Gravina Access Project

Draft Supplemental Environmental Impact Statement

Chapter 4

Environmental Consequences

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter identifies and describes potential environmental consequences of the project alternatives (including the No Action Alternative), including both adverse and beneficial impacts. All elements of each alternative are evaluated in this section: the infrastructure required for crossing Tongass Narrow (e.g., bridge and bridge piers, ferry and ferry ramps), new road connections to the crossing, improvements to existing roads, and supporting facilities (e.g., construction staging areas, toll facilities, passenger waiting area). Sections of this chapter address direct, secondary, and cumulative impacts and related issues. All figures referenced in this chapter may be found at the end of the chapter.

Direct Impacts. Impacts that occur as a direct, immediate, and local result of a project are termed direct impacts. Direct impacts can be either permanent or temporary. Permanent impacts are direct, continuing impacts that result from the existence and operation of a project. Temporary impacts are direct impacts that result from project construction activities, and can include effects such as temporary disturbance of land and wildlife habitat, noise and air pollutants from operation of construction machinery and vehicles, traffic detours and congestion, degradation of the visual environment by large construction equipment, and the economic benefits of jobs in the construction sector.

The direct impacts of the Gravina Access Project are discussed in the first 25 sections of this Chapter 4.0.

Indirect Impacts. Indirect impacts are impacts related to the project that are reasonably foreseeable, yet (compared to direct impacts) occur later in time and farther in distance (40 CFR 1508.8). For instance, the construction of a road in an undeveloped area could have direct adverse impacts (such as removing wildlife habitat, disrupting bird nesting behavior, and forcing businesses to relocate) and direct benefits (such as providing access to developable land). However, any effects of the project that occur indirectly (such as land development that is induced because the land has become road accessible) would be indirect impacts. The indirect impacts of the project alternatives are discussed in Section 4.26.

Cumulative Impacts. The cumulative effects of a project are those effects that "result from the incremental consequences of an action when added to other past and reasonably foreseeable future actions" (40 CFR 1508.7). Such future actions are those projects that are far enough along in the planning process that their implementation is reasonably foreseeable. The cumulative impacts of the project alternatives are discussed in Section 4.27.

Short-Term Uses and Long-Term Productivity. The natural productivity of land is considered a long-term, renewable use of the land, whereas land development generally is short-term and has a relatively short economic life. The short-term uses and long-term productivity of the project are described in Section 4.28.

Irreversible and Irretrievable Commitments of Resources. Implementing any of the project action alternatives would use a range of natural, physical, human, and fiscal resources. The use of some of these resources could never be undone, and the resources themselves could never be recovered. The commitment of such resources by the project is discussed in Section 4.29.

Mitigation. Measures to minimize the potential adverse impacts associated with the project alternatives, where warranted, are provided following the individual sections describing impacts. These mitigation measures are compiled in Section 4.30.

4.1 Land Use Impacts

This section discusses the project's direct impact to ownership, land use, and zoning. Section 4.1.1 examines the impacts of the project based on current ownership, land uses, and zoning, and Section 4.1.2 assesses the consistency of project alternatives with relevant land use plans. See the *Conceptual Stage Relocation Study and Assessment of Right-of-Way Acquisition Costs* in Appendix B for additional information on project alternative impacts to land uses and individual properties.

4.1.1 Direct Impacts to Ownership, Land Use, and Zoning

Table 4-1 through Table 4-3 report the direct impacts of the project alternatives' proposed rights-of-way to project area land ownership, land use, and zoning. Within each table the total acreage of each land type is listed for the entire project area. The tables also list the right-of-way requirements for each alternative relative to the total project. More specific information can be found under each alternative.

Table 4-1: Land Ownership Impacts by Alternative

Ownership	Acreage[a] in project area	Right-of-Way Requirements									
		Bridge Alternatives				Ferry Alternatives					
		C3-4		F3		G2		G3		G4/G4v	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
USCG	58	—	—	<1	<1	—	—	—	—	—	—
State of Alaska	4,345	194	4	174	4	205	5	188	4	174	4
DNR	*2,381*	*26*	*1*	*6*	*<1*	*10*	*<1*	*7*	*<1*	*6*	*<1*
DOT&PF	*1,964*	*168*	*9*	*168*	*9*	*195*	*10*	*181*	*9*	*168*	*9*
Alaska Mental Health Trust	3,984	<1	<1	—	—	—	—	—	—	—	—
Native Corporation	23	—	—	—	—	—	—	<1	<1	—	—
Borough	1,787	32	2	71	4	32	2	32	2	32	2
Private	2,334	42	2	4	<1	—	—	1	<1	—	—
Not classified/ no data[b]	10,171	32	<1	44	<1	24	<1	23	<1	22	<1
Total	**22,702**	**300**	**1**	**293**	**1**	**261**	**1**	**244**	**1**	**228**	**1**
Total number of parcels affected	—	24		14		5		10		5	
Total Number of private parcels affected	—	**19**		**7**		—		**6**		—	
Relocations	—	2 residences 6 businesses		—		2 businesses		—		—	

[a] All acreages are approximate and have been rounded to the nearest whole acre

[b] Not classified/no data represents spatial data lacking adequate attributes to accurately classify, e.g., existing ROW, ocean and other water bodies, or parcels with incomplete records.

Table 4-2: Land Use Impacts by Alternative

Land Use	Acreage[a] in project area	Right-of-Way Requirements									
		Bridge Alternatives				Ferry Alternatives					
		C3-4		F3		G2		G3		G4/G4v	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Residential	554	<1	<1	—	—	—	—	—	—	—	—
Commercial	146	—	—	—	—	—	—	1	<1	—	—
Industrial	2,782	198	7	174	6	202	7	187	7	173	6
Vacant	15,589	91	<1	96	<1	58	<1	54	<1	54	<1
Not classified/ no data[b]	3,631	11	<1	23	<1	1	<1	2	<1	1	<1
Total	**22,702**	**300**	**1**	**293**	**1**	**261**	**1**	**244**	**1**	**228**	**1**

[a] All acreages are approximate and have been rounded to the nearest whole acre

[b] Not classified/no data represents spatial data lacking adequate attributes to accurately classify, e.g., existing ROW, ocean and other water bodies, or parcels with incomplete records.

Table 4-3: Zoning Impacts by Alternative

Zoning	Acreage[a] in project area	Right-of-Way Requirements									
		Bridge Alternatives				Ferry Alternatives					
		C3-4		F3		G2		G3		G4/G4v	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
General commercial	188	1	<1	—	—	3	2	1	<1	—	—
Future development	12,516	33	<1	39	<1	32	<1	32	<1	32	<1
Light industrial	350	11	3	—	—	—	—	—	—	—	—
Heavy Industrial	439	—	—	—	—	0.1	<1	—	—	—	—
Public lands/ institutional	340	—	—	<1	<1	—	—	—	—	—	—
Low-density residential	2215	25	1	35	2	—	—	—	—	—	—
High-density residential	130	8	6	—	—	—	—	—	—	—	—
Rural residential	395	22	6	22	6	22	6	22	6	22	6
Airport[b]	1,457	181	12	173	12	200	14	183	13	173	12
Not classified/ no data[c]	4,672	19	<1	24	<1	4	<1	6	<1	1	<1
Total	**22,702**	**300**	**1**	**293**	**1**	**261**	**1**	**244**	**1**	**228**	**1**

[a] All acreages are approximate and have been rounded to the nearest whole acre

[b] Combines zoning classifications Airport, Airport Development, and Airport Reserve

[c] Not classified/no data represents spatial data lacking adequate attributes to accurately classify, e.g., existing ROW, ocean and other water bodies, or parcels with incomplete records.

4.1.1.1 No Action Alternative

Under the No Action Alternative, no bridge or additional ferry terminal would be constructed to improve access to Gravina Island, and access from Revillagigedo Island would continue to be via the existing airport ferry. No land would be acquired, developed, or directly affected as a result of the No Action Alternative. Construction of the Gravina Island Highway has allowed for better accessibility to developable lands, and land use patterns would likely change according to adopted local land use plans. However, the rate at which Gravina Island develops would likely

be slower under the No Action Alternative than with any of the action alternatives (see Section 4.26.1 for a description of induced growth and indirect impacts to land use).

4.1.1.2 Bridge Alternatives

4.1.1.2.1 Alternative C3-4

Right-of-way requirements for Alternative C3-4 would affect a total of 24 parcels and require eight relocations. The impacts of Alternative C3-4's right-of-way requirements to land ownership, land use, and zoning can be found in Table 4-1, Table 4-2, and Table 4-3, respectively.

On Revillagigedo Island, Alternative C3-4 would require acquisition of right-of-way from two residential properties located along North Tongass Highway, 12 vacant privately owned properties, and six commercial properties located along Rex Allen Drive, converting either entire parcels or portions of these properties to transportation use. The two affected residential properties along the North Tongass Highway would be converted to transportation use, and the residents would be relocated. This acquisition and change in land use would not substantially affect the overall supply of residential land in Ketchikan. Land in this vicinity is zoned for residential uses.

Alternative C3-4 would affect six commercial properties along Rex Allen Drive (currently zoned for industrial uses), including an auto body and glass business, a maintenance shop, a storage facility, an engine repair shop, a tourism business, and a warehouse. The project would acquire all of the properties along Rex Allen Drive, relocate the businesses, and convert the properties to transportation right-of-way. The relocation of these businesses would not substantially affect the overall availability of commercial properties in Ketchikan. The project would not require right-of-way from Walmart property and would not affect the existing Walmart parking area.

On Gravina Island, Alternative C3-4 would use DOT&PF lands in the vicinity of the Ketchikan International Airport. Alternative C3-4 would not adversely impact existing land uses at the airport, which would remain industrial and transportation-related under this alternative. Some temporary impacts to transportation facilities and airport circulation would occur during construction, including the relocation of existing seaplane floats where Alternative C3-4 enters the airport to accommodate fill placement for the bridge abutment (see Section 4.7 for more information). Outside the immediate terminal area, Alternative C3-4 would acquire vacant, state-owned land zoned by the Borough for industrial purposes. At the southern end of the Gravina Island Highway, rights-of-way would be acquired from two Borough-owned parcels. Other roads under Alternative C3-4 would remain as constructed except for the reconstruction of Airport Creek Bridge, and no direct land use impacts would be anticipated elsewhere on Gravina Island.

Alternative C3-4 would require right-of-way on 26 acres of DNR land. DNR would need to issue an Interagency Land Management Assignment (ILMA) to DOT&PF, which would transfer management of those state-owned lands (inclusive of submerged lands and tidelands) to DOT&PF. ILMA lands must be returned to DNR when no longer needed for transportation purposes.

4.1.1.2.2 Alternative F3

Right-of-way requirements for Alternative F3 would affect a total of 14 parcels and would require no relocations. The impacts of Alternative F3's right-of-way requirements to land ownership, land use, and zoning can be found in Table 4-1, Table 4-2, and Table 4-3, respectively.

On Gravina Island, Alternative F3 would use DOT&PF lands in the vicinity of the Ketchikan International Airport as well as Borough property south of the airport. Alternative F3 would

require a slight widening of the existing Gravina Island Highway from its current 36-foot-wide gravel surface to a 40-foot-wide paved surface. The highway would be widened along its entire length from the intersection with Airport Access Road to the Gravina Island Highway southern terminus. Alternative F3 would not adversely impact existing land uses at the airport, which would remain industrial and transportation-related under this alternative. Alternative F3 would have no direct impacts to existing land uses near the airport, and would be unlikely to directly impact land use elsewhere on Gravina Island.

On Pennock Island, this alternative would primarily affect Borough-owned land, converting undeveloped land to a 40-foot-wide roadway connecting the two bridges over the East and West channels. Approximately 4 acres of undeveloped private land on Pennock Island's eastern edge would be acquired under this alternative. Areas affected by the F3 Alternative have the general Borough zoning classification of low-density residential.

On Revillagigedo Island, Alternative F3 would intersect Tongass Avenue south of the USCG base in an area that is presently undeveloped and zoned as institutional by the Borough. This would affect approximately 0.25 acre of USCG property and less than 0.1 acre of a privately owned parcel.

Alternative F3 would require right-of-way on 6 acres of DNR land. DNR would need to issue an ILMA to DOT&PF, which would transfer management of those state-owned lands (inclusive of submerged lands and tidelands) to DOT&PF. ILMA lands must be returned to DNR when no longer needed for transportation purposes.

4.1.1.3 Ferry Alternatives

4.1.1.3.1 Alternative G2

Right-of-way requirements for Alternative G2 would affect a total of five parcels and require three relocations. The impacts of Alternative G2's right-of-way requirements to land ownership, land use, and zoning can be found in Table 4-1, Table 4-2, and Table 4-3, respectively.

On Revillagigedo Island, a single parcel at Peninsula Point would need to be acquired for transportation purposes. The buildings located on the Peninsula Point parcel would be removed and the commercial activities relocated to construct the ferry terminal and associated parking facilities. Commercial properties at Peninsula Point that would require relocation are an aviation maintenance company and a warehouse. Fire Station #3 is also located on Peninsula Point and would require relocation. The parcel shared by these three buildings is owned by the state and currently leased and zoned for commercial purposes.

On Gravina Island, Alternative G2 would use DOT&PF lands in the vicinity of the Ketchikan International Airport and Lewis Point for construction of the ferry terminal and connecting road. The ferry terminal would be constructed at Lewis Point along with a new road 40-foot-wide that would connect the terminal to Seley Road and the airport. The operation of an airport ferry terminal at Lewis Point on Gravina Island would not adversely affect existing land uses or zoning and would be compatible with planned land uses near the airport.

Alternative G2 would require right-of-way on 10 acres of DNR land. DNR would need to issue an ILMA to DOT&PF, which would transfer management of those state-owned lands (inclusive of submerged lands and tidelands) to DOT&PF. ILMA lands must be returned to DNR when no longer needed for transportation purposes.

4.1.1.3.2 Alternative G3

Right-of-way requirements for Alternative G3 would affect a total of 10 parcels and would require no relocations. The impacts of Alternative G3's right-of-way requirements to land

ownership, land use, and zoning can be found in Table 4-1, Table 4-2, and Table 4-3, respectively.

On Revillagigedo Island, Alternative G3 would require the construction of a ferry terminal and parking facilities on Bar Point, just south of the Ketchikan boat harbor and the Cedar Point buildings and Movie Gallery on Jefferson Way. The ferry terminal and parking facilities would be constructed on fill placed into Tongass Narrows. This alternative would require acquisition of portions of the parking lots owned by the Movie Gallery, the Plaza Mall, and the Safeway gas station for right-of-way to construct the access road connecting to the ferry terminal. The remaining parking lot, however, would retain sufficient parking to serve the businesses that currently use it. The Revillagigedo Island ferry terminal site has surrounding land uses that are predominantly commercial, including retail at the Plaza Mall and other businesses along Jefferson Way. The area is currently zoned for commercial uses.

Alternative G3 would use DOT&PF lands on Gravina Island, south of the Ketchikan International Airport, for the ferry terminal and 40-foot-wide road connecting to the Gravina Island Highway. Construction of new facilities would occur on land that is currently vacant and within the airport reserve and development zones of KIA. The operation of a ferry terminal south of the airport terminal on Gravina Island would not adversely affect existing land uses or zoning and would be compatible with planned land uses near the airport.

Alternative G3 would require right-of-way on 7 acres of DNR land. DNR would need to issue an ILMA to DOT&PF, which would transfer management of those state-owned lands (inclusive of submerged lands and tidelands) to DOT&PF. ILMA lands must be returned to DNR when no longer needed for transportation purposes.

4.1.1.3.3 Alternatives G4 and G4v

Right-of-way requirements for Alternative G4 and G4v would affect a total of five parcels, all of which are either State or Borough owned. The impacts of Alternatives G4 and G4v's right-of-way requirements to land ownership, land use, and zoning can be found in Table 4-1, Table 4-2, and Table 4-3, respectively.

Under Alternative G4, a new ferry terminal and parking facility would be constructed on Revillagigedo Island, on DOT&PF land at the current site of the gravel parking lot adjacent to the existing ferry terminal. The new facilities for Alternative G4 would be constructed immediately adjacent the existing airport ferry terminals on both Revillagigedo and Gravina islands and therefore would not adversely affect existing land uses or zoning.

Alternative G4v would entail the same improvements as Alternative G4, but without the addition of new ferry vessels or new ferry terminals. See Sections 2.1.3.3 and 2.1.3.4 for a description of the G4 and G4v alternatives. The new facilities for Alternative G4v would be constructed immediately adjacent to the existing airport ferry terminal on Revillagigedo Island and therefore would not adversely affect existing land uses or zoning.

Alternatives G4 and G4v would require right-of-way on 6 acres of DNR land. DNR would need to issue an ILMA to DOT&PF, which would transfer management of those state-owned lands (inclusive of submerged lands and tidelands) to DOT&PF. ILMA lands must be returned to DNR when no longer needed for transportation purposes.

4.1.2 Consistency with Land Use Plans and Policies

The Ketchikan Gateway Borough plans for land use are the 1985 *Pennock and Gravina Island Neighborhood Plan*, 2005 *Gravina Island Plan*, 2007 *Coastal Management Plan*, and 2009 *Ketchikan Gateway Borough Comprehensive Plan 2020*. DOT&PF's 2003 *Ketchikan*

International Airport Master Plan also is relevant because all action alternatives affect airport property.

4.1.2.1 No Action Alternative

The No Action Alternative would be inconsistent with the Coastal Management Program and the *Ketchikan Gateway Borough Comprehensive Plan 2020*,[246] both of which discuss the need for improved access to Gravina Island. The Coastal Management Program identifies and supports the preferred alternative from the 2004 FEIS, Alternative F1. The *Ketchikan Gateway Borough Comprehensive Plan 2020* is less specific regarding the means of access to Gravina Island but states that access to Gravina Island from Revillagigedo Island is necessary to foster economic development within the Borough. As stated in the plan, "access strategies should include, but are not limited to, a bridge, enhanced ferry service, or other practical access solutions."[247] The No Action Alternative would provide no such access improvement.

The *Gravina Island Plan* is also coordinated around Alternative F1, which would have provided a bridge crossing at Pennock Island. The goals and vision of the plan could only be recognized and implemented fully through improved access from Revillagigedo Island, which the No Action Alternative would not provide.

The *Ketchikan International Airport Master Plan* anticipates either a continuation of the existing ferry service or the creation of hard-link to Revillagigedo Island in its plans to meet future airport parking and circulation needs. Under the existing ferry service and without the construction of a hard-link, the plan recommends expansion of its long-term parking lot. Because the plan accommodates existing ferry service, the No Action Alternative appears to be consistent with the *Ketchikan International Airport Master Plan*.

4.1.2.2 Bridge Alternatives C3-4 and F3

Alternatives C3-4 and F3 appear consistent with the *Ketchikan International Airport Master Plan*, the *Gravina Island Plan*, the *Coastal Management Plan*, and the *Ketchikan Gateway Borough Comprehensive Plan 2020*.

The forecasting chapter of the *Ketchikan International Airport Master Plan* examines bridge access as a possible future mode of access and identifies a location for a parking garage, should bridge access come to fruition. Alternatives C3-4 and F3 are consistent with the plan and would not affect planned airport facilities.

The *Gravina Island Plan* focuses on the Borough's long-term plans for development of Gravina Island by identifying key economic development opportunities. The plan states that road improvements (i.e., the recently completed Gravina Island Highway as well as additional future roads identified in the plan) are integral to provide the access needed for the community to grow. Alternatives C3-4 and F3 are consistent with the *Gravina Island Plan* because each alternative would improve accessibility between the islands as compared to the existing airport ferry.

The Coastal Management Program identifies the need for improved access, specifically a bridge, between Gravina Island and Revillagigedo Island to access suitable developable lands and meet community growth needs. While this plan recognizes the 2004 FEIS preferred alternative (F1) road corridor, the language within its enforceable policies speaks more generally to the route, although it does call for a road corridor accommodating a bridge. As such, Alternatives C3-4 and F3 would be consistent with the plan. Both alternatives also would

[246] Ketchikan Gateway Borough. 2009. *Ketchikan Gateway Borough Comprehensive Plan 2020.*

[247] Ketchikan Gateway Borough. 2009. *Ketchikan Gateway Borough Comprehensive Plan 2020*, p.57.

further the implementation of the key economic development and land supply strategy articulated in the Coastal Management Program by improving accessibility between the islands.

The *Ketchikan Gateway Borough Comprehensive Plan 2020* identifies development of Gravina Island as a goal to provide "new economic opportunities to diversify and strengthen Ketchikan's economic health."[248] The plan encourages Gravina Island access strategies that "include, but are not limited to, a bridge, and enhanced ferry service, or other practical access solution."[249] As such, both bridge Alternatives C3-4 and F3 would be consistent with the plan.

