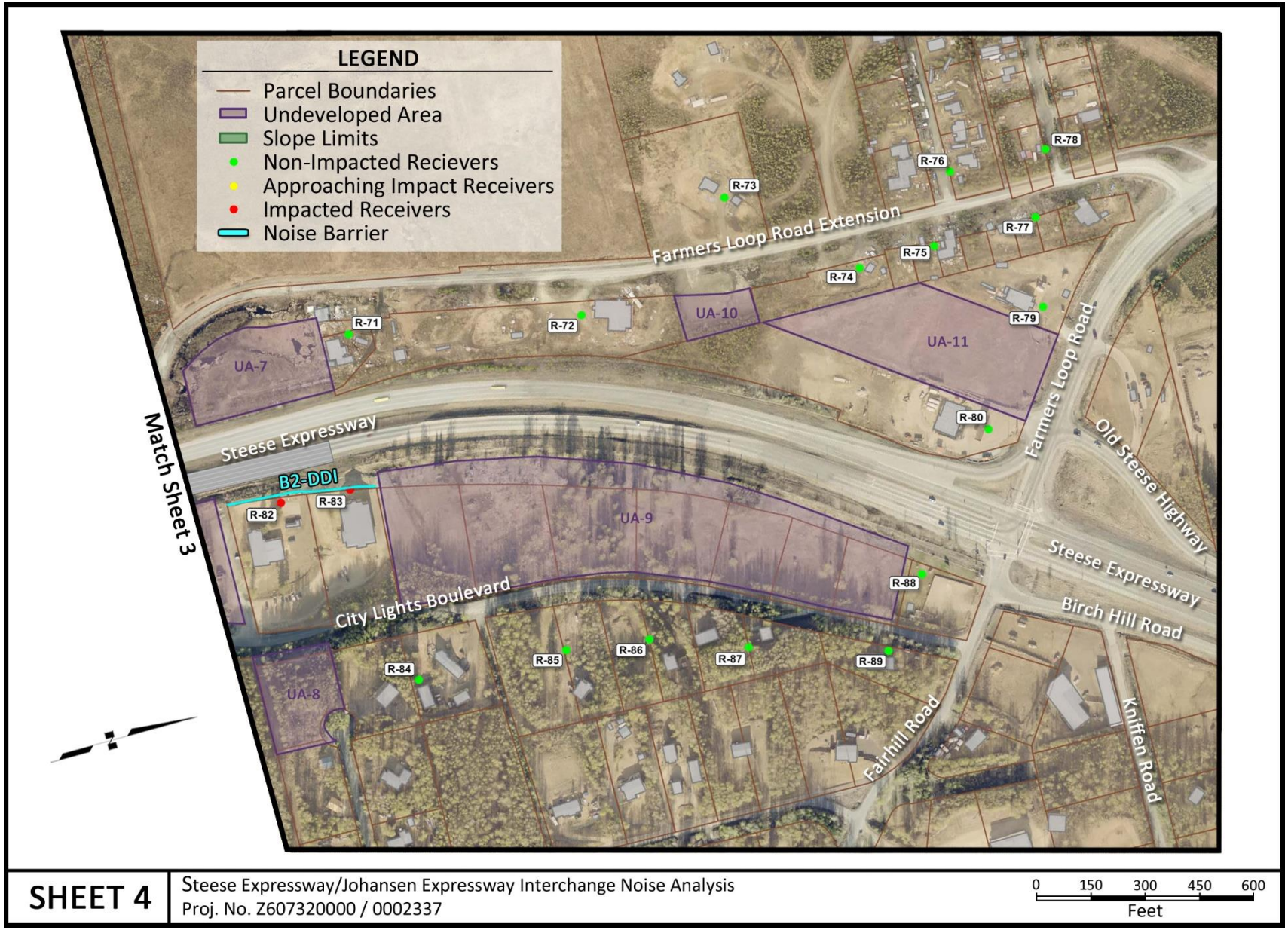

Figure 16: Diverging Diamond Interchange Noise Impacts and Proposed Barrier Walls, Sheet 4

6.3.2 Noise Abatement Analysis

Noise abatement analysis was conducted the same as for the TDI, using the methods explained in section 6.2.2 on page 37.

Table 11 on page 50 presents the noise barrier optimization for walls B1-DDI and B2-DDI.

Table 11: Diverging Diamond Interchange Noise Barrier Height Design Optimization

Barrier	Receiver	Decibel Level at Modeled Noise Barrier Height **NL** = Noise Level; **NR** = Noise Reduction (from No Barrier Condition)											Height for 5 dBA NR	Height for >50% 7 dBA NR
		No Barrier	8 ft		9 ft		10 ft		11 ft		12 ft			
			NL	NR	NL	NR	NL	NR	NL	NR	NL	NR		
B1-DDI	R-11	67	62	5	60	7	59	8	58	9	57	10	10 ft	**12 ft**
	R-14	66	62	4	61	5	61	5	59	7	58	8		
	R-15	69	64	5	63	6	61	8	60	9	59	10		
	R-17	70	64	6	62	8	61	9	60	10	59	11		
	R-19	71	64	7	62	9	61	10	60	11	59	12		
	R-21	69	64	5	63	6	61	8	60	9	59	10		
	R-22	69	65	4	64	5	63	6	61	8	60	9		
	R-24	68	65	3	63	5	61	7	61	7	60	8		
	R-25	68	66	2	64	4	63	5	62	6	61	7		
	R-27	65	64	1	63	2	61	4	60	5	60	5		
	R-28	65	64	1	63	2	61	4	60	5	60	5		
	R-30	65	62	3	61	4	60	5	59	6	59	6		
	R-31	65	63	2	63	2	61	4	61	4	60	5		
	R-33	66	62	4	60	6	60	6	59	7	59	7		
	R-34	61	57	4	56	5	55	6	54	7	54	7		
	R-36	66	61	5	60	6	60	6	59	7	58	8		
	R-38	66	63	3	61	5	60	6	60	6	59	7		
	R-39	66	64	2	63	3	62	4	61	5	60	6		
	R-41	65	63	2	63	2	62	3	61	4	60	5		
	R-42	66	61	5	60	6	59	7	58	8	57	9		
	R-44	67	65	2	63	4	61	6	60	7	59	8		
	R-45	68	64	4	63	5	61	7	60	8	59	9		
	R-47	69	63	6	62	7	61	8	59	10	59	10		
	R-49	70	68	2	65	5	63	7	61	9	60	10		
	R-50	69	68	1	66	3	64	5	62	7	61	8		
	R-52	68	68	0	67	1	67	1	65	3	63	5		
	R-54	66	65	1	64	2	63	3	62	4	61	5		
	R-13*	62	-	-	-	-	-	-	58	4	57	5		
B2-DDI	R-82	72	69	3	67	5	66	6	64	8	-	-	6 ft to 8 ft	**6 ft to 9 ft**
	R-83	72	65	7	63	9	62	10	61	11	-	-		

*Potential Benefited Second Row Receiver

Table 12 presents the results of the cost benefit analysis for the proposed noise walls. Both walls meet the reasonableness requirements for noise walls using the Alaska State Noise Analysis Policy.

Table 12: Diverging Diamond Interchange Noise Barrier Analysis Summary

Barrier	Receiver	Potential Noise Reduction (dBA)	Height (ft)	Barrier Length (ft)	Barrier Area (sq ft)	Cost of Barrier	Number of Benefited Receptors	Cost per Benefited Receptor	Feasible AND Reasonable?
B1-DDI	R-11	10	12	2,470	29,640	$1,365,000	36	$37,917	YES
	R-14	8							
	R-15	10							
	R-17	11							
	R-19	12							
	R-21	10							
	R-22	9							
	R-24	8							
	R-25	7							
	R-27	5							
	R-28	5							
	R-30	6							
	R-31	5							
	R-33	7							
	R-34	7							
	R-36	8							
	R-38	7							
	R-39	6							
	R-41	5							
	R-42	9							
	R-44	8							
	R-45	9							
	R-47	10							
	R-49	10							
	R-50	8							
	R-52	5							
	R-53	5							
	R-13	5							
B2-DDI	R-82	8	6 to 9	410	2,950	$146,500	4	$36,625	YES
	R-83	7							

6.3.3 Abatement Recommendations

Two barriers are found to be feasible and reasonable, pending the survey of benefited residents and property owners' viewpoints. Benefited residents and property owners must be surveyed regarding the interest of the proposed noise barriers, and at least 60% of the benefited receptors must be in support of the barrier for it to be reasonable. Benefited receptors were not surveyed at the time this report was written.

6.3.3.1 DDI Barrier 1

DDI Barrier 1 (B1-DDI) is a 2,470-foot long, 12-foot high barrier on the east side of Steese Expressway, north of Trainor Gate Road. The noise barrier protects impacted receivers R-11, R-14, R-15, R-17, R-19, R-21, R-22, R-24, R-25, R-33, R-36, R-38, R-39, R-42, R-44, R-45, R-47, R-49, R-50, R-52, R-53 and non-impacted receivers R-27, R-28, R-30, R-31, R-34, and R-41. The barrier also benefits R-13 in the second row. The receivers represent single-family and multi-family housing (36 receptors) along Joyce Drive. A noise reduction of 7 dBA to 12 dBA is predicted for 24 out of the 35 first row benefited receptors. The cost of the barrier is $37,917 per benefited receptor.

6.3.3.2 DDI Barrier 2

DDI Barrier 2 (B2-DDI) is a 410-foot barrier on the east side of Steese Expressway. The height of the barrier varies between 9-feet on the south end to 6 feet on the north end. The barrier mitigates the noise for impacted receivers R-82 and R-83, which represent the Fairhill Community Church of God and the Fairhill Christian School (4 receptors). A noise reduction of 7 dBA to 8 dBA is predicted for all 4 benefited receptors and would have a construction cost of $36,625 per benefited receptor.

6.4 Echelon Interchange

An Echelon Interchange (EI) concept was designed and modeled in TNM. The design would elevate the northbound Steese Expressway to an overpass where it would intersect an elevated westbound Lazelle Road at a traffic signal. The southbound Steese and the eastbound Johansen would intersect on the lower level at a similar signalized intersection. A key component of this design for the sake of noise is that the Steese Expressway traffic would not be free-flowing since it would be delayed at a signal, therefore the speed of the traffic would be reduced and likewise, the overall noise generated would be reduced.

6.4.1 Noise Level Results

Table 13 presents the predicted noise levels for the Echelon Interchange design concept.

Table 13: Noise Level Results – Echelon Interchange

Receiver ID	Category and Land Use		Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
				Existing	No-Build	Build			
R-1	F	Retail	-	66	67	66	1	0	No
R-2	F	Industrial	-	56	57	56	1	0	No
R-3	C	Medical Facilities	66	61	62	60	1	-1	No
R-4	E	Restaurant	71	58	59	59	1	1	No
R-5	C	Place of Worship	66	59	60	59	1	0	No
R-6	F	Utilities	-	65	66	65	1	0	No
R-7	E	Offices	71	57	58	58	1	1	No
R-8	C	Medical Facilities	66	62	63	63	1	1	No

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-9	E Restaurant	71	55	56	56	1	1	No
R-10	E Offices	71	65	66	64	1	-1	No
R-11	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-12	B Residential	66	58	59	58	1	0	No
R-13	B Residential	66	62	63	62	1	0	No
R-14	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-15	B Residential	66	**68**	**69**	**69**	1	1	**Impacted**
R-16	B Residential	66	56	57	56	1	0	No
R-17	B Residential	66	**70**	**71**	**70**	1	0	**Impacted**
R-18	B Residential	66	62	63	62	1	0	No
R-19	B Residential	66	**70**	**71**	**71**	1	1	**Impacted**
R-20	B Residential	66	55	56	55	1	0	No
R-21	B Residential	66	**69**	**70**	**70**	1	1	**Impacted**
R-22	B Residential	66	**68**	**69**	**69**	1	1	**Impacted**
R-23	B Residential	66	55	56	56	1	1	No
R-24	B Residential	66	**66**	**67**	**70**	1	4	**Impacted**
R-25	B Residential	66	**66**	**67**	**68**	1	2	**Impacted**
R-26	B Residential	66	58	59	59	1	1	No
R-27	B Residential	66	65	**66**	**66**	1	1	**Approaching**
R-28	B Residential	66	65	**66**	**66**	1	1	**Approaching**
R-29	B Residential	66	55	56	56	1	1	No
R-30	B Residential	66	65	**66**	65	1	0	No
R-31	B Residential	66	64	65	65	1	1	No
R-32	B Residential	66	55	56	56	1	1	No
R-33	B Residential	66	64	65	65	1	1	No
R-34	B Residential	66	60	61	60	1	0	No
R-35	B Residential	66	54	55	55	1	1	No
R-36	B Residential	66	64	65	65	1	1	No
R-37	B Residential	66	53	54	55	1	2	No
R-38	B Residential	66	64	65	64	1	0	No
R-39	B Residential	66	64	65	65	1	1	No
R-40	B Residential	66	54	55	55	1	1	No
R-41	B Residential	66	64	65	65	1	1	No
R-42	B Residential	66	65	**66**	**66**	1	1	**Approaching**
R-43	B Residential	66	54	55	55	1	1	No
R-44	B Residential	66	65	**66**	**66**	1	1	**Approaching**
R-45	B Residential	66	65	**66**	**66**	1	1	**Approaching**

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-46	B Residential	66	53	54	54	1	1	No
R-47	B Residential	66	**66**	**66**	**66**	0	0	**Approaching**
R-48	B Residential	66	53	54	54	1	1	No
R-49	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-50	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-51	B Residential	66	54	55	55	1	1	No
R-52	B Residential	66	**66**	**67**	**66**	1	0	**Approaching**
R-53	B Residential	66	65	**66**	65	1	0	No
R-54	B Residential	66	63	64	64	1	1	No
R-55	B Residential	66	60	61	61	1	1	No
R-56	B Residential	66	56	57	58	1	2	No
R-57	C Place of worship	66	61	62	61	1	0	No
R-58	C Place of worship	66	59	60	60	1	1	No
R-59	E Offices	71	61	63	63	2	2	No
R-60	F Industrial	-	52	54	54	2	2	No
R-61	E Hotel	71	63	65	65	2	2	No
R-62	E Hotel	71	59	61	61	2	2	No
R-63	F Retail	-	60	62	62	2	2	No
R-64	F Retail	-	62	64	62	2	0	No
R-65	F Utilities	-	62	63	60	1	-2	No
R-66	E Offices	71	62	64	64	2	2	No
R-67	E Offices	71	59	61	61	2	2	No
R-68	F Retail	-	58	60	60	2	2	No
R-69	F Retail	-	66	68	67	2	1	No
R-70	F Industrial	-	61	62	61	1	0	No
R-71	B Residential	66	60	61	62	1	2	No
R-72	E Commercial	71	59	61	61	2	2	No
R-73	B Residential	66	54	56	56	2	2	No
R-74	B Residential	66	55	56	56	1	1	No
R-75	B Residential	66	55	56	56	1	1	No
R-76	B Residential	66	52	53	53	1	1	No
R-77	B Residential	66	56	56	56	0	0	No
R-78	B Residential	66	52	53	53	1	1	No
R-79	E Restaurant	71	63	64	64	1	1	No
R-80	F Retail	-	65	67	67	2	2	No

Receiver ID	Category and Land Use	Approach NAC (dBA)	L_{eq}(h) (dBA)			Existing to No-Build Change (dBA)	Existing to Build Change (dBA)	Impacted? (Exceeds or Approaches NAC)
			Existing	No-Build	Build			
R-81	C Cemetery	66	59	60	59	1	0	No
R-82	C School	66	**71**	**72**	**72**	1	1	**Impacted**
R-83	C Place of Worship	66	**70**	**72**	**72**	2	2	**Impacted**
R-84	B Residential	66	57	58	59	1	2	No
R-85	B Residential	66	56	58	58	2	2	No
R-86	B Residential	66	58	59	59	1	1	No
R-87	B Residential	66	59	60	60	1	1	No
R-88	E Restaurant	71	67	68	68	1	1	No
R-89	B Residential	66	60	61	61	1	1	No

The analysis indicates that the echelon interchange design in 2045 will impact 9 receivers with another 11 approaching impacts. The noise impacts are in the front row lots on the south end of the Lazelle Estates Subdivision and in front of the Fairhill Community Church of God and the Fairhill Christian school off City Lights Boulevard. Note that there are no newly impacted receivers as a result of the echelon design. All impacted receivers in the 2045 EI model are equally impacted in the No-Build model.

Figure 17 through Figure 20 on the following pages, shows the location of the impacted receivers and the proposed noise barriers that were considered to mitigate the noise impacts.

