Gravina Access Project
Supplemental Environmental Impact Statement

Traffic Noise Memorandum
FINAL REPORT

DOT&PF Project No: 67698
Federal Project No: ACHP-0922(5)

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Abbreviations and Acronyms

CFR	Code of Federal Regulations
dB	decibels
dBA	A-weighted decibels
DOT&PF	Alaska Department of Transportation & Public Facilities
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
FHWA	Federal Highways Administration
GAP	Gravina Access Project
HP	horsepower
NAC	Noise Abatement Criteria
SEIS	Supplemental Environmental Impact Statement
TNM	Traffic Noise Model

1.0 Introduction

This report presents the results of the noise analysis prepared in support of the Gravina Access Project (GAP, or project) Supplemental Environmental Impact Statement (SEIS). This SEIS noise analysis updates the noise analysis presented in the 2004 Final Environmental Impact Statement (FEIS) for the project to comply with the Federal Highway Administration's (FHWA) 2010 update to its *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 CFR 772 [FHWA 2010]) and the resulting 2011 update of the Alaska Department of Transportation and Public Facilities (DOT&PF) *Noise Policy* (DOT&PF 2011).

2.0 Methods

Ambient noise levels were measured at nine properties in the project study area in June 2012 using a Larson Davis 820 noise meter in conjunction with a Larson Davis CAL200 acoustic calibrator. Ambient noise measurements were used for validating the FHWA's Traffic Noise Model (TNM Version 2.5) used in the analysis. Validation using ambient monitored data is included to demonstrate that the model is able to accurately predict noise levels using observed data. Ambient monitoring sites were selected to capture a representative sample of properties in the vicinity of each project alternative. In most cases, residential properties were selected for ambient monitoring; however, noise monitoring was conducted at one commercial property as well. The monitoring locations are shown in Figures 2 through 6 in Appendix A.

Noise levels were measured at 5 feet above ground level for a period of 15 minutes per measurement. Two measurements were taken at each site. For the purposes of model validation, the first measurement at each site was used to validate the noise model. Concurrent traffic counts were taken during the noise level monitoring.

A summary of the ambient monitored data and traffic data collected during each measurement is included in Appendix B.

Traffic noise levels were calculated using FHWA's TNM (Version 2.5). TNM computes highway traffic noise at nearby receivers and aids in the design of mitigation measures. Inputs to the model include three-dimensional descriptions of road alignments, vehicle volumes in defined vehicle classes, vehicle speeds, traffic control devices, and data on the characteristics and locations of specific ground types, topographical features, and other features likely to influence the propagation of vehicle noise between the roadway and the receiver. Appendix C includes TNM files in electronic format.

Existing highway traffic noise levels were modeled at 122 receptors (noise prediction sites), representing 243 individual properties in the vicinity of the project alternatives: 164 residential (Category B) properties, 2 churches (Category C), 72 commercial facilities (Category E), 3 USCG facility properties (Category F), and 2 airport sites (Category F). The location of modeled noise prediction sites are shown in Figures 1 through 6 in Appendix A.

The traffic data (e.g., peak hour traffic volumes and percentages of different types of vehicle [cars, trucks, etc.]) used as inputs to the TNM are the same as the traffic data used in support of the 2004 FEIS. Those data (from 2000) are representative of existing conditions in 2012 because levels of development in the study area have not changed substantially since 2000. Traffic data inputs to the TNM were provided by the DOT&PF. Appendix D includes a summary of the traffic data inputs to the TNM.

Noise from ferry operations were also modeled for the ferry alternatives (G2, G3, and G4). The two existing airport ferries are the M/V Ken Eichner II and the M/V Oral Freeman. Both ferries are equipped with two 850 horsepower (HP) Cummins KTA 38 MO propulsion engines, and were specially designed and built for service between the Ketchikan International Airport and the City of Ketchikan by Alaska Ship & Drydock.

The M/V Ken Eichner II and the M/V Oral Freeman ferries are small capacity vehicular roll-on/roll-off ferries that are similar in size and appearance to large tugboat vessels commonly used in a range of harbor operations. Because the ferries are custom built for the purpose, noise emission reference values for these ferries were not available in the literature, but noise emission data for tugboats with similar sized engines (a combined total of 1700 HP) were available to use as a proxy for the two airport shuttle ferries. It is assumed that future additional ferries brought into service as airport shuttles would be of a similar size.

Field monitoring of the existing airport shuttle ferries in Ketchikan was conducted in June 2012 and is presented in Appendix E. Measurements were made during ferry arrival and departures, and ferry idling and loading/unloading. The maximum observed hourly equivalent sound pressure levels (L_{eq}) during ferry arrivals and departures was 76 A-weighted decibels (dBA) and the maximum observed L_{eq} during ferry idling and loading/unloading was 72 dBA. Data used by the U.S. Army Corps of Engineers and the Port of Long Beach (USACE, 2009) for a 1,650-HP work tug estimate the L_{eq} at 50 feet at 82 dBA. Assuming an L_{eq} of 82 dBA for ferry operations (consistent with the USACE tugboat data) is a conservative approximation of the contribution of ferry-generated noise at receptors modeled for the project. During peak summer ferry operation (May through mid-August), two ferries would operate in tandem every 15 minutes between 10 a.m. and 5 p.m. Because the crossing is so short, it was assumed for the purposes of the analysis that one ferry would be at one or the other dock at any one time, and is therefore a constant source of noise at the nearest point to modeled receptors. For each ferry alternative, TNM-derived peak hour traffic noise levels were logarithmically added to peak period ferry noise estimates at the receptors to provide a combined project noise level.

Modeled noise levels for all alternatives were compared with applicable FHWA and DOT&PF noise abatement criteria to determine project impacts.

3.0 Affected Environment

Noise is defined as unwanted sound and is measured in decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies of sound are given more "weight." This process is known as "weighting" the frequency. The dBA scale corresponds to the sensitivity range for human hearing. All noise levels referred to in this report are stated as hourly L_{eq} in terms of dBA. The L_{eq} is defined as the average noise level, on an energy basis, for a stated period of time (in this case, hourly). Ambient noise level changes of 3 dBA are considered to be at the threshold of perceptible change for most adults with normal hearing.

3.1 Regulatory Overview

FHWA *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 CFR 772) defines noise abatement criteria (NAC) for traffic noise at different types of land uses next to highways. The NAC are presented in Table 3-1.

The DOT&PF *Noise Policy* states that potential noise impacts must be evaluated for all Type I federal-aid and state-funded highway construction, as defined by 23 CFR 772.5. Type I projects

are those projects that that involve constructing new highways or reconstructing existing highways by significantly changing either the horizontal or vertical alignment, or by increasing the number of through travel lanes.

Under 23 CFR 772, noise impacts occur when traffic noise levels approach or exceed the FHWA NAC for specific land use types, or when the predicted traffic noise levels substantially exceed the existing noise levels. The DOT&PF is responsible for implementing the FHWA regulations in Alaska, and considers a traffic noise impact to occur if predicted noise levels approach within 1 dBA of the FHWA NAC. This accounts for the 1-dBA difference between the federal and state NAC shown in Table 3-1. The DOT&PF considers a 15-dBA increase over existing noise levels to be a substantial exceedance. The NAC are applied to the peak noise impact hour. If an adverse noise impact is predicted, FHWA's regulations and DOT&PF policy require that noise abatement measures be considered.

3.2 Existing Noise Sources

Noise in the project area is generally attributable to transportation-related sources such as automobiles, airplanes, floatplanes, helicopters, ferries, and private and commercial boats. While these noise sources are present year-round, noise in the project area generally increases during the summer because these transportation activities increase with additional tourism and outdoor recreation activities that occur in the summer. Other noise sources include light industrial activities, and residential activities (such as voices, dogs, lawnmowers, etc.).

3.3 Noise Receptors

The noise analysis receptors (i.e., noise prediction sites), or areas that would be affected by noise on Revillagigedo Island, would be residences, churches, and commercial areas; i.e., Activity Categories B, C, and E in Table 3-1. Gravina Island is generally undeveloped (Category G), but is home to the Ketchikan International Airport (Category F), as well as a small number of residential properties (Category B) accessible only by boat (e.g., at Clam Cove).

Receptors in proximity to the proposed alternatives were identified during site visits and using aerial photographs. Receptors near Alternative G2 are on North Tongass Highway and Shoreline Drive. Under Alternative C3-4, receptors are located on Rex Allen Drive, Baker Street North, Bucey Avenue North, Larson Street, and North Tongass Highway. Under Alternative G4/G4v, receptors are located on Tongass Avenue, Cambria Drive, and Vallenar Drive. Under Alternative G3, receptors are located on Tongass Avenue, Jefferson Street, 1st Avenue, and 2nd Avenue. Under Alternative F3, receptors are located on South Tongass Highway, Forest Park Drive, Fireweed Lane, and Dogwood Place on Revillagigedo Island; the few residences on Pennock Island along the East Channel, and the few residences in the Clam Cove neighborhood on Gravina Island.

Table 3-1: Noise Abatement Criteria

Land Use - Primary Activity Category	Activity Category $L_{eq(h)}$[1]		Evaluation Location	Land Use Activity Description
	FHWA Noise Abatement Criteria	DOT&PF Noise Abatement Criteria[2]		
A	57	56	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where preserving those qualities is essential if the area is to continue to serve its intended purpose.
B[3]	67	66	Exterior	Residential.
C[3]	67	66	Exterior	Active sports 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	51	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	71	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] The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

[2] DOT&PF noise abatement "approach" criteria.

[3] Includes undeveloped lands permitted for this activity category.

3.4 Model Validation

Existing noise levels were measured at nine properties within the project study area for the purpose of validating the noise model, and providing a general indication of existing noise levels. The monitoring locations are shown in Figures 2 through 6 in Appendix A.

Table 3-2 presents the existing noise levels (L_{eq}) for each monitoring location, the alternative nearest to each location, and the noise impact threshold for applicable activity categories. Two noise measurements were taken at each monitoring site (Period 1 and Period 2 in column five of Table 3-2). For the purposes of model validation, the first measurement at each site was used to validate the noise model. The existing noise levels do not exceed the noise impact thresholds.

Table 3-2: Monitored and Modeled Noise Levels in the Project Study Area (L_{eq} - dBA)

Monitoring Site	Site Address	Nearest Project Alternative	Activity Category (Category NAC [dBA])	Monitored Noise Level (Period 1/ Period 2)	TNM Predicted Noise Level	Difference Between Period 1 Monitored and TNM Predicted Noise Levels
M1	110 W Fireweed Lane, Ketchikan	F3	B (66)	56.5/57.3	58.0	1.5
M2	2720 2nd Avenue, Ketchikan	G3	B (66)	62.3/62.4	59.8	2.5
M3	Pioneer Heights Snr Housing, Unit 100, 4640 N Tongass	C3-4	B (66)	63.8/63.5	62.5	1.3
M4	38 Baker Street, Ketchikan	C3-4	B (66)	60.3/60.1	62.0	1.7
M5	5362 N Tongass, Ketchikan	G2	B (66)	64.8/65.0	63.6	1.2
M6	5227 Shoreline Drive, Ketchikan	G2	B (66)	52.3/50.3	51.6	0.7
M7	4131 Vallenar Drive, Ketchikan	G4/G4v	B (66)	56.0/54.8	53.3	2.7
M8	Ketchikan Autobody & Glass, 4979 Rex Allen Drive	C3-4	E (71)	52.8/53.0	53.2	0.4
M9	South end of Gravina Island Hwy, Proxy for Clam Cove Residences	F3	B (66)	39.8/54.4[1]	-	-

[1] Noise levels for TNM validation were made by pausing the measurements during contributions from aircraft, except for Period 2 at Site M9 to show relative contribution from aircraft in the project study area.