4.1.2.3 Ferry Alternatives G2, G3, G4, and G4v

Improved access to Gravina Island by means of increased ferry service is consistent with the *Ketchikan International Airport Master Plan*, which anticipates that the ferry could continue to be the future mode of transport to the airport. All of the proposed ferry alternatives would be consistent and would not conflict with the policies and implementation strategies within the *Gravina Island Plan* because they would improve accessibility between the Revillagigedo and Gravina islands. Enhanced ferry access as provided by any of the ferry alternatives would also be consistent with the goals and objectives of the Borough's Coastal Management Program. The ferry alternatives are also consistent with the *Ketchikan Gateway Borough Comprehensive Plan 2020,* which encourages access strategies to Gravina Island that include enhanced ferry service.

4.1.3 Section 4(f) Lands

None of the proposed alternatives would require acquisition of Section 4(f) resources. There are 13 Borough-managed park facilities in the project area. These are shown on Figure 3.2 as recreational/park lands in relation to the alternatives. None of the alternatives would affect these parks.

There are many properties in Ketchikan and Saxman on the NRHP, particularly downtown and outside the project area. None of these sites is located within the APE of any of the project alternatives. Additional detail is provided in Sections 3.21 and 4.21.

In summary, FHWA has determined that no land from any park, recreation area, wildlife refuge, or historic site subject to Section 4(f) protection would be used for the project and that therefore, a Section 4(f) evaluation is not necessary.

4.2 Farmland Impacts

The alternatives would not impact farmland because there is no farmland in the project area that is considered prime, unique, or of statewide or local importance.

4.3 Social Impacts

4.3.1 Population and Social Groups

None of the alternatives (No Action Alternative, Alternatives C3-4, F3, G2, G3, G4, and G4v) would disproportionally affect minority or low-income populations in the Borough. The impacts of the alternatives on minority and low-income populations, relevant to the assessment of environmental justice, are described in Section 4.3.6.

[248] Ketchikan Gateway Borough. 2009. *Ketchikan Gateway Borough Comprehensive Plan 2020*, p.57.

[249] Ketchikan Gateway Borough. 2009. *Ketchikan Gateway Borough Comprehensive Plan 2020*, p.57.

4.3.2 Community Character

4.3.2.1 No Action Alternative

The No Action Alternative would not change existing neighborhoods and would not affect community character.

4.3.2.2 Bridge Alternatives

4.3.2.2.1 Alternative C3-4

The Baker Street/Bucey Avenue neighborhood, a neighborhood of fewer than 15 residences along the hillside between Signal Road and the Alternative C3-4 bridge, may be adversely affected by the proximity of traffic on the new alignment, which would diminish the sense of quiet and the suburban atmosphere. The alignment associated with this alternative would be uphill from the neighborhood and would not split the neighborhood affecting community cohesion. The Pioneer Heights Senior Housing complex also may be adversely affected by the proximity of traffic on the new alignment. The presence of the bridge immediately south of the complex and at a higher elevation would alter the setting from its current natural surroundings to a more developed environment. The bridge structure would dominate the community character at this location.

Roadway improvements on Gravina Island under this alternative would not affect existing neighborhoods. The hard-link connection would provide a greater sense of connection to Ketchikan for Gravina Island neighborhoods and the character of the communities on Gravina Island would be less isolated. Conversely, residents of Gravina Island who value the separation and remote aspects of life on the island could be affected adversely by the physical connection between the communities.

4.3.2.2.2 Alternative F3

This alternative would not bisect neighborhoods or adversely affect neighborhood cohesion on any of the islands, including on Pennock Island, where most of the land is undeveloped. There would not be any direct access off the new road and onto the lands on Pennock Island from Alternative F3, although such access could be provided by others in the future. Elsewhere, direct access to the new facility would be limited, and current neighborhood streets would not be used for cut-through access.

Some residents could view the hard link between Revillagigedo Island, Pennock Island, and Gravina Island as a benefit because it could improve the cohesion of the community by linking neighborhoods (existing and future) on all sides of Tongass Narrows. Conversely, residents of Gravina and Pennock islands who value the separation and remote aspects of life on those islands could be affected adversely by the physical connection between the communities.

4.3.2.3 Ferry Alternatives G2, G3, G4, and G4v

None of the ferry alternatives (Alternatives G2, G3, G4, and G4v) would directly affect residential areas. The alignments do not bisect any neighborhoods and would not adversely affect neighborhood cohesion (see Section 4.4 for more information). Residents of the Cedar Point Condominiums would experience an increase in activity related to the Alternative G3 ferry terminal. Since these condominium units are adjacent to other commercial and maritime activity, the change in activity would be unlikely to affect the character of that community.

The limited access provided by the ferry alternatives would not substantially change the separation and remote lifestyle of Gravina Island residents offered by the physical divide of Tongass Narrows.

4.3.3 Community and Public Facilities

4.3.3.1 No Action Alternative

Under the No Action Alternative, the problems and inconvenience identified and associated with the current ferry access between public facilities and developed land on Revillagigedo Island (police, fire stations, hospital) and Ketchikan International Airport would continue. The emergency response system would remain unchanged and therefore transporting emergency personnel and equipment between the airport and Ketchikan would remain inconvenient and limited, as described in the purpose and need (Section 1.4.2.3).

4.3.3.2 Bridge Alternatives C3-4 and F3

The bridge alternatives would not have a direct adverse impact to existing or planned community facilities or public service providers. Access to the Pioneer Heights Senior Housing complex would not be affected by either bridge alternative. Accessibility from Gravina Island to public services such as fire, police, and hospitals on Revillagigedo Island would improve considerably with the 24-hour access provided by a bridge. Travel for necessary medical services would be easier for residents of Gravina Island, and emergency personnel could travel to Gravina Island more easily than current infrastructure allows.

4.3.3.3 Ferry Alternatives G2, G3, and G4

Alternatives G2, G3, and G4 would include construction of a passenger waiting area that would create a public space for people waiting for the airport ferry. Accessibility to public services such as fire, police, and hospitals would improve with the additional ferry service, although travel time to the airport for emergency vehicles would be the same for Alternatives G2 and G3 (assuming use of the existing ferry) and improve slightly for Alternative G4. The increased capacity of an additional ferry service would make travel to Ketchikan for medical services more convenient for residents of Gravina Island and an additional ferry would make accessing Gravina Island easier for emergency personnel than it is now, but access (as with the existing ferry) would still be unavailable during non-operating hours or severe weather. The emergency response system would be the same as the existing condition except that Alternatives G2 and G3 would offer different access locations, which could improve emergency response time (depending on the location of the emergency).

4.3.3.4 Ferry Alternative G4v

Alternative G4v would include a passenger waiting area that would create a public space for people waiting for the airport ferry. With no additional ferry service, access to public services such as fire, police, and hospitals would not improve under Alternative G4v. The emergency response system would be the same as the existing condition.

4.3.4 Recreation

4.3.4.1 No Action Alternative

With the No Action Alternative, access to recreational land on Gravina Island would not improve from the existing condition. Access to and development of the recreational opportunities on Gravina Island as detailed in the Borough Comprehensive Plan 2020 and the Gravina Island Plan would be limited under the No Action Alternative.

4.3.4.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

A direct benefit of improved access to Gravina Island associated with all the action alternatives would be better accessibility to recreational areas, parks, and facilities. This applies to bidirectional access for residents on Gravina and Revillagigedo Islands, as well as visitors accessing recreational sites on either island. Recent completion of the Gravina Island Highway has provided some improvement to recreation access on Gravina Island. There are numerous recreational opportunities on Gravina Island as well as many proposed trails and recreation area improvements, and improved access with a bridge or additional ferry service would make those opportunities more accessible to Ketchikan residents and visitors. The improved access to recreational opportunities could have adverse indirect impacts by increasing demand for and use of recreational sites, requiring more frequent upkeep and repair of facilities. It would also lead to greater demand for public services, such as fire and police protection, at recreation sites. These indirect impacts are described in Section 4.26.

4.3.4.3 Ferry Alternative G4v

With Alternative G4v, access to recreational land on Gravina Island would not improve from the existing condition. Alternative G4v would not benefit or adversely affect recreational resources in the project area.

4.3.5 Accessibility

Changes to accessibility are reflected, in part, by changes to travel times for vehicles, pedestrians, and bicycles. Section 4.7.3 describes vehicle travel time impacts and Section 4.8 details pedestrian and bicycle travel time impacts.

4.3.5.1 No Action Alternative

The No Action Alternative would not change travel patterns or accessibility. Travel to the airport would continue on the existing ferry; other trips would continue to be made with private boats. Accessibility problems, as identified in Chapter 1.0, would continue.

Weather can be a factor in the reliability of ferry access, although instances of service interruption due to weather are rare. The airport ferry runs if the airport is open, and the airport ferry service was closed only once to a weather-related event in the last 15 years.[250] That closure occurred when the wind was blowing at approximately 90 miles per hour and there were no vehicles or other passengers waiting to cross.

While access to lands on Gravina Island has improved since the completion of the Gravina Island Highway in 2008, access to medical services and fire protection for Gravina residents would continue to be limited by ferry schedule and potential weather-related closures. Without improved access, residents would continue to make trips to and from Ketchikan in private skiffs across Tongass Narrows, and depending on the season, be required to navigate heavy boat and seaplane traffic.

4.3.5.2 Bridge Alternatives

4.3.5.2.1 Alternative C3-4

Alternative C3-4 would improve accessibility between Revillagigedo and Gravina islands. The alternative would improve accessibility to the airport and to developable lands on Gravina Island by providing 24-hour access. Development would increase due to more convenient access to

[250] Carney, Mike. June 25, 2009. Personal communication between Airport Manager, Ketchikan International Airport, and Mike McMahon, HDR.

Gravina Island. Vehicle travel patterns would change slightly because the location of this alternative on Revillagigedo Island is off of Signal Road (north of the existing airport ferry). Accessibility for pedestrians and bicyclists would improve as a result of 24 hours-per-day availability of access; however, the travel route would be longer for pedestrians and bicyclists originating from, or destined to, areas on Revillagigedo Island south of the existing airport ferry terminal, and require more physical exertion to overcome grade changes. The effects of this alternative on travel time are described in Sections 4.7.3 (vehicles) and 4.8 (pedestrians and bicyclists).

The bridge and additional road miles would increase the vehicle miles traveled in the Borough. Driving an automobile can be dangerous and, to the extent that traffic accidents are a function of vehicle miles traveled, the number of traffic accidents would also increase. The roads, bridges, and intersections in this alternative would be designed to current American Association of State Highway Transportation Officials (AASHTO) standards, minimizing the impact to traffic safety.

Accessibility between medical and other emergency services and Ketchikan International Airport for medevacs would improve, offering greater opportunity for sharing firefighting equipment and personnel between airport and community emergency services.

4.3.5.2.2 Alternative F3

Alternative F3, located south of downtown Ketchikan, would improve accessibility between Revillagigedo and Gravina islands, and would improve access to the airport and developable lands on Gravina Island by providing 24-hour access to the island. Development would increase due to more convenient access to Gravina Island. Vehicle travel patterns would change because the location of this alternatives on Revillagigedo Island would lie south of downtown Ketchikan. Pedestrian and bicycle access would improve as a result of a permanent, 24-hour-per-day link to between the islands, though the corridor would be longer and require more physical exertion to overcome grade changes than current conditions. Effects on travel time are described in Sections 4.7.3 (vehicles) and 4.8 (pedestrians and bicyclists).

Alternative F3 would connect to Pennock Island, though road access from the Alternative F3 alignment to Pennock Island neighborhoods is not included in these alternatives. Alternative F3 would provide an opportunity for others to connect the Pennock Island neighborhoods to Gravina and Revillagigedo islands in the future. Section 4.26.1 describes the indirect impacts and Section 4.27.1 describes the cumulative impacts related to land use and access on Pennock Island.

The bridge and additional road miles provided in Alternative F3 would increase vehicle miles traveled and, consequently, would likely increase traffic accidents. The roads, bridges, and intersections would be designed to current AASHTO standards, minimizing the impact to traffic safety.

Accessibility between medical and other emergency services and Ketchikan International Airport for medevacs would improve as a result of this alternative, and the improvement would offer greater opportunity for sharing firefighting equipment and personnel between airport and community emergency services.

4.3.5.3 Ferry Alternatives

4.3.5.3.1 Alternatives G2, G3, and G4

Alternatives G2, G3, and G4 would increase the accessibility of Gravina Island from Revillagigedo Island. The alternatives would improve accessibility to the airport and developable lands on Gravina Island by providing another option for ferry access—Alternative G2 is located

north of the existing ferry, Alternative G3 is located south of the existing ferry, and Alternative G4 is located next to the existing ferry. The island's development potential would increase due to more convenient access to Gravina Island. Vehicle travel patterns would change for Alternatives G2 and G3 because of the location of these alternatives on Revillagigedo Island (north or south of the existing airport ferry, respectively). Accessibility for pedestrians and bicyclists would improve as a result of having two location options for crossing Tongass Narrows. The effects of these alternatives on travel time are described in Sections 4.7.3 (vehicles) and 4.8 (pedestrians and bicyclists).

Ferry closures due to weather are not anticipated to occur more frequently under Alternatives G2, G3, or G4 than under the No Action Alternative (see Section 4.3.5.1).

Alternatives G2, G3, and G4 would provide greater accessibility to medical and other emergency services than the No Action Alternative as a result of the additional ferry connection to Revillagigedo Island. However, residents would continue to be adversely affected by the limitations on accessibility to medical services and fire protection as dictated by ferry scheduling. Residents would continue to rely on private water access (e.g., personal boats, skiffs, or water taxi) to cross Tongass Narrows outside of ferry operating hours.

4.3.5.3.2 Alternative G4v

There would be no change in travel patterns, accessibility to medical and other emergency services, or travel safety with Alternative G4v, similar to the No Action Alternative. Travel to the airport would continue on the existing ferry; other trips would continue to be made with private boats. Because it is unlikely that additional ferry service would be added, limitations to accessing medical services and fire protection would be more pronounced under Alternative G4v.

4.3.6 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. Race and income data in the project area, to the most refined geographic subset available, were collected and compared to data for the State of Alaska and the Borough to identify minority or low-income populations in the project area.

As described in this chapter, all of the action alternatives would have some impact to the Ketchikan area and its residents. In accordance with EO 12898 (see Section 3.3), the project team set out to analyze whether any of the alternatives would have high and adverse environmental impacts that would be borne disproportionately by environmental justice populations.

As stated in Sections 3.3.1 and 3.3.6, demographic analysis indicates there are no low-income populations in the area, but that there are some minority populations in the area (see Figure 3.6). The minority populations closest to an action alternative are those near the Alternative G3 ferry terminal on Revillagigedo Island. The area in which that community resides would not experience disproportionately high and adverse impacts to the human or natural environment. In addition, as stated in Sections 3.3.1 and 3.3.6, no pockets of predominantly minority or low-income populations in the immediate vicinity of any of the alternatives were identified during public outreach for the project.

Adding a toll to a bridge alternative could adversely affect disadvantaged segments of the population, having a disproportionate adverse economic effect particularly on low-income

populations. The existing airport ferry crossing of Tongass Narrows requires toll payment and any proposed toll associated with the action alternatives would be the same or less than the existing toll. This would result in no change or a benefit to low-income populations. Further, since there are no predominantly minority or low-income populations in the project area, none of the action alternatives would have a disproportionate adverse effect on environmental justice populations with respect to tolling.

Based on the above discussion and analysis, construction and operation, including tolling, of any of the action alternatives would not cause disproportionately high and adverse effects on any minority or low income populations in accordance with the provisions of EO 12898 and FHWA Order 6640.23.

4.3.7 Subsistence

During scoping for the 2004 EIS, the project team met with representatives of the Metlakatla Indian Community, the Ketchikan Indian Corporation Tribal Council, the Organized Village of Saxman, and Cape Fox Corporation. Discussions at these meetings identified subsistence as an issue of great concern in the Borough. In those scoping meetings, Gravina Island, in general, and the Bostwick Inlet area of the island, in particular, were noted as important subsistence areas for Alaska Natives by the tribal entities consulted. Tribal consultation included in the SEIS scoping effort did not indicate any new concerns related to subsistence resources. Improved access to more areas of Gravina Island created by the Gravina Island Highway has likely improved access for subsistence users, which in turn may increase competition for resources. See Section 4.27.1 for a discussion of the cumulative impacts of the Gravina Access Project on subsistence resources on Gravina Island.

4.3.7.1 No Action Alternative

The No Action Alternative would not impact subsistence.

4.3.7.2 Bridge Alternative C3-4 and Ferry Alternatives G2, G3, G4, and G4v

The only direct impact to subsistence from Alternatives C3-4, G2, G3, G4, and G4v would be the loss of habitat that might support subsistence activity (see Section 4.14). Habitat loss is a direct function of the amount and location of land development. While it is impractical to determine the exact level of subsistence impact, such an impact level is implied from the amount of habitat lost. Alternative C3-4 would eliminate 13 acres of wetlands and 10 acres of uplands. Alternative G2 would eliminate 24 acres of wetlands, 1 acre of ponds, and 4 acres of uplands. Alternative G3 would eliminate 18 acres of wetlands, 3 acres of ponds, and 3 acres of uplands. Alternatives G4 and G4v would each eliminate 13 acres of wetlands and 1 acre of uplands.

To characterize the direct loss of habitat from these action alternatives, it is important to note that the total area of Gravina Island is 61,404 acres. Seventy percent of the island (approximately 43,000 acres) is wetland. Approximately 3,276 acres of the wetlands, including estuaries, tall sedge fens, scrub-shrub alder/willow, and moss muskeg/sphagnum peat muskegs, were identified by the USFS as "high-value wetlands" because of their fish and wildlife habitat value, which is a relative rarity. Productive old-growth forest habitat, particularly at low elevations, is important for deer. There are 11,123 acres of productive old growth below 800 feet elevation on USFS lands of Gravina Island, and another 7,800 acres above that elevation. Additional deer habitat exists on non-USFS lands. Based on the small proportion of lands affected by the alternative relative to the total available lands, any direct loss of habitat from these action alternatives would have a negligible effect overall on subsistence practices in the area. Indirect impacts to subsistence are addressed in Section 4.26.

4.3.7.3 Bridge Alternative F3

As with the other action alternatives, impacts to habitat that might support subsistence activities (see Section 4.14) can imply an impact to subsistence. Alternative F3 would have direct impacts to 33 acres of wetlands, 1 acre of ponds, and 2 acres of uplands. Though there would not be any direct access off the road and onto the land on Pennock Island, the improved access to Pennock Island may result in increased subsistence use whereby people use the bridge/road to access inland areas on the island by foot. Alternative F3 would likely affect subsistence more than the other alternatives because it would provide access to both Pennock and Gravina Islands, but the effect will be indirect, or secondary, in nature. Indirect impacts to subsistence would result from habitat loss associated with future development on Gravina and Pennock islands. Section 4.26 addresses habitat loss associated with future development.

As noted in Section 4.3.7.2, the abundance of habitat for subsistence resources in the project area relative to the direct loss of habitat from Alternative F3 indicates that the alternative would have a negligible effect overall on subsistence practices in the area. Indirect impacts to subsistence are addressed in Section 4.26**.**

4.3.8 Utilities

4.3.8.1 Water

4.3.8.1.1 No Action Alternative

The No Action Alternative would not involve construction or additional utility usage; therefore, it would not affect the water utilities in the project area.

4.3.8.1.2 Bridge Alternative C3-4

In the Signal Road area, potable water systems consist of roof catchment systems or hauled water, and there is no water distribution system; consequently, Alternative C3-4 would not impact the existing water system on Revillagigedo Island. On Gravina Island, the water supply main to Ketchikan International Airport would not be affected by Alternative C3-4 because it is not in the area of potential disturbance.

4.3.8.1.3 Bridge Alternative F3

There is no water distribution in the vicinity of Alternative F3 on Revillagigedo, Pennock, and Gravina islands. Residences in these areas obtain potable water from roof catchment systems or hauled water. Any potential effects of Alternative F3 on surface water supplies would be minimized through a stormwater treatment system and BMPs implemented during construction and operation, as described in Section 4.12.2 and 4.25.10. Alternative F3 would not affect the water supply main to the airport because it is not in the area of potential disturbance. No other water distribution systems exist in the vicinity of this alternative, and there would be no expected impact to existing facilities.

4.3.8.1.4 Ferry Alternatives G2, G3, G4, and G4v

All project improvements for Alternatives G2, G3, G4, and G4v on Revillagigedo Island would be seaward of any water lines, and the project would not impact those lines. The 60-passenger waiting facility at the airport ferry terminal on Revillagigedo Island would tie into the city water system but would not significantly affect the system's capacity. None of these alternatives would affect any water lines on Gravina Island.