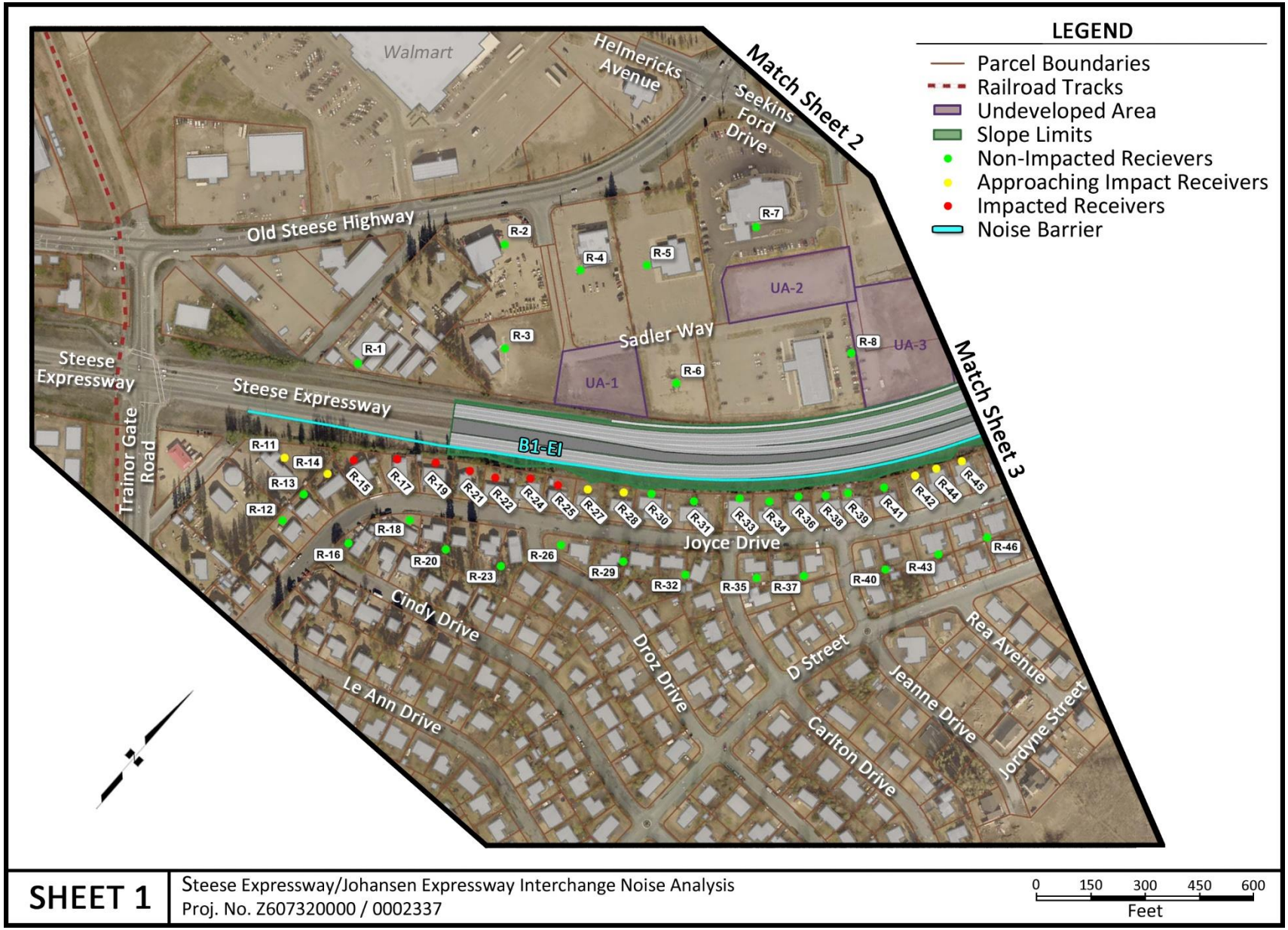

Figure 17: Echelon Interchange Noise Impacts and Proposed Barrier Walls, Sheet 1

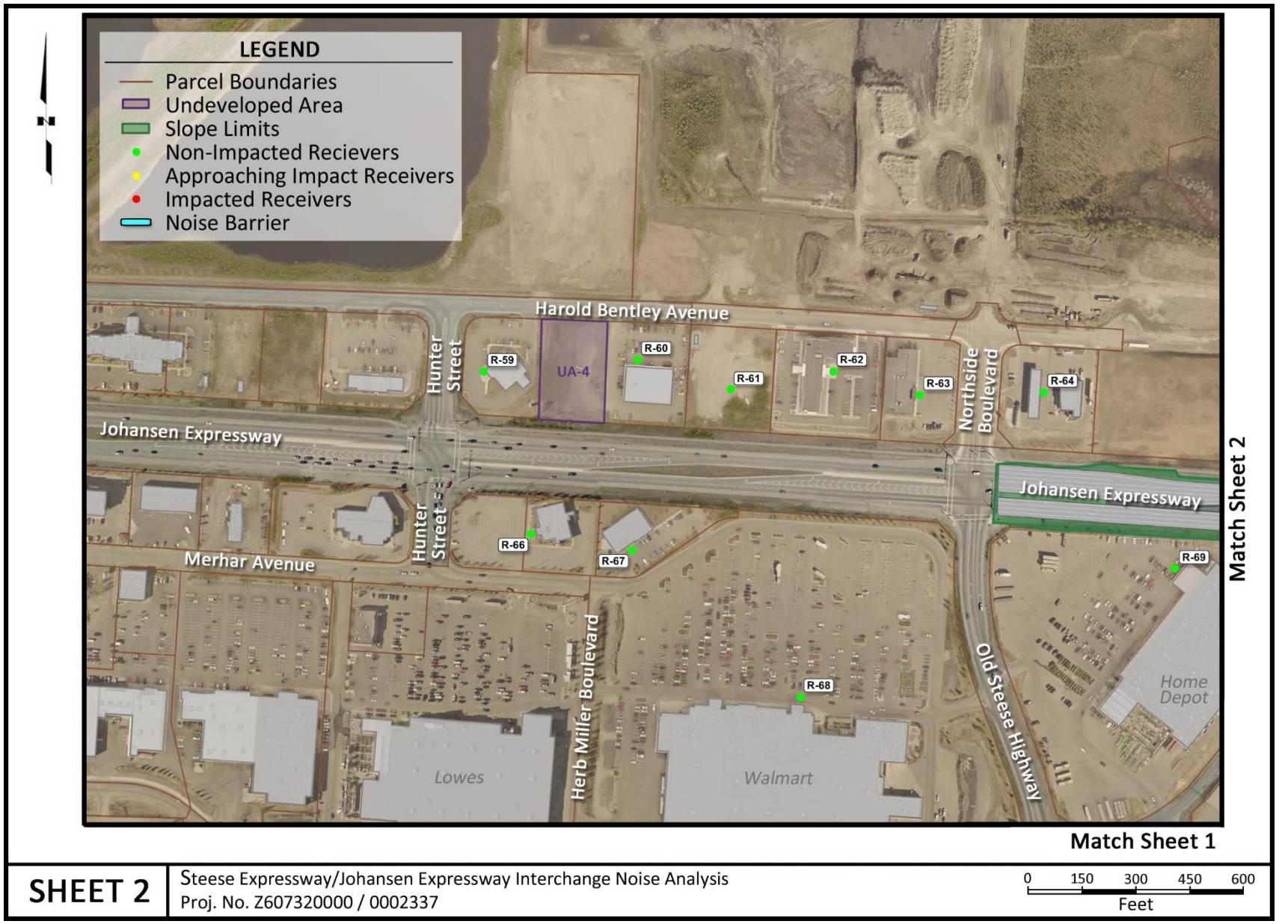

Figure 18: Echelon Interchange Noise Impacts and Proposed Barrier Walls, Sheet 2

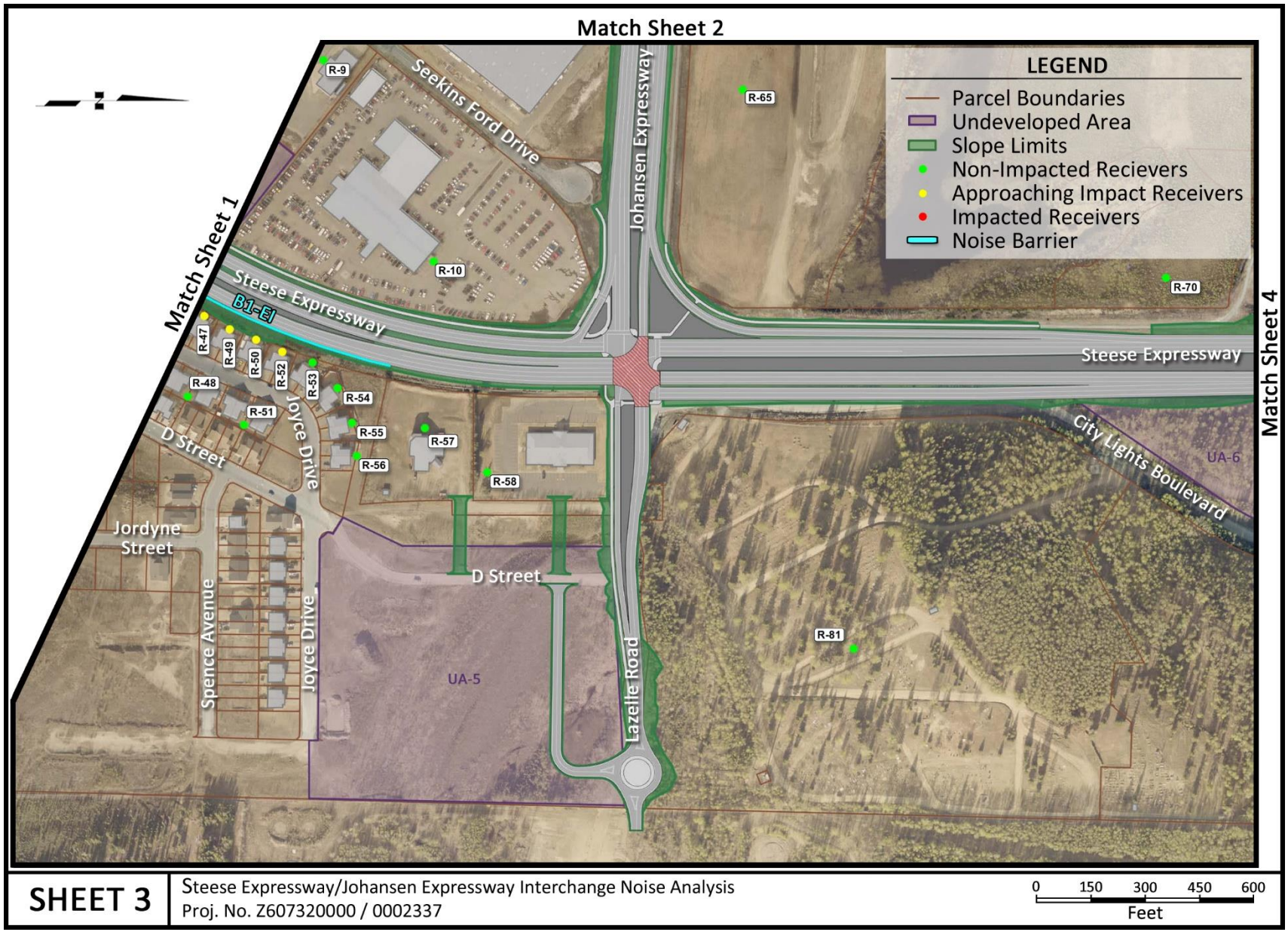

Figure 19: Echelon Interchange Noise Impacts and Proposed Barrier Walls, Sheet 3

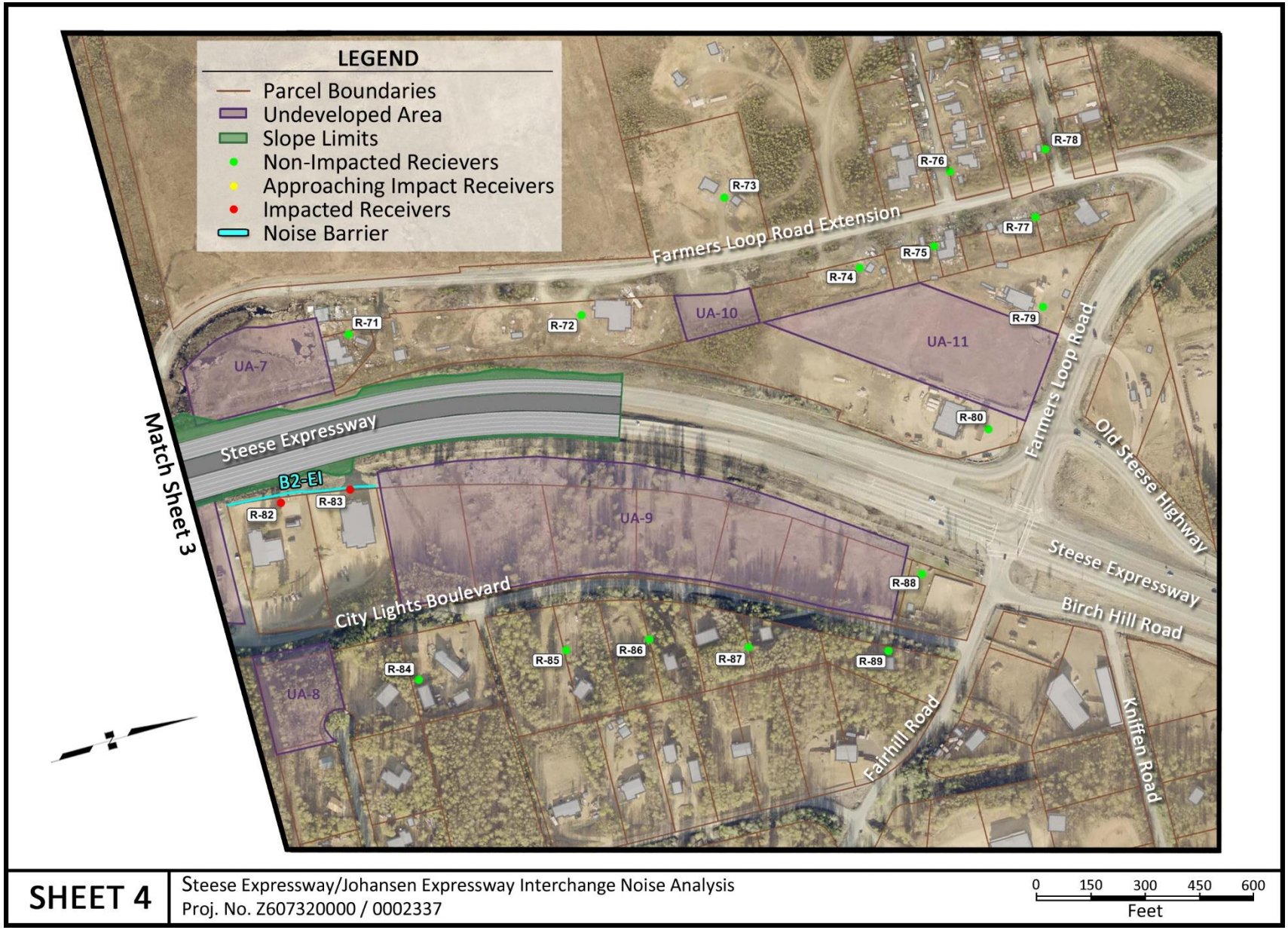

Figure 20: Echelon Interchange Noise Impacts and Proposed Barrier Walls, Sheet 4

6.4.2 Noise Abatement Analysis

Noise abatement analysis was conducted using the same methodology as was used for the TDI and DDI, which are explained in section 6.2.2 on page 37.

Table 14 on page 61 presents the noise barrier optimization for walls B1-EI and B2-EI.

Table 14: Echelon Interchange Noise Barrier Height Design Optimization

Barrier	Receiver	Decibel Level at Modeled Noise Barrier Height **NL** = Noise Level; **NR** = Noise Reduction (from No Barrier Condition)											Height for 5 dBA NR	Height for >50% 7 dBA NR
		No Barrier	6 ft		7 ft		8 ft		9 ft		10 ft			
			NL	NR	NL	NR	NL	NR	NL	NR	NL	NR		
B1-EI (First Row Receivers)	R-11	66	61	5	61	5	60	6	60	6	59	7	6 ft to 8 ft	**9 ft**
	R-14	66	61	5	60	6	60	6	59	7	59	7		
	R-15	69	63	6	62	7	62	7	61	8	60	9		
	R-17	70	64	6	64	6	63	7	63	7	61	9		
	R-19	71	65	6	64	7	64	7	63	8	62	9		
	R-21	70	64	6	63	7	63	7	61	9	59	11		
	R-22	69	63	6	63	6	62	7	61	8	60	9		
	R-24	70	64	6	63	7	62	8	61	9	59	11		
	R-25	68	63	5	63	5	62	6	61	7	60	8		
	R-27	66	63	3	62	4	61	5	60	6	58	8		
	R-28	66	62	4	61	5	60	6	59	7	58	8		
	R-30	65	62	3	60	5	59	6	58	7	57	8		
	R-31	65	61	4	61	4	59	6	58	7	57	8		
	R-33	65	61	4	59	6	58	7	58	7	57	8		
	R-34	60	56	4	56	4	53	7	53	7	52	8		
	R-36	65	61	4	59	6	58	7	58	7	57	8		
	R-38	64	61	3	61	3	59	5	58	6	57	7		
	R-39	65	62	3	61	4	60	5	58	7	58	7		
	R-41	65	62	3	61	4	60	5	58	7	58	7		
	R-42	66	62	4	61	5	60	6	59	7	58	8		
	R-44	66	63	3	62	4	61	5	59	7	59	7		
	R-45	66	63	3	62	4	62	4	59	7	59	7		
	R-47	66	64	2	62	4	61	5	59	7	59	7		
	R-49	66	64	2	62	4	60	6	59	7	59	7		
	R-50	66	63	3	62	4	60	6	59	7	59	7		
	R-52	66	62	4	61	5	59	7	58	8	58	8		
	R-53	65	59	6	59	6	58	7	57	8	57	8		
	R-54	64	61	3	60	4	60	4	58	6	58	6		
B1-EI (Potential Benefited Second Row Receivers)	R-13	62	58	4	58	4	57	5	57	5	57	5		
	R-16	56	53	3	52	4	52	4	51	5	51	5		
	R-18	62	58	4	57	5	57	5	56	6	56	6		
	R-20	55	52	3	51	4	51	4	51	4	50	5		
	R-26	59	55	4	54	5	54	5	54	5	53	6		
	R-29	56	52	4	52	4	52	4	51	5	51	5		
B2-EI	R-82	72	69	3	67	5	66	6	64	8	-	-	6 ft to 8 ft	**6 ft to 9 ft**
	R-83	72	65	7	63	9	62	10	61	11	-	-		

Table 15 presents the results of the cost-benefit analysis for the proposed noise walls. Both noise walls studied for this alternative meet the reasonableness requirements for noise walls using the Alaska State Noise Analysis Policy.

Note that B1-EI is located near the edge of pavement and follows the elevation of northbound Steese Expressway. Approximately 10% of the wall would be on the retaining wall structure to follow the northbound Steese Expressway geometry. Costs for the noise wall constructed on a structure is expected to cost more than a noise wall constructed at-grade. The unit cost used to analyze B1-EI is an average of noise walls on structure previously constructed in Anchorage[1]. The average unit cost of the walls on a structure is $61.50 per square foot. A rounded value of $62 per square foot was used to calculate the cost of the barrier on the retaining wall. The $46 per square foot unit cost was used for the barrier-grade and for B2-EI.

[1] Unit costs of noise walls on structure used in calculation found at https://www.fhwa.dot.gov/environment/noise/noise_barriers/inventory/state_summary.cfm?state=1

Table 15: Echelon Interchange Noise Barrier Analysis Summary

Barrier	Receiver	Potential Noise Reduction (dBA)	Height (ft)	Barrier Length (ft)	Barrier Area (sq ft)	Cost of Barrier	Number of Benefited Receptors	Cost per Benefited Receptor	Feasible AND Reasonable?
B1-EI	R-11	6	9	2,600	23,400	$1,119,000	43	$26,023	YES
	R-14	7							
	R-15	8							
	R-17	7							
	R-19	8							
	R-21	9							
	R-22	8							
	R-24	9							
	R-25	7							
	R-27	6							
	R-28	7							
	R-30	7							
	R-31	7							
	R-33	7							
	R-34	7							
	R-36	7							
	R-38	6							
	R-39	7							
	R-41	7							
	R-42	7							
	R-44	7							
	R-45	7							
	R-47	7							
	R-49	7							
	R-50	7							
	R-52	8							
	R-53	8							
	R-54	6							
	R-13	5							
	R-16	5							
	R-18	5							
	R-26	5							
	R-29	5							
B2-EI	R-82	8	6 - 9	410	2,950	$146,500	4	$36,325	YES
	R-83	7							

6.4.3 Abatement Recommendations

Two barriers are found to be feasible and reasonable, pending the survey of benefited residents and property owners' viewpoints. Benefited residents and property owners must be surveyed regarding the interest of the proposed noise barriers, and at least 60% of the benefited receptors must be in support of the barrier for it to be reasonable. Benefited receptors were not surveyed at the time this report was written.