Traffic noise is not a significant contributor to the noise levels at site M9; therefore, TNM validation was not conducted for this site. A comparison of the noise levels predicted using the TNM for the other eight sites, using traffic data collected during the ambient monitoring, and noise levels monitored in the field (Table 3-2) shows that monitored and modeled results are within 3 dBA, and therefore the model is considered to reasonably predict noise levels.

3.5 Existing Noise Levels

Modeled existing noise levels for the peak traffic hour at noise prediction sites located in the project study area are listed in Table 3-3. Noise levels calculated to be in exceedance of the DOT&PF NAC are shown in shaded cells.

Table 3-3: Modeled Peak Hour Noise Levels (L_{eq}) for the Existing Condition

Receptor (Alt-#) and/or Monitoring (M#) Sites	Land Use	NAC Activity Category	Number of Properties	NAC (dBA)	Noise Level (dBA) for Peak Hour Traffic Volume
C3/4-1	Residential	B	3	66	61
C3/4-2	Commercial	E	1	71	64
C3/4-3	Commercial	E	1	71	50
C3/4-4	Commercial	E	3	71	49
C3/4-5	Commercial	E	1	71	49
C3/4-6	Commercial	E	1	71	47
C3/4-7 & M8	Commercial	E	1	71	56
C3/4-8	Commercial	E	1	71	49
C3/4-9	Commercial	E	1	71	62
C3/4-10	Commercial	E	1	71	60
C3/4-11	Residential	B	1	66	67
C3/4-12	Residential	B	1	66	56
C3/4-13	Commercial	E	1	71	59
C3/4-14	Motel	B	1	66	60
C3/4-15	Commercial	E	5	71	70
C3/4-16	Residential	B	1	66	68
C3/4-17	Residential	B	2	66	63
C3/4-18	Residential	B	1	66	57
C3/4-19 & M4	Residential	B	1	66	66
C3/4-20	Residential	B	1	66	70
C3/4-21	Residential	B	2	66	65
C3/4-22	Residential	B	2	66	58
C3/4-23	Residential	B	1	66	67
C3/4-24	Residential	B	1	66	63
C3/4-25	Residential	B	1	66	67
C3/4-26	Residential	B	1	66	59
C3/4-27	Commercial	E	4	71	71
C3/4-28	Residential	B	1	66	69
C3/4-29	Residential	B	1	66	68
C3/4-30 & M3	Residential	B	12	66	64
C3/4-31	Airport	F	1	-	45
F3-1	USCG	F	1	-	48
F3-2	USCG	E	1	71	45
F3-3	Residential	B	1	66	56
F3-4	USCG	F	1	-	41
F3-5	Residential	B	1	66	71
F3-6	Residential	B	2	66	65

Receptor (Alt-#) and/or Monitoring (M#) Sites	Land Use	NAC Activity Category	Number of Properties	NAC (dBA)	Noise Level (dBA) for Peak Hour Traffic Volume
F3-7	Commercial	E	1	71	55
F3-8	Residential	B	2	66	35
F3-9	Residential	B	2	66	43
F3-10	Residential	B	3	66	43
F3-11	Residential	B	1	66	39
F3-12	Residential	B	1	66	50
F3-13 & M1	Residential	B	2	66	60
F3-14	Residential	B	3	66	45
F3-15	Residential	B	1	66	63
F3-16	Residential	B	3	66	64
F3-17	Residential	B	4	66	57
F3-18	Residential	B	3	66	43
F3-19	Residential	B	2	66	41
F3-20	Residential	B	7	66	40
F3-21	Residential	B	3	66	30
F3-22	Residential	B	1	66	29
F3-23	Residential	B	6	66	29
F3-24	Residential	B	3	66	30
G2-1	Residential	B	2	66	56
G2-2	Residential	B	2	66	66
G2-3	Residential	B	4	66	68
G2-4	Residential	B	3	66	66
G2-5	Residential	B	1	66	59
G2-6	Residential	B	3	66	59
G2-7	Commercial	E	1	71	60
G2-8	Residential	B	1	66	49
G2-9	Commercial	E	1	71	54
G2-10	Commercial	E	1	71	58
G2-11	Residential	B	3	66	67
G2-12	Commercial	E	2	71	61
G2-13	Residential	B	1	66	69
G2-14	Commercial	E	1	71	62
G2-15 & M5	Residential	B	2	66	67
G2-16	Commercial	E	2	71	58
G2-17	Commercial	E	3	71	56
G2-18	Residential	B	5	66	69
G2-19	Residential	B	3	66	62
G2-20	Residential	B	2	66	54

Receptor (Alt-#) and/or Monitoring (M#) Sites	Land Use	NAC Activity Category	Number of Properties	NAC (dBA)	Noise Level (dBA) for Peak Hour Traffic Volume
G2-21	Residential	B	1	66	58
G2-22	Residential	B	2	66	67
G2-23 & M6	Residential	B	5	66	53
G3-1	Residential	B	4	66	68
G3-2	Commercial	E	1	71	57
G3-3	Commercial	E	1	71	57
G3-4	Residential	B	3	66	63
G3-5 & M2	Residential	B	3	66	60
G3-6	Residential	B	1	66	65
G3-7	Churches	C	2	66	61
G3-8	Residential	B	1	66	65
G3-9	Commercial	E	3	71	56
G3-10	Residential	B	4	66	56
G3-11	Commercial	E	1	71	65
G3-12	Residential	B	6	66	53
G3-13	Commercial	E	2	71	64
G3-14	Commercial	E	2	71	57
G3-15	Commercial	E	2	71	58
G3-16	Commercial	E	2	71	49
G3-17	Residential - Apartments	B	1	66	45
G3-18	Commercial	E	1	71	45
G3-19	Commercial	E	1	71	60
G3-20	Commercial	E	2	71	67
G3-21	Residential	B	3	66	54
G3-22	Residential - Apartments	B	1	66	62
G3-23	Commercial	E	1	71	57
G3-24	Residential	B	1	66	56
G3-25	Commercial	E	1	71	57
G3-26	Commercial	E	3	71	67
G3-27	Commercial - Mall	E	1	71	46
G3-28	Commercial	E	1	71	46
G4-1	Commercial	E	1	71	68
G4-2	Commercial	E	1	71	68
G4-3	Commercial	E	1	71	60
G4-4	Commercial	E	1	71	65
G4-5	Commercial	E	2	71	44
G4-6	Residential	B	3	66	42

Receptor (Alt-#) and/or Monitoring (M#) Sites	Land Use	NAC Activity Category	Number of Properties	NAC (dBA)	Noise Level (dBA) for Peak Hour Traffic Volume
G4-7	Residential	B	4	66	44
G4-8	Residential	B	2	66	51
G4-9 & M7	Residential	B	1	66	54
G4-10	Residential	B	1	66	51
G4-11	Commercial	E	2	71	66
G4-12	Commercial	E	3	71	66
G4-13	Commercial	E	1	71	52
G4-14	Commercial	E	1	71	51
G4-15	Commercial	E	1	71	58
G4-16	Airport	F	1	-	45

Under existing conditions, exterior noise levels range from 29 to 71 dBA at modeled properties in the project study. Thirty five residential and four commercial properties are calculated to have existing exterior traffic noise levels greater than the DOT&PF noise abatement criteria.

4.0 Environmental Consequences

Traffic noise impacts were evaluated based on FHWA and DOT&PF definitions and criteria. Direct impacts, described in Section 4.1, are impacts that result from the physical presence of the facilities once they are constructed. The impacts of construction-related noise under the action alternatives are described in Section 4.2 (Construction Impacts). The impacts of future project-related traffic and ferry noise are described in Section 4.3 (Secondary Impacts). No other noise sources are associated with the proposed project alternatives.

4.1 Direct Impacts

4.1.1 No Action Alternative

Noise levels in the Ketchikan area would not increase as a result of the No Action Alternative.

4.1.2 Alternatives C3-4, F3, G2, G3, and G4/G4v

Traffic volumes in the first few years after the project is built would be similar to existing traffic volumes on the airport ferry and would not affect noise levels in the vicinity of the alternative alignments.

Under Alternative C3-4, seaplanes taking off and landing in the vicinity of the bridge would need to alter their travel pattern for taxiing at takeoff and landing. This would not likely alter overall noise levels at receptors in the area.

Under Alternative F3, flight paths of seaplanes departing the Ketchikan Harbor Seaplane Base might be altered by the presence of a bridge over the East and West Channels, which could increase noise levels for Pennock Island residents. Typically, seaplanes taking off to the south but bound for points north make their northward turn at the south end of Pennock Island. With the Alternative F3 bridges in place, seaplanes might need to make their northward turn north of the bridge, which would involve flying over the northern end of Pennock Island, where many of

the residences on Pennock Island are located. Residents of these areas could experience increased noise from seaplane traffic as a result of this altered flight pattern.

Under Alternatives G2, G3, and G4, new ferry service would add ferry noise at the ferry terminal locations on Revillagigedo Island. Ferry terminals themselves would be considered Category F land uses, generating their own noises, and would not be considered noise-sensitive land uses.

4.2 Construction Impacts: Noise and Vibration

The majority of the potential construction areas is primarily open space on Gravina and Pennock islands. On Revillagigedo Island, the construction areas would be adjacent to existing industrial, residential, and commercial properties. Residential areas are considered the receptors most sensitive to noise. Under all alternatives, construction would generate noise from equipment such as chain saws, front-end loaders, cranes, pile drivers, power generators, and trucks, including engine noise and backup bells. Vibrations can also be disruptive to people, structures, fish, and wildlife.

4.2.1 Construction Noise

Temporary construction noise would result from the construction activities anticipated under each project alternative. Noise levels for these activities can be expected to range from approximately 70 to 100 dBA at sites 50 feet from the activities (see Table 4-1).

Table 4-1: Typical Construction Noise Levels (dBA)

Types of Activities	Types of Equipment	Range of Noise Levels at 50 Feet (dBA)
Materials Handling	Concrete mixers	75-87
	Concrete pumps	81-83
	Cranes (movable)	76-87
	Cranes (derrick)	86-88
Stationary Equipment	Pumps	69-71
	Generators	71-82
	Compressors	74-87
Impact Equipment	Blasting[1]	94-100
	Pile Driver[1]	95-101
	Pneumatic wrenches	83-88
	Rock drills	81-98
Land Clearing	Bulldozer	77-96
	Dump truck	82-94
Grading	Scraper	80-93
	Bulldozer	77-96
Paving	Paver	86-88
	Dump truck	82-94

Source: U. S. Environmental Protection Agency, 1971 unless otherwise noted.

[1] Source: FHWA, Roadway Construction Noise Model User's Guide, 2006.

4.2.1.1 Bridge Alternatives C3-4 and F3

Bridge construction would generate noise from equipment. The effects of construction noise would be most noticeable in the area immediately surrounding the construction site. Under Alternative C3-4, the project would require construction activity in the vicinity of residential neighborhoods near Baker Street North, Bucey Avenue North, Larson Street, and Tongass Highway. Construction of Alternative C3-4 would require blasting to remove bedrock in some areas on Revillagigedo Island. Noise from blasting would be of short duration, but may be in the 75 to 80 dBA range during blasting operations at the nearest residences. Blasting would be restricted to daytime hours only.

Under Alternative F3, construction would occur in the vicinity of residential neighborhoods along South Tongass Highway near the USCG Station, Forest Park Drive, Fireweed Lane, and Dogwood Place on Revillagigedo Island; near residences on Pennock Island in the vicinity of the East Channel bridge touchdown; and residences in the Clam Cove neighborhood on Gravina Island in the vicinity of the West Channel bridge touchdown. Construction noise in these areas could cause annoyance, but would be minimized by adherence to the City of Ketchikan's noise regulations (see Section 4.2.1.3).