4.3.8.2 Sewer

4.3.8.2.1 No Action Alternative

The No Action Alternative would not involve construction or additional utility usage; it would therefore have no effect on the sewer utilities in the project area.

4.3.8.2.2 Bridge Alternative C3-4

In the Signal Road area, sewage disposal typically consists of onsite disposal systems, and there is no sewage collection system. Consequently, Alternative C3-4 would not impact the existing sewer system. On Gravina Island, the airport is connected to the public sewer in Ketchikan via a submarine pipeline across Tongass Narrows. The connection is just north of the airport terminal building. Construction activity associated with Alternative C3-4 would be designed to avoid interfering with the pipeline.

4.3.8.2.3 Bridge Alternative F3

Sewage disposal in the project area of Revillagigedo Island and for residences on Pennock and Gravina Islands typically consists of onsite disposal systems, with no other sewage collection systems in the vicinity of the alternative. As a result of the self-contained nature of the sewage disposal systems on the islands, Alternative F3 would not impact existing sewer facilities or the airport wastewater treatment facilities.

4.3.8.2.4 Ferry Alternatives G2, G3, G4, and G4v

All project improvements for Alternatives G2, G3, G4, and G4v on Revillagigedo Island would be seaward of any sewer lines, so there would be no project-related impact to those lines. The 60-passenger waiting facility at the airport ferry terminal on Revillagigedo Island would tie into the city sewer system but would not affect system capacity. None of these alternatives would affect sewer lines on Gravina Island.

4.3.8.3 Electricity and Telephone

The electrical and telephone lines on Revillagigedo Island are, in most instances, co-located and are discussed together in this impact analysis.

4.3.8.3.1 No Action Alternative

The No Action Alternative would not involve construction or additional utility usage, and therefore would have no effect on the electrical and telephone utilities in the project area.

4.3.8.3.2 Bridge Alternative C3-4

Along Tongass Avenue on Revillagigedo Island, the main electrical and telephone lines are located overhead on poles, but the proposed bridge overpass would be high enough to clear them. On Gravina Island, electric and telephone service to the airport would not be affected by Alternative C3-4.

In the Signal Road area, electric and telephone lines are overhead on poles. Construction of the bridge access corridor may require realignment of some of those facilities, which could cause temporary disruption of service, but should not cause any long-term effects.

4.3.8.3.3 Bridge Alternative F3

Alternative F3 would not affect electric and telephone service to the airport on Gravina Island because the submarine cables are not in the area of potential disturbance. On Tongass Avenue on Revillagigedo Island, the main electrical and telephone lines are located overhead on poles. The Alternative F3 bridge connection to Tongass Avenue would not require any changes to the poles and lines.

On Pennock Island, electric and telephone service is provided by overhead lines on poles. The bridge approaches and roadway would not interfere with the power poles or lines.

4.3.8.3.4 Ferry Alternatives G2, G3, G4, and G4v

All project improvements for Alternatives G2, G3, G4, and G4v on Revillagigedo Island would be seaward of any electrical and telephone lines, so there is no expected impact. The 60-passenger waiting facility at the airport ferry terminal on Revillagigedo Island would tie into the electrical supply grid but would not affect system capacity. None of these alternatives would affect electrical or telephone lines on Gravina Island.

4.4 Relocation Impacts

This section discusses impacts to housing and businesses in the project area and the relocations required as a result of the C3-4 and G2 alternatives. Alternatives F3, G3, and G4/G4v would not require relocation of any residences or businesses and are not discussed in this section. Table 4-1 in Section 4.1 contains a summary of approximate acreages required for right-of-way and the anticipated residential and business relocations for each alternative. Because the project would result in relatively few displacements, information on race, ethnicity, and income levels is not included in the SEIS to protect the privacy of those affected. Sections 4.3 and 4.5 provide general information on social and economic impacts, respectively.

The 2010 *Conceptual Stage Relocation Study and Assessment of Right-of-Way Acquisition Costs* and its 2012 addendum (see Appendix B) provide detailed evaluations of each of the alignments with respect to property acquisition requirements, affected properties, and estimated number of displaced individuals and employees. The 2010 memorandum includes an estimate of the number of households that could be relocated; verification of available decent, safe, and sanitary housing in the area; an estimate of the businesses that may be displaced with each alternative; and the number of employees potentially affected. The 2012 addendum updates the 2010 memorandum with information about new development within the proposed right-of-way of Alternative C3-4 and related changes to the right-of-way requirements and acquisition costs. It also compares the assessed property values from 2010 and 2012 and finds the 2010 values to remain valid, with the exception of the properties in the Alternative C3-4 right-of-way that have new development. The community has sufficient existing housing to accommodate those residents who would be relocated, although those residents might have to move outside of their existing neighborhood. Businesses affected under Alternatives C3-4 and G2 would also be relocated to different areas of the community. Commercial space is available and the cost of the relocations would be covered as part of the relocation process. Relocations would be done according to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, and relocation resources would be made available to all relocated residents and businesses without discrimination.

4.4.1 No Action Alternative

The No Action Alternative would have no relocation impacts; no homes or businesses would have to be relocated.

4.4.2 Bridge Alternative C3-4

This alternative would acquire property from 20 parcels on Revillagigedo Island: 3 residential properties located along North Tongass Highway, 10 vacant privately owned properties, a small portion of an Alaska Mental Health Trust parcel, and 6 commercial properties located along Rex Allen Drive. The development of Alternative C3-4 would require the relocation of 2 houses along the North Tongass Highway and 6 businesses along Rex Allen Drive. Alternative C3-4 would

require acquisition of a portion of the parcel on which the Pioneer Heights Senior Housing facility is located, but would not affect the residential building or related parking and ancillary facilities. The undeveloped portion of the parcel to be acquired is uphill from the housing facility.

Documented businesses along Rex Allen Drive that potentially could be affected by this alternative are as follows:

- Ketchikan Auto Body and Glass, 4979 Rex Allen Drive
- First Bank Emergency Operations Center and Maintenance Shop, 4987 Rex Allen Drive
- LK Storage, 4975 Rex Allen Drive
- SE Diesel and Electric, 3973A Rex Allen Drive
- Cape Fox Tours Shop, 3973B Rex Allen Drive
- Warehouse (unknown tenant), 4982 Rex Allen Drive

The residents of the two houses on Tongass Avenue and the commercial activities of the Rex Allen Drive businesses would be relocated. Appendix A of the *Conceptual Stage Relocation Study and Assessment of Right-of-Way Acquisition Costs* (see Appendix B) provides a comparison of available housing in the area for displaced individuals as well as comparable commercial real estate for the affected businesses. Replacement housing and commercial facilities are available and the cost of relocations would be covered as part of the relocation process.

On Gravina Island, Alternative C3-4 would require right-of-way from two State-owned parcels, including DNR tide land and DOT&PF land in the vicinity of Ketchikan International Airport. Outside the immediate terminal area at the southern terminus of the Gravina Island Highway, the project would acquire right-of-way from two Borough-owned parcels.

4.4.3 Ferry Alternative G2

The proposed Alternative G2 alignment would not require the relocation of any residences but would require acquisition of one parcel and construction on Peninsula Point at Revillagigedo Island, requiring the relocation of several businesses and services. Documented businesses that could be affected by this alternative include:

- Promech Air Aviation Maintenance, 5441 N. Tongass Highway
- Fire Station #3, 5401 N. Tongass Highway
- Warehouse (unknown tenant), 5403 N. Tongass Highway

Alternative G2 would require acquisition of the Peninsula Point parcel. The State of Alaska owns the Peninsula Point parcel and leases it to Peninsula Point, LLC. Because this parcel is a State-owned leased property, compensation would likely be required to acquire the property. Available commercial property exists in the Ketchikan area for relocation of the warehouse as well as several waterfront properties that may meet the needs of Promech Air. If Alternative G2 were selected for construction, the project team would need to pursue additional consultation with the City of Ketchikan to establish the specific requirements of relocating the fire station.

On Gravina Island, Alternative G2 would affect two State-owned properties (DNR tide land and DOT&PF land in the vicinity of Ketchikan International Airport) and two Borough-owned properties at the southern terminus of the Gravina Island Highway. Affected properties on Gravina Island would require no compensation because the land is government owned.

4.5 Economic Impacts

This section discusses the direct impacts of the project alternatives on the local economy; Section 4.25.4.1 discusses economic impacts from construction, and Section 4.26.3 discusses secondary economic impacts. Most of the economic impacts associated with the project alternatives would not be directly attributable to the action taken, rather they would be indirect effects, and are therefore described in Section 4.26.3.

Long-term direct impacts of the Gravina Access Project on the local economy would be largely related to O&M spending on labor. Operations and maintenance costs for materials would be more likely to benefit communities outside the local area. Operations and maintenance labor costs would benefit the local economy through employment spending.

4.5.1 No Action Alternative

The No Action Alternative would have employment impacts related to periodic replacement of facilities and equipment, in addition to the jobs associated with operating the existing ferry service. There would be approximately 13 annual O&M jobs associated with the No Action Alternative.

4.5.2 All Action Alternatives

Operations and maintenance of the action alternatives would either eliminate or create O&M jobs in the Borough over the No Action Alternative. Table 4-4 illustrates the total number of annual O&M jobs that would employ Borough residents for each alternative.

Table 4-4: Estimated Operations and Maintenance Jobs in the Borough By Alternative

Alternative	Annual O&M Jobs
No Action	13
Bridge Alternatives	
C3-4	2
C3-4 with toll	3
F3	3
F3 with toll	4
Ferry Alternatives	
G2	28
G3	28
G4	28
G4v	13

Operations and maintenance activities would also indirectly result in the creation of additional jobs in the region. Indirect impacts would include full- and part-time employment created as a result of the secondary round of spending by businesses, households, and local governments that support the project; these indirect impacts are discussed in Section 4.26.3.

4.6 Joint Development

There is no joint development project associated with the Gravina Access Project.

4.7 Transportation

4.7.1 Aviation

For each project alternative, direct effects on aviation are discussed under three aviation categories and related subcategories, as follows:

- Ketchikan International Airport, including airport property and facilities and protected airspace
- Seaplane Facilities and Operations
- Helicopter Facilities and Operations

4.7.1.1 No Action Alternative

4.7.1.1.1 Ketchikan International Airport

The No Action Alternative would not affect airport property, existing airport facilities, or Part 77 airspace associated with Ketchikan International Airport. Existing problems associated with convenience and reliability of access for passengers, airport tenants, emergency personnel and equipment, and freight shipment would continue. Congestion around the airport terminal also would continue.

4.7.1.1.2 Seaplane Facilities and Operations

The No Action Alternative would not change existing seaplane facilities or operations. Seaplane operators would continue to operate in conjunction with the airport ferries and other marine vehicles in Tongass Narrows as well as with other air traffic.

4.7.1.1.3 Helicopters Operations and Facilities

The No Action Alternative would not affect helicopter operations or facilities.

4.7.1.2 Bridge Alternative C3-4

4.7.1.2.1 Ketchikan International Airport

Alternative C3-4 would enhance access to Ketchikan International Airport from Ketchikan by providing a hard link (bridge). The bridge would touch down on Gravina Island just north of the airport terminal, connecting to the terminus of the Airport Access Road. The alternative may require modifications to the vehicle circulation system in the immediate vicinity of the terminal area to accommodate access from the bridge; i.e., the pavement may be restriped and marked to accommodate traffic flow to three destinations: the airport terminal, airport parking, and continuation on the Airport Access Road to other locations on Gravina Island (see Figure 4.1). The project would coordinate with airport management on these changes to the circulation patterns to ensure safe and efficient movement of vehicles and pedestrians outside the airport terminal.

The bridge would be on piers spaced at approximately 100- to 150-foot intervals, with the exception of the main span which has a navigational opening of 550 feet, and would span Tongass Narrows until its touchdown point on Gravina Island. The bridge structure would extend over a portion of the 24-foot-wide gravel airport service road, which parallels the runway between Tongass Narrows and Taxiway C. It would also span the seaplane base at Ketchikan International Airport. The service road would be realigned around the bridge piers. Potential effects on the seaplane base are described in the following section.

The height of the Alternative C3-4 bridge and its proximity to Ketchikan International Airport prompted concern about intrusion into Part 77 protected airspace. FHWA and DOT&PF

consulted FAA on this issue, and in July 2009 FAA issued a "determination of no hazard to air navigation" for Alternative C3-4 (Appendix C). Although the bridge would penetrate 44 feet into the horizontal surface of Part 77 airspace and 59 feet into the transitional surface, these penetrations would not affect current instrument approach procedures for Ketchikan International Airport. Alternative C3-4 would have no direct adverse effect on standard approach and departure procedures for wheeled aircraft at Ketchikan International Airport.

4.7.1.2.2 Seaplane Facilities and Operations

Alternative C3-4 would have no direct adverse effects on the existing seaplane facilities at Ketchikan Harbor Seaplane Base, Murphy's Pullout Seaplane Base, Peninsula Point Pullout Seaplane Base, or other private facilities, including Taquan Air's new facilities near the airport ferry terminal on Revillagigedo Island. As mentioned above, the bridge would span the seaplane base at Ketchikan International Airport. Access to the airport seaplane floats and removal ramp would be impaired during construction; therefore, the airport seaplane base may need to be temporarily relocated during construction (see Section 4.25.5.1.1). Following bridge construction, operations at the seaplane base would resume at the current location. Alternative C3-4 would present a new obstruction to seaplanes operating in Ketchikan Class E airspace (i.e., the restricted airspace around Ketchikan and Tongass Narrows). The presence of the bridge would reduce and constrain the area available for seaplane operations. The bridge would transect the southern portion of the waterway designated by USCG[251] for take-offs and landings from the airport seaplane base (the NWW-SEE Waterway; see Section 3.7.1.2.2), possibly requiring shortening the waterway from its current 9,500-foot length, or shifting the waterway to the north. The FAA would not permit aircraft to be airborne under the bridge, and the bridge would bisect the Revilla Corridor. Some operators would have to taxi longer distances to be appropriately aligned for takeoff, or to reach their bases after landing.

In addition, the FAA determined that Alternative C3-4 would adversely affect seaplane operations during those periods of inclement weather that require SVFR clearance (see Section 3.7.1.4.3). Although the FAA issued a "determination of no hazard to air navigation" for Alternative C3-4 (see Appendix C), its analysis found that the Operation and Letter of Agreement for operations in the Revilla Corridor would be adversely affected. The Alternative C3-4 bridge would obstruct flight under normal VFR operations and could greatly reduce the effectiveness of SVFR operations. SVFR operations on each side of the bridge would not be affected, but SVFR flights that needed to cross the bridge would be required to cross 500 feet above the obstruction (bridge), which means the minimum cloud ceiling to cross the bridge would be approximately 810 feet. It is most likely that seaplane pilots would move their operations (take-offs and landings) to avoid complications related to SVFR flights in the vicinity of the bridge.

With the ability of pilots to shift locations of takeoffs and landings within Tongass Narrows, the adverse effects of Alternative C3-4 on seaplane operations would be reduced. The FAA would evaluate, through a process separate from this SEIS, the need to adjust or eliminate the minimum altitudes allowed under SVFR as a result of Alternative C3-4. Proper lighting and marking of the bridge would reduce the risk of seaplanes colliding with the bridge.

4.7.1.2.3 Helicopter Operations and Facilities

Alternative C3-4 would have no effect on helicopter facilities, though the presence of the bridge would affect helicopter operations. Pilots would need to navigate around the bridge.

[251] U.S. Coast Guard. 2012. *Tongass Narrows Voluntary Waterway Guide.*

4.7.1.3 Bridge Alternative F3

4.7.1.3.1 Ketchikan International Airport

This alternative would enhance access to Ketchikan International Airport by providing a hard link (bridge) from Ketchikan. The two bridges would cross two channels of Tongass Narrows approximately 3 miles south of the airport, would not penetrate any airspace surfaces, and would have no effect on approaches or departures from Ketchikan International Airport (see Appendix C). Although the two bridges of Alternative F3 would not penetrate Part 77 airspace, marking and lighting on the bridge would still conform to FAA regulations and advisory circulars.

4.7.1.3.2 Seaplane Facilities and Operations

Alternative F3 would have no adverse effect on seaplane bases in the Ketchikan area.

The two bridges in Alternative F3 would adversely affect seaplane operations because pilots would have to fly over a bridge or taxi under it when traversing the East and West channels. Seaplane landings and take-offs would be displaced up or down channel, which may result in longer taxi distances. The bridges would be south of waterways designated for seaplane operations and no adjustments to the waterways would be needed. Proper lighting and marking of the bridge structures would help minimize the risk to seaplanes of collision with the bridge.

As with Alternative C3-4, the bridge structures associated with Alternative F3 would obstruct flight under normal VFR operations and could greatly reduce the effectiveness of SVFR operations. It is most likely that seaplane pilots would move their operations (take-offs and landings) to avoid complications related to SVFR flights in the vicinity of the bridges. Displaced take-off and landing activities would not affect the number of SVFR operations. With the ability of pilots to shift locations of takeoffs and landings within Tongass Narrows, the adverse effects of Alternative F3 on seaplane operations would be reduced.

4.7.1.3.3 Helicopters Operations and Facilities

Alternative F3 would not affect helicopter facilities. Helicopter operations would be affected by the presence of the bridges. Pilots would need to navigate around the bridges.

4.7.1.4 Ferry Alternative G2

4.7.1.4.1 Ketchikan International Airport

The Gravina Island terminus of Alternative G2 would be approximately 2 miles north of the airport. Alternative G2 would include roadway improvements between the ferry terminal and the airport on Gravina Island. These improvements would have no adverse effects on airport facilities or operations, and Alternative G2 would have no effect on Part 77 airspace or aviation operations at the airport.

4.7.1.4.2 Seaplane Facilities and Operations

Alternative G2 would introduce ferry traffic across the northern end of the NWW-SEE Waterway used for seaplane operations, affecting a relatively small portion of the waterway. This new ferry traffic could adversely affect seaplanes using that portion of the waterway for take-offs and landings by causing brief delays on a frequent basis. Alternative G2 would affect no other seaplane facilities. The FAA might deem it necessary to formally shift the boundaries of the NWW-SEE Waterway slightly to the south to lessen or eliminate any effects on seaplane take-offs and landings. Alternatively, seaplane operations would have to avoid that portion of the waterway affected by Alternative G2 during ferry transit.

4.7.1.4.3 Helicopters Operations and Facilities

Alternative G2 would not affect helicopter operations or facilities.

4.7.1.5 Ferry Alternative G3

4.7.1.5.1 Ketchikan International Airport

The Gravina Island terminus of Alternative G3 would be less than 1 mile south of the airport. Alternative G3 includes roadway improvements on Gravina Island. Neither the ferry terminal nor the roadway improvements would affect airport facilities or operations. Alternative G3 would not affect air space or aviation operations at the airport.

4.7.1.5.2 Seaplane Facilities and Operations

Alternative G3 would have no effect on seaplane facilities. This alternative would introduce ferry vessel traffic across the northern portion of the NW-SE Waterway, and could have a direct adverse effect on seaplane take-offs and landings in that waterway by causing brief but frequent delays; however, the portion of the waterway affected would be small relative to the size of the NW-SE Waterway. Alternative G3 would affect no other seaplane facilities or operations. The FAA may need to shift the boundaries of the NW-SE Waterway slightly to the south to lessen or eliminate any effects on seaplane take-offs and landings. Alternatively, seaplane operations could avoid that portion of the waterway affected by Alternative G3 during ferry transit.

4.7.1.5.3 Helicopters Operations and Facilities

Alternative G3 would not affect helicopter operations or facilities.

4.7.1.6 Ferry Alternative G4

4.7.1.6.1 Ketchikan International Airport

Alternative G4 would include development of a new ferry terminal adjacent to the existing terminal at Ketchikan International Airport. The alternative would require adjustments to circulation near the airport terminal to accommodate the new ferry access point. These adjustments would have no adverse effects on airport facilities because they would be specifically laid out to avoid effects on any facilities currently in use at the airport.

Alternative G4 would not affect air space or aviation operations at the airport.

4.7.1.6.2 Seaplane Facilities and Operations

Alternative G4 would have no effect on seaplane facilities or operations.

4.7.1.6.3 Helicopters Operations and Facilities

Alternative G4 would have no effect on helicopter operations or facilities.

4.7.1.7 Ferry Alternative G4v

4.7.1.7.1 Ketchikan International Airport

Alternative G4v would not affect airport property, existing airport facilities, or Part 77 airspace associated with Ketchikan International Airport. Existing problems associated with reliability of access for passengers, airport tenants, and emergency personnel and equipment would persist. Partial improvements to airport travel would be achieved by providing the passenger waiting area on Revillagigedo Island, shuttle van service, and upgraded sidewalks.