6.4.3.1 EI Barrier 1

EI Barrier 1 (B1-EI) is a 2,600-foot long, 9-foot tall barrier running along near the edge of pavement on the east side of Steese Expressway, south of Johansen Expressway (335 feet on the structure). The noise barrier shields impacted residential receivers R-11, R-14, R-15, R-17, R-19, R-21, R-22, R-24, R-25, R-27, R-28, R-42, R-44, R-45, R-47, R-49, R-50, and R-52. The barrier also has benefits for non-impacted residential receivers R-30, R-31, R-33, R-34, R-36, R-38, R-39, R-41, R-53, and R-54 in the first row, and R-13, R-16, R-18, R-26, R-29 located in the second row. A noise reduction of 7 dBA to 8 dBA is predicted for 32 receptors out of 37 first row benefited receptors (43 total benefited receptors). The cost of the barrier is $26,023 per benefited receptor.

6.4.3.2 EI Barrier 2

EI Barrier 2 (B2-EI) is a 410-foot barrier on the east side of Steese Expressway. The height of the barrier varies between 9-feet on the south end to 6 feet on the north end. The barrier mitigates the noise for impacted receivers R-82 and R-83, which represent the Fairhill Church of God and the Fairhill Christian School (4 receptors). A noise reduction of 7 dBA to 8 dBA is predicted for all 4 benefited receptors and would have a construction cost of $36,625 per benefited receptor.

6.5 Undeveloped Areas

Undeveloped Areas were identified within the study area. These undeveloped areas are depicted in the alternative maps in the sections above with a UA designation. No-build permits have currently been publicized for any of these lots, therefore no land uses were modeled at these locations for the purpose of mitigation consideration. However, for the sake of comparison, the noise impacts to each of these lots are not expected to be significantly different for each alternative. Although, the Farmers Loop Road Extension project will likely change the noise levels for the undeveloped lots along that alignment.

6.6 Construction Noise

The difference in construction noise will generally be the same for all three of the studied alternative interchanges. The echelon interchange will likely have a longer exposure time for loud activities due to the larger bridge section required in that design.

The following construction noise abatement measures are recommended to be included in this project:

- Whenever possible, limit operations of heavy equipment and other noisy procedures to the daylight house. The contractor must comply with local noise ordinances, particularly in the southern portion of the project where construction will be directly adjacent to homes. All

reasonable efforts should be made to notify the public prior to conducting work at night or on weekends and holidays or when planning to drive piles for the bridge structure.

- Install and maintain effective mufflers on equipment.
- Locate equipment and vehicle staging areas as far from residential areas as possible
- Limit unnecessary idling of equipment

6.7 Statement of Likelihood

The noise abatement recommendations in the previous sections are preliminary and based upon the feasibility and reasonableness analysis competed at the time of the environmental document. Final recommendations for noise abatement will be based upon the feasibility and reasonable analysis conducted during the detailed design of the project. Any changes in the final abatement recommendations will result in the reevaluation of the approved NEPA document and the solicitation of additional public comment.

6.8 Other Considerations

The FHWA Noise Analysis methodology is based on sound levels measured and modeled using A-weighted decibels. This methodology is effective at targeting the most common sources of noise which the public would find uncomfortable. However, it should be noted that “noise” is a subjective term, and A-weighted decibel sound levels are not all the same since the A-weighted decibel system averages the total energy of sound in all frequencies.

Given the significant change in the design of the Steese-Jo intersection, the nature of the noise that the public will experience will be changed as well. Even though the sound levels the public will experience may be measurably lower in total energy than the limiting values presented in this report, other changes may still give the impression of noise impacts which the public may need to be made aware of. For example, the frequency of the noise may change, with a decrease in the high-frequency sounds and an increase in low tones due to the vibration of trucks moving along the top of the elevated embankment and the reverberating nature of the overpass structures. These low tones are not easily mitigated by sound walls as they pass through the ground, and they are often felt more than they are heard. Likewise, an increase in irregular and unpredictable noises, such as the sound of vehicles crossing a bridge plate at uneven intervals, may be uncomfortable for some listeners. Even though the overall energy of the noise itself is low, this may be perceived as a notable change for the public. Noise abatement analysis is not designed to mitigate for such changes in the noise environment.

It is recommended that the public be informed of such possible changes to the noise environment and that the conclusions of this study be seen as a reasonable analysis of the general increase in the most common noise energy that can be mitigated by sound walls, the constant sustained background noise of traffic traveling on a roadway, and not a definitive statement of either how serene or how uncomfortable the noise environment is currently or will be in the future.

6.9 Conclusion

Three alternative interchange designs are being studied for the Steese-Jo intersection in Fairbanks, Alaska. The three alternatives currently being studied are a Tight Diamond Interchange, a Diverging Diamond Interchange, and an Echelon Interchange. A noise study was conducted in this area to determine the comparative noise impacts between the three designs.

The noise analysis concluded that there are existing noise impacts at several receptors in the study area, namely in the southern end of the Lazelle Estates Subdivision in the south-east quadrant of the study area. The proposed designs would further impact this subdivision as well as cause impacts at the Fairhill Community Church of God and the Fairhill Christian School off City Lights Boulevard. The extent of these impacts varied between alternatives, with the TDI design creating the greatest impacts, followed by the DDI. Lastly, the EI design created the lowest impacts, mainly due to the lower speed associated with the design.

Noise abatement analysis for the TDI concluded that a continuous 10-foot-high noise wall was both feasible and reasonable along the western lot lines of the front row homes in the Lazelle Estates Subdivision. This wall is estimated to cost approximately $1,072,000. The DDI would require a continuous 12-foot-high noise wall along the lot lines of the Lazelle Estates Subdivision which would cost approximately $1,365,000. The Echelon Interchange would cause the least amount of noise impacts and the impacts to the Lazelle Estates Subdivision could be mitigated with a $1,119,000 full noise barrier along the Steese Expressway.

All three interchange options should include a $150,000 barrier in front of the Fairhill school and church.

7 References

- *Alaska Environmental Procedures Manual: Noise Policy*, DOT&PF, April 2011.
- *Richardson Highway/Steese Expressway Corridor: Planning & Environmental Linkages Study*, DOT&PF, September 2015.
- The Code of Federal Regulations Title 23 Part 772: *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, FHWA.

Appendix A TNM Inputs

Traffic volumes used in the TNM were derived from historical road volumes, turning movement counts, and observed traffic. Table A-1 through Table A-3 present the volumes inputted into the TNM.

Table A-1: Traffic Data, Existing Model

Roadway	Direction	Traffic Volume					
		Total	Auto	Medium Truck	Heavy Truck	Bus	Motorcycle
Steese Expressway, north of Johansen Expressway	Northbound	1,907	1,760	49	74	3	21
	Southbound	817	754	21	32	1	9
Steese Expressway, south of Johansen Expressway	Northbound	997	904	31	48	4	10
	Southbound	537	487	17	26	2	5
Johansen Expressway	Westbound	1,392	1,276	47	39	16	14
	Eastbound	927	851	31	26	10	9
Lazelle Road	Westbound	80	80	0	0	0	0
	Eastbound	65	65	0	0	0	0

Table A-2: Traffic Data, No-Build and Build 2045 Model

Roadway	Direction	Traffic Volume					
		Total	Auto	Medium Truck	Heavy Truck	Bus	Motorcycle
Steese Expressway, north of Johansen Expressway	Northbound	2,945	2,718	76	115	4	32
	Southbound	1,320	1,218	34	51	2	14
Steese Expressway, south of Johansen Expressway	Northbound	1,510	1,369	47	73	6	15
	Southbound	755	685	24	36	3	8
Johansen Expressway	Westbound	1,300	1,192	44	37	15	13
	Eastbound	2,180	1,999	73	62	24	21
Lazelle Road	Westbound	115	115	0	0	0	0
	Eastbound	125	125	0	0	0	0

Table A-3: Traffic Data, With Farmers Loop Extension 2045 Models

Roadway	Direction	Traffic Volume					
		Total	Auto	Medium Truck	Heavy Truck	Bus	Motorcycle
Steese Expressway, north of Johansen Expressway	Northbound	2,715	2,506	70	106	4	29
	Southbound	1,180	1,089	30	46	2	13
Steese Expressway, south of Johansen Expressway	Northbound	1,510	1,369	47	73	6	15
	Southbound	755	685	24	36	3	8
Johansen Expressway	Westbound	1,160	1,064	39	33	13	11
	Eastbound	1,950	1,788	66	55	22	19
Lazelle Road	Westbound	115	115	0	0	0	0
	Eastbound	125	125	0	0	0	0

Table A-4 presents the field monitor sites used to validate the TNM model.

Table A-4: Field Monitor Sites

Monitor ID	Description	Distance from Travel Way (feet)	Latitude (decimal degree)	Longitude (decimal degree)
M-1	Jorgensen's Custard Corner (ROW)	74	N 64.868692	W 147.671910
M-2	Fairhill Christian School	119	N 64.864478	W 147.675538
M-3	Fairhill Community Church of God	106	N 64.863949	W 147.675602
M-4	Undeveloped lot on Northside Business Park	105	N 64.859063	W 147.682008
M-5	Birch Hill Cemetery	232	N 64.859962	W 147.674619
M-6	Near Walmart sign	59	N 64.858461	W 147.689353
M-7	End of Seekins Drive	80	N 64.858242	W 147.679322
M-8	Church of Jesus Christ of Latter-day Saints	272	N 64.857523	W 147.674258
M-9	Shannon Park Baptist Church (ROW)	23	N 64.856886	W 147.676016
M-10	Steese Medical Center	227	N 64.855240	W 147.679922
M-11	Jeanne Drive and Joyce Drive intersection	235	N 64.853965	W 147.677728
M-12	1132 Joyce Drive	56	N 64.853638	W 147.680089
M-13	Flower and Garden Center	63	N 64.852412	W 147.686864
M-14	1018 Joyce Drive	102	N 64.852400	W 147.684121
M-15	Pathway near Farmers Loop Road Extension and Benson Street Intersection	20	N 64.870181	W 147.678006

Table A-5 presents the location of the receiver sites that were modeled in the TNM.

Table A-5: Modeled Receiver Sites

Receiver ID	Land Use	Distance from Travel Way (feet)	Latitude (decimal degree)	Longitude (decimal degree)	Number of Units Represented
R-1	Commercial	87	N 64.852566	W 147.686197	4
R-2	Equipment Shop	460	N 64.853951	W 147.685750	5
R-3	Medical	181	N 64.853382	W 147.684526	5
R-4	Restaurant	424	N 64.854219	W 147.684431	6
R-5	Place of worship	470	N 64.854608	W 147.683633	2
R-6	24-hour Water	150	N 64.854084	W 147.681826	3
R-7	Credit Union	585	N 64.855355	W 147.682669	13
R-8	Medical Center	206	N 64.855147	W 147.679918	11
R-9	Event Center	617	N 64.856208	W 147.681469	7
R-10	Car Dealership	195	N 64.857078	W 147.677963	40
R-11	Residential	124	N 64.851669	W 147.686014	1
R-12	Residential	296	N 64.851312	W 147.685284	1
R-13	Residential	215	N 64.851564	W 147.685326	1
R-14	Residential	148	N 64.851800	W 147.685262	1
R-15	Residential	100	N 64.852009	W 147.685085	1
R-16	Residential	327	N 64.851524	W 147.684156	1
R-17	Residential	77	N 64.852237	W 147.684537	1
R-18	Residential	237	N 64.851965	W 147.683638	1
R-19	Residential	70	N 64.852414	W 147.683991	1
R-20	Residential	300	N 64.851987	W 147.682820	2
R-21	Residential	76	N 64.852544	W 147.683451	1
R-22	Residential	85	N 64.852637	W 147.683040	1
R-23	Residential	323	N 64.852177	W 147.681903	2
R-24	Residential	73	N 64.852812	W 147.682574	1
R-25	Residential	80	N 64.852917	W 147.682137	1
R-26	Residential	242	N 64.852601	W 147.681377	1
R-27	Residential	80	N 64.853046	W 147.681699	1
R-28	Residential	74	N 64.853212	W 147.681196	1
R-29	Residential	262	N 64.852828	W 147.680374	2
R-30	Residential	68	N 64.853347	W 147.680818	1
R-31	Residential	79	N 64.853523	W 147.680180	2
R-32	Residential	282	N 64.853073	W 147.679407	2
R-33	Residential	68	N 64.853773	W 147.679621	1
R-34	Residential	49	N 64.853908	W 147.679198	1
R-35	Residential	288	N 64.853421	W 147.678444	1

Table A-5: Modeled Receiver Sites, cont.

Receiver ID	Land Use	Distance from Travel Way (feet)	Latitude (decimal degree)	Longitude (decimal degree)	Number of Units Represented
R-36	Residential	71	N 64.854084	W 147.678880	1
R-37	Residential	290	N 64.853673	W 147.677855	2
R-38	Residential	77	N 64.854228	W 147.678537	1
R-39	Residential	79	N 64.854355	W 147.678277	1
R-40	Residential	304	N 64.854126	W 147.676875	2
R-41	Residential	82	N 64.854572	W 147.677877	1
R-42	Residential	69	N 64.854796	W 147.677617	1
R-43	Residential	295	N 64.854481	W 147.676368	2
R-44	Residential	67	N 64.854943	W 147.677427	2
R-45	Residential	68	N 64.855115	W 147.677184	2
R-46	Residential	288	N 64.854823	W 147.675941	4
R-47	Residential	65	N 64.855362	W 147.676893	2
R-48	Residential	283	N 64.855253	W 147.675461	4
R-49	Residential	66	N 64.855557	W 147.676669	2
R-50	Residential	63	N 64.855757	W 147.676498	2
R-51	Residential	291	N 64.855682	W 147.674988	4
R-52	Residential	66	N 64.855957	W 147.676296	2
R-53	Residential	66	N 64.856186	W 147.676122	2
R-54	Residential	112	N 64.856380	W 147.675681	2
R-55	Residential	195	N 64.856495	W 147.675072	2
R-56	Residential	280	N 64.856538	W 147.674490	2
R-57	Place of worship	169	N 64.857044	W 147.675015	2
R-58	LDS Church	272	N 64.857523	W 147.674258	3
R-59	Credit Union	183	N 64.859500	W 147.695111	5
R-60	Car Body Shop	249	N 64.859620	W 147.692369	6
R-61	Hotel	185	N 64.859417	W 147.690697	6
R-62	Hotel	252	N 64.859572	W 147.688871	8
R-63	Liquor Store	201	N 64.859409	W 147.687325	5
R-64	Gas Station / Mart	224	N 64.859454	W 147.685115	2
R-65	Industrial/Utility	219	N 64.859363	W 147.681144	14
R-66	Commercial	154	N 64.858277	W 147.694191	4
R-67	GCI	181	N 64.858174	W 147.692385	5
R-68	Walmart	586	N 64.857093	W 147.689387	106
R-69	Home Depot	133	N 64.858146	W 147.682692	51
R-70	Industrial/Utility	168	N 64.862584	W 147.678019	3

Table A-5: Modeled Receiver Sites, cont.

Receiver ID	Land Use	Distance from Travel Way (feet)	Latitude (decimal degree)	Longitude (decimal degree)	Number of Units Represented
R-71	Residential	184	N 64.864746	W 147.678212	1
R-72	Commercial	193	N 64.866482	W 147.677557	3
R-73	Residential	565	N 64.867737	W 147.678974	1
R-74	Residential	467	N 64.868601	W 147.677196	1
R-75	Residential	622	N 64.869184	W 147.677257	3
R-76	Residential	796	N 64.869438	W 147.678531	2
R-77	Residential	738	N 64.869994	W 147.677416	3
R-78	Residential	908	N 64.870155	W 147.678450	2
R-79	Coffee Shop	488	N 64.869871	W 147.675754	2
R-80	Gas Station / Mart	122	N 64.869253	W 147.673880	2
R-81	Cemetery	749	N 64.860308	W 147.671315	33
R-82	Fairhill Church	106	N 64.863949	W 147.675602	2
R-83	Fairhill School	119	N 64.864478	W 147.675538	2
R-84	Residential	670	N 64.864639	W 147.671984	2
R-85	Residential	702	N 64.865783	W 147.671871	1
R-86	Residential	635	N 64.866407	W 147.671626	2
R-87	Residential	507	N 64.867109	W 147.671146	2
R-88	Restaurant	230	N 64.868508	W 147.671687	1
R-89	Residential	373	N 64.868124	W 147.670493	1

Appendix B Ambient Highway Noise Monitoring Data

The following tables present data collected in the field. Table B-1 presents the measured noise levels at each monitor site. Table B-2 presents the observed traffic counts and the adjusted 1-hour equivalent volumes.