4.2.1.2 Ferry Alternatives G2, G3, G4/G4v

Construction of new ferry facilities under Alternatives G2, G3, and G4/G4v would generate noise from equipment. The construction activities on Revillagigedo Island would be confined to the new ferry terminal site and the site of the existing airport ferry where site improvements would be made.

Construction noise in the vicinity of the project alternatives could disrupt residential activities in these areas during the construction period, but would be minimized by adherence to the City of Ketchikan's noise regulations (see Section 4.2.1.3).

4.2.1.3 Mitigation of Construction Impacts from Noise

In accordance with City of Ketchikan noise regulations (City of Ketchikan Municipal Code, Title 19, Section 05, *Construction and Excavation Activities – Noise Restrictions*), construction activities would be prohibited between the hours of 10:00 p.m. and 6:00 a.m. to minimize disruption to residents. The project may request some exceptions to the noise regulations during special construction activities.

4.2.2 Construction Vibration

The effects of ground-borne vibration include perceptible movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for normal transportation projects, with the occasional exception of blasting and pile-driving during construction. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings.

Blasting and pile driving can be a major source of vibration on land and in the water. Less substantial sources of vibration are movements of heavy equipment on land and large boats in the water, and dredging operations in water. The effects of construction vibration associated with each alternative are described in the following sections.

4.2.2.1 Alternative C3-4

Construction of Alternative C3-4 would require blasting to remove bedrock in some areas on Revillagigedo Island. Tight control of blasting would minimize the risk of slides; the nearby area would be closed immediately before the blast and remain closed until after the blasted area had been inspected. Short-duration vibration may be perceptible at the closest properties to the blasting location; however, blasting-related vibration is not expected to be sufficient to cause structural damage.

In Tongass Narrows, pile driving would generate vibration, which would affect aquatic resources. Vibration impacts to these resources from pile driving are described in Sections 4.25.12.3 and 4.25.15 of the SEIS.

4.2.2.2 Alternative F3

No blasting on Revillagigedo Island would be expected for Alternative F3. On Gravina and Pennock islands, the roadway would require minimal blasting to remove bedrock. Residents of Gravina and Pennock islands may feel the vibration associated with the blasting, as might wildlife in the area of the blasting, but the vibration would not have long-term, adverse effects on residents or wildlife resources.

In Tongass Narrows, underwater blasting and pile driving during pier construction and channel widening would generate vibration, which would affect aquatic resources. These impacts will be addressed in the Gravina Access Project SEIS.

4.2.2.3 Alternatives G2, G3, G4/G4v

No blasting on Revillagigedo Island would be expected under any of the ferry alternatives. On Gravina Island, roadway widening and improvements would require minimal blasting to remove bedrock. Gravina Island residents may feel vibration associated with the blasting, as might wildlife in the area of the blasting, but the vibration would not have long-term adverse effects on these resources.

In Tongass Narrows, pile driving during ferry terminal pier construction would generate vibration, which would affect aquatic resources. These impacts will be addressed in the Gravina Access Project SEIS.

4.2.2.4 Mitigation for Construction Impacts from Vibration

Blasting would be controlled to avoid damage of nearby structures and to meet the requirements of the local noise ordinance. In-water blasting, pile driving, and/or drilling would be controlled to ensure that the pressure waves generated would not pose a consistent, adverse threat to fish and other marine resources. The construction contractors would adhere to permit conditions for in-water work during construction.

4.3 Secondary Impacts

Secondary noise impacts would result from new residential, commercial, and industrial developments that would occur because of improved access to Gravina Island (i.e., induced growth); long-term operations at the new industrial and commercial sites; and vehicular travel associated with the new land uses on Gravina Island. Noise from commercial and industrial sources would be limited to development zones specifically intended for such uses; therefore, the nearby land uses would not be expected to be sensitive to noise emanating from these sources.

In accordance with FHWA noise regulations (23 CFR Part 772) and the DOT&PF *Noise Policy* (DOT&PF, 2011), noise impacts were determined using traffic forecasts associated with the proposed bridge and ferry alternatives, as well as the No Action Alternative. Future noise levels were modeled using the FHWA TNM (Version 2.5). The model inputs include:

- Afternoon peak hour traffic volumes for 2025, assuming medium economic growth and development (DOT&PF 2002);
- A proposed fleet mix for vehicle travel north of Dock Street of 92.0 percent Autos, 6.2 percent Medium Trucks, 0.4 percent Heavy Trucks, 1.3 percent Buses, and 0.13 percent Motorcycles (Purves 2003);
- A proposed fleet mix for vehicle travel south of Dock Street of 93.7 percent Autos, 4.0 percent Medium Trucks, 0.4 percent Heavy Trucks, 1.8 percent Buses, and 0.1 percent Motorcycles (Purves 2003);
- Operational speed on Tongass Avenue of 50 mph north of the existing airport ferry terminal, 25 mph from the ferry terminal to Schoenbar Road, 20 mph from Schoenbar Road to Deermount Avenue (a.k.a. Mill Street and Stedman Street), 30 mph from Deermount Avenue to the USCG station, and 45 mph south of the USCG station;
- Operational speed of 45 mph along the alternative roadway and on proposed bridges, where applicable.

The TNM modeling used default options for meteorological conditions and pavement type (i.e., 50 percent humidity, 68°F, average pavement type).

Traffic noise levels were modeled at discrete receptors in the vicinity of each project alternative (see Figures 1 through 6 in Appendix A), and are described in the sections below.

4.3.1 No Action Alternative

Future (2025) No Action Alternative noise levels were modeled at 122 receptors (noise prediction sites), representing 164 residential properties (Category B), 2 churches (Category C), 72 commercial facilities (Category E), 3 USCG facility properties (Category F), and 2 airport sites (Category F) within the study area. The modeled No Action Alternative roadway configuration is the same as the existing configuration. The results for the No Action Alternative analysis are shown in Table 4-2. Predicted noise impacts are shown in shaded cells.

Table 4-2: Predicted Noise Levels (L_{eq}) for the Existing Condition and Future (2025) Condition under No Action Alternative Assuming Peak Hour Traffic Volume

Receptor #	Land Use	Activity Category	Number of Properties	Noise Abatement Criteria (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)
C3/4-1	Residential	B	3	66	61	62
C3/4-2	Commercial	E	1	71	64	66
C3/4-3	Commercial	E	1	71	50	51
C3/4-4	Commercial	E	3	71	49	51
C3/4-5	Commercial	E	1	71	49	51
C3/4-6	Commercial	E	1	71	47	48
C3/4-7 &M8	Commercial	E	1	71	56	58

Receptor #	Land Use	Activity Category	Number of Properties	Noise Abatement Criteria (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)
C3/4-8	Commercial	E	1	71	49	50
C3/4-9	Commercial	E	1	71	62	64
C3/4-10	Commercial	E	1	71	60	62
C3/4-11	Residential	B	1	66	67	68
C3/4-12	Residential	B	1	66	56	57
C3/4-13	Commercial	E	1	71	59	60
C3/4-14	Motel	B	1	66	60	61
C3/4-15	Commercial	E	5	71	70	72
C3/4-16	Residential	B	1	66	68	69
C3/4-17	Residential	B	2	66	63	65
C3/4-18	Residential	B	1	66	57	59
C3/4-19 & M4	Residential	B	1	66	66	68
C3/4-20	Residential	B	1	66	70	72
C3/4-21	Residential	B	2	66	65	67
C3/4-22	Residential	B	2	66	58	59
C3/4-23	Residential	B	1	66	67	69
C3/4-24	Residential	B	1	66	63	64
C3/4-25	Residential	B	1	66	67	68
C3/4-26	Residential	B	1	66	59	60
C3/4-27	Commercial	E	4	71	71	72
C3/4-28	Residential	B	1	66	69	71
C3/4-29	Residential	B	1	66	68	69
C3/4-30 & M3	Residential	B	12	66	64	65
C3/4-31	Airport	F	1	-	45	47
F3-1	USCG	F	1	-	48	50
F3-2	USCG	E	1	71	45	46
F3-3	Residential	B	1	66	56	58
F3-4	USCG	F	1	-	41	42
F3-5	Residential	B	1	66	71	73
F3-6	Residential	B	2	66	65	66
F3-7	Commercial	E	1	71	55	57
F3-8	Residential	B	2	66	35	37
F3-9	Residential	B	2	66	43	45
F3-10	Residential	B	3	66	43	44
F3-11	Residential	B	1	66	39	41
F3-12	Residential	B	1	66	50	51
F3-13 & M1	Residential	B	2	66	60	62
F3-14	Residential	B	3	66	45	47
F3-15	Residential	B	1	66	63	65
F3-16	Residential	B	3	66	64	65

Receptor #	Land Use	Activity Category	Number of Properties	Noise Abatement Criteria (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)
F3-17	Residential	B	4	66	57	59
F3-18	Residential	B	3	66	43	44
F3-19	Residential	B	2	66	41	43
F3-20	Residential	B	7	66	40	42
F3-21	Residential	B	3	66	30	31
F3-22	Residential	B	1	66	29	31
F3-23	Residential	B	6	66	29	31
F3-24	Residential	B	3	66	30	31
G2-1	Residential	B	2	66	56	58
G2-2	Residential	B	2	66	66	68
G2-3	Residential	B	4	66	68	70
G2-4	Residential	B	3	66	66	68
G2-5	Residential	B	1	66	59	61
G2-6	Residential	B	3	66	59	61
G2-7	Commercial	E	1	71	60	61
G2-8	Residential	B	1	66	49	51
G2-9	Commercial	E	1	71	54	55
G2-10	Commercial	E	1	71	58	60
G2-11	Residential	B	3	66	67	69
G2-12	Commercial	E	2	71	61	63
G2-13	Residential	B	1	66	69	70
G2-14	Commercial	E	1	71	62	64
G2-15 & M5	Residential	B	2	66	67	68
G2-16	Commercial	E	2	71	58	60
G2-17	Commercial	E	3	71	56	58
G2-18	Residential	B	5	66	69	70
G2-19	Residential	B	3	66	62	63
G2-20	Residential	B	2	66	54	56
G2-21	Residential	B	1	66	58	59
G2-22	Residential	B	2	66	67	68
G2-23 & M6	Residential	B	5	66	53	55
G3-1	Residential	B	4	66	68	70
G3-2	Commercial	E	1	71	57	59
G3-3	Commercial	E	1	71	57	58
G3-4	Residential	B	3	66	63	64
G3-5 & M2	Residential	B	3	66	60	62
G3-6	Residential	B	1	66	65	67
G3-7	Churches	C	2	66	61	63
G3-8	Residential	B	1	66	65	67
G3-9	Commercial	E	3	71	56	57

Receptor #	Land Use	Activity Category	Number of Properties	Noise Abatement Criteria (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)
G3-10	Residential	B	4	66	56	57
G3-11	Commercial	E	1	71	65	66
G3-12	Residential	B	6	66	53	55
G3-13	Commercial	E	2	71	64	65
G3-14	Commercial	E	2	71	57	58
G3-15	Commercial	E	2	71	58	60
G3-16	Commercial	E	2	71	49	50
G3-17	Residential - Apartments	B	1	66	45	47
G3-18	Commercial	E	1	71	45	47
G3-19	Commercial	E	1	71	60	61
G3-20	Commercial	E	2	71	67	68
G3-21	Residential	B	3	66	54	56
G3-22	Residential - Apartments	B	1	66	62	64
G3-23	Commercial	E	1	71	57	59
G3-24	Residential	B	1	66	56	58
G3-25	Commercial	E	1	71	57	58
G3-26	Commercial	E	3	71	67	69
G3-27	Commercial - Mall	E	1	71	46	47
G3-28	Commercial	E	1	71	46	47
G4-1	Commercial	E	1	71	68	70
G4-2	Commercial	E	1	71	68	70
G4-3	Commercial	E	1	71	60	62
G4-4	Commercial	E	1	71	65	66
G4-5	Commercial	E	2	71	44	45
G4-6	Residential	B	3	66	42	44
G4-7	Residential	B	4	66	44	46
G4-8	Residential	B	2	66	51	53
G4-9 & M7	Residential	B	1	66	54	56
G4-10	Residential	B	1	66	51	52
G4-11	Commercial	E	2	71	66	67
G4-12	Commercial	E	3	71	66	67
G4-13	Commercial	E	1	71	52	54
G4-14	Commercial	E	1	71	51	52
G4-15	Commercial	E	1	71	58	59
G4-16	Airport	F	1	-	45	47

Under the No Action Alternative, modeled noise levels are expected to increase by 1 to 2 dBA over existing conditions because of traffic volume growth over time. Thirty-nine residential and 10 commercial properties (Categories B and E, respectively) within the study area are predicted

to have exterior traffic noise levels equal to or above the applicable DOT&PF NAC under the No Action Alternative.