4.7.1.7.2 Seaplane Facilities and Operations

Alternative G4v would not affect existing seaplane facilities or operations.

4.7.1.7.3 Helicopters Operations and Facilities

Alternative G4v would not affect helicopter operations or facilities.

4.7.1.8 Mitigation of Aviation Impacts

4.7.1.8.1 No Action Alternative

No mitigation measures for aviation impacts are warranted for the No Action Alternative.

4.7.1.8.2 Bridge Alternatives

The FAA would require any bridge crossings of Tongass Narrows (including East and West channels, in the case of Alternative F3) to be lighted and marked in accordance with FAA regulations and advisory circulars to facilitate existing aviation operations in proximity to the bridge(s). The FAA also would require DOT&PF to complete and return FAA Form 7460-2, Notice of Actual Construction or Alteration, within 5 days after the construction reached its greatest height (7460-2, Part II).

4.7.1.8.3 Ferry Alternatives

No mitigation measures for aviation impacts are warranted under the ferry alternatives.

4.7.2 Marine Transportation

This section describes the potential effects on marine transportation. Considerable technical analyses were completed in support of the 2004 FEIS to characterize the effects of the Gravina Access Project alternatives on marine navigation. This SEIS references those analyses where appropriate.

With respect to cruise ships as an element of marine navigation, this section presents the direct effects of the project alternatives (i.e., how alternatives affect cruise ship access to Ketchikan, mobility within Tongass Narrows, and durations of travel and port calls). The indirect impacts of changes in cruise ship traffic and navigation are presented in Section 4.26.4. Effects related to cruise ship emissions are addressed in Section 4.10.

4.7.2.1 No Action Alternative and Ferry Alternative G4v

4.7.2.1.1 Cruise Ships

The No Action Alternative and Alternative G4v would have no effect on cruise ship operations or the Ketchikan docking and berthing areas and facilities used by the cruise ships. No new infrastructure or marine operations would be introduced to the project area.

4.7.2.1.2 Alaska Marine Highway System Ferry

The No Action Alternative and Alternative G4v would have no effect on AMHS ferry services or facilities.

4.7.2.1.3 Airport Ferry

The No Action Alternative and Alternative G4v would have no effect on the existing airport ferry service or facilities.

4.7.2.1.4 Tugs and Barges

The No Action Alternative and Alternative G4v would not affect tug and barge traffic in Tongass Narrows.

4.7.2.1.5 USCG Facilities and Operations and NOAA Vessels

The No Action Alternative and Alternative G4v would have no effect on the USCG Station or USCG operations. NOAA vessels would not be affected by these alternatives.

4.7.2.1.6 Small Boats and Other Watercraft

The No Action Alternative and Alternative G4v would have no effect on the facilities for or the use of small boats, kayaks, or other watercraft in Tongass Narrows.

4.7.2.2 Bridge Alternative C3-4

4.7.2.2.1 Cruise Ships

The bridge associated with Alternative C3-4 would have a navigational clearance of 200 feet (vertical) and 550 feet (horizontal), which would accommodate the passage of all ships currently transiting Tongass Narrows. This finding is based on studies completed in support of the 2004 FEIS that modeled ships 142 feet wide, 894 feet long, and 200 feet tall based on surveys of all cruise ships sailing in Alaska at the time.[252] The introduction of piers in the deep navigable waters of Tongass Narrows would introduce new, permanent grounding and allision[253] risks and increase the imperative for the existing custom and practice of one-way traffic for large vessels operating in Tongass Narrows.[254]

There is no generally recognized and accepted standard for assessing the probability of ship allisions or groundings. A Monte Carlo navigation simulation study conducted for the Gravina Access Project[255] used the risk associated with current operations in Tongass Narrows as the basis for assessing the probable safety of navigating proposed bridges with a 550-foot horizontal clearance in the 2004 FEIS. Simulator tests were also run at the American Maritime Officers' Raymond T. McKay Simulator Training, Assessment, and Research Center (RTM STAR Center) in Dania Beach, Florida, with marine pilots from Southeast Alaska to identify safety and operational issues associated with bridge alternatives in the 2004 FEIS.[256] Because the proposed Alternative C3-4 bridge would have a horizontal clearance of 550 feet, the simulation results presented in the Monte Carlo study and RTM STAR Center report are applicable to this analysis of Alternative C3-4.

The Monte Carlo study evaluated the risks for single, maximum-width cross-sections, i.e., the area of greatest constriction. Based on the study results, a bridge with an effective horizontal clearance of 550 feet at the approximate location of Alternative C3-4 would present a theoretical passage hazard approximately three times greater than the existing operations passage near Charcoal Point (maximum width 687 feet). According to the Monte Carlo simulation, the statistically expected number of groundings or allisions of large cruise ships at Charcoal Point in a 50-year period would be 244, whereas the statistically expected number of groundings or allisions at the proposed bridge crossing in a 50-year period would be 746. The findings of the RTM STAR Center report upheld the findings of the Monte Carlo study.

As noted above, the simulation studies to determine the impacts of a bridge to cruise ship passage through Tongass Narrows considered ships sailing in Alaska at the time of the studies. Recent inquiries to the North West and Canada Cruise Association[257] revealed that larger ships (e.g., *Freedom of the Seas*, which is 127 feet wide; 1,112 feet long; and 208 feet high) could

[252] Alaska Department of Transportation and Public Facilities. May 2003. *Gravina Access Project Effects on Cruise Ship Operations*. Prepared by Northern Economics, Inc. and Klugherz and Associates.

[253] An allision is defined as a moving object colliding with a stationary object (e.g., a ship hitting a bridge pier).

[254] Alaska Department of Transportation and Public Facilities. January 2002. *Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum*. Prepared by The Glosten Associates.

[255] Alaska Department of Transportation and Public Facilities. January 2002 *Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum*. Prepared by The Glosten Associates.

[256] Raymond T. McCay Simulator Training, Assessment, and Research Center. April 2003. *Ketchikan Bridge Project Summary Report*.

[257] Spalding, Donna. September 14, 2010, Personal communication between North West and Canada Cruise Association representative and Carol Snead, HDR.

operate in Alaska in the future, with stops in Ketchikan. With a vertical clearance of 200 feet at MHHW, pilots of ships taller than 200 feet would have to schedule their passage under the bridge with lower tides, which would avoid ship allisions with the bridge deck. Scheduling ship arrival and departure times around the tides could affect overall cruise schedule, including time in port and running time or running speed. Alternatively, taller ships could enter and exit Tongass Narrows from the south to avoid the bridge.

The risk of allisions of ships with bridge piers would increase with ship length because the sweep of the ship when approaching the bridge at an angle (referred to as "crabbing') would be wider with a longer ship than with a shorter ship. The sweep of a ship 894 feet long and 142 feet wide with a 10-degree crabbing angle (an extreme case; most crabbing angles are 7 or 8 degrees)[258] would be approximately 292 feet wide. A ship 1,112 feet long and 127 feet wide with a 10-degree crabbing angle would create a sweep approximately 327 feet wide. While these widths are well within the proposed horizontal navigational opening of 550 feet, the greater sweep width of longer ships represents an increased risk in allisions.

4.7.2.2.2 AMHS Ferry

Alternative C3-4 would not affect AMHS ferry facilities or operations. The vertical clearance of the bridge would be significantly higher than is required for AMHS ferries. The introduction of piers in the deep navigable waters of Tongass Narrows would introduce new, permanent, grounding and allision risks;[259] but the horizontal spans would be substantially wider than the other navigational clearances on the AMHS system routes (e.g., Wrangell Narrows).

4.7.2.2.3 Airport Ferry

Airport ferry service would be discontinued under Alternative C3-4, thereby reducing overall marine operations crossing Tongass Narrows. The reduction in cross-pattern marine operations would increase the safety of ongoing long-channel transits of Tongass Narrows.

4.7.2.2.4 Tugs and Barges

The vertical and horizontal clearance of Alternative C3-4 would be sufficient to accommodate tug and barge traffic in Tongass Narrows and would not affect tug and barge operations. The introduction of piers in the deep navigable waters of Tongass Narrows would introduce new, permanent grounding and allision risks.[260]

4.7.2.2.5 USCG Facilities and Operations and NOAA Vessels

Alternative C3-4 would not affect USCG facilities, as the alternative alignments would be substantially north of the USCG Station. The introduction of piers in the deep navigable waters of Tongass Narrows would introduce new, permanent grounding and allision risks;[261] however, the 550-foot horizontal span would provide substantial clearance for USCG and NOAA vessels operating in Tongass Narrows.

[258] Alaska Department of Transportation and Public Facilities. June 14, 2010. Notes from a meeting of the Southeast Alaska Pilots Association with DOT&PF. Ketchikan, Alaska.

[259] Alaska Department of Transportation and Public Facilities. January 2002.*Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum*. Prepared by The Glosten Associates.

[260] Alaska Department of Transportation and Public Facilities. January 2002.*Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum*. Prepared by The Glosten Associates.

[261] Alaska Department of Transportation and Public Facilities. January 2002.*Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum*. Prepared by The Glosten Associates.

4.7.2.2.6 Small Boats and Other Watercraft

Alternative C3-4 would have no effect on the facilities for or the use of small boats, kayaks, or other watercraft in Tongass Narrows. If these boats and watercraft were to navigate near the bridge, they should be able to maneuver around the piers and avoid allision.

4.7.2.3 Bridge Alternative F3

4.7.2.3.1 Cruise Ships

Alternative F3 includes a low (60-foot vertical clearance) bridge over East Channel and a higher bridge (200-foot vertical clearance) over West Channel. Similar to Alternative C3-4, the vertical and horizontal clearances of the West Channel bridge (200 feet and 550 feet, respectively) would accommodate the passage of all ships currently transiting Tongass Narrows (see Section 4.7.2.2).

The Alternative F3 bridges would be south of the Ketchikan cruise ship dock. This alternative would require cruise ships calling at Ketchikan to use West Channel or enter and exit Tongass Narrows from the north. Either option would have an adverse effect on cruise ship operations because it would require additional maneuvering and increased sailing time.

Use of West Channel by large cruise ships adds approximately 1.8 nautical miles to the running distance, adding approximately 3 minutes to total cruise ship run-times for southbound voyages, and 18 minutes to northbound voyages (Table 4-5). These increases would consume more fuel, thereby increasing costs to ship operators (see Section 4.26.4). In addition, cruise ships would have to execute difficult maneuvers, consisting of either turns around Pennock Reef and/or a 180-degree turn in the berthing and swinging area. The two 180-degree turns would presumably be executed on that section of the voyage that is least time critical, or the maneuvers may be split between the northern and southern segments of the Ketchikan port call. Overall, these turns likely would add 30 to 40 minutes to the ships' harbor maneuvers. It is anticipated that cruise lines would recover the additional transit time needed to utilize West Channel by using faster running speeds between Ketchikan and Juneau; therefore, no reduction in port time is expected.[262] The potential economic effects of changes in cruise ship operations are discussed in Section 4.26.3.

Table 4-5: Analysis of Sailing Time between Juneau and Ketchikan for Alternative F3-Pennock Island Crossing

2001 Cruise Season	Baseline Hours between Ketchikan and Juneau	Average Hours at Max Cruise	Average Time Lost (minutes)
Ketchikan to Juneau—95 trips	16.56	16.60	3
Juneau to Ketchikan—94 trips	16.49	16.79	18

Source: Glosten Associates. August 28, 2001. *Running Time and Other Impacts on Large Cruise Ships.* Fax Memo to HDR.

The Monte Carlo and STAR Center simulation studies prepared for the 2004 FEIS[263] evaluated the safety of cruise ships navigating West Channel with the Alternative F3 bridge. Safety

[262] Alaska Department of Transportation and Public Facilities. May 2003. *Gravina Access Project Effects on Cruise Ship Operations*. Prepared by Northern Economics, Inc. and Klugherz and Associates.

[263] Alaska Department of Transportation and Public Facilities. January 2002. *Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum*. Prepared by The Glosten Associates; April 2003.; July 2003. *Gravina Access Project Supplemental Monte Carlo Navigation Simulation Study Technical Memorandum*. Prepared by The Glosten Associates; Raymond T. McCay Simulator Training, Assessment, and Research Center. April 2003. *Ketchikan Bridge Project Summary Report*.

concerns were identified by cruise ship lines and marine pilots in the STAR Center report.[264] As presented in the report, Ketchikan cruise ship pilots commented that West Channel with the Alternative F3 bridge would be too narrow to safely navigate large ships.

In response to these safety concerns, DOT&PF added modification of the West Channel to improve navigation in Alternative F3. A supplement to the Monte Carlo simulation study[265] determined that navigation through the widened West Channel under the Alternative F3 bridge would be 62 percent safer than existing navigation through East Channel.

In the RTM STAR Center report, marine pilots also expressed concern over the bridges' angled crossings of East and West channels.[266] For the SEIS, project engineers realigned the Alternative F3 bridges so that they would cross perpendicular to East and West channels to reduce the risk of allisions.

As noted for Alternative C3-4, the simulation studies conducted for the 2004 FEIS to assess effects of a bridge on cruise ship passage through Tongass Narrows considered ships sailing in Alaska at the time of the studies. Recent inquiries to the North West and Canada Cruise Association[267] revealed that larger ships (e.g., 1,112 feet long; 127 feet wide; and 208 feet high) are anticipated to operate in Alaska and stop in Ketchikan in the future. With a vertical clearance of 200 feet at MHHW, pilots of taller ships would have to schedule their passage under the bridge with lower tides. This would avoid ship allisions with the bridge deck. Scheduling ship arrival and departure times around the tides could affect overall cruise schedule, including time in port and running time or running speed. Alternatively, taller ships could enter and exit Tongass Narrows from the north to avoid the bridge.

The risk of allisions would increase with longer ships because the sweep of the ship when approaching the bridge at an angle would be wider with a longer ship. The sweep of a ship 894 feet long and 142 feet wide with a 10-degree crabbing angle would be approximately 292 feet. A ship 1,112 feet long and 127 feet wide with a 10-degree crabbing angle would create a sweep approximately 327 feet wide. While these widths are well within the proposed horizontal navigational opening of 550 feet, the greater sweep width of longer ships represents an increased risk in allisions.

4.7.2.3.2 AMHS Ferry

As noted above, AMHS ferries usually use West Channel, and the high span over West Channel would allow continued use by the AMHS ferries. The AMHS ferries would not be able to transit East Channel because of the bridge's low (60-foot) navigational clearance. With cruise ships and AMHS ferries required to use West Channel, marine traffic in West Channel would increase. The added traffic could adversely affect AMHS ferry operations because the timing of AMHS transits through the West Channel would have to be coordinated with cruise ship transits. In addition, the introduction of piers in the deep navigable waters of Tongass Narrows would introduce new, permanent grounding and allision risks.[268] However, the horizontal spans are substantially wider than the other navigational clearances in the AMHS system routes (e.g., Wrangell Narrows).

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[264] Raymond T. McCay Simulator Training, Assessment, and Research Center. April 2003. *Ketchikan Bridge Project Summary Report*.

[265] Alaska Department of Transportation and Public Facilities. July 2003. *Gravina Access Project Supplemental Monte Carlo Navigation Simulation Study Technical Memorandum*. Prepared by The Glosten Associates.

[266] Raymond T. McCay Simulator Training, Assessment, and Research Center. April 2003. *Ketchikan Bridge Project Summary Report*.

[267] Spalding, Donna. September 14, 2010. Personal communication between North West and Canada Cruise Association representative and Carol Snead, HDR.

[268] Alaska Department of Transportation and Public Facilities. January 2002. *Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum.* Prepared by The Glosten Associates.

4.7.2.3.3 Airport Ferry

Airport ferry service would be discontinued in Alternative F3, thereby reducing overall marine operations crossing Tongass Narrows. The reduction in cross-channel marine operations would increase the safety of ongoing long-channel transits of Tongass Narrows.

4.7.2.3.4 Tugs and Barges

The vertical and horizontal clearances of the Alternative F3 bridges would be sufficient to accommodate most tug and barge traffic in the East Channel and all other marine traffic in the West Channel of Tongass Narrows. The introduction of piers in the navigable waters of East and West channels would introduce new, permanent grounding and allision risks;[269] though the widths of the navigational clearances (200 feet wide for East Channel and 550 feet wide for West Channel) would present a relatively low risk of allision for barges passing through Tongass Narrows.

Barges have been known to transit Tongass Narrows with container stacks and cargo that require air drafts (i.e., height above the water surface) of 64 feet; however, this is the maximum air draft requirement and does not represent the majority of barges in Tongass Narrows. Since the East Channel bridge has a vertical clearance of 60 feet above high tide, tug masters could elect to wait for lower tides to navigate 64-foot-high barges through East Channel rather than navigating these barges through West Channel. Barge operators may limit the height of their container stacks to avoid reliance on the tides, or may transit through West Channel. In summary, the operations of some barges may change as a result of Alternative F3, causing delay of shipment, which may adversely impact tug and barge operators.

4.7.2.3.5 USCG Facilities and Operations and NOAA Vessels

Alternative F3 would have no direct effect on USCG facilities; however, the 60-foot bridge over East Channel would adversely affect operations of USCG vessels with air drafts greater than 60 feet, including the USCG cutter *Acushnet*, which has an air draft of 100 feet. Such vessels would have to use the northern section of East Channel to approach and depart from the USCG pier. The taller vessels (greater than 60-foot air draft) departing from the USCG Station could continue northward through Tongass Narrows or cross into West Channel after passing the northern tip of Pennock Island. From there they could sail southward under the 200-foot West Channel Bridge. The introduction of piers in the navigable waters of East and West channels would introduce new, permanent grounding and allision risks;[270] however, the 200-foot (East Channel) and 550-foot (West Channel) horizontal bridge spans provide sufficient clearance and low allision risk for USCG and NOAA vessels operating in those waters.

The NOAA Ship *Fairweather* would not be able to cross under the East Channel Bridge to reach its proposed mooring site south of the USCG pier, although it could cross under the West Channel Bridge. The need to transit via the West Channel Bridge would have an adverse effect on the proposed operations of this NOAA vessel because it would require additional turning maneuvers for the ship to navigate around Pennock Island via the West Channel and under the West Channel Bridge when approaching from or departing to the south.

The new Fast Response Cutter (FRC) patrol boats being stationed at the Ketchikan facility, with air drafts less than 50 feet, would be able to transit the East Channel on approach and

[269] Alaska Department of Transportation and Public Facilities. January 2002. *Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum.* Prepared by The Glosten Associates.

[270] Alaska Department of Transportation and Public Facilities. January 2002. *Gravina Access Project Monte Carlo Navigation Simulation Technical Memorandum.* Prepared by The Glosten Associates.

departure from the USCG base. Alternative F3 would not require land from the USCG base or interfere with existing or planned development there.

4.7.2.3.6 Small Boats and Other Watercraft

Alternative F3 would not affect the facilities for or the use of small boats, kayaks, or other watercraft in Tongass Narrows. If these boats and watercraft were to navigate near the bridge, they should be able to maneuver around the piers and avoid allision. Restriction of large vessel traffic to West Channel could improve safety for watercraft using East Channel, though small vessels in West Channel would have greater risk of collision with large vessels, as the number of large vessels in West Channel would increase under Alternative F3.

4.7.2.4 Ferry Alternatives G2, G3, G4, and G4v

4.7.2.4.1 Cruise Ships, AMHS Ferry, Tugs and Barges, USCG and NOAA Vessels

Alternatives G2, G3, and G4 would introduce a new perpendicular route of frequent regular ferry travel across Tongass Narrows, which is also used by in- and outbound cruise ships, AMHS ferries, tugs and barges, USCG vessels, and NOAA vessels. However, given the regularity of the ferry schedules and the current general compatibility of the airport ferry and other marine traffic at the existing airport ferry location, the new ferry operations would not substantially affect marine vessels transiting north-south through Tongass Narrows. These alternatives would not affect any shoreside facilities associated with cruise ships, AMHS ferries, tugs and barges, or USCG and NOAA vessels.

Alternative G4v would not alter existing marine traffic and, therefore, would have no effect on marine navigation.

4.7.2.4.2 Airport Ferry

The existing airport ferry would continue operations from its current location. Alternatives G2, G3, and G4 would supplement this service, and would reduce crowding on the ferries during peak usage, providing a benefit for the ferry passengers. Alternative G4v would result in no change to existing ferry operations.