Table B-1: Measured Noise Levels

Monitor	Location	Date	Start Time	Duration (minutes)	Measurement	Weather	Temperature (°F)	Wind Speed/ Direction	Ground Cover	Measured L_{eq} (dBA)	Lmin (dBA)	Lmax (dBA)	Notes
M-1	Jorgensen's Custard Corner (ROW)	8/2/2018	2:47 PM	15	1	Overcast	63	Low/South	Vegetation (Soft Site)	65.1	47.6	81.3	1 noisy southbound truck, car honks
			3:04 PM	15	2					66.2	50.9	78	3 short and 1 long car honk, plane flyover, loud accelerating passenger vehicle
M-2	Fairhill Christian School	7/31/2018	4:02 PM	15	1	Clear, direct sun	83	Low/South	Grass (Soft Site)	69.0	44.3	80.8	-
			4:22 PM	15	2					70.7	47.1	86.8	Small plane flyover, couple northbound cars drove on rumble strip, loud northbound truck
M-3	Fairhill Community Church of God	7/31/2018	4:45 PM	15	1	Clear, direct sun	81	Low/South	Grass (Soft Site)	69.3	44.7	80.8	Car honks, 1 slow northbound heavy vehicle
			5:01 PM	15	2					69.6	44.9	75.7	1 loud motorcycle
M-4	Undeveloped lot on Northside Business Park	8/1/2018	4:05 PM	15	1	Overcast	60	~10mph/East	Grass (Soft Site)	61.4	49.6	61.4	1 loud pickup truck, tarp flapping, car honk, accelerating heavy vehicles
			4:21 PM	15	2					62.9	53.3	78.5	1 really loud heavy vehicle, car honks, car alarm went off for about 304 seconds at nearby parking lot
M-5	Birch Hill Cemetery	8/1/2018	5:04 PM	15	1	Overcast	60	~8mph/East	Grass (Soft Site)	68.9	58.6	78.7	1 passenger vehicle on outside northbound shoulder
			5:21 PM	15	2					69.2	55.4	81.5	1 loud rattling southbound motorcycle
M-6	Near Walmart sign	8/2/2018	12:08 PM	15	1	Overcast	61	Low/West	Grass (Soft Site)	67.3	50.6	87.2	Airplane flyover, loud sports car, 1 noisy car with a loud muffler, tarp flapping, heavy vehicles accelerating from and decelerating to Old Steese signal
			12:25 PM	15	2					64.1	51.9	74.9	Car screeching to acceleration at Old Steese signal, jet flyover
			12:43 PM	15	3					64.2	49.4	73.8	3 planes flyover, dog barking
M-7	End of Seekins Drive	7/31/2018	12:15 PM	15	1	Sun, partly cloudy	74	None	Pavement (Hard Site)	63.4	49.1	85	Accelerating heavy vehicles, accelerating northbound motorcycle on Steese, motor home turned in cul-de-sac
			12:33 PM	15	2					60.6	48.7	70.9	2 helicopters flew over towards base, truck turned in cul-de-sac
M-8	Church of Jesus Christ of Latter-day Saints	7/31/2018	9:19 AM	15	1	Sun, partly cloudy	65	None	Grass (Soft Site)	53.1	36.9	66.3	Apache helicopter flyover south of monitor, 1 rattling car, accelerating heavy vehicles
			9:39 AM	15	2					51.5	40.2	62.7	Commercial jet flyover, car honk, loud accelerating motorcycle
			9:59 AM	15	3					52.0	39.6	64.5	Jet flyover, car honks, heavy vehicles accelerating from stop, traffic audible east of monitor
M-9	Shannon Park Baptist Church (ROW)	8/2/2018	3:59 PM	15	1	Overcast	63	Low/North	Grass (Soft Site)	70.2	48	84.4	
			4:15 PM	15	2					69.9	47.1	85.8	1 car with whistling tire, 1 car with squeaking brakes
M-10	Steese Medical Center	7/30/2018	2:17 PM	15	1	Sun, partly cloudy	79	Low/North	Dirt/Gravel (Soft Site)	57.5	46.6	66.9	Airplane flyover on east side
			2:34 PM	15	2					59.9	47.6	78.1	Slight winds, helicopter flyover on east side

Table B-1: Measured Noise Levels, cont.

Monitor	Location	Date	Start Time	Duration (minutes)	Measurement	Weather	Temperature (°F)	Wind Speed/ Direction	Ground Cover	Measured L_{eq} (dBA)	Lmin (dBA)	Lmax (dBA)	Notes
M-11	Jeanne Drive & Joyce Drive Intersection	7/30/2018	4:32 PM	15	1	Sun, partly cloudy	80	Low/North	Grass (Soft Site)	56.2	44.8	70.3	Some rustle of leaves, NB Joyce Dr traffic higher due to accelerating from stop, delivery truck idling in area, child playing with metal shovel, car honks
			4:50 PM	15	2					55.6	44.4	69.7	Windchimes, car honks
M-12	1132 Joyce Drive	7/30/2018	5:15 PM	15	1	Sun, partly cloudy	72	Low / North &West	Grass (Soft Site)	61.7	42.5	75.4	Car honks
			5:36 PM	15	2					62.6	40.6	78.8	Small plane flyover
M-13	Flower and Garden Center	7/30/2018	3:23 PM	15	1	Sun, partly cloudy	80	Low	Pavement (Hard Site)	59.1	48.2	68.5	Small plane flyover, slight wind, truck backing up in parking lot
			3:40 PM	15	2					59.9	47	69.8	1 loud passenger truck, person opened a conex nearby
M-14	1018 Joyce Drive	7/31/2018	10:45 AM	15	1	Sun, partly cloudy	65	Low/North	Grass (Soft Site)	64.5	40.5	76.3	3 planes flew over north of monitor
			11:04 AM	15	2					64.4	43.4	76.2	Music audible from neighbor's residence, truck doors slammed nearby
M-15	Pathway near Farmers Loop Road Extension & Benson Street Intersection	8/6/2019	2:10 PM	15	1	Sun, partly cloudy	80	Low	Pavement (Hard Site)	52.9			Loud slow-moving passenger car NB peaked near 70dBA, light rustle of trees, vehicle u-turned at Farmers Loop/Farmers Loop Ext intersection, pick-up truck with squeaky brakes on NB Steese
			2:30 PM	15	2	Sunny	58	Low		53.9			Pedestrian talking while passing monitor, truck idling at Benson intersection for about 1 minute, airplane flyover propeller plane 13:30 minutes in, car horn at gas station

Table B-2: Observed Traffic Counts and Adjusted 1-Hour Equivalent Volumes

			Observed Traffic Data										Adjusted 1-Hour Equivalent Traffic Data				
Monitor	Measurement	Roadway	Direction	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles	% Auto	% Medium Trucks	% Heavy Trucks	% Buses	% Motorcycles	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles
M-1	1	Steese Expressway	NB	178	4	8	0	1	93%	2%	4%	0%	1%	712	16	32	0	4
			SB	156	8	7	1	1	90%	5%	4%	1%	1%	624	32	28	4	4
			Total	334	12	15	1	2	92%	3%	4%	0%	1%	1336	48	60	4	8
	2	Steese Expressway	NB	183	4	8	0	2	93%	2%	4%	0%	1%	732	16	32	0	8
			SB	148	4	11	1	2	89%	2%	7%	1%	1%	592	16	44	4	8
			Total	331	8	19	1	4	91%	2%	5%	0%	1%	1324	32	76	4	16
M-2	1	Steese Expressway	NB	255	4	6	0	1	96%	2%	2%	0%	0%	1020	16	24	0	4
			SB	166	3	6	7	0	91%	2%	3%	4%	0%	664	12	24	28	0
			Total	421	7	12	7	1	94%	2%	3%	2%	0%	1684	28	48	28	4
	2	Steese Expressway	NB	262	4	9	0	4	94%	1%	3%	0%	1%	1048	16	36	0	16
			SB	158	8	13	0	5	86%	4%	7%	0%	3%	632	32	52	0	20
			Total	420	12	22	0	9	91%	3%	5%	0%	2%	1680	48	88	0	36
M-3	1	Steese Expressway	NB	303	9	4	0	6	94%	3%	1%	0%	2%	1212	36	16	0	24
			SB	169	8	13	0	3	88%	4%	7%	0%	2%	676	32	52	0	12
			Total	472	17	17	0	9	92%	3%	3%	0%	2%	1888	68	68	0	36
	2	Steese Expressway	NB	371	10	8	0	4	94%	3%	2%	0%	1%	1484	40	32	0	16
			SB	179	3	11	0	8	89%	1%	5%	0%	4%	716	12	44	0	32
			Total	550	13	19	0	12	93%	2%	3%	0%	2%	2200	52	76	0	48
M-4	1	Johansen Expressway	WB	131	12	1	4	1	88%	8%	1%	3%	1%	524	48	4	16	4
			EB	186	4	5	2	2	93%	2%	3%	1%	1%	744	16	20	8	8
			Total	317	16	6	6	3	91%	5%	2%	2%	1%	1268	64	24	24	12
	2	Johansen Expressway	WB	162	2	8	0	1	94%	1%	5%	0%	1%	648	8	32	0	4
			EB	215	7	5	0	3	93%	3%	2%	0%	1%	860	28	20	0	12
			Total	377	9	13	0	4	94%	2%	3%	0%	1%	1508	36	52	0	16
M-5	1	Steese Expressway	NB	358	13	7	0	0	95%	3%	2%	0%	0%	1432	52	28	0	0
			SB	183	5	15	0	2	89%	2%	7%	0%	1%	732	20	60	0	8
			Total	541	18	22	0	2	93%	3%	4%	0%	0%	2164	72	88	0	8
	2	Steese Expressway	NB	457	9	7	0	5	96%	2%	1%	0%	1%	1828	36	28	0	20
			SB	175	2	6	0	1	95%	1%	3%	0%	1%	700	8	24	0	4
			Total	632	11	13	0	6	95%	2%	2%	0%	1%	2528	44	52	0	24

Table B-2: Observed Traffic Counts and Adjusted 1-Hour Equivalent Volumes, cont.

			Observed Traffic Data										Adjusted 1-Hour Equivalent Traffic Data				
Monitor	Measurement	Roadway	Direction	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles	% Auto	% Medium Trucks	% Heavy Trucks	% Buses	% Motorcycles	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles
M-7	1	Steese Expressway	NB	79	2	5	0	0	92%	2%	6%	0%	0%	316	8	20	0	0
			SB	81	3	7	0	0	89%	3%	8%	0%	0%	324	12	28	0	0
			Total	160	5	12	0	0	90%	3%	7%	0%	0%	640	20	48	0	0
		Johansen Expressway	WB	160	2	1	1	4	95%	1%	1%	1%	2%	640	8	4	4	16
			EB	114	4	3	0	3	92%	3%	2%	0%	2%	456	16	12	0	12
			Total	274	6	4	1	7	94%	2%	1%	0%	2%	1096	24	16	4	28
	2	Steese Expressway	NB	106	3	6	0	1	91%	3%	5%	0%	1%	424	12	24	0	4
			SB	134	3	8	0	1	92%	2%	5%	0%	1%	536	12	32	0	4
			Total	240	6	14	0	2	92%	2%	5%	0%	1%	960	24	56	0	8
		Johansen Expressway	WB	156	7	3	6	2	90%	4%	2%	3%	1%	624	28	12	24	8
			EB	146	6	3	0	1	94%	4%	2%	0%	1%	584	24	12	0	4
			Total	302	13	6	6	3	92%	4%	2%	2%	1%	1208	52	24	24	12
M-8	1	Steese Expressway	NB	51	3	3	0	1	88%	5%	5%	0%	2%	204	12	12	0	4
			SB	73	3	4	0	0	91%	4%	5%	0%	0%	292	12	16	0	0
			Total	124	6	7	0	1	90%	4%	5%	0%	1%	496	24	28	0	4
	2	Steese Expressway	NB	59	5	3	1	1	86%	7%	4%	1%	1%	236	20	12	4	4
			SB	108	2	8	0	0	92%	2%	7%	0%	0%	432	8	32	0	0
			Total	167	7	11	1	1	89%	4%	6%	1%	1%	668	28	44	4	4
	3	Steese Expressway	NB	54	7	2	2	1	82%	11%	3%	3%	2%	216	28	8	8	4
			SB	95	5	6	0	0	90%	5%	6%	0%	0%	380	20	24	0	0
			Total	149	12	8	2	1	87%	7%	5%	1%	1%	596	48	32	8	4
M-9	1	Steese Expressway	NB	158	5	5	0	1	93%	3%	3%	0%	1%	632	20	20	0	4
			SB	116	5	7	4	0	88%	4%	5%	3%	0%	464	20	28	16	0
			Total	274	10	12	4	1	91%	3%	4%	1%	0%	1096	40	48	16	4
	2	Steese Expressway	NB	173	1	8	0	1	95%	1%	4%	0%	1%	692	4	32	0	4
			SB	84	2	5	0	0	92%	2%	5%	0%	0%	336	8	20	0	0
			Total	257	3	13	0	1	94%	1%	5%	0%	0%	1028	12	52	0	4

Table B-2: Observed Traffic Counts and Adjusted 1-Hour Equivalent Volumes, cont.

			Observed Traffic Data										Adjusted 1-Hour Equivalent Traffic Data				
Monitor	Measurement	Roadway	Direction	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles	% Auto	% Medium Trucks	% Heavy Trucks	% Buses	% Motorcycles	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles
M-10	1	Steese Expressway	NB	90	2	4	0	1	93%	2%	4%	0%	1%	360	8	16	0	4
			SB	85	4	7	1	0	88%	4%	7%	1%	0%	340	16	28	4	0
			Total	175	6	11	1	1	90%	3%	6%	1%	1%	700	24	44	4	4
	2	Steese Expressway	NB	93	1	5	1	1	92%	1%	5%	1%	1%	372	4	20	4	4
			SB	103	3	7	1	0	90%	3%	6%	1%	0%	412	12	28	4	0
			Total	196	4	12	2	1	91%	2%	6%	1%	0%	784	16	48	8	4
M-11	1	Steese Expressway	NB	198	4	1	1	6	94%	2%	0%	0%	3%	792	16	4	4	24
			SB	98	1	4	0	1	94%	1%	4%	0%	1%	392	4	16	0	4
			Total	296	5	5	1	7	94%	2%	2%	0%	2%	1184	20	20	4	28
	2	Steese Expressway	NB	162	4	8	0	8	89%	2%	4%	0%	4%	648	16	32	0	32
			SB	101	4	5	0	0	92%	4%	5%	0%	0%	404	16	20	0	0
			Total	263	8	13	0	8	90%	3%	4%	0%	3%	1052	32	52	0	32
M-12	1	Steese Expressway	NB	221	3	4	0	3	96%	1%	2%	0%	1%	884	12	16	0	12
			SB	107	3	1	0	0	96%	3%	1%	0%	0%	428	12	4	0	0
			Total	328	6	5	0	3	96%	2%	1%	0%	1%	1312	24	20	0	12
	2	Steese Expressway	NB	160	2	8	1	6	90%	1%	5%	1%	3%	640	8	32	4	24
			SB	111	3	3	0	2	93%	3%	3%	0%	2%	444	12	12	0	8
			Total	271	5	11	1	8	92%	2%	4%	0%	3%	1084	20	44	4	32
M-13	1	Steese Expressway	NB	117	3	5	0	2	92%	2%	4%	0%	2%	468	12	20	0	8
			SB	82	0	6	0	1	92%	0%	7%	0%	1%	328	0	24	0	4
			Total	199	3	11	0	3	92%	1%	5%	0%	1%	796	12	44	0	12
	2	Steese Expressway	NB	129	3	6	0	2	92%	2%	4%	0%	1%	516	12	24	0	8
			SB	116	3	2	0	1	95%	2%	2%	0%	1%	464	12	8	0	4
			Total	245	6	8	0	3	94%	2%	3%	0%	1%	980	24	32	0	12
M-14	1	Steese Expressway	NB	81	1	5	0	1	92%	1%	6%	0%	1%	324	4	20	0	4
			SB	86	6	8	0	0	86%	6%	8%	0%	0%	344	24	32	0	0
			Total	167	7	13	0	1	89%	4%	7%	0%	1%	668	28	52	0	4
	2	Steese Expressway	NB	87	5	4	0	0	91%	5%	4%	0%	0%	348	20	16	0	0
			SB	79	6	9	0	0	84%	6%	10%	0%	0%	316	24	36	0	0
			Total	166	11	13	0	0	87%	6%	7%	0%	0%	664	44	52	0	0

Table B-2: Observed Traffic Counts and Adjusted 1-Hour Equivalent Volumes, cont

			Observed Traffic Data										Adjusted 1-Hour Equivalent Traffic Data				
Monitor	Measurement	Roadway	Direction	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles	% Auto	% Medium Trucks	% Heavy Trucks	% Buses	% Motorcycles	Auto	Medium Trucks	Heavy Trucks	Buses	Motorcycles
M-15	1	Steese Expressway	NB	169	7	2	0	1	94%	4%	1%	0%	1%	676	28	8	0	4
			SB	151	6	3	0	2	93%	4%	2%	0%	1%	604	24	12	0	8
			Total	320	13	5	0	3	94%	4%	1%	0%	1%	1280	52	20	0	12
		Farmers Loop Road	WB	61	0	0	0	1	98%	0%	0%	0%	2%	244	0	0	0	4
			EB	47	0	0	0	2	96%	0%	0%	0%	4%	188	0	0	0	8
			Total	108	0	0	0	3	97%	0%	0%	0%	3%	432	0	0	0	12
		Farmers Loop Road Extension	NB	2	1	0	0	0	67%	33%	0%	0%	0%	8	4	0	0	0
			SB	0	0	0	0	0	0%	0%	0%	0%	0%	0	0	0	0	0
			Total	2	1	0	0	0	67%	33%	0%	0%	0%	8	4	0	0	0
	2	Steese Expressway	NB	190	10	6	0	1	92%	5%	3%	0%	0%	760	40	24	0	4
			SB	169	3	4	0	1	95%	2%	2%	0%	1%	676	12	16	0	4
			Total	359	13	10	0	2	93%	3%	3%	0%	1%	1436	52	40	0	8
		Farmers Loop Road	WB	60	0	0	0	0	100%	0%	0%	0%	0%	240	0	0	0	0
			EB	48	1	1	0	1	94%	2%	2%	0%	2%	192	4	4	0	4
			Total	108	1	1	0	1	97%	1%	1%	0%	1%	432	4	4	0	4
		Farmers Loop Road Extension	NB	1	0	0	0	0	100%	0%	0%	0%	0%	4	0	0	0	0
			SB	2	1	0	0	0	67%	33%	0%	0%	0%	8	4	0	0	0
			Total	3	1	0	0	0	75%	25%	0%	0%	0%	12	4	0	0	0

Appendix C Noise Barrier Cost Estimation

The following table presents the calculations used to estimate the noise barrier unit cost used in the noise abatement analysis. Table C-1 presents the unit cost calculations for noise barriers at-grade and Table C-2 present the calculations for noise barriers on a structure.