4.3.2 Alternative C3-4

Modeled future noise levels at properties in the vicinity of Alternative C3-4 are shown in Table 4-3. The modeled Alternative C3-4 roadway configuration is shown in Figure 2 in Appendix A. Modeled noise impact locations are shown in shaded cells.

Table 4-3: Predicted Noise Levels (L_{eq}) for the Existing Condition and Future (2025) Condition under No Action Alternative and Alternative C3-4 Assuming Peak Hour Traffic Volume

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt C3-4 2025 Noise Levels (dBA)
C3/4-1	Residential	B	3	66	61	62	63
C3/4-2	Commercial	E	1	71	64	66	66
C3/4-3	Commercial	E	1	71	50	51	54
C3/4-4	Commercial	E	3	71	49	51	55
C3/4-5[1]	Commercial	E	1	71	49	51	-
C3/4-6	Commercial	E	1	71	47	48	62
C3/4-7 &M8	Commercial	E	1	71	56	58	60
C3/4-8	Commercial	E	1	71	49	50	58
C3/4-9	Commercial	E	1	71	62	64	65
C3/4-10	Commercial	E	1	71	60	62	62
C3/4-11	Residential	B	1	66	67	68	69
C3/4-12	Residential	B	1	66	56	57	58
C3/4-13	Commercial	E	1	71	59	60	61
C3/4-14	Motel	B	1	66	60	61	62
C3/4-15	Commercial	E	5	71	70	72	73
C3/4-16	Residential	B	1	66	68	69	70
C3/4-17	Residential	B	2	66	63	65	65
C3/4-18	Residential	B	1	66	57	59	60
C3/4-19 & M4	Residential	B	1	66	66	68	69
C3/4-20	Residential	B	1	66	70	72	73
C3/4-21	Residential	B	2	66	65	67	67
C3/4-22	Residential	B	2	66	58	59	60
C3/4-23	Residential	B	1	66	67	69	69
C3/4-24	Residential	B	1	66	63	64	65
C3/4-25	Residential	B	1	66	67	68	69
C3/4-26	Residential	B	1	66	59	60	61
C3/4-27	Commercial	E	4	71	71	72	73
C3/4-28	Residential	B	1	66	69	71	71
C3/4-29	Residential	B	1	66	68	69	70

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt C3-4 2025 Noise Levels (dBA)
C3/4-30 & M3	Residential	B	12	66	64	65	66
C3/4-31	Airport	F	1	-	45	47	63

[1] Model Receptor C3/4-5 would be displaced under Alternative C3-4.

Under Alternative C3-4, 22 residential properties (Category B), 10 commercial properties (Category E), and 1 airport property (Category F) are predicted to experience noise impacts. The 22 residential properties and 9 of the commercial properties are predicted to experience noise levels greater than or equal to the DOT&PF NAC, compared to 10 residential and 9 commercial properties under the future No Action Alternative. The other two potentially affected properties are predicted to experience substantial increases over the existing condition: Ketchikan International Airport (Receptor C3/4-31), which is predicted to have peak hour L_{eq} noise levels 18 dBA above existing conditions; and a commercial property (Receptor C3/4-6) close to the Alternative C3-4 alignment on Rex Allen Drive, which is predicted to have peak hour L_{eq} noise levels 15 dBA over existing conditions. In both cases, substantial increases are expected because of very low existing traffic volumes and the proximity of these receptors to the proposed roadway alignments.

Under Alternative C3-4, increases in noise levels are predicted to range from 2 to 18 dBA over existing conditions.

The results also show that changes in noise levels under Alternative C3-4 are predicted to range from 0 dBA to an increase of 16 dBA over the No Action Alternative. Changes in noise levels are due to changes in roadway alignment, changes in shielding, and decibel rounding.

4.3.3 Alternative F3

Modeled future noise levels at properties in the vicinity of Alternative F3 are shown in Table 4-4. The modeled Alternative F3 roadway configuration is shown in Figure 3 in Appendix A. Modeled noise impacts are shown in shaded cells.

Table 4-4: Predicted Noise Levels (L_{eq}) for the Existing Condition and Future (2025) Condition under No Action Alternative and Alternative F3 Assuming Peak Hour Traffic Volume

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt F3 2025 Noise Levels (dBA)
F3-1	USCG	F	1	-	48	50	51
F3-2	USCG	E	1	71	45	46	48
F3-3	Residential	B	1	66	56	58	59
F3-4	USCG	F	1	-	41	42	45
F3-5	Residential	B	1	66	71	73	74
F3-6	Residential	B	2	66	65	66	67

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt F3 2025 Noise Levels (dBA)
F3-7	Commercial	E	1	71	55	57	58
F3-8	Residential	B	2	66	35	37	40
F3-9	Residential	B	2	66	43	45	48
F3-10	Residential	B	3	66	43	44	45
F3-11	Residential	B	1	66	39	41	45
F3-12	Residential	B	1	66	50	51	53
F3-13 & M1	Residential	B	2	66	60	62	62
F3-14	Residential	B	3	66	45	47	49
F3-15	Residential	B	1	66	63	65	65
F3-16	Residential	B	3	66	64	65	66
F3-17	Residential	B	4	66	57	59	59
F3-18	Residential	B	3	66	43	44	48
F3-19	Residential	B	2	66	41	43	44
F3-20	Residential	B	7	66	40	42	43
F3-21	Residential	B	3	66	30	31	37
F3-22	Residential	B	1	66	29	31	37
F3-23	Residential	B	6	66	29	31	38
F3-24	Residential	B	3	66	30	31	37

Under Alternative F3, six residential properties (Category B) are predicted to experience noise levels greater than or equal to the DOT&PF NAC. No substantial noise increases are predicted under this alternative. Increases in traffic-related noise under Alternative F3 range from 2 to 9 dBA over existing conditions and from 0 to 7 dBA over the future No Action Alternative. The increases in noise levels are due to changes in roadway alignment, changes in shielding, and decibel rounding.

4.3.4 Alternative G2

Combined future highway and ferry noise levels at properties in the vicinity of Alternative G2 are shown in Table 4-5. The Alternative G2 ferry alignment is shown in Figure 4 in Appendix A. Predicted noise impacts are shown in shaded cells.

Table 4-5: Predicted Noise Levels (L_{eq}) for the Existing Condition and Future (2025) Condition under No Action Alternative and Alternative G2 Assuming Peak Hour Traffic Volume

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt G2 2025 Noise Levels (dBA)
G2-1	Residential	B	2	66	56	58	59
G2-2	Residential	B	2	66	66	68	68
G2-3	Residential	B	4	66	68	70	70

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt G2 2025 Noise Levels (dBA)
G2-4	Residential	B	3	66	66	68	68
G2-5	Residential	B	1	66	59	61	62
G2-6	Residential	B	3	66	59	61	61
G2-7	Commercial	E	1	71	60	61	62
G2-8	Residential	B	1	66	49	51	55
G2-9	Commercial	E	1	71	54	55	58
G2-10	Commercial	E	1	71	58	60	62
G2-11	Residential	B	3	66	67	69	69
G2-12	Commercial	E	2	71	61	63	64
G2-13	Residential	B	1	66	69	70	70
G2-14	Commercial	E	1	71	62	64	64
G2-15 & M5	Residential	B	2	66	67	68	68
G2-16	Commercial	E	2	71	58	60	61
G2-17	Commercial	E	3	71	56	58	59
G2-18	Residential	B	5	66	69	70	70
G2-19	Residential	B	3	66	62	63	64
G2-20	Residential	B	2	66	54	56	57
G2-21	Residential	B	1	66	58	59	60
G2-22	Residential	B	2	66	67	68	68
G2-23 & M6	Residential	B	5	66	53	55	56

Under Alternative G2, 22 residential (Category B) properties are predicted to experience noise levels equal to or above the DOT&PF NAC. The same 22 residential properties are predicted to experience noise levels equal to or above the DOT&PF NAC under the No Action Alternative. No substantial noise increase impacts are predicted as a result of the project.

The results of the analysis show that increases in noise levels under Alternative G2 are predicted to range from 1 to 6 dBA over existing conditions. The results also show that changes in noise levels under Alternative G2 are predicted to range from no change (0 dBA change) to an increase of 4 dBA over the future No Action Alternative noise levels. Changes in noise levels are due to changes in roadway alignment, the addition of ferry noise, and decibel rounding.

4.3.5 Alternative G3

Modeled future noise levels at properties in the vicinity of Alternative G3 are shown in Table 4-6. The Alternative G3 ferry alignment is shown in Figure 5 in Appendix A. Predicted noise impacts are shown in shaded cells.

Table 4-6: Predicted Noise Levels (L_{eq}) for the Existing Condition and Future (2025) Condition under No Action Alternative G3 Assuming Peak Hour Traffic Volume

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt G3 2025 Noise Levels (dBA)
G3-1	Residential	B	4	66	68	70	70
G3-2	Commercial	E	1	71	57	59	60
G3-3	Commercial	E	1	71	57	58	60
G3-4	Residential	B	3	66	63	64	65
G3-5 & M2	Residential	B	3	66	60	62	62
G3-6	Residential	B	1	66	65	67	67
G3-7	Churches	C	2	66	61	63	64
G3-8	Residential	B	1	66	65	67	67
G3-9	Commercial	E	3	71	56	57	60
G3-10	Residential	B	4	66	56	57	59
G3-11	Commercial	E	1	71	65	66	67
G3-12	Residential	B	6	66	53	55	58
G3-13	Commercial	E	2	71	64	65	66
G3-14	Commercial	E	2	71	57	58	61
G3-15	Commercial	E	2	71	58	60	62
G3-16	Commercial	E	2	71	49	50	61
G3-17	Residential - Apartments	B	1	66	45	47	65
G3-18	Commercial	E	1	71	45	47	62
G3-19	Commercial	E	1	71	60	61	62
G3-20	Commercial	E	2	71	67	68	69
G3-21	Residential	B	3	66	54	56	59
G3-22	Residential - Apartments	B	1	66	62	64	64
G3-23	Commercial	E	1	71	57	59	60
G3-24	Residential	B	1	66	56	58	59
G3-25	Commercial	E	1	71	57	58	59
G3-26	Commercial	E	3	71	67	69	69
G3-27	Commercial - Mall	E	1	71	46	47	58
G3-28	Commercial	E	1	71	46	47	54

Under Alternative G3, 7 residential properties (Category B) and 1 commercial property are predicted to experience noise impacts. Six of the residential properties are predicted to experience noise levels equal to or above the DOT&PF NAC. The same six residential properties are predicted to experience noise levels equal to or above the DOT&PF NAC under the No Action Alternative. The other two potentially affected properties are predicted to experience substantial increases over the existing condition: The Point residential apartment

building on the waterfront adjacent to the proposed ferry terminal near the south end of Jefferson Street, (Receptor G3-17) which is predicted to have peak hour outdoor L_{eq} noise levels 20 dBA above existing conditions; and a nearby commercial property (Receptor G3-18), which is predicted to have peak hour L_{eq} noise levels 17 dBA over existing conditions. In both cases, substantial increases are expected because of very low existing traffic volumes and the proximity of these receptors to the proposed ferry route alignments.