4.7.2.4.3 Small Boats and Other Watercraft

Although the additional ferry services of Alternatives G2, G3, and G4 would introduce more marine traffic into Tongass Narrows at a new location, they would not adversely affect the facilities for or use of boats, kayaks, and other watercraft in Tongass Narrows. Alternative G4v would not alter existing marine traffic and, therefore, would have no impact on boats, kayaks, and other watercraft in Tongass Narrows.

4.7.2.5 Mitigation of Marine Transportation Impacts

4.7.2.5.1 No Action Alternative

No mitigation measures for marine transportation impacts are warranted under the No Action Alternative.

4.7.2.5.2 Bridge Alternatives

The bridge piers would be design to withstand ship impact using AASHTO design standards and would be equipped with a fendering system to help protect the ships.

4.7.2.5.3 Ferry Alternatives

No mitigation measures for marine transportation impacts are warranted for any of the ferry alternatives.

4.7.3 Vehicles

The direct effects of the Gravina Access Project alternatives on vehicles would include effects related to traffic delays during construction and new traffic patterns. Section 4.25 describes construction-related effects, while Section 4.26 details the project's secondary effects, including traffic projections based on the growth that would be induced by new access opportunities and the effects of that traffic. Changes in Level of Service (LOS) at the study area intersections were modeled using traffic projections based on induced growth and are presented in Section 4.26.

The primary measure of the project alternatives' direct impacts to vehicle travel (not related to construction) is based on travel time. For this assessment, the time of travel was calculated for vehicles traveling to Ketchikan International Airport and the closest developable (Borough-owned) land on Gravina Island from three points of origin on Revillagigedo Island:

- The Ketchikan central business district (downtown)
- The U.S. Post Office at Ward Cove
- Carlanna Creek

Table 4-6 presents the travel times for each of the project alternatives. Analysis is based on travel speed of 5 miles per hour (mph) below the posted speed limit. In this table, the travel times to the airport that are shorter than existing conditions, or the No Action Alternative, are shown in boldface.

4.7.3.1 No Action Alternative

Under the No Action Alternative, there would be no traffic improvements that would change vehicle access to Ketchikan International Airport or developable lands on Gravina Island. Vehicles would continue to use the existing airport ferry to access the airport and access developable lands off of the Gravina Island Highway and Lewis Reef Road, and the travel time to the airport would be the same from any location in Ketchikan as under existing conditions. Travel would continue to be limited by the ferry schedule and hours of operation.

Table 4-6: Travel Distances and Estimated Vehicle Travel Times

Origin and Destination		Travel Distances and Estimated Vehicle Travel Times[a]						
		No Action	Bridge Alternatives		Ferry Alternatives			
			C3-4	F3	G2	G3	G4	G4v
From Downtown to Airport Terminal	Distance (miles)	***3.3***	6.3	7.4	10.6	5.5	3.3	***3.3***
	Vehicle travel time (minutes)	***28***	**14**	**13**	43[b]	35[b]	**25**	***28***
From Ward Cove to Airport Terminal	Distance (miles)	5.0	5.6	14.7	8.1	9.7	5.0	5.0
	Vehicle travel time (minutes)	25	**8**	28	34[b]	39[b]	**22**	25
From Carlanna Creek to Airport Terminal	Distance (miles)	0.5	3.5	10.2	7.8	5.2	0.5	0.5
	Vehicle travel time (minutes)	19	**6**	22	34[b]	33[b]	**16**	19
From Downtown to Developable Land	Distance (miles)	6.5	8.7	6.2	5.9	2.5	6.5	6.5
	Vehicle travel time (minutes)	32	**17**	**11**	35	**29**	**29**	32
From Ward Cove to Developable Land	Distance (miles)	8.2	8.0	13.5	3.4	6.7	8.2	8.2
	Vehicle travel time (minutes)	30	**11**	**25**	**26**	34	**27**	30
From Carlanna Creek to Developable Land	Distance (miles)	3.7	6.0	9.0	3.1	2.2	3.7	3.7
	Vehicle travel time (minutes)	24	**8**	**19**	26	28	**21**	24

[a] Travel times are rounded to the nearest minute. Numbers in **bold** type indicate travel times shorter than existing conditions (represented by the No Action Alternative).

[b] This travel time represents travel to the airport using a ferry at the new location. The existing airport ferry would remain in operation and would provide more efficient airport access, with the same travel times presented for the No Action Alternative.

4.7.3.2 Bridge Alternatives

4.7.3.2.1 Alternative C3-4

Alternative C3-4 would have a beneficial effect on vehicle travel by providing round-the-clock access between Revillagigedo and Gravina islands. Travel would no longer be limited by the ferry schedule and hours of operation. Travel time to the airport would be shorter with the bridge than with ferry access under existing conditions, requiring half the time or less from downtown Ketchikan, Ward Cove, and Carlanna Creek. The same would be true for access to developable land from those points of origin. Unrestricted and efficient access under Alternative C3-4 would represent a substantial benefit to vehicle travel across Tongass Narrows.

The intersection of the alternative alignment with the existing road network on Revillagigedo Island would be designed to accommodate all vehicle movements.

4.7.3.2.2 Alternative F3

Alternative F3 would have a beneficial effect on vehicle travel by providing round-the-clock access between Revillagigedo and Gravina islands. Travel time to the airport would be shorter than under existing conditions for vehicles originating from downtown Ketchikan. Vehicles originating from the Carlanna Creek area and points north, including Ward Cove, would have longer travel times compared to ferry access under existing conditions (assuming that the time of travel were occurring during the normal ferry hours of operations). However, unrestricted and

efficient access under Alternative F3 would represent a substantial benefit to vehicle travel across Tongass Narrows. This alternative would require a new intersection with Tongass Avenue south of downtown Ketchikan, resulting in a new traffic pattern in that area.

While a new roadway would be constructed across Pennock Island, Alternative F3 would not provide vehicle access beyond the road alignment of Alternative F3 to other areas on Pennock Island. Residents of Pennock Island would likely need to continue using their current mode of water access. While the alternative would not preclude future development of a road network on Pennock Island, that development is not part of this project.

4.7.3.3 Ferry Alternatives

4.7.3.3.1 Alternative G2

By providing an additional access point to Gravina Island, Alternative G2 would benefit vehicle travel in general, and in particular would benefit travelers from Ward Cove to developable land on Gravina Island with shorter travel times as compared to existing conditions.

Alternative G2 would have no beneficial effect on travel time to the airport, because the existing airport ferry would still be operational. Because travel time to the airport from downtown Ketchikan, Ward Cove, and Carlanna Creek would be longer if the traveler were to use the Alternative G2 ferry rather than the existing airport ferry, it is likely that airport-bound traffic would continue to use the airport ferry. Travel time to developable land on Gravina Island for vehicles originating in downtown Ketchikan or Carlanna Creek would be shorter using the airport ferry, rather than the new ferry. This alternative would require intersection improvements to the point of access for Peninsula Point from Tongass Avenue, resulting in a new traffic pattern in that area.

4.7.3.3.2 Alternative G3

By providing an additional access point to Gravina Island, Alternative G3 would benefit vehicle travel, particularly for those travelers from downtown Ketchikan to developable land on Gravina Island, who would experience shorter travel times than they do under existing conditions.

Alternative G3 would have no beneficial effect on travel time to the airport, because the existing airport ferry would still be operational. Travel time to the airport from downtown Ketchikan, Ward Cove, and Carlanna Creek would be longer using the Alternative G3 ferry rather than the existing airport ferry; therefore, it is likely that airport-bound traffic would continue to use the airport ferry. Travel time to developable land on Gravina Island for vehicles originating in from Carlanna Creek or Ward Cove would be shorter using the airport ferry, rather than the new ferry. This alternative would require a new intersection with Tongass Avenue near the Plaza Mall, resulting in a new traffic pattern in that area.

4.7.3.3.3 Alternative G4

Alternative G4 would have a beneficial effect on travel time to the airport. Travel time for vehicles traveling to Gravina Island would be approximately 3 minutes shorter than the travel time under the No Action Alternative because the co-location of the two ferries would reduce the amount of time spent waiting for the transit across Tongass Narrows (see Table 4-6). This alternative would require improvements to the ferry terminal access point and its intersection with Tongass Avenue, but would not substantially change the traffic pattern in that area.

4.7.3.3.4 Alternative G4v

Alternative G4v would have no effect on travel time because, relative to existing conditions, no change in ferry operations would occur. Improvement to travel time would occur only in the

event that new ferry service is provided; however, new ferry service would not be provided in the reasonably foreseeable future.

4.7.3.4 Effects of Wind—All Alternatives

The effects of high winds and inclement weather on any crossing of Tongass Narrows can be considered a direct effect to vehicle transportation. The design of the bridge alternatives must accommodate the wind loading on the structure itself, as well as the safety implications of vehicles, bicycles, and pedestrians crossing during inclement weather. Ferries would also be affected by extreme weather conditions. The effects of wind, tide, or waves in Tongass Narrows could individually or in combination make the ferry crossing unsafe. The master of the ferry would be responsible for determining whether or not to delay ferry sailing until conditions improved. There is no record of suspended ferry service as a result of poor weather conditions that did not also close airport operations; i.e., airport and ferry closures have been concurrent and attributable to overall weather conditions, not just hazardous conditions for marine navigation.

The structural design of all bridge alternatives would include wind loadings as one of the design criteria. A wind study conducted for DOT&PF in support of the design of Alternative F1, the selected alternative in the 2004 Record of Decision for the Gravina Access Project, used historic records of wind speed at the airport correlated to wind data from a station on Pennock Island to determine appropriate design loading for the Alternative F1 bridges. The study included a wind tunnel model to account for the surrounding land shapes, prevailing wind direction and speed, and the proposed bridge height to obtain values of probable maximum design wind speed and resultant force on the bridge.[271] A review and update of the study may be needed to ensure safety of the structure if Alternative C3-4 or F3 were selected in the Record of Decision for this project.

As with other DOT&PF facilities, high winds (typically 80 miles per hour [mph] or higher) could cause local authorities to close the bridge or invoke restrictions on certain types of high-profile vehicles, such as panel trucks, empty truck-trailer combinations, or motor homes. If a bridge alternative were selected, the Tongass Narrows bridge(s) would be designed for wind loadings expected at the peak bridge elevation in accordance with DO&PF design parameters. Additional weather-induced travel restrictions would apply for high winds to ensure the safety of the traveling public.

4.8 Considerations Relating to Pedestrians and Bicyclists

Impacts to pedestrians and bicyclists were determined by assessing how each alternative would:

- Affect non-motorized mobility in the areas that pedestrians and cyclists currently use
- Affect access for pedestrians and cyclists to areas they do not currently use
- Affect pedestrian and cyclist travel times for purposes of assessing the alternatives relative to the need for "…more reliable, efficient, convenient, and cost effective access for vehicles, bicycles, and pedestrians to Borough lands and other developable or recreational lands on Gravina Island…" (Chapter 1.0).

Travel times to Ketchikan International Airport and developable land on Gravina Island were calculated from three points of origin on Revillagigedo Island: the Ketchikan central business district (downtown), the U.S. Post Office at Ward Cove, and Carlanna Creek. Analysis is based

[271] West Wind Laboratory, Inc. August 2005. *Wind Study, Gravina Island Access, Ketchikan, Alaska, Wind Design Study*. Prepared for DOT&PF and HDR.

on a travel speed of 3 mph for pedestrians and 10 mph for bicyclists. The travel routes for pedestrians and bicyclists are the same as those used for vehicles in the analysis of vehicle travel time.

Table 4-7 presents the calculated travel times for each of the project alternatives. Travel times that are shorter than the existing condition are shown in boldface.

4.8.1 No Action Alternative

Under the No Action Alternative, there would be no improvements that would change pedestrian and bicycle transportation in and around Ketchikan. Pedestrian and bicyclist access to Ketchikan International Airport or developable lands on Gravina Island would be the same as existing conditions. Pedestrians and bicyclists would continue to use the existing airport ferry to access the airport and lands beyond the Airport Reserve Zone via Lewis Reef Road and the Gravina Island Highway. There would be no improvements to pedestrian and bicycle transportation routes. Travel time to the airport and developable lands for pedestrians and bicyclists would be the same from any location in Ketchikan as under existing conditions.

4.8.2 Bridge Alternatives C3-4 and F3

Alternatives C3-4 and F3 would not alter existing pedestrian or bicycle facilities on Revillagigedo Island and would not alter non-motorized mobility in the areas that pedestrians and cyclists currently use. Most pedestrian activities would continue to be concentrated in the Downtown Ketchikan area. Recreational cycling would continue on existing roads and trails on Revillagigedo and Gravina islands. Both bridge alternatives would include an 8-foot-wide walkway on one side of the bridge structures, intended for use by pedestrians and bicycles, in addition to 8-foot shoulders. This new link would improve access for pedestrians and cyclists to areas they do not currently use and could encourage more pedestrian and bicycle use in the area. Alternatives C3-4 and F3 would be unlikely to result in regular pedestrian and bicycle use of Gravina Island.

Table 4-7: Travel Distances and Estimated Pedestrian and Bicycle Travel Times

Origin and Destination	Travel Distance and Travel Time [b]	Alternative[a]						
		No Action	Bridge Alternatives		Ferry Alternatives			
			C3-4	F3	G2	G3	G4	G4v
From Downtown to Airport Terminal	Distance (miles)	***3.3***	6.3	7.4	10.6	5.5	3.3	***3.3***
	Pedestrian travel time (minutes)	***76***	126	149	217	116	**73**	***76***
	Bicycle travel time (minutes) [b]	***36***	38	45	81	52	**33**	***36***
From Ward Cove to Airport Terminal	Distance (miles)	5.0	5.6	14.7	8.1	9.7	5.0	5.0
	Pedestrian travel time (minutes)	111	112	294	168	200	**108**	111
	Bicycle travel time (minutes)	47	**34**	88	66	77	**44**	47
From Carlanna Creek to Airport Terminal	Distance (miles)	0.5	3.5	10.2	7.8	5.2	0.5	0.5
	Pedestrian travel time (minutes)	21	71	204	162	110	**18**	21
	Bicycle travel time (minutes)	20	21	61	65	50	**17**	20
From Downtown to Developable Land	Distance (miles)	6.4	8.7	6.2	5.9	2.5	6.4	6.4
	Pedestrian travel time (minutes)	139	174	**124**	**123**	**55**	**136**	139
	Bicycle travel time (minutes)	55	**52**	**37**	**53**	**33**	**52**	55
From Ward Cove to Developable Land	Distance (miles)	8.2	8.0	13.5	3.4	6.7	8.2	8.2
	Pedestrian travel time (minutes)	174	**160**	270	**73**	**139**	**171**	174

Origin and Destination	Travel Distance and Travel Time [b]	Alternative[a]						
		No Action	Bridge Alternatives		Ferry Alternatives			
			C3-4	F3	G2	G3	G4	G4v
	Bicycle travel time (minutes)	66	**48**	81	**38**	**59**	**63**	66
From Carlanna Creek to Developable Land	Distance (miles)	3.7	6.0	9.0	3.1	2.2	3.7	3.7
	Pedestrian travel time (minutes)	84	119	180	**67**	**49**	**81**	84
	Bicycle travel time (minutes)	38	**36**	54	**36**	**32**	**35**	38

[a] Numbers in **bold** type indicate travel times shorter than existing conditions.
[b] Travel times are rounded to the nearest minute.

Alternative C3-4 would not reduce pedestrian or bicyclist travel times to the airport for travelers originating in the Carlanna Creek area or points south of that, compared to the No Action Alternative. Pedestrians travelling from the Ward Cove area to the airport and developable land would experience similar travel times or slight travel time benefits (9 percent shorter) with Alternative C3-4 relative to the No Action Alternative, whereas the benefit to bicyclists would more noticeable, with travel time reduced by 27 to 28 percent (see Table 4-8).

Bicyclists traveling to developable land on Gravina Island from the Carlanna Creek area and points south of that would benefit slightly with Alternative C3-4 compared to the No Action Alternative, with approximately 5 percent in time savings.

Under Alternative F3, pedestrian travel times to the airport would be approximately 1 to 3 hours longer than current times using the existing airport ferry. Bicyclists would also see a substantial increase in travel time to the airport under Alternative F3. As a result, Alternative F3 would have an adverse impact to pedestrian and bicycle travel times to the airport. Travel time for pedestrians and bicyclists destined for developable land on Gravina Island would be improved for travelers originating from downtown Ketchikan and points south (see Table 4-9).

Table 4-8: Alternative C3-4 Travel Time Benefit for Pedestrian and Bicycle Travel

Origin and Destination		*No Action*	C3-4	Time savings	Percent(%) time savings
		In minutes[a]			
From Downtown to Airport Terminal	Pedestrian travel time	76	126	—	—
	Bicycle travel time	36	38	—	—
From Ward Cove to Airport Terminal	Pedestrian travel time	111	112	—	—
	Bicycle travel time	47	**34**	13	28
From Carlanna Creek to Airport Terminal	Pedestrian travel time	21	71	—	—
	Bicycle travel time	20	21	—	—
From Downtown to Developable Land	Pedestrian travel time	139	174	—	—
	Bicycle travel time	55	**52**	3	5
From Ward Cove to Developable Land	Pedestrian travel time	174	**160**	16	9
	Bicycle travel time	66	**48**	18	27
From Carlanna Creek to Developable Land	Pedestrian travel time	84	119	—	—
	Bicycle travel time	38	**36**	2	5

[a] Numbers in **bold** type indicate travel times shorter than existing conditions.

Table 4-9: Alternative F3 Travel Time Benefit for Pedestrian and Bicycle Travel

Origin and Destination		No Action	F3	Time savings	Percent (%) time savings
		In minutes[a]			
From Downtown to Airport Terminal	Pedestrian travel time	76	149	—	—
	Bicycle travel time	36	45	—	—
From Ward Cove to Airport Terminal	Pedestrian travel time	111	294	—	—
	Bicycle travel time	47	88	—	—
From Carlanna Creek to Airport Terminal	Pedestrian travel time	21	204	—	—
	Bicycle travel time	20	61	—	—
From Downtown to Developable Land[a]	Pedestrian travel time	139	**124**	14	43
	Bicycle travel time	55	**37**	18	57
From Ward Cove to Developable Land	Pedestrian travel time	174	270	—	—
	Bicycle travel time	66	81	—	—
From Carlanna Creek to Developable Land	Pedestrian travel time	84	180	—	—
	Bicycle travel time	38	54	—	—

[a] Numbers in **bold** type indicate travel times shorter than existing conditions.

4.8.3 Ferry Alternatives G2 and G3

Alternatives G2 and G3 would include continued operation of the existing airport ferry and an additional access option for pedestrians and bicyclists traveling to Gravina Island. These alternatives would not alter non-motorized mobility in the areas that pedestrians and cyclists currently use. With continued operation of the airport ferry, these alternatives would not impact pedestrian and bicycle travel times to the airport. Travel times for pedestrians and bicyclists to the airport using the new ferry (i.e., at a new location) would be longer under these alternatives than the travel time using the existing ferry. The new ferry locations associated with Alternatives G2 and G3 would improve access for pedestrians and cyclists to areas they do not currently use.

Alternatives G2 and G3 would have a beneficial impact to access to developable lands on Gravina Island by providing new opportunities for access at new locations and reducing the travel time (see Table 4-10 and Table 4-11). Access to developable land would be possible from both the existing and the new ferries, providing additional access options for pedestrians and bicycles.

Table 4-10: Alternative G2 Travel Time Benefit for Pedestrian and Bicycle Travel

Origin and Destination		No Action	G2	Time savings	Percent (%) time savings
		In minutes[a]			
From Downtown to Developable Land	Pedestrian travel time	139	**123**	15	11
	Bicycle travel time	55	**53**	2	4
From Ward Cove to Developable Land	Pedestrian travel time	174	**73**	101	58
	Bicycle travel time	66	**38**	29	44
From Carlanna Creek to Developable Land	Pedestrian travel time	84	**67**	16	19
	Bicycle travel time	38	**36**	2	5

[a] Numbers in **bold** type indicate travel times shorter than existing conditions.

Table 4-11: Alternatives G3 Travel Time Benefit for Pedestrian and Bicycle Travel

Origin and Destination		No Action	G3	Time savings	Percent (%) time savings
		In minutes[a]			
From Downtown to Developable Land	Pedestrian travel time	139	**55**	84	61
	Bicycle travel time	55	**33**	22	40
From Ward Cove to Developable Land	Pedestrian travel time	174	**139**	35	20
	Bicycle travel time	66	**59**	8	12
From Carlanna Creek to Developable Land	Pedestrian travel time	84	**49**	35	42
	Bicycle travel time	38	**32**	7	18

[a] Numbers in **bold** type indicate travel times shorter than existing conditions.