Table C-1: Noise Barrier Cost Calculation

Projects	Year	Quantity (Square foot)	Low Bidder
Seward Hwy Reconstruction: Dowling Rd to Tudor Road	2011	49,488	$50.00
West Dowling Phase II	2013	7,400	$21.00
O'Malley Road Reconstruction: Phase I	2017	5,630	$16.77
		Average Low Bidder Cost	$29.26
Additional Costs	**Percentage of Average Bid Cost**		**Cost**
Design Engineering	10%		$2.93
Construction Engineering	15%		$4.39
640 Items	5%		$1.46
641 Items	7%		$2.05
643 Items	15%		$4.39
ICAP	5.64%		$1.65
		Additional Costs	$16.86

Estimated Unit Cost per square foot	
Average Low Bidder Cost	$29.26
Additional Costs	$16.86
Total Cost	**$46.12**

Table C-2: Noise Barrier on Structure Cost Calculation

Unit Cost for Barriers on Structure	$ 66.00
	$ 65.00
	$ 68.00
	$ 44.00
	$ 64.00
	$ 65.00
	$ 50.00
	$ 64.00
	$ 64.00
	$ 65.00
Average Unit Cost	**$ 61.50**

Appendix D Abatement Forms

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-11**
Location Description: **997 Blair Road**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **67 dBA**
Future No-Build Noise Level (Leq): **67 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-14**
Location Description: **1004 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **66 dBA**
Future No-Build Noise Level (Leq): **67 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — 8/17/2020
Regional Manager — Date

8/21/2020
DOT&PF Project Manager — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-15**
Location Description: **1008 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **68 dBA**
Future Build Noise Level (Leq): **69 dBA**
Future No-Build Noise Level (Leq): **69 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-17**
Location Description: **1012 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **70 dBA**
Future Build Noise Level (Leq): **70 dBA**
Future No-Build Noise Level (Leq): **71 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — 8/17/2020
Regional Manager — Date

8/21/2020
DOT&PF Project Manager — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-19**
Location Description: **1018 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **70 dBA**
Future Build Noise Level (Leq): **71 dBA**
Future No-Build Noise Level (Leq): **71 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-21**
Location Description: **1022 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **69 dBA**
Future Build Noise Level (Leq): **69 dBA**
Future No-Build Noise Level (Leq): **70 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — 8/17/2020
Regional Manager — Date

8/21/2020
DOT&PF Project Manager — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-22**
Location Description: **1030 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **68 dBA**
Future Build Noise Level (Leq): **69 dBA**
Future No-Build Noise Level (Leq): **69 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson

Regional Manager — Date: 8/17/2020

DOT&PF Project Manager — Date: 8/21/2020

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-24**
Location Description: **1036 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **68 dBA**
Future No-Build Noise Level (Leq): **67 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-25**
Location Description: **1106 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **68 dBA**
Future No-Build Noise Level (Leq): **67 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-33**
Location Description: **1214 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **64 dBA**
Future Build Noise Level (Leq): **66 dBA**
Future No-Build Noise Level (Leq): **65 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-36**
Location Description: **1240 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **64 dBA**
Future Build Noise Level (Leq): **66 dBA**
Future No-Build Noise Level (Leq): **65 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-38**
Location Description: **1250 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **64 dBA**
Future Build Noise Level (Leq): **66 dBA**
Future No-Build Noise Level (Leq): **65 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-39**
Location Description: **1316 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **64 dBA**
Future Build Noise Level (Leq): **66 dBA**
Future No-Build Noise Level (Leq): **65 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-42**
Location Description: **1340 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **65 dBA**
Future Build Noise Level (Leq): **66 dBA**
Future No-Build Noise Level (Leq): **66 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-44**
Location Description: **1350 Joyce Drive, 1352 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **65 dBA**
Future Build Noise Level (Leq): **67 dBA**
Future No-Build Noise Level (Leq): **66 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — Date: 8/17/2020

DOT&PF Project Manager — Date: 8/21/2020

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-45**
Location Description: **1358 Joyce Drive, 1360 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **65 dBA**
Future Build Noise Level (Leq): **68 dBA**
Future No-Build Noise Level (Leq): **66 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson
Regional Manager

8/17/2020
Date

DOT&PF Project Manager

8/21/2020
Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-47**
Location Description: **1364 Joyce Drive, 1366 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **69 dBA**
Future No-Build Noise Level (Leq): **66 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — 8/17/2020
Regional Manager — Date

8/21/2020
DOT&PF Project Manager — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-49**
Location Description: **1372 Joyce Drive, 1374 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **70 dBA**
Future No-Build Noise Level (Leq): **67 dBA**

Has a noise impact been identified? **No**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-50**
Location Description: **1380 Joyce Drive, 1382 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **69 dBA**
Future No-Build Noise Level (Leq): **67 dBA**

Has a noise impact been identified? **No**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-52**
Location Description: **1390 Joyce Drive, 1392 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **66 dBA**
Future Build Noise Level (Leq): **68 dBA**
Future No-Build Noise Level (Leq): **67 dBA**

Has a noise impact been identified? **No**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible? **Yes**

Is the proposed noise abatement measure engineering feasible? **Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable? **Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective? **Yes**

2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement? **Unknown**

3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures? **Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-53**
Location Description: **1400 Joyce Drive, 1402 Joyce Drive**
Activity Category Type: **B**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **65 dBA**
Future Build Noise Level (Leq): **66 dBA**
Future No-Build Noise Level (Leq): **66 dBA**

Has a noise impact been identified? **No**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **12-foot Noise Barrier (Barrier B1-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — 8/17/2020 — Date

DOT&PF Project Manager — 8/21/2020 — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-82**
Location Description: **Fairhill Church of God**
Activity Category Type: **C**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **71 dBA**
Future Build Noise Level (Leq): **72 dBA**
Future No-Build Noise Level (Leq): **72 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend ~~no~~ noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **6 to 9-foot Noise Barrier (Barrier B2-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — 8/17/2020
Regional Manager — Date

8/21/2020
DOT&PF Project Manager — Date

Feasibility and Reasonableness Worksheet

Highway Traffic Noise Abatement for Project: **Steese Expressway/Johansen Expressway Interchange**

Receiver ID Number: **R-83**
Location Description: **Fairhill Christian School**
Activity Category Type: **C**
Noise Abatement Criteria for this Activity (Leq): **67 dBA**
Existing Noise Level (Leq): **70 dBA**
Future Build Noise Level (Leq): **72 dBA**
Future No-Build Noise Level (Leq): **72 dBA**

Has a noise impact been identified? **Yes**

If a noise impact has been identified, continue filling out worksheet. If no impacts have been identified no noise abatement is required. Sign worksheet and recommend no noise abatement.

Noise Abatement Analysis

Feasibility

Is the proposed noise abatement measure acoustically feasible?	**Yes**
Is the proposed noise abatement measure engineering feasible?	**Yes**

Reasonableness

Is the proposed noise abatement measure considered reasonable?	**Yes**

Federal Mandatory Factors

1. **Cost Effectiveness.** Is the abatement measure cost effective?	**Yes**
2. **Views of Benefited Residents and Property Owners.** Do at least 60% of the impacted residents and property owners' surveyed desire noise abatement?	**Unknown**
3. **Noise Reduction Design Goal.** Does the noise abatement measure provide 7dBA reduction to 50% or more of the benefitted receptors in the first row of structures?	**Yes**

Is Noise Abatement Recommended for this impacted receptor(s)? **Yes**

What Type of noise abatement is recommended? **6 to 9-foot Noise Barrier (Barrier B2-DDI)**

What is the basis for this recommendation? **Noise barrier meets both feasibility and reasonableness criteria.**

Brett D Nelson — Regional Manager — Date: 8/17/2020

DOT&PF Project Manager — Date: 8/21/2020

Appendix E DOT&PF Noise Policy

(http://dot.alaska.gov/stwddes/desenviron/assets/pdf/resources/aknoisepolicy_18.pdf)

THE STATE
of ALASKA
GOVERNOR BILL WALKER

Department of Transportation and Public Facilities

Statewide Design & Engineering Services
Environmental Section

3132 Channel Drive
Juneau, Alaska 99811-2500
Main: 907-465-2975
Toll free: 800-467-6955
Fax: 907-465-3124

November 1, 2018

Sandra Garcia-Aline
P.O. Box 21648
Juneau, AK 99802-1648

Reference: DOT&PF Noise Policy

Dear Mrs. Garcia-Aline,

The Alaska Department of Transportation and Public Facilities (DOT&PF) hereby submits a copy of the DOT&PF Noise Policy dated October 2018 for review and approval by the Federal Highway Administration Alaska Division. We would like to thank your staff and Aileen Varela-Margolles of your Washington D.C. office for your review and comments on previous drafts. This policy is an update of DOT&PFs April 2011 policy and in response to changes in 23CFR 772. It is our intent that this Noise Policy will go into effect upon your approval.

Your approval of the attached noise policy is hereby requested. If you have any questions or wish to discuss further do not hesitate to contact Douglas Kolwaite of my office.

Approved: _____

(Sandra Garcia-Aline, Division Administrator, FHWA Alaska Division)

Sincerely,

Kenneth J. Fisher, P.E.
Chief Engineer

Enclosure: DOT&PF Noise Policy (October 2018)

Alaska Department of Transportation & Public Facilities

Noise Policy

November 2018

ACRONYMS USED IN THIS DOCUMENT

ADT: Average Daily Traffic

ANSI: American National Standards Institute

BR: Benefitted Receptor

CE: Categorical Exclusion (as defined in 23 CFR Part 771)

CEI: Cost Effectiveness Index

CFR: Code of Federal Regulations

CPI: Consumer Price Index

dB: Decibel

dBA: Decibel when referring to an A-weighted sound level

DHV: Design Hourly Volume (for traffic)

DOT&PF: Alaska Department of Transportation and Public Facilities

EA: Environmental Assessment (as defined in 23 CFR 771)

EIS: Environmental Impact Statement (as defined in 23 CFR 771)

FHWA: Federal Highway Administration

FHWA TNM: Federal Highway Administration Traffic Noise Model

FONSI: Finding of No Significant Impact (as defined in 23 CFR 771)

LOS: Level of Service

L_{eq}: Equivalent sound level in dBA

$L_{eq}(h)$: One-hour equivalent sound level in dBA

NAC: Noise Abatement Criterion

NEPA: National Environmental Policy Act

NSA: Noise Study Areas

RCNM: Road Construction Noise Model

REM: Regional Environmental Manager

ROD: Record of Decision (as defined in 23 CFR 771)

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1.0 INTRODUCTION

This document contains the Alaska Department of Transportation and Public Facilities (DOT&PF) policy on highway traffic noise and construction noise as it affects the human environment. The policy describes DOT&PF's implementation of the requirements of the Federal Highway Administration (FHWA) Noise Standard at Title 23 Code of Federal Regulations (CFR) Part 772 (see Appendix A.) The policy also addresses how traffic noise is considered on state funded projects. DOT&PF developed this policy which was then, reviewed and approved by FHWA, and is considered effective as of the date on the title page. This policy replaces DOT&PF's Noise Policy dated April 2011.

During the rapid expansion of the Interstate Highway System and other roadways in the 20th century, communities began to recognize highway traffic noise and construction noise as important environmental impacts. In the 1972 Federal-aid Highway Act, Congress required FHWA to develop a noise standard for new Federal-aid highway projects. While providing national criteria and requirements for all highway agencies, the FHWA Noise Standard gives highway agencies flexibility that reflects state-specific attitudes and objectives in approaching the problem of highway traffic and construction noise. This document contains DOT&PF's policy on how highway traffic and construction noise impacts are defined, how noise abatement is evaluated, and how noise abatement decisions are made.

The FHWA Noise Standard requires noise abatement measures be considered when traffic noise impacts are identified for Type I federal projects, as defined in 23 CFR 772.5. Noise abatement measures found to be feasible and reasonable must be constructed for Type I federal projects. Feasible and reasonable noise abatement measures are eligible for federal-aid participation at the same ratio or percentage as other eligible project costs. As part of NEPA's requirement to consider the environmental effects of federally funded projects, the impact determinations and abatement considerations will be used to support development of the NEPA document.

2.0 PURPOSE

This policy outlines the DOT&PF program to implement the FHWA Noise Standards found in 23 CFR 772. These standards include traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials. Where FHWA has given DOT&PF flexibility in implementing the standard, this policy describes the DOT&PF approach to implementation. This policy also defines how the DOT&PF addresses traffic noise in State-funded projects.

The State of Alaska does not have any traffic noise regulations. It is the DOT&PF policy to follow the federal standards for traffic noise prediction requirements, and noise analyses. Federal noise abatement criteria are followed to determine whether noise

impacts exist and if abatement is feasible and reasonable, however, the decision to provide noise abatement on State-funded projects follows slightly different procedures (see Section 9.0 of this policy, *State-Funded Projects.*)

3.0 DEFINITIONS

A-Weighted Sound Level: The sound level in decibels measured with a frequency weighting network corresponding to the A-scale on a standard Type 1 or 2 sound level meter as specified by ANSI S1.4-1983 (R2006)/ANSI S1.4a-1985 (R2006,) American National Standard Specification for Sound Level meters (or latest version.) This is the most widely used weighting system for assessing transportation-related noise because it best approximates sound as heard by the normal human ear.

Acoustically Representative: A receptor location that represents the same land use category and magnitude of noise as another location. Proper acoustical representation includes nearly the same roadway geometry, topography, traffic flow, and distance from source to receptor.

Benefited Receptor: A receptor that receives at least a 5dBA noise reduction from an abatement measure.

Common Noise Environment: A group of receptors within the same Activity Category in 23 CFR 772, Table 1 that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources such as interchanges, intersections, and cross-roads.

Date of Development: The date at which land is permitted for development.

Date of Public Knowledge: The date of approval of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), the Record of Decision (ROD), or in the case of a state-funded project, approval of the State Environmental Checklist.

Decibel (dB): A unit of sound pressure level which denotes the ratio between two sound pressures; the number of decibels is 10 times the base 10 logarithm of this ratio.

Design Hourly Volume (DHV): The 30th highest hourly volume of the future year traffic assigned for the design, expressed in vehicles per hour.

Design Year: The future year used to estimate the probable traffic volume for which a highway is designed. This is determined by adding the project's design life to the anticipated date of construction completion.

Existing Noise Levels: The representative worst noise hour level resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

Feasibility: The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

Federal-aid Project: Any project utilizing federal funds for one or more phases (*i.e.*, Environmental, Design, Right of Way, or Construction) or that is otherwise subject to federal approval.

Field Measurement Point: Physical noise measurement site within the noise study boundary used to validate TNM and document existing noise levels. A field noise measurement point may also serve as a receiver in the TNM.

First Row Receptors: Closest residences or businesses impacted by noise from the highway facility.

Impacted Receptor: A noise-sensitive location for which a traffic noise impact has been calculated.

L_{eq}: The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq}(h)$ being the L_{eq} for one hour.

Multifamily Dwelling: A residential structure containing more than one residence. Each residence with a private exterior space in a multifamily dwelling shall be counted as one receptor when determining impacted receptors and benefited receptors and determining barrier reasonableness.

Noise Analysis Boundary: Limits of analysis for the proposed project(s). Boundaries typically extend 500 feet on either side of a proposed projects improvements; however, some geometric conditions and traffic volumes/mixes may cause noise impacts beyond 500 feet. The boundaries must encompass all potential noise impacts.

Noise Barrier: A physical obstruction constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level by reducing the transmission of sound, including stand-alone noise walls, noise berms (earth or other material), and combination berm/wall systems.

Noise Contour: A line on a map representing points of equal sound level (similar to ground elevation contour lines on a topographic map.)

Noise Reduction Design Goal: The minimum desired sound level reduction, determined by calculating the difference between future build noise levels with and without abatement. The DOT&PF noise reduction design goal is 7 dBA.

Permitted: A definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit.

Property Owner: An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

Reasonableness: The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

Receiver: A modeling point in the FHWA Traffic Noise Model (TNM) at which sound levels are predicted. An individual receiver may represent multiple receptors.

Receptor: A discrete or representative location (such as a residence or an activity area on a parcel of land) being studied for noise impacts.

Residence: A dwelling unit, such as a single family home or each dwelling unit in a multifamily dwelling.

Resident: Someone who resides at a dwelling unit. May not necessarily be the owner of the dwelling unit.

State-funded Project: A project that is solely funded by state monies appropriated by the Alaska State Legislature and requires no federal approvals for implementation.

Statement of Likelihood: A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

Substantial Noise Increase: One of two types of highway traffic noise impacts. For a Type I project, DOT&PF defines it as an increase in design year noise levels of 15 or more dBA over the existing noise level.

Traffic Noise Impacts: Design year build condition noise levels that create a substantial noise increase (defined above) over existing noise levels or design year build condition noise levels that approach or exceed the Noise Abatement Criteria (NAC) listed in Table 1 in 23 CFR 772 for the future build condition. The DOT&PF defines "approach" as one dBA below the NAC.

Type I Project: As defined in 23 CFR 772:
(1) The construction of a highway on new location; or,
(2) The physical alteration of an existing highway where there is either:
    (i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
    (ii) Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,

(3) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
(4) The addition of an auxiliary lane, except when the auxiliary lane is a turn lane; or,
(5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
(6) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,
(7) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.
(8) If a project is determined to be a Type I project under this definition, the entire project area as defined in the environmental document is a Type I project.

Type II Project: A Federal or Federal aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e). DOT&PF does not have a Type II program.

Type III Project: A Federal or Federal aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Worst Noise Hour: A period of 60 minutes within a 24-hour day that reflects the noisiest hour resulting from the maximum amount of traffic traveling at the greatest speed. The worst noise hour may be when the vehicle mix is dominated by truck traffic rather than a high volume of automobile traffic.

4.0 APPLICABILITY

This Noise Policy applies to all Federal or Federal Aid Highway Projects authorized under Title 23, United States Code; therefore, this Noise Policy applies to any highway or multimodal project that:

1. Requires FHWA approval regardless of funding sources, or

2. Is funded with Federal Aid highway funds. This includes Federal or Federal-aid projects that are administered by Local Public Agencies as well as Alaska DOT&PF.

All projects without an approved noise report before the 2018 Noise Policy update adoption date shall use the 2018 Noise Policy update. Projects that have an approved noise report under the 2011 Noise Policy may continue to use the existing noise report or prepare a new noise report using the 2018 Noise Policy update. Projects that have an approved noise report under the 2011 Noise Policy have three years from the adoption date of the 2018 Noise Policy update to obtain an Authority to Proceed with Construction; otherwise, the noise report shall be updated to conform to the 2018 Noise Policy update.

4.1 Type I Projects

The requirements of this policy apply uniformly and consistently to all Type I federal projects, Type I State-funded projects (see Section 9.0 of this policy), and Type I Toll Authority projects within the State of Alaska. If a project is determined to be a Type I project under the definition outlined in 23 CFR 772.5, then the entire project area as defined in the environmental document is a Type I project.

4.2 Type II Projects

DOT&PF has elected not to participate in the voluntary Type II noise program; therefore, no noise analyses will be completed for Type II projects. Type II projects are not discussed further in this policy.

4.3 Type III Projects

Type III projects are those projects that neither meet the definition of a Type I or Type II project nor require a noise analysis or consideration of noise abatement. However, it may be necessary to consider conducting a construction noise analyses in certain circumstances (*e.g.*, pile driving near residences.) Construction noise is discussed in Section 8.0 of this policy.

5.0 ANALYSIS OF TRAFFIC NOISE IMPACTS

It is important to determine early on in project scoping if a noise analysis is necessary, in order to accurately plan a project timeline.

5.1 Minimum Qualifications for Noise Analysts

DOT&PF highway traffic noise analyses must be performed by qualified personnel who have successfully completed training in the area of highway noise analysis and are proficient in the use of the latest version of the FHWA-approved traffic noise modeling software. These personnel must have experience conducting noise analysis studies for highway transportation projects and have a working knowledge of this policy and the regulations outlined in 23 CFR 772.

5.2 General Requirements for All Type I Projects

All Type I projects require a noise analysis; however, projects may not require the same level of analysis. This policy describes three levels of analyses:

- Narrative Analysis – a non-quantitative analysis of noise impacts where noise impacts are not anticipated.
- Screening Analysis – a streamlined quantitative analysis where noise impacts are unlikely or abatement actions are clearly not feasible and/or reasonable.