The results of the analysis of Alternative G3 show that increases in noise levels are predicted to range from 2 to 20 dBA over existing conditions. The results also show that changes in noise levels under Alternative G3 are predicted to range from no change (0 dBA change) to an increase of 18 dBA over the future No Action Alternative noise levels. Changes in noise levels are due to changes in roadway alignment, the addition of ferry noise, and decibel rounding.

4.3.6 Alternative G4/G4v

Alternative G4v would not add new ferry service on this alignment, and so the noise levels at nearby receptors would be the same as under the No Action Alternative for Alternative G4v.

Alternative G4 would add two new ferries on this alignment. Modeled future noise levels at properties in the vicinity of Alternative G4 are shown in Table 4-7. The Alternative G4 ferry alignment is shown in Figure 6 in Appendix A. Predicted noise impacts are shown in shaded cells.

Table 4-7: Predicted Noise Levels (L_{eq}) for the Existing Condition and Future (2025) Condition under No Action Alternative and Alternative G4 Assuming Peak Hour Traffic Volume

Receptor #	Land Use	Activity Category	Number of Properties	NAC (dBA)	Existing Noise Levels (dBA)	No Action 2025 Noise Levels (dBA)	Alt G4/G4v 2025 Noise Levels (dBA)
G4-1	Commercial	E	1	71	68	70	70
G4-2	Commercial	E	1	71	68	70	70
G4-3	Commercial	E	1	71	60	62	64
G4-4	Commercial	E	1	71	65	66	67
G4-5	Commercial	E	2	71	44	45	56
G4-6	Residential	B	3	66	42	44	54
G4-7	Residential	B	4	66	44	46	54
G4-8	Residential	B	2	66	51	53	56
G4-9 & M7	Residential	B	1	66	54	56	58
G4-10	Residential	B	1	66	51	52	56
G4-11	Commercial	E	2	71	66	67	67
G4-12	Commercial	E	3	71	66	67	68
G4-13	Commercial	E	1	71	52	54	58
G4-14	Commercial	E	1	71	51	52	56
G4-15	Commercial	E	1	71	58	59	60
G4-16	Airport	F	1	-	45	47	53

No properties are predicted to experience noise levels greater than or equal to the DOT&PF NAC under Alternative G4/G4v. No substantial noise increase impacts are predicted as a result of this alternative.

Under Alternative G4/G4v, noise levels increase by 1 to 12 dBA over existing conditions and by 0 to 11 dBA over the No Action Alternative. Changes in noise levels are due to changes in roadway alignment, the addition of ferry noise, and decibel rounding.

4.3.7 Secondary Impact Mitigation

Noise abatement measures are considered in areas where predicted traffic noise levels approach or exceed the noise abatement criteria, or when the predicted traffic noise levels substantially exceed the existing noise levels. Abatement measures are considered for these receivers consistent with the DOT&PF guidelines.

Where traffic noise impacts are identified, noise abatement is considered and evaluated for acoustic feasibility and reasonableness. DOT&PF policy is that abatement for Activity Category A, B, C, D, or E land uses needs to be feasible and reasonable on their own merits. Land uses not sensitive to highway traffic noise, and undeveloped lands will not be provided noise abatement.

Acoustic feasibility criteria deal primarily with physics and engineering considerations (i.e., can a substantial noise reduction be achieved given the conditions of a specific location; is the ability to achieve noise reduction limited by factors such as topography, access requirements for driveways or ramps, the presence of cross streets, or other noise sources in the area).

Reasonableness is a more subjective criterion than feasibility. It implies that common sense and good judgment were applied in arriving at a decision. Reasonableness is based on a number of factors, not just one criterion. FHWA noise regulations define three mandatory reasonableness factors that must be evaluated for a noise abatement measure to be considered reasonable. They are:

- Viewpoints of the property owners and residents of that benefit from noise abatement measures
    - To determine the desires 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. At least 60 percent of households and property owners surveyed must want the noise abatement measure.
- Cost Effectiveness
    - The DOT&PF policy requires that the noise abatement measure cost no more than $32,000 per benefited receptor, based upon the design engineer's estimate. A benefited receptor is defined as the recipient of an abatement measure that receives a noise reduction of 5 dBA or more.
- Noise Reduction Design Goal
    - The DOT&PF noise reduction design goal is a minimum of 7 dBA. Fifty percent or more of the benefitted receptors in the first row of structures must achieve this design goal for the noise abatement to be considered reasonable.

The DOT&PF considers these three mandatory reasonableness factors to determine reasonableness. The following reasonableness factors are also used to evaluate mitigation on state-funded projects:

- Development vs. Highway Timing
    - At least 50 percent of affected 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.
- 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.
- 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.
- 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.
- 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 is given to areas where larger changes in traffic noise levels are expected to occur if the project is constructed than if it is not.

No single DOT&PF reasonableness factor is used to determine that a noise abatement measure is unreasonable.

It should be noted that noise barriers could have their own negative impacts. Barriers may interfere with the passage of air, interrupt scenic views, create objectionable shadows, contribute to increased road icing, and reduce or eliminate visibility of a business from the roadway. Barriers could also create snow removal problems, cause maintenance access problems, make it difficult to maintain landscaping, create drainage problems, and provide pockets for trash and garbage to accumulate. Depending on location, noise barriers could also compromise traffic safety by reducing stopping or merging sight distance, or by reducing errant vehicle recovery room.

Noise abatement, in the form of noise barriers, was considered for all receptors predicted to be affected under the project action alternatives.

4.3.7.1 Alternative C3-4

Under Alternative C3-4, 22 residential properties (Category B), 10 commercial properties (Category E), and 1 airport property (Category F) are predicted to experience noise impacts. The 22 residential properties and 9 of the commercial properties are predicted to experience noise levels greater than or equal to the DOT&PF NAC. Two properties are predicted to experience substantial increases over the existing condition: the Ketchikan International Airport (Receptor C3/4-31) and a commercial property (Receptor C3/4-6) close to the C3-4 alignment on Rex Allen Drive.

The DOT&PF does not provide noise abatement for Category F properties. Therefore, noise abatement was not considered for Receptor C3/4-31 (Ketchikan International Airport).

Noise mitigation in the form of noise barriers was considered for:

- Receptor C3/4-6 (1 commercial property) – substantial increase impact
- Receptor C3/4-11 (1 residence)
- Receptor C3/4-15 (5 commercial properties)
- Receptor C3/4-16 (1 residence)
- Receptors C3/4-19 (1 residence), C3/4-20 (1 residence), and C3/4-21 (2 residences)
- Receptors C3/4-23 (1 residence), and C3/4-25 (1 residence)
- Receptor C3/4-27 (4 commercial properties)
- Receptors C3/4-28 (1 residence), and C3/4-29 (1 residence)
- Receptor C3/4-30 (12 residences)

For Receptors C3/4-11, C3/4-16, C3/4-23, C3/4-25, C3/4-28, and C3/4-29, barriers would not be effective at mitigating highway noise because of the need to maintain direct access onto Tongass Highway (i.e., the wall required breaks to allow access to the properties).

For Receptors C3/4-19, C3/4-20, and C3/4-21, a barrier would not be effective at mitigating highway noise because of a combination of direct access points onto Tongass Highway and elevated residences at C3/4-19 (approximately 25 feet above the roadway) and C3/4-21 (approximately 35 feet above the roadway). To mitigate noise levels at elevated residences, walls need to be very tall to break the line of sight between the roadway and the residence, requiring very large walls that often have constructability issues and do not meet the cost effectiveness criterion.

For Receptor C3/4-30, a barrier was not able to provide the minimum noise reduction at these properties while complying with the maximum cost-effectiveness criterion. A barrier was not effective in this location because the residences represented by Receptor C3/4-30 are elevated approximately 55 feet above the roadway. A wall could not be designed to effectively break the line of sight between the roadway and the residences.

For Receptors C3/4-6, C3/4-15, and C3/4-27, a combination of direct access points and proximity to the roadway precludes effective siting of a noise barrier for these commercial properties.

Noise mitigation is therefore not recommended under Alternative C3-4.

4.3.7.2 Alternative F3

Under Alternative F3, six residential properties (Category B) are predicted to experience noise levels equal to or above the DOT&PF NAC. No substantial noise increase impacts are predicted as a result of the project. Noise mitigation in the form of noise barriers was considered for:

- Receptors F3-5 (1 residence) and F3-6 (2 residences)
- Receptor F3-16 (3 residences)

A barrier for Receptors F3-5 and F3-6 would not be able to provide the minimum noise reduction at these properties while complying with the maximum cost-effectiveness criterion. A barrier would not be effective in this location because of the need to maintain direct access onto Tongass Highway (i.e., the wall required breaks to allow access to the properties), and because

the residences represented by Receptor F3-6 are elevated approximately 20 feet above the roadway.

A barrier for Receptor F3-16 was not able to provide the minimum noise reduction at these properties while complying with the maximum cost-effectiveness criterion. A barrier would not be effective in this location because the residences represented by Receptor F3-16 are elevated approximately 40 feet above the roadway. A wall could not be designed to effectively break the line of sight between the roadway and the residences.

Noise mitigation is therefore not recommended under Alternative F-3.

4.3.7.3 Alternative G2

Under Alternative G2, 22 residential properties (Category B) are predicted to experience noise levels equal to or above the DOT&PF NAC. The same 22 residential properties are predicted to experience noise levels equal to or above the DOT&PF NAC under the No Action Alternative. No substantial noise increase impacts are predicted as a result of the project.

Noise mitigation in the form of noise barriers were considered for:

- Receptors G2-2 (2 residences) and G2-4 (3 residences)
- Receptor G2-3 (4 residences)
- Receptors G2-11 (3 residences), G2-13 (1 residence), and G2-15 (2 residences)
- Receptors G2-18 (5 residences) and G2-22 (2 residences)

In all four cases, barriers would not be effective at mitigating highway noise because of the need to maintain direct access onto Tongass Highway (i.e. the wall required breaks to allow access to the properties). In addition, the result of the combined ferry and highway noise analysis show that the project does not cause any noise impacts that would not already occur under the No Action Alternative.

Noise mitigation is therefore not recommended under Alternative G-2.

4.3.7.4 Alternative G3

Under Alternative G3, 7 residential properties (Category B) and 1 commercial property are predicted to experience noise impacts. Six of the residential properties are predicted to experience noise levels equal to or above the DOT&PF NAC. The same six residential properties are predicted to experience noise levels equal to or above the DOT&PF NAC under the No Action Alternative. The other two potentially affected properties are predicted to experience substantial increases over the existing condition: The Point residential apartment building on the waterfront adjacent to the proposed ferry terminal near the south end of Jefferson Street, (Receptor G3-17); and a nearby commercial property (Receptor G3-18).

Noise mitigation in the form of noise barriers were considered for:

- Receptor G3-1 (4 residences)
- Receptor G3-6 (1 residence)
- Receptor G3-7 (1 residence)
- Receptor G3-17 (Apartment Building)
- Receptor G3-18 (1 commercial property)

A barrier to mitigate highway noise at Receptor G3-1 would not be effective because of the need to maintain direct access onto Tongass Highway (i.e., the wall required breaks to allow access to the properties).

Barriers for Receptors G3-6 and G3-7 were determined not be to feasible because the residences abut directly onto the sidewalk and construction of a noise barrier would result in the loss of the sidewalk, or a barrier that is placed directly onto the side of the structure, which would preclude normal maintenance activities.