4.8.4 Ferry Alternative G4

Alternative G4 would include continued operation of the existing airport ferry; therefore, the new ferry would provide an additional access option for pedestrians and bicyclists. Alternative G4 would have a beneficial impact to pedestrian and bicycle travel time to the airport and other locations on Gravina Island. For Alternative G4, travel times for pedestrians and bicyclists traveling to Gravina Island would be approximately 3 minutes shorter than the travel time under the No Action Alternative because the co-location of the two ferries would reduce the amount of time spent waiting for the transit across Tongass Narrows. Alternative G4 would improve access for pedestrians and cyclists to areas they do not currently use by shortening travel time, but no new access would be created.

4.8.5 Ferry Alternative G4v

Similar to the No Action Alternative, Alternative G4v would not affect pedestrian and bicycle transportation in and around Ketchikan. Under Alternative G4v, there would be no improvements in the foreseeable future that would change pedestrian and bicycle access to Ketchikan International Airport or developable lands on Gravina Island. Pedestrians and bicyclists would continue to use the existing airport ferry to access the airport and lands beyond the Airport Reserve Zone via Lewis Reef Road and the Gravina Island Highway. Travel time to the airport and developable lands for pedestrians and bicyclists would be the same from any location in Ketchikan as for existing conditions.

4.9 Geology, Topography, and Wind

4.9.1 Geology and Topography

None of the project alternatives would adversely affect any unique or significant geologic feature.

4.9.1.1 No Action Alternative

The No Action Alternative would not affect the topography in the project area. No excavation would be required, and no changes to the existing landforms would occur.

4.9.1.2 Bridge Alternatives

4.9.1.2.1 Alternative C3-4

Construction of Alternative C3-4 would require blasting to remove bedrock in some areas along the Revillagigedo Island alignment. Other areas would require fill (e.g., for the bridge abutment). Removed overburden material on Revillagigedo Island, which typically has a high organic content, would be used in slope flattening and for topsoil. 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. A geotechnical investigation would be conducted during final design of the selected alternative to identify any localized slope stability problems and devise an approach to removing material and placing fill that protect public safety.

The proposed improvements on Gravina Island would require minimal blasting to remove bedrock for pier foundation construction. Embankment construction at the bridge approach to the airport would require some fill placement on upland. On Gravina Island, borrow material would be obtained from existing sources on Gravina Island within the project area and, when possible, from construction cut areas. Materials removed during construction and determined to be unsuitable for reuse in the development of the road would be disposed of on an upland site that would be identified during final design and approved by the DOT&PF.

Removal of surface sediments, soils, and bedrock to accommodate roadway construction and grading on Revillagigedo Island and, to a lesser extent, roadway improvements on Gravina Island would alter the topography along the roadway corridor. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC and EPA requirements of the Clean Water Act.

4.9.1.2.2 Alternative F3

No blasting of bedrock on Revillagigedo Island would be needed to construct Alternative F3. On Pennock and Gravina Islands, the roadway would require minimal blasting to remove bedrock. In most areas, the road would be constructed using off road haul trucks, dozers, compactors and graders. On Pennock Island for Alternative F3, material from cut would be used in slope flattening and for topsoil, effectively balancing material. On Gravina Island, borrow material would be obtained from existing sources on Gravina Island within the project area and, when possible, from construction cut areas. Materials removed during construction and determined to be unsuitable for reuse in the development of the road would be disposed of on an upland site that would be identified during final design and approved by the DOT&PF. Removal of surface sediments, soils, and bedrock to accommodate roadway construction and grading for the Alternative F3 alignment would alter the topography along the roadway corridor. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC and EPA requirements of the Clean Water Act.

Blasting and dredging in West Channel would be required for the channel modification, resulting in the removal of approximately 184,000 cubic yards of material (bedrock, gravel, silts) over 16 acres. These actions would permanently alter the configuration of the channel bottom at that location. Dredging in Tongass Narrows would be subject to a Section 404 permit and USACE approval. Refer to Section 4.13 for more information on required permits.

4.9.1.3 Ferry Alternatives

4.9.1.3.1 Alternatives G2, G3, and G4

Alternatives G2, G3, and G4 would not require bedrock blasting on Revillagigedo Island, though fill could be needed at the site of the new ferry terminals. On Gravina Island, roadway improvements would require minimal blasting, if any, to remove bedrock. In most areas of Gravina Island, new road construction and widening of existing roads could be completed using off road haul trucks, dozers, compactors, and graders. Removal of surface sediments, soils, and bedrock to accommodate roadway construction and improvements, and grading under any of these alternatives would alter the topography at the ferry terminals and along the roadway corridor. Borrow material for fill areas would be obtained from existing sources on Gravina Island within the project area and, when possible, from construction cut areas. Materials removed during construction and determined to be unsuitable for reuse in the development of the road would be disposed of on an upland site that would be identified during final design and approved by the DOT&PF.

Dredging for Alternatives G2, G3, and G4 would likely be required (estimated dredged material amounts of 1,400; 18,600; and 15,200 cubic yards, respectively) to provide adequate navigation depths for the ferry terminals. Such dredging would modify the configuration of the channel bottom at these locations. No dredging would be required for the heavy freight terminal.

4.9.1.3.2 Alternative G4v

Improvements associated with Alternative G4v would require minimal earthmoving activities and likely would not impact geological resources or topography.

4.9.2 Soils

4.9.2.1 No Action Alternative

The No Action Alternative would not affect soils in the project area.

4.9.2.2 All Action Alternatives

The temporary adverse effects of construction on soils and surface sediments are described in Section 4.25. The action alternatives would require excavation of surface sediments and/or soils along the entire overland alignment. Removal of surface sediments and soils to accommodate roadway construction and grading under any of these alternatives would not adversely affect any unique or significant soil materials.

4.9.3 Wind

The Gravina Access Project would have no effect on wind. Bridge alternatives would be subject to wind forces, particularly at higher elevations and over water where wind is unimpeded by surface features and where the structure is elevated on piers. Ferry alternatives would be affected by wind and wind-driven waves.

The highest point of the deck elevation for the Alternative C3-4 bridge would be approximately 280 feet above the water surface and for the Alternative F3 bridges the bridge deck elevations would be approximately 275 feet and 115 feet above the water surface. Similar to designing for seismicity, traffic loads, bridge deck loads, and potential ship impact loading, the bridge foundations would be designed to handle any wind loading stemming from wind hitting the

structure high above the water level. Wind speeds at a range of elevations were modeled from wind monitoring data at the airport and on Pennock Island,[272] and are provided in Table 4-12.

Table 4-12: Service Load Wind Speeds at Elevation

Return Period and Elevation	Averaged Wind Speed (mph)		
	3-second	10-minute	1-hour
25-year return period			
300 feet	142	108	103
280 feet	141	107	102
260 feet	140	106	101
120 feet	129	95	89
100 feet	127	92	87
100-year return period			
300 feet	161	122	116
280 feet	160	121	115
260 feet	159	119	112
120 feet	146	107	104
100 feet	143	104	101

4.10 Air Quality Impacts

Air pollutants of concern associated with the Gravina Access Project are elevated concentrations of:

- Carbon monoxide from vehicle emissions at intersections, interchanges, and other similar sites with high vehicle densities and slow speeds
- Particulate matter with a diameter equal to or less than 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$), resulting primarily from construction activities that generate dust

4.10.1 Emissions

4.10.1.1 No Action Alternative

The No Action Alternative would not affect air quality in the Ketchikan area and would not cause increases in emissions of carbon monoxide, PM_{10}, or $PM_{2.5}$.

4.10.1.2 All Action Alternatives

Construction activities associated with the project would have direct impacts to air quality in the Ketchikan area. The effects of emissions from construction activities associated with the action alternatives are described in Section 4.25.

None of the action alternatives would increase traffic volumes immediately; consequently none of the alternatives would have a direct impact to air quality. Over time, all of the action alternatives may result in greater vehicle emissions as a result of increased road travel. The effects of projected traffic levels on air quality are described in Section 4.26.

[272] West Wind Laboratory, Inc. August 2005. *Gravina Island Access, Ketchikan, Alaska, Wind Design Study*. Prepared for DOT&PF and HDR Alaska, Inc.

The bridge alternatives would eliminate emissions from the airport ferry, resulting in an overall decrease in emissions compared to the No Action Alternative. The ferry alternatives, however, would increase ferry emissions, resulting in an overall increase in emissions. Emissions from marine vessels are regulated only for opacity levels (see Section 3.10.2), and no new violations of the regulated levels are expected to result from implementation of any of the project alternatives. As Ketchikan is located in an attainment area for air quality, no conformity analysis is required per the ADEC Division of Air Quality (Appendix D).[273]

4.10.2 Greenhouse Gases and Climate Change

From a quantitative perspective, global climate change is the cumulative result of numerous and varied GHG emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad scale actions, such as actions involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for a particular transportation project. Furthermore, presently there is no scientific methodology for attributing specific climatological changes to a particular transportation project's actual or projected emissions. For purposes of this SEIS, climate change is addressed as a cumulative impact in Section 4.27.6.

4.10.2.1 Mitigation of Air Pollutant Emissions

4.10.2.1.1 No Action Alternative

There are no mitigation measures recommended for air pollutant emissions under the No Action Alternative.

4.10.2.1.2 All Action Alternatives

To reduce vehicle emissions during operation, the proposed project under all action alternatives would incorporate designs that are expected to reduce the use of single-occupancy vehicles and improve fuel efficiency compared to the No Action Alternative. In addition, the alternative designs would include improvements to bicycle and pedestrian infrastructure.

All alternatives are designed using materials with the longest available life. These choices would result in new facilities that have a longer life before needing to be replaced than those built without such considerations, which in turn would reduce overall emissions for reconstruction and replacing materials.

4.11 Noise Impacts

The adverse effects of construction-related noise by the action alternatives are described in Section 4.25. The adverse effects of projected traffic levels on noise levels are described in Section 4.26.

4.11.1 No Action Alternative

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

4.11.2 All Action Alternatives

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.

[273] Alaska Department of Environmental Conservation. May 18, 2009. Concurrence Letter regarding air quality conformity. Division of Air Quality Air Non-Point and Mobile Sources.

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 as Category F land uses, generating their own noises, and would not be considered noise-sensitive land uses.

4.12 Water Quality Impacts

None of the alternatives would cross major drainages on either Revillagigedo or Pennock islands. The action alternatives, however, could affect Government Creek, two branches of Airport Creek, and other lesser creeks on Gravina Island. There is no upstream development along these Gravina Island creeks aside from the Seley Road, Lewis Reef Road, and Gravina Island Highway crossings. The area these creeks drain consists primarily of wetlands. The creeks generally are not turbid and have good water quality.

The following sections describe the potential direct effects of the project alternatives on water quality in Tongass Narrows and in streams, wetlands, ponds, and other water bodies on the islands in the project area. Section 4.25.10 describes the temporary adverse effects of project construction activities, such as dredging, on water quality. Section 4.26.10 discusses the indirect impacts of the project on water quality.

4.12.1 No Action Alternative

Under the No Action Alternative, the ferry between Revillagigedo and Gravina Islands would continue to be operated. Pollutants would continue to be washed off the ferry terminals into Tongass Narrows and be produced by the ferry itself. Pollutants might include particulates, petroleum products, metals, and solvents.

4.12.2 Bridge Alternatives C3-4 and F3

Alternatives C3-4 and F3 could affect the water quality of water bodies crossed by the bridge and roadway alignment on Revillagigedo or Gravina islands. No major water bodies would be crossed on Pennock Island. Pollutants from runoff would include particulate matter, metals, and petroleum products from vehicle emissions and maintenance activities. With respect to Tongass Narrows, these impacts would be of similar character to those that occur today from ferry operations.

4.12.3 Ferry Alternatives G2, G3, and G4

Alternatives G2, G3, and G4 could affect water quality of streams crossed by associated roadway development and improvement; i.e., both channels of Airport Creek, Government Creek, and several lesser creeks on Gravina Island. The water quality of Tongass Narrows and freshwater creeks could be adversely affected by pollutants in runoff from the ferry terminals

and roadways, and by ferry vessel emissions. These pollutants could include petroleum products, metals, and particulate matter from ferry operations and maintenance, ferry terminals, and roads, similar to those that occur today from ferry terminals, the ferry deck, and the ferry engines. Four ferries instead of two (during peak summer season), more traffic on Gravina Island, and additional roads in the case of Alternatives G2 and G3 (i.e., ferry terminal access roads on Gravina Island connecting Alternative G2 with Seley Road and Alternative G3 with the Gravina Island Highway) would result in incrementally more of these pollutants and effects to new areas, but with mitigation, overall water quality in Tongass Narrows and streams crossed by the new and improved roadways would not be noticeably changed.

4.12.4 Ferry Alternative G4v

Alternative G4v could affect water quality of streams crossed by associated roadway development and improvement, including both channels of Airport Creek, Government Creek, and several lesser creeks on Gravina Island. Pollutants in runoff from the ferry docks, ramps, and roadways could adversely affect the water quality of Tongass Narrows and freshwater creeks. These pollutants could include petroleum products, metals, and particulate matter from the operation and maintenance of the ferry docks and road links, similar to those that occur today from the ferry dock.

4.12.5 Mitigation of Water Quality Impacts

4.12.5.1 No Action Alternative

There are no mitigation measures recommended for water quality impacts under the No Action Alternative.

4.12.5.2 Bridge Alternatives C3-4 and F3

All new and improved roads would be designed to maintain existing surface water courses (e.g., by using ditches) and stormwater drainage. Final roadway design would include culverts or bridges along existing drainages and across streams on Revillagigedo and Gravina islands: Alternative C3-4 would include 15 culverts and two bridges, and Alternative F3 would include 23 culverts and five bridges. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet requirements of the Clean Water Act. Ditches would be constructed along each side of the new and improved roads to capture stormwater runoff. The ditches would be seeded and act as filters for stormwater. The drainage would funnel to low spots or existing channels that would eventually flow to Tongass Narrows.

In the airport terminal area, some curb and gutter may be used to direct roadway runoff into the existing storm and roof drain system. The method of removing of stormwater from the bridge structure(s) would be determined in the final design phase. Typical DOT&PF bridge design would direct stormwater from the bridge deck to the railing curb and then to vertical pipes that discharge the stormwater to the waters or land below the bridge. The stormwater treatment system would need to be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. Impacts to water quality would be minimized through the use of BMPs, most of which would be part of the Stormwater Pollution Prevention Plan (SWPPP). BMPs that would be employed to protect water quality include:

- Increasing, where practicable, the angle of fill slopes to reduce encroachment into adjacent wetlands

- Designing and constructing the roadway with a low-profile embankment to minimize the fill footprint
- Using rock to stabilize toes of slopes to limit the erosion of fine-grained material into adjacent waters and wetlands
- Using plant species indigenous to the area for vegetating road slopes wherever possible to protect the integrity of the natural plant communities
- Using non-native, non-invasive annual grasses (such as annual rye) to provide rapid, initial soil cover to prevent runoff of fine-grained material into adjacent wetlands
- Applying topsoil to the surface of road slopes to aid in the reseeding process
- Designing roadside swales to keep surface water within the natural drainage basins to allow sediment-laden water to clear before its discharge to adjacent wetlands and waters
- Recontouring stream banks at all stream crossings (both culverts and bridge crossings), to approximate original conditions
- Reseeding recontoured stream banks with native seed and annual rye to minimize erosion, as recommended in the DNR *Coastal Revegetation and Erosion Control Guide*[274]

Section 4.25.10 describes construction-related BMPs to protect water quality. All necessary permits and agency approvals would be obtained prior to construction, and any permit stipulations would be incorporated into the construction contract specifications.

4.12.5.3 Ferry Alternatives G2, G3, and G4

New roads for Alternatives G2 and G3 would be designed to maintain existing surface water courses and stormwater drainage. Final roadway design would include culverts or bridges along existing drainages and across streams on Gravina Island: Alternative G2 would include 13 culverts and one bridge, Alternative G3 would include 13 culverts and two bridges, and Alternative G4 would include 12 culverts and one bridge. The construction contractor would be responsible for developing erosion and sediment control and SWPPP to meet requirements of the Clean Water Act. The roadway and ferry terminal designs would incorporate a stormwater treatment system to minimize the effects of runoff. The stormwater treatment system would be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. BMPs would further reduce adverse effects on water quality (see Sections 4.12.2 and 4.25.10).

4.12.5.4 Ferry Alternative G4v

Final roadway design would include culverts or bridges along existing drainages and across streams on Gravina Island. The construction contractor would be responsible for developing erosion and sediment control and SWPPP to meet requirements of the Clean Water Act. The roadway design would incorporate a stormwater treatment system to minimize the effects of runoff. The stormwater treatment system would be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. BMPs would further reduce adverse effects on water quality (see Sections 4.12.2 and 4.25.10).

[274] Wright, Stoney J., and Philip K. Czapla. 2011. *Alaska Coastal Revegetation and Erosion Control Guide*. Palmer, Alaska: Alaska Department of Natural Resources, Division of Agriculture, Plant Materials Center.

4.13 Permits

All the permits and coordination activities that may be required for this project are listed in Section 3.13. The following section summarizes and describes major permits that would be required for each alternative.

4.13.1 No Action Alternative

The No Action Alternative would not require any permits or certifications.

4.13.2 All Action Alternatives

USACE, EPA, ADEC, USCG, NMFS, DNR, SHPO, ADF&G, the Borough, and City of Ketchikan would require permits or approvals to implement any of the Gravina Access Project action alternatives. Permits and approvals for temporary construction activities would also be necessary from the USACE, DNR, NMFS, and EPA. Major federal, state, and local permits common to all the action alternatives would be:

- USACE, Clean Water Act Section 404 Permit for placement of dredged or fill material in waters of the United States, including wetlands, and Section 10 permit for work in, on, and over navigable waters
- Ketchikan Gateway Borough *Coastal Management Plan* review
- ADF&G, Title 16 Fish Habitat Permit for crossings of fish bearing streams
- ADEC, APDES General Permit for Stormwater Discharges from Construction Activities
- ADEC Section 401 Certification (Certificate of Reasonable Assurance)
- ADEC plan review for non-domestic wastewater treatment system
- ADEC non-domestic wastewater disposal permit
- Borough and City of Ketchikan zoning, conditional use, and/or site development permits and approvals, as required

Construction impacts that have the potential to result in harassment of marine mammals (as defined at 50 CFR 216.3) would be mitigated as described in Sections 4.25.12.3 and 4.25.15. Consequently, no Incidental Harassment Permit or Letter or Authorization from NMFS would be necessary. If plans changed during final design or prior to construction of any of these alternatives such that marine mammal harassment could not be avoided or mitigated, FHWA and DOT&PF would apply for a permit in accordance with Section 101(a)5 of the Marine Mammal Protection Act.

Alternatives C3-4 and F3 would require permits common to all alternatives, described above, plus a USCG Bridge Permit issued under the authority of Section 9 of the Rivers and Harbors Act of 1899. Alternative F3 could also require USACE permitting under Sections 102 and 103 of the Marine Protection, Research, and Sanctuaries Act (i.e., Ocean Dumping Act) for ocean disposal of dredged material removed from West Channel. Section 404 of the Clean Water Act would also apply to ocean disposal.

4.14 Wetland and Vegetation Impacts

Table 4-13 provides the number of acres of wetlands (by type) that would be directly affected by each project alternative, as well as the approximate amount of fill to be placed in wetlands (given in cubic yards). Figure 3.17 shows the locations of alternatives relative to wetlands, ponds, and uplands.

Section 4.25.11 describes the additional temporary effects of project construction on wetlands and vegetation. Section 4.26.9 provides a discussion of the indirect impacts of the project on wetlands and vegetation.

Table 4-13: Impacts to Wetlands, Ponds, and Uplands (acres)

Wetland Type[a]	*No Action*	*Bridge Alternatives*		*Ferry Alternatives*			
		C3-4	**F3**	**G2**	**G3**	**G4**	**G4v**
Forested wetlands	0	5	14	11	7	5	5
Shrub/scrub wetlands[a]	0	6	16	9	7	6	6
Muskegs	0	2	3	3	2	2	2
Intertidal marshes and meadows[b]	0	0	0	1.2	2.9	0	0
Below the high tide line (HTL)	*0*	*0*	*0*	*0.6*	*1.1*	*0*	*0*
Below the Mean High Water (MHW) mark	*0*	*0*	*0*	*0.6*	*1.8*	*0*	*0*
Below the ordinary high water mark (OHWM)	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Total Wetland Impacts	**0**	**13**	**33**	**24.2**	**18.9**	**13**	**13**
Ponds	0	0	1	1	3	0	0
Uplands (Non-wetlands)	0	10	2	4	3	1	1
Piers in wetlands (number)[c]	0	12	6	0	0	0	0
Approximate amount of fill placed in wetlands (thousand cubic yards)	0	623	880	91	85	56	56

[a] Total wetland acreage in Tongass Narrows Watershed is based on NWI mapping. NWI showed no shrub/scrub, but shrub/scrub type does exist (see discussion in Section 3.14).