- Detailed Analysis – a comprehensive quantitative analysis where noise impacts are possible and noise abatement may be feasible and reasonable.

Coordination with the Statewide Environmental Office (SEO) is required before a narrative or screening analysis is conducted. Failure to coordinate with the SEO may result in a need to reanalyze the project using a detailed analysis. There are limitations to the narrative and screening procedures, and they are not applicable to all projects. The appropriate level of noise analysis will depend on the presence of noise sensitive land uses (existing or permitted), probable occurrence of highway traffic noise impacts, the potential for noise abatement measures, and/or noise-related public controversy. The levels of analysis are described in detail in Sections 5.4 through 5.6 of this policy.

For Type I projects, a traffic noise analysis is required for all build alternatives under detailed study in the NEPA process. All reasonable alternatives that have been carried forward for detailed analysis and were not rejected as unreasonable during the alternatives screening process will be analyzed for noise impacts. For Environmental Impact Statements or other studies that will examine broad corridors, the appropriate scope and methodology of the noise analysis should be discussed with participating agencies early in the project planning process.

A Type I traffic noise analysis generally consists of the following steps, which are described in more detail in subsequent sections of this policy:

1. Identify noise analysis boundaries and receptors by land use Activity Category (Section 5.3) and distance to the edge of the closest travel lane of the proposed project;
2. Determine existing noise levels at a representative subset of receptors;
3. Predict future "build" noise levels at a larger representative subset of receptors. Predict future "no-build" noise levels for the proposed project;
4. Determine traffic noise impacts;
5. Evaluate abatement feasibility and reasonableness if there are traffic noise impacts;
6. Address coordination with local officials;
7. Address construction noise; and
8. Prepare the noise analysis report (Section 6.7.)

Noise impact modeling and abatement evaluation/design for DOT&PF projects require use of the latest approved version of the FHWA Traffic Noise Model (FHWA TNM) or another model determined by FHWA to be consistent with the methodology of the FHWA TNM, pursuant to 23 CFR 772.9(a.)

If any segment or component of an alternative meets the definition of a Type I project, then the entire alternative is considered to be Type I and is subject to these noise analysis requirements. The noise analysis boundaries will be consistent with project limits, from the beginning of the project to the end of the project based on logical termini for that specific project (BOP to EOP).

5.3 Land Use Activity Categories

Federal land use activity categories are defined in 23 CFR 772. DOT&PF has accepted the FHWA definition of these activity categories (Appendix B, Table 1.) Noise analyses must address each activity category present within the noise analysis boundaries. If undeveloped land has been permitted for development (*i.e.*, a building permit has been issued on or before the date of public knowledge,) that land should be assigned to the appropriate activity category and analyzed in the same manner as developed lands in that category.

Activity Category A: Lands on which serenity and quiet are of extraordinary significance and serve an important public need 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.

Activity Category B: Residential (single-family and multi-family homes.) Noise receivers should be located in exterior areas that receive frequent human use (*i.e.*, patios, balconies, playgrounds, gardens, etc.) When an area of frequent use cannot be determined, an area mid-way between the residence and the right-of-way line should be chosen. For residences and structures that face the highway, choose an area of frequent use in the front, such as a front door landing. For apartment buildings, second-floor or higher balconies should be used in addition to ground floor units. For any shared-use exterior areas, the number of residential equivalents will be equal to the total number of dwelling units in multi-family building(s).

Activity Category C: Exterior areas of non-residential lands such as schools, parks, cemeteries, etc., as listed in Appendix B. Receivers should be located in areas that receive the most frequent human use and represent the typical use of the area. Since impact determinations are based on each area of frequent human use, the number of areas impacted should be calculated and an equivalent number of residential units should then be calculated to assess the feasibility and reasonableness of abatement measures. The equivalent number of residential units is calculated by determining the average residential lot size for the vicinity and dividing it into the non-residential area, for a total number of residential units. For example: if a park has an area of 87,120 square feet, and the average residential lot size is 60 feet by 200 feet, or 12,000 square feet, use 8 equivalent residential units to assess the feasibility and reasonableness of a proposed abatement measure. Receiver placement for non-residential use sites is similar to that of the residential analysis. Receivers should be placed at the closest location to the highway right of way (ROW) line where outdoor activity normally occurs to determine if the NAC is exceeded. In addition, receivers should be placed at locations away from the ROW line to determine the extent of impact and to consider sensitive receptors if the NAC are exceeded at the ROW line.

Activity Category D: Interiors of certain Category C facilities, such as those listed in Appendix B. Interior receptor locations should only be used if there are no reasonable

exterior (Category C) receptor options. Only consider the interior levels at these land uses after fully completing an analysis of any outdoor activity areas or determining that exterior abatement measures are not feasible or reasonable. The 52 dB(A) criteria for the category only apply to the interior areas of this category.

An interior analysis will only be performed after exhaustion all exterior options.

This will involve:

1,) identify the expected noise reduction due to the composition of the building envelope: Table 6.1 found in the FHWA publication HEP-18-065, Noise Measurement Handbook Final Report (2018)

www.fhwa.dot.gov/environment/noise/measurement/handbook.cfm#toc492990722

2.) Determine if interior noise levels should assume an open-window or closed window conditions; Open window should be assumed unless there is reliable information that the windows are in fact kept closed almost all of the time while the facility is in use.

3.) If the expected reductions cannot be determined as identified in #1 or #2, physical measurements of the amount of noise reduction provided by the building envelop will be conducted consistent with methodology found in the FHWA publication HEP-18-065, Noise Measurement Handbook Final Report (2018)

www.fhwa.dot.gov/environment/noise/measurement/handbook.cfm#toc492990722

Activity Category E: Exteriors of developed lands that are less sensitive to highway noise that are not included in Categories A-D of F. Noise measurements will be taken and predictions will be made at locations that receive the most frequent use. Category E are specifically excluded from Category D and no interior noise analysis is required. The FHWA research publication A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations shall be used to assess whether noise abatement is feasible and/or reasonable.

www.fhwa.dot.gov/environMent/noise/noise_barriers/abatement/reasonableness_2009/met02.cfm

Activity Category F: Land uses that are not sensitive to highway noise (examples listed in Appendix B.) No highway noise analysis is required under 23 CFR 772 for Activity Category F land uses. The noise analysis report should identify any Category F land uses by name, location, and type of land use.

Activity Category G: Undeveloped lands that are not permitted. Land permitted for development (*i.e.,* a building permit has been issued on or before the date of public knowledge) shall be analyzed under the Activity Category for that type of development. When possible, use the filed plat to choose receptor locations representing the exterior

areas of frequent human use. For residential plats, determine if each lot represents a single-family or multifamily dwelling. Choose representative receptor locations for second row residences as well (these receptors may be grouped two or three at a time.)

For lands not permitted for development by the date of public knowledge, DOT&PF shall determine future noise levels pursuant to 23 CFR 772.17(a). For detailed noise analyses, this analysis should report (at a minimum) the distances from the proposed edge of the near travel lane out to where worst hour $L_{eq}(h)$ levels of 60 and 64 dBA are modeled to occur. The results shall be documented in the project environmental documentation and in the noise analysis report, when applicable. Federal participation in noise abatement measures will not be considered for Category G lands unless another future Type I project is planned adjacent to such lands.

5.4 Narrative Analysis for Type I Projects

A narrative analysis is a qualitative analysis that may be completed for Type I projects where noise-related impacts are not anticipated. If there are no receptors that could potentially be exposed to traffic noise impacts, a narrative analysis is appropriate, and no further analysis is required. If there are receptors that could potentially be exposed to traffic noise impacts, and the project has the potential to adversely affect the acoustic environment based on an evaluation of the following factors, a quantitative analysis (i.e., screening or detailed analysis) is required and a narrative analysis is not applicable.

- The identification of any existing activities, developed lands, and undeveloped lands for which development is permitted which may be affected by noise from the proposed project;
- Change of traffic volume (greater than 10%);
- Change of traffic composition (increased truck volumes);
- Change of traffic speed (greater than 10 miles per hour);
- Change of geometric relationships (either horizontal or vertical) between the roadway facility and receptors;
- Projects on new location;
- Change in distribution of traffic patterns; and/or;
- Public controversy based on noise-related issues or perceptions.

It is impossible to identify and account for every special consideration that may arise on a specific highway project and address it in the corresponding noise analysis. Therefore, the list above is to be used as a guide and not considered inclusive.

A narrative analysis will consist of a discussion of the proposed project, its relationship to receptors (if present) and why further analysis is not required. If no receptors are present, a brief statement should be included that summarizes the fact that there are no noise-sensitive land uses within the noise analysis boundaries. Depending on the project circumstances, some analysis may be required to justify the results of the narrative analysis and to document the non-significance of the change in the acoustical

environment (*e.g.* noise measurements or using a simplified two-dimensional FHWA TNM run to assess the worst-case conditions.)

If local officials associated with undeveloped lands in the project area could benefit from information regarding future noise levels for planning purposes, then that information still needs to be provided even if a narrative analysis has been performed. This can be done using the simplified modeling procedure described in Section 5.5, below.

5.5 Screening Analysis for Type I Projects

For some Type I projects, a screening analysis may be appropriate. The screening analysis is a streamlined procedure in which simplified TNM modeling is used to predict traffic noise levels and make a conservative estimation of noise impacts. This procedure can be effective for reducing time and resources associated with a detailed analysis. If a project passes the screening analysis, additional noise analysis under 23 CFR 772 is normally not necessary. If a project is considered controversial, a detailed analysis (see "Detailed Analysis") is warranted regardless of whether the screening procedure indicates otherwise.

A screening analysis is generally appropriate for projects where the following conditions occur:

- No noise impacts are anticipated;
- Noise impacts are anticipated but potential noise abatement actions will clearly not be feasible and reasonable.

Typically, these will be rural highway projects with uncontrolled access, few receptors, and large distances between receptors.

For example, acoustical feasibility (Section 6.4.1) requires that at least three receptors be protected by a continuous proposed noise barrier that guarantees at least a 5 dBA reduction in noise. If there are less than three receptors in the area where noise abatement is being considered, then no further analysis of noise abatement is required.

Unless or until there are other FHWA-approved screening methods available, TNM modeling must still be performed. However, the models may be simpler than for a detailed analysis. There are several simplifying measures that can be used in screening TNM template models, including using flat ground elevation data with straight-line roads. Receptors will be offset perpendicularly from the center of the model roads at distances that represent the distances from project roads to the nearest noise-sensitive receptors, and/or spaced at 50-foot intervals out to 500 feet to identify distances to NAC approach levels. The model roads will extend a minimum of 1,500 feet past the model receptors at each end of the study area.

The following items must be considered when using a screening analysis:

- Model validation is not required, but the need for onsite noise measurements will be determined on a case by case basis;
- Non-traffic noise sources important to the analysis area must be taken into account;
- Existing conditions for the analysis area must be modeled to determine if future noise levels may increase by 15 dBA or more;
- All of the future alternatives under consideration for the project must be modeled;
- Future noise levels must be evaluated for noise impacts according to the criteria in Section 3;
- If design year noise levels are 64 dBA or less or if noise levels are not predicted to increase more than 10 dBA over existing, then the screening analysis is sufficient;
- Traffic noise abatement actions will not be modeled;
- Noise measurements may be needed to justify results of a screening analysis that has identified impacts and feasible abatement appears unlikely.

This procedure can be used for Type I projects void of sensitive receptors in order to satisfy the requirement of analyzing noise impacts for undeveloped lands for use in local noise compatible planning (see Sections 5.4. and 5.6.4 of this policy.)

The decision to use a screening analysis in place of a detailed analysis should be made carefully. If the screening procedure is passed and no need for a detailed analysis is indicated, the results of the screening procedure are documented in a Noise Analysis report. If impacts are noted and abatement is clearly NOT feasible (*e.g.* driveway access), the screening procedure should suffice and a detailed analysis is not needed. However, impacts and the rationale for determining that noise abatement would not be feasible and reasonable must be clearly documented in a Noise Analysis report. If a project does not pass the screening procedure or if warranted by other conditions (*e.g.* public controversy), a detailed noise impact analysis must be performed.

5.6 Detailed Analysis for Type I Projects

A detailed noise analysis is the level of analysis performed for DOT&PF Type I projects when a narrative or screening analysis has been determined to not be appropriate. DOT&PF's processes for determining which projects qualify for a narrative or screening level analysis are described in Sections 5.4 and 5.5, respectively.

5.6.1 Identification of Analysis Boundaries, Noise Study Areas, and Receptors

Noise analysis boundaries must encompass all potential impacts. Potential benefits and impacts outside of the project limits may also need to be considered (*e.g.*, changes in traffic volumes on other facilities due to the proposed project.) All land uses within the noise analysis boundaries are identified and assigned to the appropriate Activity Categories.

It is usually beneficial on large projects to group land uses together into smaller noise study areas for the purposes of noise modeling and abatement evaluation. A noise

study area (NSA) is generally not longer than a mile. Decision factors for dividing a project into NSAs include the extents of individual neighborhoods or residential subdivisions, major terrain features, location of large tracts of undeveloped lands, and boundaries defining major changes in land use. Individual receptor locations within the land uses are also chosen, as outlined above in Section 5.3, Land Use Activity Categories.

5.6.2 Determination of Existing Noise Levels and Model Validation

For projects on new alignments, determine the worst hour existing noise levels (including non-highway traffic noise sources) for developed land uses and activities by field noise measurements. For projects on existing alignments, existing noise levels can be determined by modeling, although field measurements are recommended.

5.6.2.1 Ambient Noise Level Measurements

Field measurements are conducted in accordance with procedures outlined in FHWA's *Measurement of Highway-Related Noise* report (FHWA Report Number FHWA-PD-96-046, 1996) or the most recent available protocols. Field measurement points are generally a subset of all identified receptors, and should be chosen to be acoustically representative of a grouping of similarly located receptors.

Noise measurements typically consist of a series of 15-minute measurements (minimum of two at roughly the same time of day.) If these measurements differ by more than 3 dBA, a third measurement is needed, unless the variation can be explained by specific noise events that occurred during the measurement period.

On rural or smaller widening road projects, there may be a small number of receptors, such that determination of existing noise levels along the entire project may not be necessary. One approach to this situation is to make a longer term measurement (including peak traffic periods and daytime off-peak periods) at one measurement location close to the existing road. The results can then be used to determine the worst noise hour. Short term measurements taken at other locations during this longer term measurement can be adjusted later to represent the worst hour based on data from the longer term measurement location. While ambient noise level measurements should be made during the worst noise hour, it may not always be practical to do so in rural areas of Alaska.

5.6.2.2 Model Validation

Model validation is done by comparing measured noise levels with modeled noise levels using the same traffic volumes, mix, and speeds tallied during field noise measurements. Noise measurements for model validation do not have to be during the worst noise hour, but should not be made during periods of slow-moving traffic congestion.

Validation measurement locations should be representative of first-row receptor locations and should not be blocked by buildings or terrain features. Two or three measurements of at least 15 minutes in length are made at each location. Directional

traffic classification counts and average travel speeds of the five FHWA TNM vehicle types are made during each measurement. Pavement type must be noted and used in FHWA TNM.

For a FHWA TNM run of an NSA to be considered valid, two of the three modeled levels at each validation location must be within +/-3 dBA of the corresponding measured levels. When a discrepancy is over 3 dBA, the model input data should be examined for errors and refinements made. If a measured/modeled difference remains over 3 dBA after revision of the model, the discrepancy (and potential explanation) is noted in the noise analysis report.

5.6.3 Prediction of Future Noise Levels

Future condition noise predictions are made for each alternative under consideration, including the no-build alternative, using the latest version of the FHWA TNM program. Design year traffic conditions representing the worst noise hour (generally, Level of Service (LOS) C or D,) are used. Highway traffic noise analysis should consider absolute noise levels as well as substantial increases in noise levels for abatement evaluations.

Where appropriate, take into account any seasonal variations in traffic. Use the guidance in Sections 5.3 and 5.4.1 of this policy when choosing receptors for modeling as receivers in FHWA TNM. Loss of shielding of the roadway due to topography, buildings, or vegetation that may be eliminated when the roadway is built should be taken into account.

5.6.4 Determination of Future Noise Levels on Undeveloped Lands

Design year noise levels based on design hourly volumes need to be predicted for Category G lands. This can be done using the simplified modeling procedure described in Section 5.5 of this policy. At a minimum, this analysis should report the distances from the proposed edge of the near travel lane out to where worst hour $L_{eq}(h)$ levels of 60 and 64 dBA are modeled to occur. These results are then provided to local public agencies to assist them in planning.

Creation of noise contours for undeveloped lands will be considered on an individual project basis. Noise contours may only be used for project alternative screening or for land use planning purposes. They may not be used for determining highway traffic noise impacts.

5.6.5 Determination of Traffic Noise Impacts

For Type I projects, noise impacts must be determined for all Activity Category A-E land uses in the analysis area. Impacts occur when a proposed project results in a substantial noise increase or when the predicted design year noise levels approach, meet, or exceed the NAC. As defined in Section 3.0, a "substantial noise increase" occurs when a design year noise level ($L_{eq}(h)$) is predicted to increase 15 or more dBA above the existing level and "approach" means a design year noise level is predicted to be one decibel below the NAC for Activity Categories A-E (Appendix B, Table 1.) When

one or both impact type(s) occur, noise abatement measures must be evaluated for Type I projects.

6.0 ANALYSIS OF NOISE ABATEMENT MEASURES

Depending upon the date of public knowledge of the project and the Activity Category of the receptors, traffic noise abatement measures are to be considered when traffic noise impacts have been identified through the noise analysis process, with the exceptions noted in Sections 5.4 and 5.5.

6.1 Date of Public Knowledge

The date of public knowledge of a proposed transportation project is used to determine whether noise abatement should be considered as part of the project. This date (as defined in 23 CFR 772) is the date that a NEPA decision document was approved for the project. DOT&PF will only consider abatement measures if the impacted receptor was developed or permitted for development before the date of public knowledge.

6.2 Abatement Considerations

Noise abatement measures must be found to be both feasible and reasonable in order to be included in a proposed project. A Noise Abatement Recommendation Worksheet (located in Appendix C) should be completed to assist in the decision-making process. Feasibility and reasonableness are each described in detail later in this section.

For Type I projects that have had a Detailed Noise Analysis conducted, DOT&PF will evaluate noise abatement when traffic noise impacts are predicted for land use Activity Categories A-E, with some exceptions as noted in Section 5.3. When an impact is identified, noise abatement measures will be evaluated after first considering whether project design changes (*e.g.*, altering the horizontal and/or vertical alignment) may reduce or eliminate the impact.

6.3 Possible Noise Abatement Measures

Federal funds may be used for the following noise abatement measures when traffic noise impacts have been identified and abatement measures have been determined to be feasible and reasonable, pursuant to 23 CFR 772.13(d). The costs of such measures may be included in Federal-aid participation project costs with the Federal share being the same as that for the system on which the project is located.