Barriers for Receptors G3-17 and G3-18 were determined not be to feasible because much of the noise contribution comes from the ferry activity on the water and constructing a noise wall on the shoreline to mitigate noise from the water side would require acquisition of new right-of-way, and would block scenic views from the waterfront. In addition, placement of noise barriers on the Jefferson Street side of these properties would create access issues and would block the view of the commercial property from the public.

Noise mitigation is therefore not recommended under Alternative G-3.

5.0 References

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Appendix A
Project Maps

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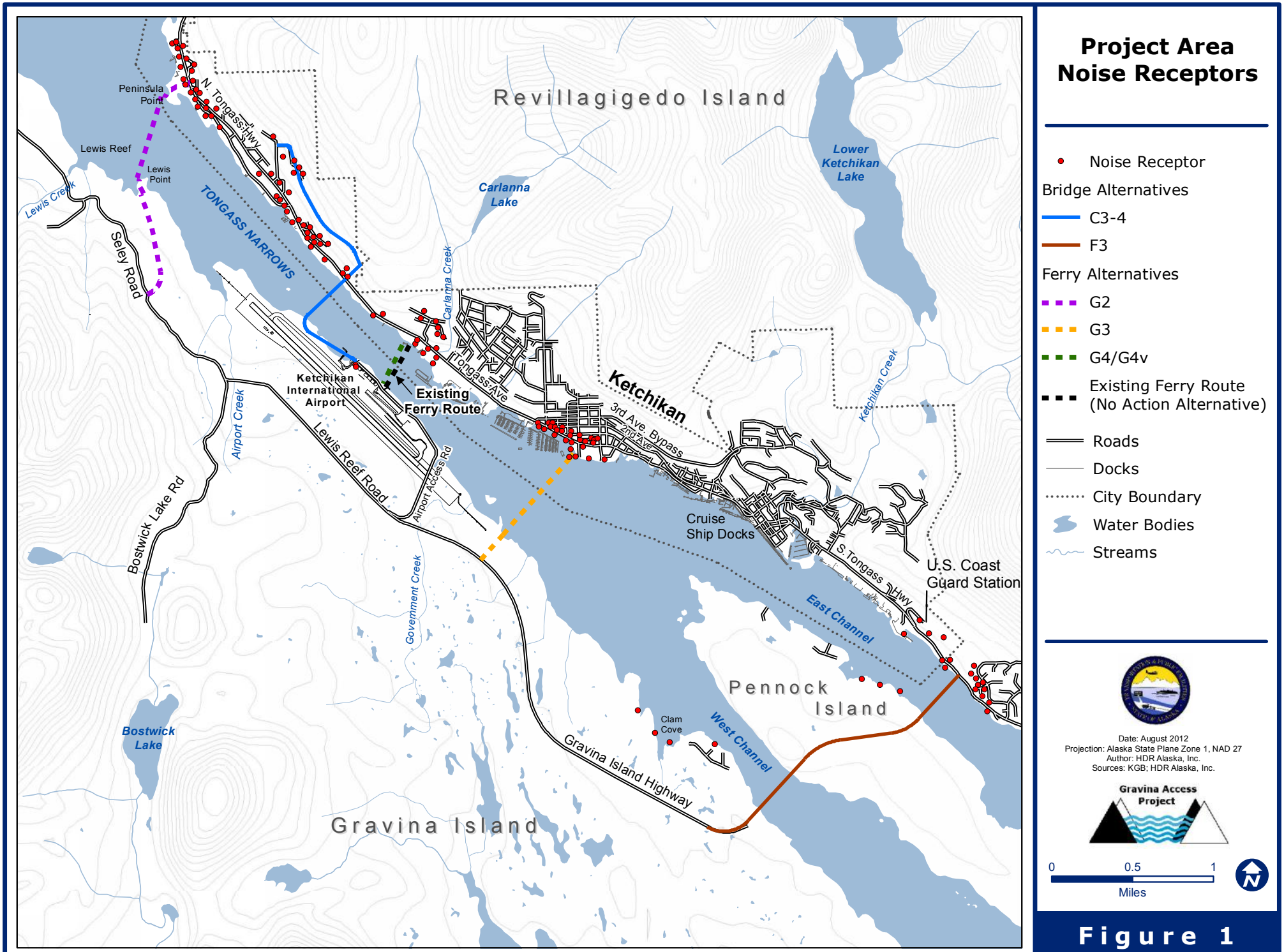
Revillagigedo Island
Gravina Island
Pennock Island
Peninsula Point
Lewis Reef
Lewis Point
Lewis Creek
N. Tongass Hwy
TONGASS NARROWS
Seley Road
Carlanna Lake
Carlanna Creek
Lower Ketchikan Lake
Ketchikan Creek
Ketchikan International Airport
Existing Ferry Route
Tongass Ave
Ketchikan
3rd Ave. Bypass
2nd Ave
Airport Creek
Lewis Reef Road
Airport Access Rd
Bostwick Lake Rd
Government Creek
Cruise Ship Docks
S. Tongass Hwy
U.S. Coast Guard Station
East Channel
West Channel
Clam Cove
Gravina Island Highway
Bostwick Lake
Project Area Noise Receptors
Noise Receptor
Bridge Alternatives
C3-4
F3
Ferry Alternatives
G2
G3
G4/G4v
Existing Ferry Route (No Action Alternative)
Roads
Docks
City Boundary
Water Bodies
Streams
Date: August 2012
Projection: Alaska State Plane Zone 1, NAD 27
Author: HDR Alaska, Inc.
Sources: KGB; HDR Alaska, Inc.
Gravina Access Project
0
0.5
1
Miles
N
Figure 1

Alternative C3-4: Noise Receptors

- Noise Receptor
- Alternative C3-4
- Alternative G2
- Alternative G4/G4v

Date: August 2012
Projection: Alaska State Plane Zone 1, NAD 83
Author: HDR Alaska, Inc.
Sources: KGB, HDR Alaska, Inc.

Gravina Access Project

0 500 1,000
Feet

N

Figure 2

Alternative F3: Noise Receptors

- Noise Receptor
- Alternative F3

Date: August 2012
Projection: Alaska State Plane Zone 1, NAD 83
Author: HDR Alaska, Inc.
Sources: KGB, HDR Alaska, Inc.

Gravina Access Project

0 800 1,600
Feet

N

Figure 3

Alternative G2: Noise Receptors

- Noise Receptor
- G2
- Alternative C3-4

Date: August 2012
Projection: Alaska State Plane Zone 1, NAD 83
Author: HDR Alaska, Inc.
Sources: KGB, HDR Alaska, Inc.

Gravina Access Project

0 500 1,000
Feet

N

Figure 4

Alternative G3: Noise Receptors

- Noise Receptor
- Alternative G3

Date: August 2012
Projection: Alaska State Plane Zone 1, NAD 83
Author: HDR Alaska, Inc.
Sources: KGB, HDR Alaska, Inc.

Gravina Access Project

0 400 800
Feet

N

Figure 5

Alternative G4/G4v: Noise Receptors

- Noise Receptor
- Alternative G4/G4v
- Alternative C3-4

Date: August 2012
Projection: Alaska State Plane Zone 1, NAD 83
Author: HDR Alaska, Inc.
Sources: KGB, HDR Alaska, Inc.

Gravina Access Project

0 400 800
Feet

N

Figure 6

Gravina Access Project SEIS
Traffic Noise Memorandum

Appendix B
Ambient Noise Monitoring Data

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GRAVINA ACCESS PROJECT

AMBIENT NOISE MONITORING SUMMARY, JUNE 2012

Alaska Department of Transportation & Public Facilities (AK DOT&PF)

Table 1. Ambient Noise Measurement Results

Site ID	Location	Land Use	Date	Start Time	Duration (mins)	Weather	Temp-erature (^{O}F)	Wind Speed (mph)	RH (%)	Measure ment Number	L_{eq} (dBA)	Notes
1	110 W Fireweed Lane, Ketchikan	Residential	6/4/2012	9:25 AM	15	Clear	49	0-4	65	1	56.5	TNM Cal Run = 58.0 Δ = 1.5
				9:50 AM	15					2	57.3	
2	2720 2nd Avenue, Ketchikan	Residential	6/4/2012	12:20 PM	15	Clear	60	2-4	58	1	62.3	TNM Cal Run = 59.8 Δ= 2.5
				12:40 PM	15					2	62.4	
3	Pioneer Heights Snr Housing, Unit 100, 4640 N Tongass	Residential	6/4/2012	1:30 PM	15	Clear	62	0-6	56	1	63.8	TNM Cal Run = 62.5 Δ= 1.3
				1:48 PM	15					2	63.5	
4	38 Baker Street, Ketchikan	Residential	6/4/2012	2:20 PM	15	Clear	63	0-4	52	1	60.3	TNM Cal Run = 62.0 Δ= 1.7
				2:40 PM	15					2	60.1	
5	5362 N Tongass, Ketchikan	Residential	6/4/2012	3:20 PM	15	Clear	65	0-2	53	1	64.8	TNM Cal Run = 63.6 Δ= 1.2
				3:40 PM	15					2	65.0	
6	5227 Shoreline Drive, Ketchikan	Residential	6/4/2012	4:10 PM	15	Clear	66	0-4	52	1	52.3	TNM Cal Run = 51.6 Δ= 0.7
				4:28 PM	15					2	50.3	
7	4131 Vallender Drive, Ketchikan	Residential	6/4/2012	5:03 PM	15	Clear	65	0-4	47	1	56.0	TNM Cal Run = 53.3 Δ= 2.7
				5:27 PM	15					2	54.8	
8	Ketchikan Autobody & Glass, 4979 Rex Allen Drive	Commercial	6/5/2012	9:05 AM	15	Overcast	51	0-2	89	1	52.8	TNM Cal Run = 53.2 Δ= 0.4
				9:30 AM	15					2	53.0	
9	S. end of Gravina Hwy, Proxy for Clam Cove Residences	Residential	6/5/2012	1:10 PM	15	Overcast	53	0-2	83	1	39.8	M1 without planes; M2 with 4 planes.
				1:37 PM	15					2	54.4	

Note: Two measurements were performed at each site to demonstrate that measurements were representative of traffic levels (i.e. within 2 dBA of the other measurement). However, in each case, only Measurement 1 was used for TNM model calidation.