[b] Impacts to marine waters other than mapped intertidal marshes and meadows are discussed in Section 4.15.4.4.

[c] This indicates the number of bridge piers and abutments in the wetland types listed above. Table 4-14 lists piers in Tongass Narrows.

4.14.1 Wetlands

Direct impacts to wetlands would primarily be permanent loss resulting from placing roadway, ferry, or bridge facilities in wetland areas. The project design would avoid and minimize such use of wetlands to the extent practicable. The following characterization of wetland impacts is based on the best available design information at this stage of the project.

4.14.1.1 No Action Alternative

The No Action Alternative would not affect wetlands.

4.14.1.2 All Action Alternatives

As indicated in Section 3.14, the wetlands in the project area are extensive. There are nearly 17,000 acres of wetlands in the watersheds that drain to Tongass Narrows, an area of just under 40,000 acres total. The proportion of wetlands that would be converted to transportation facilities under any of the action alternatives would be greatest under Alternative F3, which would result in a loss of 0.08 percent of the total wetlands in the area.

4.14.1.2.1 Forested Wetlands

All action alternatives would result in the elimination and alteration of forested wetlands, principally along the road alignments for the proposed widening. Overall, Alternative F3 would have the greatest acreage of impacts to forested wetlands (see Table 4-13). Areas that support adjacent stream habitat (e.g., woody debris and invertebrates from overhanging vegetation) would be eliminated. Impacts to forested wetlands would occur primarily north and west of the airport and on Revillagigedo Island.

The elimination of forested wetlands would result in increased runoff, altered surface and subsurface drainage patterns, loss of wildlife habitat, and slight changes in plant community composition in forested wetlands adjacent to the road due to increased sunlight in the understory. Impacts to wetland-dependant wildlife from human activity (motion, noise, and people leaving the roadway) would extend beyond the project footprint and would be permanent (see also Section 4.15.3 regarding impacts to wetland-dependent wildlife species).

4.14.1.2.2 Shrub/Scrub Wetlands

Impacts to shrub/scrub wetlands for all the action alternatives would be the same as those described for forested wetlands. Specific acreages of impact are summarized in Table 4-13.

4.14.1.2.3 Muskegs

All action alternatives would result in the loss and alteration of muskegs resulting from placement of road embankment fill. Impacts to muskegs would occur primarily along road routes west and south of the airport on Gravina Island. Alternatives F3 and G2 would have the greatest impacts because they have the longest roads (see Table 4-13). A road across muskeg wetlands would eliminate a ribbon of wildlife habitat and could alter the flow patterns of both surface and subsurface water. Altering flow patterns could reduce the amount of organic material exported to downstream ecosystems. It could also cause slight changes in plant community composition as a result of altered drainage patterns and runoff of pollutants to the wetlands. Mitigation, addressed below, would be designed to minimize or eliminate these effects. Impacts to wetland-dependant wildlife from human activity would extend beyond the project footprint and would be permanent.

4.14.1.2.4 Intertidal Marshes and Meadows

Alternatives G2 and G3 would eliminate intertidal marshes and meadows at their terminal areas (Lewis Point and south of the airport, respectively—see Table 4-13). Potential direct impacts resulting from removal of this highly productive habitat include loss of important feeding areas for terrestrial and aquatic species, loss of nurseries for young fish, and loss of organic matter produced in these marshes and exported to deeper marine waters. Impacts to wetland-dependant wildlife from human activity would extend beyond the project footprint and would be permanent (see also Section 4.15.3 and Table 4-14, below, regarding impacts to other marine vegetated shallows, including eelgrass and kelp in Tongass Narrows).

4.14.1.3 Mitigation of Impacts to Wetlands

4.14.1.3.1 No Action Alternative

No mitigation measures for wetlands impacts are warranted under the No Action Alternative.

4.14.1.3.2 All Action Alternatives

Final mitigation would be based on discussions among DNR, FHWA, USACE, and other resource management agencies. Detailed mitigation measures would be developed and implemented as a condition of federal permits for the project. In addition to the BMPs listed in Section 4.12.2, culverts would be installed through fill slopes in appropriate locations to maintain

natural flow patterns for surface water courses and to ensure that the existing timing and amounts of inflow to adjacent wetlands and waters were retained.

DOT&PF proposes to compensate for unavoidable adverse impacts to wetlands by paying a fee in lieu of onsite wetland restoration, enhancement, or preservation. This compensatory mitigation would be calculated and applied to the preferred alternative identified in the Final SEIS. This fee would be provided to a land trust acceptable to the USACE. The proposed fee would be directed toward activities relating to wetland creation, restoration, enhancement, and preservation or land acquisition in the region.

4.14.2 Vegetation

4.14.2.1 No Action Alternative

The No Action Alternative would have no adverse impact to upland vegetation.

4.14.2.2 Bridge Alternatives C3-4 and F3

Alternatives C3-4 and F3 would require the permanent removal of upland vegetation on some steep slopes and high knobs on Revillagigedo Island and, for Alternative F3, on Pennock Island. The upland vegetation affected by these alternatives would be primarily western hemlock/Sitka spruce forest in the relatively undisturbed areas and alder thickets in more disturbed areas. Vegetation loss would reduce wildlife habitat, and would increase surface runoff volume. Table 4-13 provides the total amount of upland and wetland vegetation affected by each of these alternatives.

4.14.2.3 Ferry Alternatives G2, G3, G4, and G4v

Alternative G2 would require removal of upland forest in undisturbed areas at Lewis Point on Gravina Island, as well as upland forest vegetation in previously disturbed areas of the island. The vegetation affected by this alternative would be primarily western hemlock/Sitka spruce forest in the relatively undisturbed areas and alder thickets in more disturbed areas. Alternatives G3, G4, and G4v would result in the removal of relatively undisturbed areas of western hemlock/Sitka spruce forest, and alder thickets in more disturbed areas. Vegetation removal would contribute to loss of wildlife habitat and increases in surface runoff. The total amounts of upland and wetland vegetation affected by these alternatives are listed in Table 4-13.

4.14.2.4 Mitigation of Impacts to Vegetation

4.14.2.4.1 No Action Alternative

There are no mitigation measures recommended for vegetation impacts under the No Action Alternative.

4.14.2.4.2 All Action Alternatives

Final project design would avoid and minimize direct impacts to vegetation by reducing clearing limits and using previously disturbed areas for staging wherever feasible. Temporary disturbed areas would also be planted with native woody vegetation that would provide forage value for wildlife and a net gain in stormwater quality.

4.15 Water Body and Wildlife Impacts

Direct adverse impacts to water bodies and wildlife would result from roadway stream crossings, roadway placement within terrestrial areas that serve as wildlife habitat, placement of bridge

piers in Tongass Narrows, placement of pilings for ferry terminals on the shoreline of Tongass Narrows, and placement of fill on the margins of Tongass Narrows. Table 4-14 tabulates the expected impacts to water bodies. The same numbers are important indicators of effects on fish and marine mammal habitats.

Section 4.25.12 discusses the temporary impacts to water bodies and wildlife during project construction. Section 4.26.10 details the indirect impacts of the project on water bodies and wildlife.

Table 4-14: Quantities of Fill and Dredging in Tongass Narrows, and Numbers of Piers

	Alternative					
	Bridge Alternatives		Ferry Alternatives			
	C3-4	F3	G2	G3	G4	G4v
Number of crossings of anadromous fish streams [a]	2	7	2	3	2	2
Piers in Tongass Narrows (number)	12	6	0	0	0	0
Fill in Tongass Narrows (acres)[b]	0	0	1.2	2.9	0	0
Dredging quantities (cubic yards)	0	213,000	1,400	18,600	15,200	0

[a] Number of crossings does not include Tongass Narrows. No permanent loss of EFH would occur because bridge and culvert design would preserve EFH.

[b] For the bridge alternative, fill quantities shown do not include the bridge piers themselves.

4.15.1 Water Bodies

4.15.1.1 No Action Alternative

The No Action Alternative would not modify water bodies in the project area.

4.15.1.2 Bridge Alternatives C3-4 and F3

The bridge alternatives would require the placement of piers in Tongass Narrows, which would affect water flow locally but would not alter general flow patterns in Tongass Narrows (see Table 4-14). These alternatives would include roadway crossings of several creeks on Gravina Island. Both alternatives would require reconstruction of the bridge over Airport Creek using a bridge with no midstream supports, known as a clear-span bridge. Alternative F3 would require widening of the clear-span bridges over Government Creek and Gravina Creek, which would not require modification of these water bodies. Smaller unnamed creeks would also be crossed for both alternatives using culverts.

Alternative F3 would require the removal of approximately 213,000 cubic yards of material (bedrock, gravel, silts) from West Channel to create adequate navigation clearance. This loss of material would widen the channel and modify the localized flow regime, but would not substantially affect overall flow through the channel.

4.15.1.3 Ferry Alternatives G2, G3, G4, and G4v

Alternatives G2, G3, and G4 would require building pile-supported docks and floating ferry berthing facilities in intertidal and subtidal areas of Tongass Narrows to accommodate ferry docking and loading areas at the ferry terminals. As shown in Table 4-14, all ferry alternatives except G4v would require minor dredging in Tongass Narrows to produce adequate water depths for ferry docking at all tidal stages. Alternative G2 would require the removal of approximately 1,400 cubic yards of material in Tongass Narrows near the proposed Gravina Island terminal. Alternative G3 would require the removal of approximately 18,600 cubic yards

of material near both the Revillagigedo and Gravina island terminals. Alternative G4 would require the removal of approximately 15,200 cubic yards of material near both the Revillagigedo and Gravina island terminals. The structures, fill, and dredging associated with the ferry alternatives would have localized impacts to water flow but would not substantially alter general flow patterns in Tongass Narrows.

The roadway on Gravina Island associated with the ferry alternatives would require crossings at Airport Creek and several unnamed streams. Alternative G3 would also require widening of the bridge at Government Creek. In-water work and structure placement in streams at these crossings could alter stream flow and water quality and affect aquatic species and their habitat.

4.15.1.4 Mitigation of Impacts to Water Bodies

4.15.1.4.1 No Action Alternative

There are no mitigation measures recommended for water bodies under the No Action Alternative.

4.15.1.4.2 Bridge Alternatives C3-4 and F3

The project design would maintain natural water flow conditions under the Airport Creek bridge for Alternative C3-4. Potential adverse impacts of the crossing at Airport Creek would be avoided by using a clear-span bridge at the crossing. Changes to the hydrology of smaller creeks would be minimized by designing culverts that are appropriately sized and placed, would allow fish passage, would accommodate stormwater flow, and would not cause scour.

All construction in and around anadromous fish streams would occur when stream disturbances would have the least impact to anadromous fish species (see Section 4.25.12.3, subsection on EFH, for related detail regarding mitigation of construction impact). In accordance with the memorandum of agreement between DOT&PF and ADF&G,[275] the culvert crossing would use a Tier 1 stream simulation design, which means that it would maintain natural stream conditions such as flow, substrate, and existing fish passage efficiency for the fish in the stream. In-water work areas would be limited to the stream crossing areas and isolated from flowing waters in all anadromous fish streams. Additionally, gravels and streambed material would be used in the bottoms of culverts to simulate the natural streambed.

To reduce impacts of runoff on water bodies, roadway improvements would be designed to collect and filter stormwater in ditches before it is conveyed to surface waters. Bridge runoff likely would be collected in the railing curb and then directed through vertical pipes to the land or waters below the bridge. The stormwater treatment system would be submitted to ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC, EPA, and USACE requirements of the Clean Water Act.

4.15.1.4.3 Ferry Alternatives G2, G3, G4, and G4v

The design of the ferry alternatives would maintain natural water flow conditions, and bridge or culvert design would accommodate stormwater flow, not result in scour, and allow fish passage. All construction in and around anadromous fish streams would occur when stream disturbances would have the least impact to anadromous fish species. In-water work areas, except for stream crossings by construction equipment, would be isolated from flowing waters in all anadromous fish streams. In addition, gravels and streambed material would be used in the bottoms of

[275] Alaska Department of Fish and Game and Alaska Department of Transportation and Public Facilities. August 3, 2001. *Memorandum of Agreement Between the ADF&G and DOT&PF for the Design, Permitting, and Construction of Culverts for Fish Passage*. Juneau, Alaska.

culverts. Potential adverse impacts of the reconstructed Airport Creek crossing would be avoided by using a clear-span bridge. The roadway and ferry terminal designs would incorporate a stormwater treatment system to minimize the effects of runoff. The stormwater treatment system would be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit.

Section 4.25.12.3, subsection on EFH, details mitigation of construction impact to EFH.

4.15.2 Ponds

4.15.2.1 No Action Alternative

There would be no adverse impact to ponds as a result of the No Action Alternative.

4.15.2.2 All Action Alternatives

The action alternatives likely would not impact ponds on Pennock and Revillagigedo islands.

There would be no impacts to large ponds, but all action alternatives might eliminate very small ponds within muskeg areas on Gravina and Pennock islands. Filling ponds for roadway construction would result in a permanent loss of pond habitat. Section 4.14.1 describes acreages of pond loss.

4.15.3 Marine Habitat

4.15.3.1 No Action Alternative

The No Action Alternative would have continued noise, water pollution, and propeller scour effects on marine habitat, with no change from current conditions.

4.15.3.2 Bridge Alternatives

4.15.3.2.1 Alternative C3-4

Alternative C3-4 would require a pier in nearshore waters on the eastern side of Tongass Narrows that could affect bull kelp beds. However, these beds would likely reestablish on the lower intertidal rock or concrete structure of the pier. Deep-water piers in mid-channel would foster a rich community of marine organisms.

On the western side of Tongass Narrows, the required bridge piers would be located in an area that currently supports part of a near-continuous eelgrass bed that is interspersed with beds of kelp and an area of bull kelp (see Figure 4.2). In the area where the bridge would extend southward, parallel to the airport runway, the bridge would likely create shade due to the elevation of the proposed design. The proposed bridge would also require pier placement in an area near eelgrass or kelp beds but would not directly affect these resources (Figure 4.2).

4.15.3.2.2 Alternative F3

The bridge construction associated with Alternative F3 would likely have few direct impacts to eelgrass and kelp beds. The eastern take-off of Alternative F3 from Revillagigedo Island for the East Channel bridge would require an abutment along the shoreline in the vicinity of the south dump. This shoreline contains mixed gravel-sand beaches scattered with much debris, such as broken glass and metal. The East Channel bridge of Alternative F3 would cross kelp beds on both the eastern and western shores at approximately 60 feet above the water. Shading by this bridge would likely reduce the productivity of those kelp beds. Piers on both sides would avoid productive shallower nearshore waters.

The West Channel bridge crossings of Alternative F3 would require three piers in Tongass Narrows. These piers would likely avoid direct impacts to marine vegetation because they would be placed in deeper waters. The West Channel bridge of Alternative F3 would be 200 feet above the water surface over these beds and over the mid- and upper intertidal vegetation along Gravina and Pennock islands. Because the bridge is high, little reduction in productivity is expected because shading impacts would be minimal.

Blasting and dredging associated with modification of West Channel would remove materials over approximately 15 acres of subtidal habitat from areas between Gravina and Pennock islands. This action would eliminate approximately 0.0.9 acre of eelgrass located in the area, though the vegetation may reestablish itself after project completion (Figure 4.3). The channel widening could also adversely affect the densities of hard-shell clams (littleneck and butter clams) located within the project impact area, although populations may reestablish to levels approximating existing conditions. There would be no noticeable effect on net flow through West Channel, and therefore, no measurable impacts to marine communities adjacent to the channel entrances.

4.15.3.3 Ferry Alternatives

4.15.3.3.1 Alternative G2

Construction of a ferry terminal at Peninsula Point on Revillagigedo Island would fill a portion of the point's rich rocky intertidal face. However, because of the steepness of this face, the net area affected would be relatively small, and similar organisms would reestablish on the new hard structures placed for the terminal.

Construction of the ferry terminal at Lewis Point on the western side of Tongass Narrows would likely eliminate some of the areas of eelgrass and some of the kelp beds that lie offshore of the rocky point and in silty-sand pocket beaches at the base of the rocky intertidal outcrops (Figure 4.4). These same pocket beaches and those lying to the south on the shore have very high densities of butter and littleneck clams, cockles, mussels, and soft-shell clams, three types of sea star, and lesser amounts of horse clams. Alternative G2 would eliminate a portion of this diverse community of organisms.

Ferry alternatives could result in substantial scour of the bottom of the channel in areas under and near the loading ramps. Propeller scour caused by power reversal during docking would eliminate existing unconsolidated surficial sediments and associated biota over a small area (assumed 0.1 acre for each ferry docking area) shoreward of the berth.

4.15.3.3.2 Alternative G3

Under this alternative, placement of a ferry terminal at Bar Point on Revillagigedo Island would disrupt a portion of the intertidal area at this site. Beds of eelgrass, kelp, and other algae offshore of Bar Point could be eliminated by project-related dredging and/or filling to extend the existing pier.

A band of kelp and other algae likely would be eliminated by dredging at the proposed western ferry terminal near East Clump on Gravina Island. The ferry terminal would also be located partially on a relatively broad intertidal bench that has a mix of habitat types, with bedrock outcrops in a mixed-soft (cobble/gravel/silt) lower beach and a mixed gravel/cobble upper beach. This mix of habitat types supports a diverse community of organisms (including hard-shell clams, which are abundant on the lower beach), and Alternative G3 would eliminate a portion of this diverse habitat (Figure 4.4).

Ferry alternatives could result in substantial scour of the bottom of the channel in areas under and near the loading ramps. Propeller scour caused by power reversal during docking would

eliminate existing unconsolidated surficial sediments and associated biota over a small area (assumed 0.1 acre for each ferry docking area) shoreward of the berth.

4.15.3.3.3 Alternative G4

This alternative would require construction of new ferry terminals near the existing terminals on each side of Tongass Narrows. Both terminals would be close to deep water and would require little dredging. Also, both would be constructed in areas that are already riprapped, and thus would avoid impacts to natural intertidal areas. Narrow bands of bull kelp lie offshore of the proposed eastern terminal and would be eliminated in the area of construction (Figure 4.4).

Alternative G4 could result in substantial scour of the bottom of the channel in areas under and near the loading ramps. Propeller scour caused by power reversal during docking would eliminate existing unconsolidated surficial sediments and associated biota over a small area (assumed 0.1 acre for each ferry docking area) shoreward of the berth.

4.15.3.3.4 Alternative G4v

This alternative would require construction of new ferry docks near the existing terminals on each side of Tongass Narrows. Docks would be close to deep water and would not require dredging. Also, both would be constructed in areas that are already riprapped, and thus would avoid impacts to natural intertidal areas. Narrow bands of bull kelp lie offshore of the proposed eastern terminal and would be eliminated in the area of construction (Figure 4.4).

Ferry Alternative G4v could result in substantial scour of the bottom of the channel in areas under and near the loading ramps. Propeller scour caused by power reversal during docking would eliminate existing unconsolidated surficial sediments and associated biota over a small area (assumed 0.1 acre for each ferry docking area) shoreward of the berth.

4.15.3.4 Mitigation of Impacts to Marine Habitat

4.15.3.4.1 No Action Alternative

No mitigation measures for marine habitat impacts are warranted under the No Action Alternative.

4.15.3.4.2 All Action Alternatives

Marine habitat mitigation is included in the description of mitigation for EFH at the end of Section 4.15.4.4. Further mitigation for adversely affected marine habitat may be determined at the time of project permitting with input from DNR, NMFS, USACE, and USFWS.

4.15.4 Wildlife—Aquatic Species

4.15.4.1 Marine Mammals

Section 4.20 describes potential adverse impacts to Steller sea lions and humpback whales. Section 4.25.15 addresses construction impacts to these species. All project-related activities for the action alternatives would conform to the pertinent provisions of the Marine Mammal Protection Act and the Endangered Species Act.

4.15.4.1.1 No Action Alternative

The No Action Alternative would involve continued slight disturbance of marine mammals in the project area by the existing ferry service's engine noise and occasional in-water construction in Tongass Narrows associated with routine maintenance.

4.15.4.1.2 Bridge Alternatives C3-4 and F3

Neither of the bridge alternatives, once constructed, would increase impacts to marine mammals compared to the No Action Alternative. Marine mammal habitat and food sources would not be substantially affected.