The following noise abatement measures may be considered for incorporation into a Type I project to reduce traffic noise impacts.

> (1) Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way. Landscaping is not a viable noise abatement measure.

(2) Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
(3) Alteration of horizontal and vertical alignments.
(4) Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
(5) Noise insulation of Activity Category D land use facilities listed in Table 1. Post-installation maintenance and operational costs for noise insulation are not eligible for federal-aid funding.

Alternative (quieter) pavement is not a FHWA-approved noise abatement measure for Federal-aid projects and consequently cannot be used as noise abatement on Federal-aid projects. DOT&PF may consider using alternative pavements to reduce traffic noise on State-funded projects (see Section 9.0 of this policy.)

At this time, DOT&PF does not use absorptive treatments as a functional enhancement of noise barriers.

6.4 Feasibility

Determinations of noise abatement measure feasibility are made by considering whether a certain amount of noise reduction can be achieved by the measure and whether the measure is possible to design and construct.

6.4.1 Acoustical Feasibility

Acoustical feasibility refers to the minimum number of impacted receptors that must receive 5 dBA highway traffic noise reduction for a proposed abatement measure to be feasible. For DOT&PF projects, a 5 dBA or more reduction must be achieved for at least three impacted front row receptors in order for the abatement measure to be considered acoustically feasible.

If significant non-highway noise sources exist in the project area, such as rail lines or airports, noise barrier effectiveness may be compromised. These situations will be carefully evaluated to determine if a noise barrier for the highway noise sources is feasible.

6.4.2 Engineering Feasibility

Noise abatement measures are not feasible if they create a safety hazard to the driving public, protected receptors, or maintenance personnel. The project development team will consult with the appropriate DOT&PF functional groups when determining whether it is possible to design and construct a noise abatement measure. Noise abatement measures should be consistent with the following general design principles:

- Noise abatement measures should be located beyond the recovery zone of the traveled way; if a noise abatement measure must be located within the recovery zone, a traffic barrier may be warranted.

- Noise abatement measures may not block the recommended sight distance (Alaska Highway Preconstruction Manual, Chapter 11) between vehicles and intersecting roadways or on/off-ramps.
- Protrusions on noise abatement measures near a traffic lane should be avoided.
- Facings on noise abatement measures that can become dislodged, or barrier components that could shatter during an accident, or facings that create excessive glare should be avoided.
- Access should be provided to all sides of noise abatement measures to allow for maintenance activities to take place.

All noise abatement measures should consider the design principles outlined in the "*Guide on Evaluation and Abatement of Traffic Noise*", AASHTO, 1993 and the *"FHWA Highway Noise Barrier Design Handbook*", FHWA, 2000.

6.5 Reasonableness

The following three reasonableness factors must be evaluated in order for a noise abatement measure to be considered reasonable, pursuant to 23 CFR 772.13:

1) Viewpoints of the property owners and residents of the benefitted receptors.
2) Cost Effectiveness.
3) Noise Reduction Design Goal.

These three reasonableness factors must collectively be achieved in order for a noise abatement measure to be deemed reasonable. Refer to Section 9.0 for a list of additional optional reasonableness factors that may be used only on State-funded projects.

6.5.1 Viewpoints of the property owners and residents of the benefited receptors

Public involvement for noise abatement is required for all categories of environmental document. To determine the views of benefited households and property owners, DOT&PF will contact all benefited households and property owners to determine the level of interest for a noise abatement measure. This contact can be in the form of a mail out questionnaire, phone call survey, or door to door interviews - whichever is most practical and cost effective for the size of the proposed project.

Noise abatement will be carried forward if there is a 60% majority of viewpoints received in support of the barrier. If a property has multiple dwelling units, the owner(s) of the multi-unit dwelling will provide input for the property as a whole, not for each individual dwelling unit. A second outreach attempt will be made if the response rate is less than 40% of all possible respondents.

6.5.2 Cost Effectiveness

The noise abatement measure cost is no more than $38,000[1] per benefitted receptor, based upon the design engineer's estimate. This is determined by counting all receptors (including owner-occupied, rental units, mobile homes, and businesses) benefited by the noise abatement measure in any subdivision and/or given development, and dividing that number into the total cost of the noise abatement measure. A benefited receptor is defined as the recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dBA. Each unit in a multi-family building will be counted as a separate receptor. Cost per benefited receptor must be reanalyzed at a regular interval not to exceed 5 years.

When the design engineer determines abatement measure cost, the estimate will include all items necessary for the construction of the noise abatement measure. Examples of cost items that should be included are traffic control (related to the noise barrier), drainage modification, foundations, retaining walls and right-of-way. Include a cost item only if it is directly related to the construction of the noise abatement measure[2]. If a necessary project feature such as a retaining wall is included, then that cost will not be added into the noise abatement construction cost estimate. If the project incorporates visual mitigation such as the use of a transparent barrier with surface texture, the additional cost will not be included in the abatement construction cost estimate for the purpose of determining reasonableness. Aesthetic treatments, such as artwork, re-vegetation, landscaping, and barrier treatments will not be included in the abatement measure cost estimate for the purpose of determining reasonableness.

6.5.3 Noise Reduction Design Goal

The DOT&PF noise reduction design goal is 7 dBA. At least 50 percent of the benefited receptors in the first row of structures must achieve this design goal for the noise abatement to be considered reasonable. If this design goal is not attainable, then the noise abatement cannot be carried forward. Refer to Section 9.0 for a list of additional criteria that apply only to State-funded projects.

6.5.4 Noise Abatement Recommendation Worksheet

A noise abatement recommendation worksheet (Appendix C) will be filled out for each NSA in the noise analysis. The REM will approve and sign the worksheets. If an abatement measure is determined to not be feasible, then the reasonableness analysis section of the worksheet does not need to be completed. Likewise, if it is determined that the abatement measure is not reasonable, the feasibility portion of the worksheet does not have to be filled out.

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[1] DOT&PFs April 2011 cost per benefited receptor was adjusted for inflation (CPI September 2018) to $38,000 cost per benefited receptor.

[2] DOT&PF will need to provide proof to the FHWA Division Office that the cost of any of these are solely and directly related to the noise abatement measure

DOT&PF will only implement a noise abatement measure if it has been determined to be both feasible and reasonable. The REM will recommend or not recommend that a noise abatement measure be implemented. The recommendation worksheet will be submitted to the Project Manager (PM) who will sign the recommendation worksheet. If the PM does not approve the recommendation then the Preconstruction Engineer will resolve the dispute. The Preconstruction Engineer only needs to sign the noise abatement recommendation worksheet if alternative pavements are recommended as abatement on State-funded projects. The REM will ensure that the recommendation is included in the project's environmental document.

6.6 Third Party Funding

For Type I Federal-aid projects, third party funding cannot be used if the noise abatement would require the additional funding in order to be considered feasible and/or reasonable. Third party funding can be used to pay for additional features such as landscaping, aesthetic treatments, and functional enhancements for noise barriers that have already been determined to be feasible and reasonable.

6.7 Information Required for a NEPA Decision

It is important to maintain accurate and complete documentation of noise impact analyses and any decisions to provide noise abatement. The noise analysis reports for Type I projects are stand-alone documents. Information is taken from the noise analysis report to support the NEPA analysis and decision. The specific information required is outlined in 23 CFR 772.13.

Decisions to provide or not provide noise abatement must be well-explained and defensible. Prior to the NEPA decision, DOT&PF must identify and document:

1) Where noise impacts occur;
2) The prospective noise abatement measures that are feasible and reasonable, and are likely to be incorporated into the project; and
3) Noise impact locations for which no abatement appears to be feasible and reasonable.

For noise abatement measures that have been found to be feasible and reasonable, a statement of likelihood, similar to the following, should be included in the environmental document narrative in the interest of public disclosure:

"As a result of the feasibility and reasonableness analysis conducted as a part of the environmental document, the DOT&PF proposes to incorporate the following noise abatement measures (type, locations) into the proposed project. These noise abatement recommendations are preliminary and based upon the feasibility and reasonableness analysis completed at the time the environmental document. Final recommendations for noise abatement will be based upon the feasibility and reasonable analysis conducted during the detailed design of the project. Any changes in the final abatement

recommendations will result in the reevaluation of the approved NEPA document and the solicitation of additional public comment."

The noise analysis report should include a description of each abatement measure considered, a discussion of the anticipated costs, problems, and disadvantages associated with that abatement measure, and a discussion of the anticipated benefits. The noise analysis must be appended to the environmental document, and should be in the following general format:

Cover Page
Table of Contents
Summary
Project Background
Purpose of Analysis
Methods
    Model
    Validation Process
Description of Land Use Categories along the Corridor
Results
Identification of Noise Impacts
Noise Abatement Analysis
Abatement Recommendations
Statement of Likelihood
Construction Noise
Conclusion
Appendices
    DOT&PF NOISE POLICY
    TNM Model inputs/outputs and supporting CAD/design files

During the detailed design of the proposed project, recommendations for noise abatement made in the environmental document will be reevaluated to determine if they are still valid. If it is determined that any noise abatement measure recommendation is no longer valid, then the affected public will be notified and the environmental document will be reevaluated or supplemented as appropriate.

6.8 Design-Build Projects

For design-build projects, as with any DOT&PF project, DOT&PF is ultimately responsible for the NEPA decisions and as such, noise abatement measures must be considered, developed, and constructed in accordance with the provisions of 23 CFR 772, 23 CFR 636.109, and this policy.

6.9 Inventory and Reporting of Abatement Measures

DOT&PF will maintain an inventory of all constructed noise abatement measures and will on a periodic basis provide the Alaska Division of FHWA the parameters outlined in

23 CFR 772.13(f). DOT&PF will enter the data into a spreadsheet as abatement measures are implemented.

7.0 INFORMATION FOR LOCAL OFFICIALS

In an effort to reduce future traffic noise impacts on currently undeveloped lands and to maintain compatibility between highways and future development, DOT&PF will provide the results of Type I highway traffic noise analyses to local government officials. With regard to undeveloped lands that have not been permitted for development, the results will include at a minimum the distances from the proposed edge of the traveled way to where the design year $L_{eq}(h)$ of 60 and 64 dBA are predicted to occur.

8.0 CONSTRUCTION NOISE

Construction of a highway project may cause localized, short-duration noise impacts. Construction noise can adversely affect people living in the area. Analysis and mitigation of construction noise impacts will be addressed when noise and vibration issues arise during project development or if complaints are received by the public.

For all Type I Federal and State Projects, it is DOT&PF policy to:

(a) Identify land uses or activities that may be affected by noise from construction of the project. The identification is to be performed during the project development studies.
(b) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall include a weighing of the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.
(c) Incorporate the needed abatement measures in the plans and specifications.

The REM, environmental analyst and design engineering manager will coordinate to incorporate appropriate mitigation measures for construction noise as determined appropriate by DOT&PF. These may be incorporated into the plans and specifications and include: requirements for staging areas, time periods where no noise generating activities can occur, and public outreach requirements.

In the event that construction noise complaints occur during the course of construction activities, measures will be taken by the Construction Project Engineer, in consultation with the REM, to resolve the problem to the extent practical. Measures might include locating stationary construction equipment as far from nearby noise sensitive receivers as possible, shutting off idling equipment, rescheduling construction operations to avoid periods of noise annoyance, notifying nearby residents whenever extremely noisy operations will be occurring, and installing permanent or portable acoustic abatement measures around stationary construction noise sources.

In some cases there are no alternatives to conducting construction activities during the night, on weekends, or on holidays. When deemed necessary, DOT&PF will make every effort to notify the public prior to conducting these activities. Public involvement in these cases should occur during design and throughout the construction duration. In some communities, local ordinances may restrict noise generating activities. DOT&PF and its contractor(s) will comply with local noise ordinances and acquire any necessary noise permits for construction activities prior to their initiation.

While construction noise modeling is not regularly done for Type I noise studies, the FHWA Roadway Construction Noise Model (RCNM) may be used to predict noise levels from various types of equipment and construction activities. In some cases (*e.g.*, pile driving near residences,) construction noise modeling may be warranted for Type III projects as well.

9.0 STATE-FUNDED PROJECTS

In general, the same methods are followed in the identification of noise impacts for Type I State-funded projects as for Type I Federal-aid projects. Results of noise analyses will be documented in the State Project Environmental Checklist. If noise abatement is determined to be feasible and reasonable, then the REM will make a recommendation to the Preconstruction Engineer. The Preconstruction Engineer will decide whether the recommended abatement measure will be constructed. Abatement will be provided only if it meets the feasibility and reasonableness criteria of this policy and the Preconstruction Engineer determines that the state funded appropriation can accommodate the expenditure.

In addition to the reasonableness factors outlined for Federal-aid projects in Section 6.5, above, the following optional reasonableness factors may be used to increase the cost allowed on State-funded projects:

1) Date of development.
2) Length of time receivers have been exposed to highway traffic noise impacts.
3) Exposure to higher absolute traffic noise levels.
4) Changes between existing and future build conditions.
5) Percentage of mixed zone development.
6) Use of noise compatible planning concepts by the local government.

No single optional reasonableness factor shall be used to determine that a noise abatement measure is unreasonable.

In addition to the criteria outlined for Federal-aid projects in Section 6.5.3, above, the following noise reduction design goal criteria apply only to State-funded projects:

1) Development vs. Highway Timing. At least 50 percent of impacted receptors in the development (subdivision, apartment complex, etc.) were built before initial construction of the highway. The date of development is an important part of the determination of reasonableness. More consideration is given to developments that were built before the highway was built.
2) Development Existence. At least 50 percent of impacted receptors in the development have existed for at least 10 years. More consideration is given to residents who have experienced traffic noise impacts for long periods of time.
3) Absolute Predicted Build Noise Level. The predicted future build noise levels are at least 66 dBA. More consideration should be given to areas with higher absolute traffic noise levels. Absolute noise levels typically found along highways, 60-75 dBA, are deemed undesirable and cause complaints from adjacent residents. In general, the higher the absolute noise, the more complaints.
4) Relative Predicted Build Noise Level. The predicted future build noise levels are at least 10 dBA greater than the existing noise levels. More consideration is given to areas with larger increases over existing noise levels. This gives greater consideration to projects for highways on new location and major reconstruction than it does to projects of smaller magnitude. For most people, a 3 dBA increase is barely perceptible, a 5 dBA increase is readily perceptible, and a 10 dBA increase doubles the perceived loudness of the noise.
5) Build vs. No-Build Noise Levels. The future build noise levels are at least 5 dBA greater than the future no-build noise levels. More consideration should be given to areas where larger changes in traffic noise levels are expected to occur if the project is constructed than if it is not.
6) Land use. Land use is not changing rapidly and there are local ordinances or zoning in place to control the new development of noise sensitive land uses adjacent to transportation corridors.

DOT&PF may consider using alternative pavements to reduce traffic noise on State-funded projects. However, the decision to provide such a measure will be made by the Preconstruction Engineer.

10.0 UPDATES TO POLICY

This policy is effective upon signature and replaces the Alaska DOT&PF April 2011 Noise Policy. Changes to the policy will be made as needed, or every 5 years, per FHWA recommendation.

REFERENCES

"*Guide on Evaluation and Abatement of Traffic Noise*" (AASHTO, 1993)

"FHWA Highway Noise Barrier Design Handbook" (FHWA, 2000)

"Measurement of Highway-Related Noise" report (FHWA Report Number FHWA-PD-96-046, 1996)

http://www.fhwa.dot.gov/environment/noise/

FHWA *Highway Traffic Noise: Analysis and Abatement Guidance* June 2010 is available at the following website
http://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/guidancedoc.pdf

Noise Model Web site at the following URL http://www.fhwa.dot.gov/environment/noise/index.htm.

APPENDIX A - FHWA 23 CFR 772

Code of Federal Regulations
Current as of October 12, 2018
Title 23 → Chapter I → Subchapter H → Part 772

PART 772—PROCEDURES FOR ABATEMENT OF HIGHWAY TRAFFIC NOISE AND CONSTRUCTION NOISE

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§772.17 Information for local officials.
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Table 1 to Part 772—Noise Abatement Criteria

AUTHORITY: 23 U.S.C. 109(h) and (i); 42 U.S.C. 4331, 4332; sec. 339(b), Pub. L. 104-59, 109 Stat. 568, 605; 49 CFR 1.48(b).

SOURCE: 75 FR 39834, July 13, 2010, unless otherwise noted.

§772.1 Purpose.

To provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to title 23 U.S.C.

§772.3 Noise standards.

The highway traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials in this regulation constitute the noise standards mandated by 23 U.S.C. 109(1). All highway projects which are developed in conformance with this regulation shall be deemed to be in accordance with the FHWA noise standards.

§772.5 Definitions.

Benefited receptor. The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dB(A), but not to exceed the highway agency's reasonableness design goal.

Common Noise Environment. A group of receptors within the same Activity Category in Table 1 that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections, cross-roads.

Date of public knowledge. The date of approval of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), or the Record of Decision (ROD), as defined in 23 CFR part 771.

Design year. The future year used to estimate the probable traffic volume for which a highway is designed.

Existing noise levels. The worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

Feasibility. The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

Impacted Receptor. The recipient that has a traffic noise impact.

L10. The sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration, with L10(h) being the hourly value of L10.

Leq. The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

Multifamily dwelling. A residential structure containing more than one residence. Each residence in a multifamily dwelling shall be counted as one receptor when determining impacted and benefited receptors.

Noise barrier. A physical obstruction that is constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level, including stand alone noise walls, noise berms (earth or other material), and combination berm/wall systems.

Noise reduction design goal. The optimum desired dB(A) noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The noise reduction design goal shall be at least 7 dB(A), but not more than 10 dB(A).

Permitted. A definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit.

Property owner. An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

Reasonableness. The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

Receptor. A discrete or representative location of a noise sensitive area(s), for any of the land uses listed in Table 1.

Residence. A dwelling unit. Either a single family residence or each dwelling unit in a multifamily dwelling.

Statement of likelihood. A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

Substantial construction. The granting of a building permit, prior to right-of-way acquisition or construction approval for the highway.

Substantial noise increase. One of two types of highway traffic noise impacts. For a Type I project, an increase in noise levels of 5 to 15 dB(A) in the design year over the existing noise level.

Traffic noise impacts. Design year build condition noise levels that approach or exceed the NAC listed in Table 1 for the future build condition; or design year build condition noise levels that create a substantial noise increase over existing noise levels.

Type I project. (1) The construction of a highway on new location; or,

(2) The physical alteration of an existing highway where there is either:

(i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,

(ii) Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,

(3) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,

(4) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,

(5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,

(6) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,

(7) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

(8) If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I project.

Type II project. A Federal or Federal-aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e).