Table 2. Observed Traffic Volume Data

Site ID	Location	Date	Start Time	Count Length (mins)	Measure ment Number	Measured Roadway	Direction	Vehicle Volume Timescale	Cars	Medium Trucks	Heavy Trucks	Buses	Motor Cycles
1	110 W Fireweed Lane, Ketchikan	6/4/2012	9:25 AM	15	1	Tongass Hwy	Combined	15-minute count	66	5	3	4	1
								1-hour equivalent	264	20	12	16	4
			9:50 AM	15	2	Tongass Hwy	Combined	15-minute count	79	5	1	6	0
								1-hour equivalent	316	20	4	24	0
2	2720 2nd Avenue, Ketchikan	6/4/2012	12:20 PM	15	5	Tongass Hwy	Combined	15-minute count	265	9	4	5	4
								1-hour equivalent	1060	36	16	20	16
			12:40 PM	15	6	Tongass Hwy	Combined	15-minute count	293	2	4	3	3
								1-hour equivalent	1172	8	16	12	12

3	Pioneer Heights Snr Housing, Unit 100, 4640 N Tongass	6/4/2012	1:30 PM	15	7	Tongass Hwy	Combined	15-minute count	182	5	5	2	5
								1-hour equivalent	728	20	20	8	20
			1:48 PM	15	8	Tongass Hwy	Combined	15-minute count	167	9	3	4	5
								1-hour equivalent	668	36	12	16	20
4	38 Baker Street, Ketchikan	6/4/2012	2:20 PM	15	9	Tongass Hwy	Combined	15-minute count	206	4	3	4	2
								1-hour equivalent	824	16	12	16	8
			2:40 PM	15	10	Tongass Hwy	Combined	15-minute count	180	7	4	5	5
								1-hour equivalent	720	28	16	20	20
5	5362 N Tongass, Ketchikan	6/4/2012	3:20 PM	15	11	Tongass Hwy	Combined	15-minute count	131	3	4	2	2
								1-hour equivalent	524	12	16	8	8
			3:40 PM	15	12	Tongass Hwy	Combined	15-minute count	154	5	5	0	5
								1-hour equivalent	616	20	20	0	20
6	5227 Shoreline Drive, Ketchikan	6/4/2012	4:10 PM	15	13	Tongass Hwy	Combined	15-minute count	150	4	4	1	2
								1-hour equivalent	600	16	16	4	8
			4:28 PM	15	14	Tongass Hwy	Combined	15-minute count	144	2	4	1	3
								1-hour equivalent	576	8	16	4	12
7	4131 Vallender Drive, Ketchikan	6/4/2012	5:03 PM	15	15	Tongass Hwy	Combined	15-minute count	290	3	3	0	4
								1-hour equivalent	1160	12	12	0	16
			5:27 PM	15	16	Tongass Hwy	Combined	15-minute count	230	3	2	3	2
								1-hour equivalent	920	12	8	12	8
8	Ketchikan Autobody & Glass, 4979 Rex Allen Drive	6/5/2012	9:05 AM	15	1	Tongass Hwy	Combined	15-minute count	109	7	2	4	0
								1-hour equivalent	436	28	8	16	0
						Don King Rd	Combined	15-minute count	40	3	2	2	0
								1-hour equivalent	160	12	8	8	0
			9:30 AM	15	2	Tongass Hwy	Combined	15-minute count	106	11	6	5	2
								1-hour equivalent	424	44	24	20	8
						Don King Rd	Combined	15-minute count	51	3	2	1	0
								1-hour equivalent	204	12	8	4	0
9	S. end of Gravina Hwy, Proxy for Clam Cove Residences	6/5/2012	1:10 PM	15	17	Tongass Hwy	Combined	15-minute count	-	-	-	-	-
								1-hour equivalent	-	-	-	-	-
			1:37 PM	15	18	Tongass Hwy	Combined	15-minute count	-	-	-	-	-
								1-hour equivalent	-	-	-	-	-

Gravina Access Project SEIS
Traffic Noise Memorandum

Appendix C
Electronic TNM Files

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On file at the Alaska Department of Transportation & Public Facilities.

Gravina Access Project SEIS
Traffic Noise Memorandum

Appendix D
Traffic Data

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Gravina Access Project - TNM Traffic Inputs

August, 2012

Table 1. Existing (2000) Traffic Data

Street	From	To	Condition	Posted Speed (mph)	Total Volume	% Cars	# Cars	% Medium Trucks	# Medium Trucks	% Heavy Trucks	# Heavy Trucks	% Bus	# Bus	% Motor cycles	# Motor cycles
Tongass Highway	North of Ferry Terminal Access Drive		Existing (2000)	50	1221	92.0	1123	6.2	76	0.4	5	1.3	16	0.1	1
Tongass Highway	Ferry Terminal Access Drive	Bryant Street	Existing (2000)	25	1257	92.0	1156	6.2	78	0.4	5	1.3	16	0.1	1
Tongass Highway	Bryant Street	Carlanna Lake Drive	Existing (2000)	25	1231	92.0	1133	6.2	76	0.4	5	1.3	16	0.1	1
Tongass Highway	Carlanna Lake Drive	Third Avenue	Existing (2000)	25	1697	92.0	1561	6.2	105	0.4	7	1.3	22	0.1	2
Tongass Highway	Third Avenue	Jefferson Street	Existing (2000)	25	1661	92.0	1528	6.2	103	0.4	7	1.3	22	0.1	2
Tongass Highway	Jefferson Street	Washington Street	Existing (2000)	25	1551	92.0	1427	6.2	96	0.4	6	1.3	20	0.1	2
Tongass Highway	Washington Street	Schoenbar Rd	Existing (2000)	25	1614	92.0	1485	6.2	100	0.4	6	1.3	21	0.1	2
Tongass Highway	Deermount Ave	USCG Access	Existing (2000)	30	802	93.7	751	4.0	32	0.4	3	1.8	14	0.1	1
Tongass Highway	South of USCG Access		Existing (2000)	45	802	93.7	751	4.0	32	0.4	3	1.8	14	0.1	1
Rex Allen Dr[1]	North of Tongass Hwy		Existing (2000)	25	501	92.0	461	6.2	31	0.4	2	1.3	7	0.1	1

[1] Volumes for Rex Allen Drive derived from relative percentage of Rex Allen Dr vs Tongass Hwy observed during field monitoring and assuming same vehicle class split as Tongass Hwy.

Table 2. Future (2025) No Build Traffic Data

Street	From	To	Condition	Posted Speed (mph)	Total Volume	% Cars	# Cars	% Medium Trucks	# Medium Trucks	% Heavy Trucks	# Heavy Trucks	% Bus	# Bus	% Motor cycles	# Motor cycles
Tongass Highway	North of Ferry Terminal Access Drive		No Build (2025)	50	1768	92.0	1627	6.2	110	0.4	7	1.3	23	0.1	2
Tongass Highway	Ferry Terminal Access Drive	Bryant Street	No Build (2025)	25	1822	92.0	1676	6.2	113	0.4	7	1.3	24	0.1	2
Tongass Highway	Bryant Street	Carlanna Lake Drive	No Build (2025)	25	1786	92.0	1643	6.2	111	0.4	7	1.3	23	0.1	2
Tongass Highway	Carlanna Lake Drive	Third Avenue	No Build (2025)	25	2462	92.0	2265	6.2	153	0.4	10	1.3	32	0.1	2
Tongass Highway	Third Avenue	Jefferson Street	No Build (2025)	25	2410	92.0	2217	6.2	149	0.4	10	1.3	31	0.1	2
Tongass Highway	Jefferson Street	Washington Street	No Build (2025)	25	2250	92.0	2070	6.2	140	0.4	9	1.3	29	0.1	2
Tongass Highway	Washington Street	Schoenbar Rd	No Build (2025)	25	2341	92.0	2154	6.2	145	0.4	9	1.3	30	0.1	2
Tongass Highway	Deermount Ave	USCG Access	No Build (2025)	30	1164	93.7	1091	4.0	47	0.4	5	1.8	21	0.1	1
Tongass Highway	South of USCG Access		No Build (2025)	45	1164	93.7	1091	4.0	47	0.4	5	1.8	21	0.1	1
Rex Allen Dr[1]	North of Tongass Hwy		No Build (2025)	25	725	92.0	667	6.2	45	0.4	3	1.3	9	0.1	1

[1] Volumes for Rex Allen Drive derived from relative percentage of Rex Allen Dr vs Tongass Hwy observed during field monitoring and assuming same vehicle class split as Tongass Hwy.

Table 3. Future (2025) Alternative C3-4 Traffic Data															
Street	From	To	Condition	Posted Speed (mph)	Total Volume	% Cars	# Cars	% Medium Trucks	# Medium Trucks	% Heavy Trucks	# Heavy Trucks	% Bus	# Bus	% Motor cycles	# Motor cycles
Bridge	New Alt C3-4 roadway and bridge		Alt C3-4 (2025)	45	330	92.0	304	6.2	20	0.4	1	1.3	4	0.1	0
Tongass Highway	North of Rex Allen Drive		Alt C3-4 (2025)	50	1808	92.0	1663	6.2	112	0.4	7	1.3	24	0.1	2
Tongass Highway	Rex Allen Drive	Ferry Terminal Access Drive	Alt C3-4 (2025)	50	2050	92.0	1886	6.2	127	0.4	8	1.3	27	0.1	2
Tongass Highway	Ferry Terminal Access Drive	Bryant Street	Alt C3-4 (2025)	25	2040	92.0	1877	6.2	126	0.4	8	1.3	27	0.1	2
Tongass Highway	Bryant Street	Carlanna Lake Drive	Alt C3-4 (2025)	25	1990	92.0	1831	6.2	123	0.4	8	1.3	26	0.1	2
Tongass Highway	Carlanna Lake Drive	Third Avenue	Alt C3-4 (2025)	25	2648	92.0	2436	6.2	164	0.4	11	1.3	34	0.1	3
Tongass Highway	Third Avenue	Jefferson Street	Alt C3-4 (2025)	25	2564	92.0	2359	6.2	159	0.4	10	1.3	33	0.1	3
Tongass Highway	Jefferson Street	Washington Street	Alt C3-4 (2025)	25	2386	92.0	2195	6.2	148	0.4	10	1.3	31	0.1	2
Tongass Highway	Washington Street	Schoenbar Rd	Alt C3-4 (2025)	25	2469	92.0	2271	6.2	153	0.4	10	1.3	32	0.1	2
Tongass Highway	Deermount Ave	USCG Access	Alt C3-4 (2025)	30	1249	93.7	1170	4.0	50	0.4	5	1.8	22	0.1	1
Tongass Highway	South of USCG Access		Alt C3-4 (2025)	45	1249	93.7	1170	4.0	50	0.4	5	1.8	22	0.1	1
Rex Allen Dr[1]	North of Tongass Hwy		Alt C3-4 (2025)	25	1171	92.0	1077	6.2	73	0.4	5	1.3	15	0.1	1

[1] Volumes for Rex Allen Drive derived from relative percentage of Rex Allen Dr vs Tongass Hwy observed during field monitoring and assuming same vehicle class split as Tongass Hwy + bridge traffic.

Table 4. Future (2025) Alternative F3 Traffic Data															
Street	From	To	Condition	Posted Speed (mph)	Total Volume	% Cars	# Cars	% Medium Trucks	# Medium Trucks	% Heavy Trucks	# Heavy Trucks	% Bus	# Bus	% Motor cycles	# Motor cycles
Bridge	New Alt F3 roadway and bridge		Alt F3 (2025)	45	420	92.0	386	6.2	26	0.4	2	1.3	5	0.1	0
Tongass Highway	North of Ferry Terminal Access Drive		Alt F3 (2025)	50	1869	92.0	1719	6.2	116	0.4	7	1.3	24	0.1	2
Tongass Highway	Ferry Terminal Access Drive	Bryant Street	Alt F3 (2025)	50	1869	92.0	1719	6.2	116	0.4	7	1.3	24	0.1	2
Tongass Highway	Bryant Street	Carlanna Lake Drive	Alt F3 (2025)	25	1874	92.0	1724	6.2	116	0.4	7	1.3	24	0.1	2
Tongass Highway	Carlanna Lake Drive	Third Avenue	Alt F3 (2025)	25	2587	92.0	2380	6.2	160	0.4	10	1.3	34	0.1	3
Tongass Highway	Third Avenue	Jefferson Street	Alt F3 (2025)	25	2535	92.0	2332	6.2	157	0.4	10	1.3	33	0.1	3
Tongass Highway	Jefferson Street	Washington Street	Alt F3 (2025)	25	2413	92.0	2220	6.2	150	0.4	10	1.3	31	0.1	2
Tongass Highway	Washington Street	Schoenbar Rd	Alt F3 (2025)	25	2521	92.0	2319	6.2	156	0.4	10	1.3	33	0.1	3
Tongass Highway	Deermount Ave	USCG Access	Alt F3 (2025)	30	1422	93.7	1332	4.0	57	0.4	6	1.8	26	0.1	1
	USCG Access	Alt F3 Intersection	Alt F3 (2025)	45	1492	93.7	1398	4.0	60	0.4	6	1.8	27	0.1	1
Tongass Highway	South of Alt F3 Intersection		Alt F3 (2025)	45	1256	93.7	1177	4.0	50	0.4	5	1.8	23	0.1	1
Rex Allen Dr[1]	North of Tongass Hwy		Alt F3 (2025)	25	766	92.0	705	6.2	48	0.4	3	1.3	10	0.1	1

[1] Volumes for Rex Allen Drive derived from relative percentage of Rex Allen Dr vs Tongass Hwy observed during field monitoring and assuming same vehicle class split as Tongass Hwy.