Type III project. A Federal or Federal-aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

§772.7 Applicability.

(a) This regulation applies to all Federal or Federal-aid Highway Projects authorized under title 23, United States Code. Therefore, this regulation applies to any highway project or multimodal project that:

(1) Requires FHWA approval regardless of funding sources, or

(2) Is funded with Federal-aid highway funds.

(b) In order to obtain FHWA approval, the highway agency shall develop noise policies in conformance with this regulation and shall apply these policies uniformly and consistently statewide.

(c) This regulation applies to all Type I projects unless the regulation specifically indicates that a section only applies to Type II or Type III projects.

(d) The development and implementation of Type II projects are not mandatory requirements of section 109(i) of title 23, United States Code.

(e) If a highway agency chooses to participate in a Type II program, the highway agency shall develop a priority system, based on a variety of factors, to rank the projects in the program. This priority system shall be submitted to and approved by FHWA before the highway agency is allowed to use Federal-aid funds for a project in the program. The highway agency shall re-analyze the priority system on a regular interval, not to exceed 5 years.

(f) For a Type III project, a highway agency is not required to complete a noise analysis or consider abatement measures.

§772.9 Traffic noise prediction.

(a) Any analysis required by this subpart must use the FHWA Traffic Noise Model (TNM), which is described in "FHWA Traffic Noise Model" Report No. FHWA-PD-96-010, including Revision No. 1, dated April 14, 2004, or any other model determined by the FHWA to be consistent with the methodology of the FHWA TNM. These publications are incorporated by reference in accordance with section 552(a) of title 5, U.S.C. and part 51 of title 1, CFR, and are on file at the National Archives and Record Administration (NARA). For information on the availability of this material at NARA, call (202) 741-6030 or go to *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* These documents are available for copying and inspection at the Federal Highway Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590, as provided in part 7 of title 49, CFR. These documents are also available on the FHWA's Traffic Noise Model Web site at the following URL: *http://www.fhwa.dot.gov/environment/noise/index.htm.*

(b) Average pavement type shall be used in the FHWA TNM for future noise level prediction unless a highway agency substantiates the use of a different pavement type for approval by the FHWA.

(c) Noise contour lines may be used for project alternative screening or for land use planning to comply with §772.17 of this part, but shall not be used for determining highway traffic noise impacts.

(d) In predicting noise levels and assessing noise impacts, traffic characteristics that would yield the worst traffic noise impact for the design year shall be used.

§772.11 Analysis of traffic noise impacts.

(a) The highway agency shall determine and analyze expected traffic noise impacts.

(1) For projects on new alignments, determine traffic noise impacts by field measurements.

(2) For projects on existing alignments, predict existing and design year traffic noise impacts.

(b) In determining traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs.

(c) A traffic noise analysis shall be completed for:

(1) Each alternative under detailed study;

(2) Each Activity Category of the NAC listed in Table 1 that is present in the study area;

(i) *Activity Category A.* This activity category includes the exterior impact criteria for 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 for the area to continue to serve its intended purpose. Highway agencies shall submit justifications to the FHWA on a case-by-case basis for approval of an Activity Category A designation.

(ii) *Activity Category B.* This activity category includes the exterior impact criteria for single-family and multifamily residences.

(iii) *Activity Category C.* This activity category includes the exterior impact criteria for a variety of land use facilities. Each highway agency shall adopt a standard practice for analyzing these land use facilities that is consistent and uniformly applied statewide.

(iv) *Activity Category D.* This activity category includes the interior impact criteria for certain land use facilities listed in Activity Category C that may have interior uses. A highway agency shall conduct an indoor analysis after a determination is made that exterior abatement measures will not be feasible and reasonable. An indoor analysis shall only be done after exhausting all outdoor analysis options. In situations where no exterior activities are to be affected by the traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, the highway agency shall use Activity Category D as the basis of determining noise impacts. Each highway agency shall adopt a standard practice for analyzing these land use facilities that is consistent and uniformly applied statewide.

(v) *Activity Category E.* This activity category includes the exterior impact criteria for developed lands that are less sensitive to highway noise. Each highway agency shall adopt a standard practice for analyzing these land use facilities that is consistent and uniformly applied statewide.

(vi) *Activity Category F.* This activity category includes developed lands that are not sensitive to highway traffic noise. There is no impact criteria for the land use facilities in this activity category and no analysis of noise impacts is required.

(vii) *Activity Category G.* This activity includes undeveloped lands.

(A) A highway agency shall determine if undeveloped land is permitted for development. The milestone and its associated date for acknowledging when undeveloped land is considered permitted shall be the date of issuance of a building permit by the local jurisdiction or by the appropriate governing entity.

(B) If undeveloped land is determined to be perrmitted, then the highway agency shall assign the land to the appropriate Activity Category and analyze it in the same manner as developed lands in that Activity Category.

(C) If undeveloped land is not permitted for development by the date of public knowledge, the highway agency shall determine noise levels in accordance with 772.17(a) and document the results in the project's environmental clearance documents and noise analysis documents. Federal participation in noise abatement measures will not be considered for lands that are not permitted by the date of public knowledge.

(d) The analysis of traffic noise impacts shall include:

(1) Identification of existing activities, developed lands, and undeveloped lands, which may be affected by noise from the highway;

(2) For projects on new or existing alignments, validate predicted noise level through comparison between measured and predicted levels;

(3) Measurement of noise levels. Use an ANSI Type I or Type II integrating sound level meter;

(4) Identification of project limits to determine all traffic noise impacts for the design year for the build alternative. For Type II projects, traffic noise impacts shall be determined from current year conditions;

(e) Highway agencies shall establish an approach level to be used when determining a traffic noise impact. The approach level shall be at least 1 dB(A) less than the Noise Abatement Criteria for Activity Categories A to E listed in Table 1 to part 772;

(f) Highway agencies shall define substantial noise increase between 5 dB(A) to 15 dB(A) over existing noise levels. The substantial noise increase criterion is independent of the absolute noise level.

(g) A highway agency proposing to use Federal-aid highway funds for a Type II project shall perform a noise analysis in accordance with §772.11 of this part in order to provide information needed to make the determination required by §772.13(a) of this part.

§772.13 Analysis of noise abatement.

(a) When traffic noise impacts are identified, noise abatement shall be considered and evaluated for feasibility and reasonableness. The highway agency shall determine and analyze alternative noise abatement measures to abate identified impacts by giving weight to the benefits and costs of abatement and the overall social, economic, and environmental effects by using feasible and reasonable noise abatement measures for decision-making.

(b) In abating traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs.

(c) If a noise impact is identified, a highway agency shall consider abatement measures. The abatement measures listed in §772.15(c) of this part are eligible for Federal funding.

(1) At a minimum, the highway agency shall consider noise abatement in the form of a noise barrier.

(2) If a highway agency chooses to use absorptive treatments as a functional enhancement, the highway agency shall adopt a standard practice for using absorptive treatment that is consistent and uniformly applied statewide.

(d) *Examination and evaluation of feasible and reasonable noise abatement measures for reducing the traffic noise impacts.* Each highway agency, with FHWA approval, shall develop feasibility and reasonableness factors.

(1) *Feasibility*: (i) Achievement of at least a 5 dB(A) highway traffic noise reduction at impacted receptors. The highway agency shall define, and receive FHWA approval for, the number of receptors that must achieve this reduction for the noise abatement measure to be acoustically feasible and explain the basis for this determination; and

(ii) Determination that it is possible to design and construct the noise abatement measure. Factors to consider are safety, barrier height, topography, drainage, utilities, and maintenance of the abatement measure, maintenance access to adjacent properties, and access to adjacent properties (*i.e.* arterial widening projects).

(2) *Reasonableness*:(i) *Consideration of the viewpoints of the property owners and residents of the benefited receptors.* The highway agency shall solicit the viewpoints of all of the benefited receptors and obtain enough responses to document a decision on either desiring or not desiring the noise abatement measure. The highway agency shall define, and receive FHWA approval for, the number of receptors that are needed to constitute a decision and explain the basis for this determination.

(ii) *Cost effectiveness of the highway traffic noise abatement measures.* Each highway agency shall determine, and receive FHWA approval for, the allowable cost of abatement by determining a baseline cost reasonableness value. This determination may include the actual construction cost of noise abatement, cost per square foot of abatement, the maximum square

footage of abatement/benefited receptor and either the cost/benefited receptor or cost/benefited receptor/dB(A) reduction. The highway agency shall re-analyze the allowable cost for abatement on a regular interval, not to exceed 5 years. A highway agency has the option of justifying, for FHWA approval, different cost allowances for a particular geographic area(s) within the State, however, the highway agancy must use the same cost reasonableness/construction cost ratio statewide.

(iii) *Noise reduction design goals for highway traffic noise abatement measures.* When noise abatement measure(s) are being considered, a highway agency shall achieve a noise reduction design goal. The highway agency shall define, and receive FHWA approval for, the design goal of at least 7 dB(A) but not more than 10 dB(A), and shall define the number of benefited receptors that must achieve this design goal and explain the basis for this determination.

(iv) The reasonableness factors listed in §772.13(d)(5)(i), (ii) and (iii), must collectively be achieved in order for a noise abatement measure to be deemed reasonable. Failure to achieve §772.13(d)(5)(i), (ii) or (iii), will result in the noise abatement measure being deemed not reasonable.

(v) In addition to the required reasonableness factors listed in §772.13(d)(5)(i), (ii), and (iii), a highway agency has the option to also include the following reasonableness factors: Date of development, length of time receivers have been exposed to highway traffic noise impacts, exposure to higher absolute highway traffic noise levels, changes between existing and future build conditions, percentage of mixed zoning development, and use of noise compatible planning concepts by the local government. No single optional reasonableness factor can be used to determine reasonableness.

(e) Assessment of Benefited Receptors. Each highway agency shall define the threshold for the noise reduction which determines a benefited receptor as at or above the 5 dB(A), but not to exceed the highway agency's reasonableness design goal.

(f) *Abatement measure reporting*: Each highway agency shall maintain an inventory of all constructed noise abatement measures. The inventory shall include the following parameters: type of abatement; cost (overall cost, unit cost per/sq. ft.); average height; length; area; location (State, county, city, route); year of construction; average insertion loss/noise reduction as reported by the model in the noise analysis; NAC category(s) protected; material(s) used (precast concrete, berm, block, cast in place concrete, brick, metal, wood, fiberglass, combination, plastic (transparent, opaque, other); features (absorptive, reflective, surface texture); foundation (ground mounted, on structure); project type (Type I, Type II, and optional project types such as State funded, county funded, tollway/turnpike funded, other, unknown). The FHWA will collect this information, in accordance with OMB's Information Collection requirements.

(g) Before adoption of a CE, FONSI, or ROD, the highway agency shall identify:

(1) Noise abatement measures which are feasible and reasonable, and which are likely to be incorporated in the project; and

(2) Noise impacts for which no noise abatement measures are feasible and reasonable.

(3) *Documentation of highway traffic noise abatement*: The environmental document shall identify locations where noise impacts are predicted to occur, where noise abatement is feasible and reasonable, and locations with impacts that have no feasible or reasonable noise abatement alternative. For environmental clearance, this analysis shall be completed to the extent that design information on the alterative(s) under study in the environmental document is available at the time the environmental clearance document is completed. A statement of likelihood shall be included in the environmental document since feasibility and reasonableness determinations may change due to changes in project design after approval of the environmental document. The statement of likelihood shall include the preliminary location and physical description of noise abatement measures determined feasible and reasonable in the preliminary analysis. The statement of likelihood shall also indicate that final recommendations on the construction of an abatement measure(s) is determined during the completion of the project's final design and the public involvement processes.

(h) The FHWA will not approve project plans and specifications unless feasible and reasonable noise abatement measures are incorporated into the plans and specifications to reduce the noise impact on existing activities, developed lands, or undeveloped lands for which development is permitted.

(i) For design-build projects, the preliminary technical noise study shall document all considered and proposed noise abatement measures for inclusion in the NEPA document. Final design of design-build noise abatement measures shall be based on the preliminary noise abatement design developed in the technical noise analysis. Noise abatement measures shall be considered, developed, and constructed in accordance with this standard and in conformance with the provisions of 40 CFR 1506.5(c) and 23 CFR 636.109.

(j) Third party funding is not allowed on a Federal or Federal-aid Type I or Type II project if the noise abatement measure would require the additional funding from the third party to be considered feasible and/or reasonable. Third party funding is acceptable on a Federal or Federal-aid highway Type I or Type II project to make functional enhancements, such as absorptive treatment and access doors or aesthetic enhancements, to a noise abatement measure already determined feasible and reasonable.

(k) On a Type I or Type II projects, a highway agency has the option to cost average noise abatement among benefited receptors within common noise environments if no single common noise environment exceeds two times the highway agency's cost reasonableness criteria and collectively all common noise environments being averaged do not exceed the highway agency's cost reasonableness criteria.

§772.15 Federal participation.

(a) *Type I and Type II projects.* Federal funds may be used for noise abatement measures when:

(1) Traffic noise impacts have been identified; and

(2) Abatement measures have been determined to be feasible and reasonable pursuant to §772.13(d) of this chapter.

(b) *For Type II projects.* (1) No funds made available out of the Highway Trust Fund may be used to construct Type II noise barriers, as defined by this regulation, if such noise barriers were not part of a project approved by the FHWA before the November 28, 1995.

(2) Federal funds are available for Type II noise barriers along lands that were developed or were under substantial construction before approval of the acquisition of the rights-of-ways for, or construction of, the existing highway.

(3) FHWA will not approve noise abatement measures for locations where such measures were previously determined not to be feasible and reasonable for a Type I project.

(c) *Noise abatement measures.* The following noise abatement measures may be considered for incorporation into a Type I or Type II project to reduce traffic noise impacts. The costs of such measures may be included in Federal-aid participating project costs with the Federal share being the same as that for the system on which the project is located.

(1) Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way. Landscaping is not a viable noise abatement measure.

(2) Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.

(3) Alteration of horizontal and vertical alignments.

(4) Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise. This measure may be included in Type I projects only.

(5) Noise insulation of Activity Category D land use facilities listed in Table 1. Post-installation maintenance and operational costs for noise insulation are not eligible for Federal-aid funding.

§772.17 Information for local officials.

(a) To minimize future traffic noise impacts on currently undeveloped lands of Type I projects, a highway agency shall inform local officials within whose jurisdiction the highway project is located of:

(1) Noise compatible planning concepts;

(2) The best estimation of the future design year noise levels at various distances from the edge of the nearest travel lane of the highway improvement where the future noise levels meet the highway agency's definition of "approach" for undeveloped lands or properties within the project limits. At a minimum, identify the distance to the exterior noise abatement criteria in Table 1;

(3) Non-eligibility for Federal-aid participation for a Type II project as described in §772.15(b).

(b) If a highway agency chooses to participate in a Type II noise program or to use the date of development as one of the factors in determining the reasonableness of a Type I noise abatement measure, the highway agency shall have a statewide outreach program to inform local officials and the public of the items in §772.17(a)(1) through (3).

§772.19 Construction noise.

For all Type I and II projects, a highway agency shall:

(a) Identify land uses or activities that may be affected by noise from construction of the project. The identification is to be performed during the project development studies.

(b) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall include a weighing of the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.

(c) Incorporate the needed abatement measures in the plans and specifications.

Table 1 to Part 772—Noise Abatement Criteria

[Hourly A-Weighted Sound Level_decibels (dB(A))[1]]

Activity category	Activity Leq(h)	Criteria[2] L10(h)	Evaluation location	Activity description
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[3]	67	70	Exterior	Residential.
C[3]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of

				worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F				Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G				Undeveloped lands that are not permitted.

[1]Either Leq(h) or L10(h) (but not both) may be used on a project.

[2]The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[3]Includes undeveloped lands permitted for this activity category.

APPENDIX B - Land Use Activity Categories and Noise Abatement Criteria

Table 1. Land Use Activity Categories and Noise Abatement Criteria

Activity Category	Activity Criteria[1] $L_{eq}(h)$, dBA	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A–D or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

[1]Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2]Includes undeveloped lands permitted for this activity category.

APPENDIX C - Feasibility and Reasonableness Worksheet

Feasibility and Reasonableness Worksheet Example

HIGHWAY TRAFFIC NOISE ABATEMENT FOR PROJECT:

Receiver ID No.(s):

Location/Description:

Activity Category type:

Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy):

Existing Noise Level (Leq):

Future Build Noise Level (Leq):

Future No-Build Noise Level:

Has a noise impact been identified (If yes continue filling out worksheet. If no, no noise abatement is required. Sign worksheet and recommend no noise abatement)?: Yes No

Highway Traffic Noise Abatement Feasibility and Reasonableness Analysis:

Feasibility

Is the proposed noise abatement measure acoustically feasible?	Yes	No

Is the proposed noise abatement measure engineering feasible	Yes	No

Reasonableness

Is the proposed noise abatement measure considered reasonable?	Yes	No

Federal Mandatory Factors

1 **Cost Effectiveness.** Is the abatement measure cost effective?

2 **Views of Benefited Residents and Property Owners.** Do at least 60 percent of the impacted residents and property owners' surveyed desire noise abatement?

3 **Noise reduction design goal**? Does the noise abatement measure provide 7 dBA reduction to 50 percent or more of the benefitted receptors in the first row of structures?

DOT&PF Mandatory Factors (State funded only)

4. Development vs. Highway Timing. Were at least 50 percent of benefited receptors in the development built before highway construction?

5 **Development Existence.** Have at least 50 percent of benefited receptors in the development existed for at least 10 years?

6 **Absolute Predicted Build Noise Level**. Are the predicted future build noise levels at least 66dBA?

7 **Relative Predicted Build Noise Level**. Are the predicted future build noise levels at least 10 dBA greater than the existing noise levels?

8 **Build vs. No-Build Noise Levels**. Are the future build noise levels at least 5 dBA greater than the future No-Build noise levels?

9..**Land Use**. Is the land use changing rapidly and are there local ordinances or zoning in place to control the new development of noise sensitive land uses adjacent to transportation corridors?

Is Noise Abatement recommended for this impacted receptor(s)?

What type of noise abatement is recommended? (Note – The use of quiet pavements is not an approved noise abatement measure on Federal- Aid Projects. Quiet pavements can be utilized as an abatement measure on State-funded projects with the approval of the Regional Preconstruction Engineer)

What is the basis for this recommendation?

_____ _____

Regional Environmental Manager Date

_____ _____

DOT&PF Project Manager Date

I have determined that the use of quiet pavement to mitigate noise impacts on a state-funded project is within the cost constraints of the legislative appropriation for the proposed project.

_____ _____

Preconstruction Engineer [3] Date

[3] The Preconstruction Engineer's signature is only required if quiet pavements are recommended on State-funded projects. The Preconstruction Engineer must determine whether the incorporation of quiet pavements into the State-funded project is within the cost constraints of the legislative appropriation