Table 5. Future (2025) Alternative G2 Traffic Data															
Street	From	To	Condition	Posted Speed (mph)	Total Volume	% Cars	# Cars	% Medium Trucks	# Medium Trucks	% Heavy Trucks	# Heavy Trucks	% Bus	# Bus	% Motor cycles	# Motor cycles
Alt G2 Access	Either end of Ferry Loading/Unloading		Alt G2 (2025)	25	101	92.0	93	6.2	6	0.4	0	1.3	1	0.1	0
Tongass Highway	North of Alt G2 Access Rd		Alt G2 (2025)	50	1721	92.0	1583	6.2	107	0.4	7	1.3	22	0.1	2
Tongass Highway	Alt G2 Access Rd	Ferry Terminal Access Drive	Alt G2 (2025)	50	1721	92.0	1583	6.2	107	0.4	7	1.3	22	0.1	2
Tongass Highway	Ferry Terminal Access Drive	Bryant Street	Alt G2 (2025)	25	1827	92.0	1681	6.2	113	0.4	7	1.3	24	0.1	2
Tongass Highway	Bryant Street	Carlanna Lake Drive	Alt G2 (2025)	25	1814	92.0	1669	6.2	112	0.4	7	1.3	24	0.1	2
Tongass Highway	Carlanna Lake Drive	Third Avenue	Alt G2 (2025)	25	2486	92.0	2287	6.2	154	0.4	10	1.3	32	0.1	2
Tongass Highway	Third Avenue	Jefferson Street	Alt G2 (2025)	25	2434	92.0	2239	6.2	151	0.4	10	1.3	32	0.1	2
Tongass Highway	Jefferson Street	Washington Street	Alt G2 (2025)	25	2268	92.0	2087	6.2	141	0.4	9	1.3	29	0.1	2
Tongass Highway	Washington Street	Schoenbar Rd	Alt G2 (2025)	25	2358	92.0	2169	6.2	146	0.4	9	1.3	31	0.1	2
Tongass Highway	Deermount Ave	USCG Access	Alt G2 (2025)	30	1175	93.7	1101	4.0	47	0.4	5	1.8	21	0.1	1
Tongass Highway	South of USCG Access		Alt G2 (2025)	45	1175	93.7	1101	4.0	47	0.4	5	1.8	21	0.1	1
Rex Allen Dr[1]	North of Tongass Hwy		Alt G2 (2025)	25	706	92.0	649	6.2	44	0.4	3	1.3	9	0.1	1

[1] Volumes for Rex Allen Drive derived from relative percentage of Rex Allen Dr vs Tongass Hwy observed during field monitoring and assuming same vehicle class split as Tongass Hwy.

Table 6. Future (2025) Alternative G3 Traffic Data															
Street	From	To	Condition	Posted Speed (mph)	Total Volume	% Cars	# Cars	% Medium Trucks	# Medium Trucks	% Heavy Trucks	# Heavy Trucks	% Bus	# Bus	% Motor cycles	# Motor cycles
Alt G3 Access	Either end of Ferry Loading/Unloading		Alt G3 (2025)	25	138	92.0	127	6.2	9	0.4	1	1.3	2	0.1	0
Tongass Highway	North of Ferry Terminal Access Drive		Alt G3 (2025)	50	1732	92.0	1593	6.2	107	0.4	7	1.3	23	0.1	2
Tongass Highway	Ferry Terminal Access Drive	Bryant Street	Alt G3 (2025)	25	1784	92.0	1641	6.2	111	0.4	7	1.3	23	0.1	2
Tongass Highway	Bryant Street	Carlanna Lake Drive	Alt G3 (2025)	25	1794	92.0	1650	6.2	111	0.4	7	1.3	23	0.1	2
Tongass Highway	Carlanna Lake Drive	Third Avenue	Alt G3 (2025)	25	2472	92.0	2274	6.2	153	0.4	10	1.3	32	0.1	2
Tongass Highway	Third Avenue	Jefferson Street	Alt G3 (2025)	25	2432	92.0	2237	6.2	151	0.4	10	1.3	32	0.1	2
Tongass Highway	Jefferson Street	Washington Street	Alt G3 (2025)	25	2305	92.0	2121	6.2	143	0.4	9	1.3	30	0.1	2
Tongass Highway	Washington Street	Schoenbar Rd	Alt G3 (2025)	25	2359	92.0	2170	6.2	146	0.4	9	1.3	31	0.1	2
Tongass Highway	Deermount Ave	USCG Access	Alt G3 (2025)	30	1175	93.7	1101	4.0	47	0.4	5	1.8	21	0.1	1
Tongass Highway	South of USCG Access		Alt G3 (2025)	45	1175	93.7	1101	4.0	47	0.4	5	1.8	21	0.1	1
Rex Allen Dr[1]	North of Tongass Hwy		Alt G3 (2025)	25	710	92.0	653	6.2	44	0.4	3	1.3	9	0.1	1

[1] Volumes for Rex Allen Drive derived from relative percentage of Rex Allen Dr vs Tongass Hwy observed during field monitoring and assuming same vehicle class split as Tongass Hwy.

Table 6. Future (2025) Alternative G4/G4v Traffic Data															
Street	From	To	Condition	Posted Speed (mph)	Total Volume	% Cars	# Cars	% Medium Trucks	# Medium Trucks	% Heavy Trucks	# Heavy Trucks	% Bus	# Bus	% Motor cycles	# Motor cycles
Alt G4 Access	Either end of Ferry Loading/Unloading		Alt G4/G4v (2025)	25	202	92.0	186	6.2	13	0.4	1	1.3	3	0.1	0
Tongass Highway	North of Ferry Terminal Access Drive		Alt G4/G4v (2025)	50	1775	92.0	1633	6.2	110	0.4	7	1.3	23	0.1	2
Tongass Highway	Ferry Terminal Access Drive	Bryant Street	Alt G4/G4v (2025)	25	1845	92.0	1697	6.2	114	0.4	7	1.3	24	0.1	2
Tongass Highway	Bryant Street	Carlanna Lake Drive	Alt G4/G4v (2025)	25	1810	92.0	1665	6.2	112	0.4	7	1.3	24	0.1	2
Tongass Highway	Carlanna Lake Drive	Third Avenue	Alt G4/G4v (2025)	25	2482	92.0	2283	6.2	154	0.4	10	1.3	32	0.1	2
Tongass Highway	Third Avenue	Jefferson Street	Alt G4/G4v (2025)	25	2429	92.0	2235	6.2	151	0.4	10	1.3	32	0.1	2
Tongass Highway	Jefferson Street	Washington Street	Alt G4/G4v (2025)	25	2266	92.0	2085	6.2	140	0.4	9	1.3	29	0.1	2
Tongass Highway	Washington Street	Schoenbar Rd	Alt G4/G4v (2025)	25	2357	92.0	2168	6.2	146	0.4	9	1.3	31	0.1	2
Tongass Highway	Deermount Ave	USCG Access	Alt G4/G4v (2025)	30	1175	93.7	1101	4.0	47	0.4	5	1.8	21	0.1	1
Tongass Highway	South of USCG Access		Alt G4/G4v (2025)	45	1175	93.7	1101	4.0	47	0.4	5	1.8	21	0.1	1
Rex Allen Dr[1]	North of Tongass Hwy		Alt G4/G4v (2025)	25	728	92.0	670	6.2	45	0.4	3	1.3	9	0.1	1

[1] Volumes for Rex Allen Drive derived from relative percentage of Rex Allen Dr vs Tongass Hwy observed during field monitoring and assuming same vehicle class split as Tongass Hwy.

Gravina Access Project SEIS
Traffic Noise Memorandum

Appendix E
Ketchikan Airport Ferry Noise Monitoring Data

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Gravina Access Project - Airport Ferry Noise Measurements

Weather Description During Measurements

Description	Cloud Cover (Oktas)	Temp (oF)	Wind Speed	Wind Direction	RH (%)	Precipitation	Notes
Overcast	8	52	0-4	South	83	None	-

Noise Data - Ferry Boat Arrival & Departures

Measurement #	Date	Start Time	Description/Activity	Duration (Mins:Secs)	Distance (ft)	Leq (dBA)	Lmax (dBA)
1	6/5/2012	10:05 AM	Ferry approach and docking	1:20	250	58.6	71.0
3	6/5/2012	10:17 AM	Ferry departure	0:25	250	60.4	67.5
4	6/5/2012	10:18 AM	Ferry approach and docking	1:17	250	60.8	69.5
7	6/5/2012	10:29 AM	Ferry departure	0:45	250	60.3	66.6
8	6/5/2012	10:33 AM	Ferry approach and docking	0:45	250	60.5	75.2
11	6/5/2012	10:45 AM	Ferry departure	0:50	250	62.0	70.1
12	6/5/2012	10:47 AM	Ferry approach and docking	0:45	250	61.9	69.9
14	6/5/2012	11:00 AM	Ferry departure	0:50	250	59.9	63.1
15	6/5/2012	11:03 AM	Ferry approach and docking	Interference from sea planes during ferry arrival			
17	6/5/2012	11:15 AM	Ferry departure	0:51	250	61.3	69.5
18	6/5/2012	11:18 AM	Ferry approach and docking	1:00	250	59.6	66.7

Noise Levels at 50 ft		
Reference Distance (ft)	Leq (dBA)	Lmax (dBA)
50	73	85
50	74	81
50	75	83
50	74	81
50	74	89
50	76	84
50	76	84
50	74	77
50	-	-
50	75	83
50	74	81

Notes:

Ferry boat measurements include some noise from other ambient sources in the vicinity of the pier. These sources include traffic on the Tongass Hwy approximately 240 feet to the north, noise from cars entering and leaving the ferry parking lot, and some industrial noise from properties to the south. However, ferry noise was dominant at the measurement location.

Max approach/depart	76	89

Noise Data - Ferry Boat Arrival & Departures

Measurement #	Date	Start Time	Description/Activity	Duration (Mins:Secs)	Distance (ft)	Leq (dBA)	Lmax (dBA)
2	6/5/2012	10:12 AM	Ferry moored and engine running	2:30	180	60.4	79.6
5	6/5/2012	10:20 AM	Ferry moored + engine running + unloading	5:00	180	58.6	71.2
6	6/5/2012	10:25 AM	Ferry moored + engine running + loading	3:40	180	59.0	69.8
9	6/5/2012	10:35 AM	Ferry moored + engine running + unloading	5:00	180	58.3	68.6
10	6/5/2012	10:41 AM	Ferry moored + engine running + loading	4:00	180	58.7	80.9
13	6/5/2012	10:50 AM	Ferry moored + engine running + unloading	8:45	180	59.0	74.9
16	6/5/2012	11:05 AM	Ferry moored + engine running + loading	10:00	180	58.4	72.9

Noise Levels at 50 ft		
Reference Distance (ft)	Leq (dBA)	Lmax (dBA)
50	72	91
50	70	82
50	70	81
50	69	80
50	70	92
50	70	86
50	70	84

Notes:

Ferry boat measurements include some noise from other ambient sources in the vicinity of the pier. These sources include traffic on the Tongass Hwy approximately 240 feet to the north, noise from cars entering and leaving the ferry parking lot, and some industrial noise from properties to the south. However, ferry noise was dominant at the measurement location.

Max loading/unloading	72	92