4.15.4.1.3 Ferry Alternatives G2, G3, G4 and G4v

The ferry alternatives likely would not substantially affect marine mammal habitat and food sources. Marine mammals could be exposed to slightly increased noise levels from an approximate doubling in ferry operations, but this would be of the same character of noise already present in Tongass Narrows shipping lanes. Such noise likely would not be distinguishable from daily and annual variations in noise level or character. Collision with vessels is not likely, because marine mammals in general tend to avoid collisions by using their excellent auditory capabilities, but may occur rarely.

4.15.4.2 Anadromous Fish

4.15.4.2.1 No Action Alternative

The No Action Alternative would not adversely affect anadromous fish in the project area.

4.15.4.2.2 Bridge Alternative C3-4

Alternative C3-4 would require crossings of anadromous fish streams. The alternative would employ a clear-span bridge crossing at Airport Creek and would not cause a loss of EFH. No fill would be required in Airport Creek because bridge abutments would be above stream floodplains. Placing concrete, rock, and other fill materials in intertidal and subtidal areas adjacent to the airport, however, would displace fish and permanently eliminate foraging habitat and cover.[276]

Communities of small organisms typical of natural hard-bottom areas would develop on bridge piers and provide cover to small fish. Placing bridge piers in Tongass Narrows would have a slight effect on the movements of juvenile anadromous fish in nearshore areas, particularly where the bridge structure parallels the shore, because the fish would need to swim around the structures.

Partial shading by a small portion of the bridge structure could slow the growth of the eelgrass beds that provide an important habitat for juvenile salmon during their migration and an area of refuge for salmon and other small fish. Less robust eelgrass beds would provide less eelgrass blade area to support aquatic insects and zooplankton, which are an important food source for juvenile salmon.

4.15.4.2.3 Bridge Alternative F3

Alternative F3 would employ a clear-span bridge crossing at Airport Creek and require widening of the bridges at Government Creek and Gravina Creek. No loss of EFH would occur by the placement of bridges over the creeks. No fill would be required in Airport Creek, Government Creek, and Gravina Creek because bridge abutments would be outside stream floodplains.

Placing bridge piers in Tongass Narrows would have a slight effect on the movements of juvenile anadromous fish in nearshore areas because the fish would need to swim around the structures. As with Alternative C3-4, bridge piers would replace a small area of ocean bottom habitat with a community of organisms that would establish on the piers. Placing piers in

[276] Alaska Department of Transportation and Public Facilities. October 2001. *Gravina Access Project Biology Report.* Prepared by HDR and Pentec Environmental.

intertidal and subtidal areas would displace fish and permanently eliminate small amounts of bottom foraging habitat and cover.

4.15.4.2.4 Ferry Alternatives G2, G3, G4 and G4v

The roadways associated with Alternatives G2, G3, G4 and G4v would require crossings of anadromous fish streams. These alternatives would use clear-span bridge crossings at Airport Creek. In addition, Alternative G3 would require widening of the bridge at Government Creek, an anadromous fish stream. Direct impacts from Alternatives G2, G3, and G4 would result from placement of pilings for ferry terminals in Tongass Narrows and dredging to produce adequate water depths for ferry terminal docking at all tidal stages.

All of the ferry alternatives would result in construction of ferry docks. Placing ferry docks in Tongass Narrows would have a slight effect on the movements of juvenile anadromous fish in nearshore areas because the fish would need to swim around the structures. Placing pilings in intertidal and subtidal areas and shading these areas would displace fish and permanently eliminate foraging habitat and cover (see Table 4-13, at the beginning of Section 4.14).

4.15.4.2.5 Mitigation of Anadromous Fish Impacts

No Action Alternative

No mitigation measures for anadromous fish impacts are warranted under the No Action Alternative.

Action Alternatives

All anadromous stream crossings would be designed to minimize impacts to proper stream function and, at fish streams, to provide passage to both anadromous and resident fish. At all stream crossings (both culverts and bridge crossings), stream banks would be recontoured to approximate original conditions and reseeded with native vegetation to minimize erosion. All road structures crossing other fish habitat would be designed to provide passage for resident fish. To mitigate the effects of placing bridge piers in nearshore areas, structures would be located in a manner that would leave a nearshore migration corridor (down to at least -5 feet MLLW) clear of obstruction to the extent practicable.

4.15.4.3 Marine Fish

4.15.4.3.1 No Action Alternative

The No Action Alternative would continue to affect marine fish in the project area with the noise and activity of regular ferry crossings.

4.15.4.3.2 All Action Alternatives

The effects of the action alternatives on marine fish would be similar to the impacts to anadromous fish in Tongass Narrows, discussed in Section 4.15.4.2. In particular, impacts to eelgrass beds could reduce the availability of spawning sites for Pacific herring and other marine fish (refer to Table 4-15 for impacts to eelgrass and kelp). Herring, herring eggs, and larvae are an important food source for a wide variety of fish, mammals, and birds. In addition, the loss of soft-bottom substrate to bridge pier foundations would reduce habitat for halibut and other bottom-dwelling species.

Placing concrete, rock, and other fill materials or removing materials in intertidal and subtidal areas would displace fish (such as Pacific herring, surf smelt, and Pacific sand lance) and result in long term effects by eliminating small percentages of spawning, rearing, and foraging habitat.

4.15.4.4 Essential Fish Habitat

An EFH Assessment was completed in 2004 to satisfy Federal agency consultation and response requirements with NMFS. The EFH Assessment concluded that the proposed Gravina Access Project action alternatives have the potential for adverse impacts to EFH in the project area. Adverse impacts to EFH would include direct, indirect, site-specific, and cumulative impacts. The impacts likely would be localized and minimal. Extensive interagency discussion and negotiation have resulted in mitigation measures to address and minimize these impacts. NMFS concurred with the EFH findings and mitigation with issuance of the Record of Decision in September 2004 for the FEIS. DOT&PF prepared an addendum to the EFH Assessment in 2011 for the alternatives evaluated in this SEIS and reinitiated consultation with NMFS for EFH (see Appendix E). Based on the 2011 addendum, NMFS recommended Alternative G4v as the least damaging alternative to the aquatic environment. Since that time, FHWA and DOT&PF have modified the bridge design for Alternative C3-4, substantially reducing impacts to EFH by eliminating fill in marine waters near the airport seaplane basin. Where the 2011 EFH addendum indicates 42,000 cubic yards of fill in marine waters for Alternative C3-4, current design places the bridge structure on piers, requiring no fill in Tongass Narrows. FHWA and DOT&PF will provide NMFS with a revised addendum to the EFH Assessment and continue to consult on EFH impacts through the Draft SEIS review process.

All action alternatives would require placement of either pier footings (for the bridge alternatives) or pilings (for ferry facilities) in shallower waters (e.g., shallower than -50 feet MLLW) near the shoreline of Tongass Narrows. Table 4-14 at the beginning of Section 4.15 shows the required number of piers, anadromous water body crossings, amount of roadway fill for Tongass Narrows, and the dredging quantity for each alternative. Relatively small areas of EFH would be permanently lost in all cases, although the alternatives would have varying impacts, as described in the subsections below. Construction impacts to aquatic animals and EFH are addressed in Section 4.25.12.3, and mitigation of construction impacts to aquatic animals and EFH is discussed in Section 4.25.12.4.

Table 4-15 characterizes the acreage loss of EFH for each alternative.

Table 4-15: Potential Adverse Impacts to Essential Fish Habitat

Type of EFH	No-Action	Bridge Alternatives		Ferry Alternatives			
		C3-4	F3	G2	G3	G4	G4v
Marine EFH (Impacts measured in acres)							
Dredging	0.0	0.0	15.0	0.25	2.2	0.4	0.0
Shading[a]	0.0	1.2	0.1	0.2	0.2	0.3	0.1
Filling	0.0	0	0.1	0.5	1.6	0.0	0.0
Pier Area[b]	0.0	0.7	0.7	0.0	0.0	0.0	0.0
Total[c]	**0.0**	**1.9**	**15.9**	**1.0**	**4.0**	**0.7**	**0.1**
The following three rows indicate subsets of the marine total shown above							
Eelgrass	0.0	0.0	0.9	0.0	0.7	0.0	0.0
Kelp	0.0	0.0	0.0	0.0	0.5	0.1	0.0
Saltmarsh	0.0	0.2	0.1	1.0	2.0	0.0	0.0
Freshwater EFH (number of crossings)							
Streams[d]	0	2	7	2	3	2	2

[a] Area that is covered by over-water structures fewer than 30 feet above MHHW, both for ferry docks and the low portions of bridge alternatives. Ferry loading transfer bridge was assumed to be 24 feet wide by 140 feet long; floating barge was assumed to be 24 feet wide by 60 feet long; apron was assumed to be 24 feet wide by 24 feet long.

[b] Pilings for the ferry alternatives would be of small diameter and were not calculated. The area of EFH impact for the ferry pilings is included with the impact area for shading.

[c] The total of the first four rows of the table. Impacts include loss of habitat and change in habitat function. Eelgrass, kelp, and saltmarsh impacts are a subset of this total. Total is rounded up to the next tenth acre.

[d] Number of anadromous fish streams shaded by bridge or covered with culvert. No permanent loss of EFH is anticipated at these locations.

4.15.4.4.1 No Action Alternative

The No Action Alternative would not adversely affect EFH in the project area.

4.15.4.4.2 Bridge Alternative C3-4

Table 4-14 at the beginning of Section 4.15 shows the required number of piers in Tongass Narrows and anadromous water body crossings for Alternative C3-4. The placement of piers in Tongass Narrows for the Alternative C3-4 bridge would cause minor loss of spawning areas and food sources, and minor permanent displacement of fish species, adversely impacting EFH through loss and alteration.This alternative would involve crossing Airport Creek and modifying the crossing at Government Creek, both are anadromous fish streams. The crossings would be by clear-span bridge, therefore avoiding loss of EFH.

4.15.4.4.3 Bridge Alternative F3

The placement of piers in East and West channels for the Alternative F3 bridges would cause minor loss of spawning areas and food sources, and minor permanent displacement of fish species, adversely impacting EFH through loss and alteration.

Additionally, the widening of West Channel to improve navigation clearances would modify the localized nearshore tidal flow regime slightly, though it would not affect overall flow through West Channel. Altered hydrology in the channel would not substantially impact benthic

assemblages or productivity outside of the modified area. Channel modification would require the removal of approximately 213,000 cubic yards of fractured rock and solid bedrock. Dredging in West Channel would remove approximately 15 acres of subtidal habitat between Gravina and Pennock Islands (Table 4-15). This action would eliminate approximately 1.8 acres of existing kelp beds and 0.5 acre of eelgrass beds (see Table 4-15).

Newly exposed soil and rock surfaces would be recolonized over a period of several years. Newly exposed lower rock at depths from the lower intertidal zone to about –20 feet MLLW would be recolonized by epibenthic biota similar to that seen at low tide levels on the existing west shore, including red algae, kelp, and a variety of other small species. Subtidal rock would be colonized by a wide variety of invertebrates such as coral, erect bryozoan, scallop, gastropods, white limpet, sea peach, and several other hydroids and bryozoans. A variety of red algae would form an understory, and large kelp species would form an overstory. Bull kelp would recolonize at depths down to about –20 to –25 feet MLLW. Red algae would form the deepest zone and may extend to –50 feet MLLW. Pockets of newly exposed sediment and sediment that accumulates in rock crevices will be colonized by an infauna composed of a variety of polychaetes, crustaceans, bivalves, echinoderms, and other taxa.[277] Because of the loss of some shallow water habitats, especially on the southwest side of the channel, overall productivity in the area would be less than current productivity in the existing shallower areas.

Alternative F3 would cross seven anadromous fish streams: Airport Creek, Government Creek, Gravina Creek, Fiedler Creek, Stensland Creek, Rain Creek, and Clam Creek. A clear-span bridge would be used at Airport Creek to avoid EFH loss. The existing bridges at Government Creek and Gravina Creek are clear-span bridges and would be widened. The remaining anadromous fish stream crossings would require lengthening of the culverts. Changes in the hydrology of smaller creeks would be minimized by designing culverts that are appropriately sized and placed, would accommodate stormwater flow, and would not cause scour.

The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC and EPA requirements of the Clean Water Act. The road and bridge would be designed to minimize the effects of runoff. Ditches would be constructed along each side of the new and improved roads to capture stormwater runoff and filter it before it flows to low spots or existing channels that would eventually flow to Tongass Narrows. The method of removing stormwater from the bridge structures would be determined in the final design phase. Typical DOT&PF bridge design would direct stormwater from the bridge deck to the railing curb and then to vertical pipes that discharge the stormwater to the waters or land below the bridge. The stormwater treatment system would be submitted to ADEC under its plan review authority for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. Any impacts to EFH would be temporary and would be related to the installation of the culverts (see Section 4.25.12.1 for construction and temporary impacts). There would be no permanent loss of EFH resulting from the culverts or bridge crossings. EFH mitigation for all alternatives is discussed under Construction Impacts below and in Sections 4.25.12.1 and 4.25.12.3.

4.15.4.4.4 Ferry Alternatives G2, G3, and G4

The ferry alternatives would cause EFH loss and alteration, which could result in the loss of spawning areas, food sources, and cover, and permanent displacement of fish species. Alternative G2 would require the removal of approximately 1,400 cubic yards of material near the proposed Gravina Island terminal (Table 4-14). Alternative G3 would require the removal of approximately 18,600 cubic yards of material combined from the proposed Gravina and

[277] Wright, Stoney J., and Philip K. Czapla. 2011. *Alaska Coastal Revegetation and Erosion Control Guide*. Palmer, Alaska: Alaska Department of Natural Resources, Division of Agriculture, Plant Materials Center.

Revillagigedo terminals (Table 4-14). Alternative G4 would require the removal of approximately 15,200 cubic yards) of material combined from the Gravina and Revillagigedo terminals (Table 4-14). The roadway portions of the ferry alternatives would require placement of a clear-span bridge at the crossing of Airport Creek to avoid EFH loss. Additionally, Alternative G3 would require widening of the clear-span bridge at Government Creek. Section 4.25.12.5 discusses construction impacts.

4.15.4.4.5 Ferry Alternative G4v

Alternative G4v would require no require dredging, but construction of the ferry docks would result in EFH loss and alteration, which could cause loss of spawning areas, food sources, and cover, and permanent displacement of fish species (Table 4-15). The roadway portions of Alternative G4v would include placement of a clear-span bridge at the crossing of Airport Creek to avoid EFH loss. Section 4.25.12.5 discusses construction impacts.

4.15.4.4.6 Mitigation of EFH Impacts

No Action Alternative

No mitigation measures for EFH impacts are warranted under the No Action Alternative.

All Action Alternatives

Construction of this project would require a DNR Title 16 Fish Habitat Permit and a USACE Permit for fill in waters of the United States. As a result of the coordination with NMFS during development of the 2004 FEIS and ongoing coordination through development of this SEIS, the following conservation measures would be incorporated to avoid, minimize, and mitigate impacts to EFH:

- Recontour stream banks at all stream crossings (both culverts and bridge crossings) to approximate original conditions
- Reseed streambanks at all stream crossings (both culverts and bridge crossings) with native seed and annual rye to minimize erosion as recommended in the DNR Coastal Revegetation and Erosion Control Guide[278]
- Employ BMPs consistent with the Alaska Pollutant Discharge Elimination System Permit to minimize the introduction of sediment and siltation of ponds and streams during adjacent fill placement and during culvert placement; related BMPs are listed in Sections 4.12; 4.14.1; 4.15.1 through 4.15.4; 4.25.10; and 4.25.11
- Design all anadromous fish stream crossings to provide passage for the salmon present in any given stream, per DOT&PF's memorandum of agreement with the ADF&G

These are general measures that would be modified during design to address specific details of the preferred alternative through further coordination with the agencies.

4.15.5 Wildlife—Amphibians

4.15.5.1 No Action Alternative

There would be no effect on amphibian species as a result of the No Action Alternative.

[278] Wright, Stoney J., and Philip K. Czapla. 2011. *Alaska Coastal Revegetation and Erosion Control Guide*. Palmer, Alaska: Alaska Department of Natural Resources, Division of Agriculture, Plant Materials Center.

4.15.5.2 All Action Alternatives

Roadways associated with all of the action alternatives would eliminate some habitat potentially used by the rough-skinned newt and the western toad, though neither species has been documented as inhabiting the project area. Direct impacts would include filling wetlands and uplands, clearing of habitat adjacent to roadways, and amphibian losses due to vehicle strikes.

4.15.6 Wildlife—Birds

4.15.6.1 No Action Alternative

The No Action Alternative would not affect birds.

4.15.6.2 All Action Alternatives

All action alternatives would result in a permanent loss of bird habitat. This loss would include a variety of habitats (including marine waters, freshwater wetlands, and forests) that support approximately 160 bird species. All action alternatives would require construction of new roads, which would eliminate habitat within the road footprint (including the loss of food sources, cover, breeding grounds, and roosting sites), reduce habitat quality adjacent to the road, and increase disturbance of avian species by human activity.

Northern Goshawk. Northern goshawks use old growth and mature forest habitat, which is limited in the project area. No documented goshawk nesting occurs on Gravina Island or Revillagigedo Island. The minor amounts of road widening are in already disturbed areas where human activity occurs. The action alternatives likely would not impact goshawks.

Bald Eagles. All proposed action alternatives could disturb breeding eagles due to the proximity of the alternatives to known nests (see Section 3.15.6 for information on eagle distribution). No bald eagle nest trees would need to be removed; however, nesting eagles could become disturbed and stressed from project construction and operation, possibly to the point of nest abandonment. Of the potential adverse impacts to bald eagles, the roadway construction phase would be the most disturbing. Construction impacts to bald eagles are discussed in Section 4.25.12.7.

The new roads and ferry docks or bridges proposed in the action alternatives would reduce eagle perching and feeding areas along the shoreline and inland. Other possible direct impacts could include bald eagles being struck by vehicles while foraging for carrion on or along the new roadway. Given the activity of the airport and existing roads, it is unlikely that the eagles using nearby nest sites will be disturbed by long-term use of any of the proposed roads, ferries, or bridges.

4.15.7 Wildlife—Land Mammals

Roads fragment habitat and act as barriers to land mammal movement. Some animals will avoid roads altogether, which might be detrimental to those animals' fitness. Some animals would choose to use the new road as an easy ground travel corridor, which could aid the survival of some animals but lead to other animals' deaths due to collisions with vehicles.

4.15.7.1 No Action Alternative

The No Action Alternative would not affect Sitka black-tailed deer, Alexander Archipelago wolf, and black bear.

4.15.7.2 All Action Alternatives

Sitka Black-Tailed Deer. All action alternatives would result in the loss and alteration of deer habitat, which is primarily associated with loss of wetland and non-wetland vegetation (see Section 4.14). Direct impacts to Sitka black-tailed deer habitat would include loss of food sources and cover, loss of winter habitat, habitat fragmentation, permanent displacement from habitats within and adjacent to the project footprint, and occasional incidental deaths from vehicle collisions.

Because the proposed road in Alternative G2 would bisect winter foraging habitat, effectively fragmenting it, the alternative could interfere with the access or migration of deer to winter foraging habitat immediately north of the airport.

Alexander Archipelago Wolf. Because Sitka black-tailed deer comprise 80 percent of the diet of the wolf on Gravina Island, the direct impacts of the action alternatives on the Alexander Archipelago wolf would be similar to the impacts of the action alternatives to deer. All action alternatives would eliminate wolf habitat and could affect Sitka black-tailed deer, and therefore could affect the wolf by reducing its primary prey.

Black Bear. The direct impacts to black bears would mainly consist of habitat loss within the road footprint and displacement of bears from habitat adjacent to the road due to increased human disturbance.

4.16 Floodplain Impacts

Mapped floodplains exist for only a small portion of the Borough (see Figure 3.16). The proposed action alternatives have been examined in relation to the FEMA-mapped floodplains and potential effects are described below.

The proposed designs for all the alternatives would maintain existing surface water courses and would incorporate swales or a stormwater treatment system, where appropriate, to minimize the effects of runoff. Additionally, all action alternatives would avoid or minimize alterations to surface drainage and hydrology that could adversely affect nearby water bodies through incorporation of appropriately sized and placed culverts in the roadway design.

Although the proposed project is within or adjacent to tidally influenced coastal waters, as defined in E.O. 11988, elements of the project alternatives that encroach into the coastal flood zone will not reduce or increase the elevation of the landward-defined 100-year base flood flow. It should be noted that wave velocity and height, together with storm surge and an extremely high tide, may produce water surface elevations that exceed the landward 100-year base flood at the tidewater/landward interface. This extreme condition has been incorporated into the design elements of the proposed project.

4.16.1 No Action Alternative

The No Action Alternative would have no effect on FEMA mapped floodplains, the Tongass Narrows, or SFHAs in the project area.

4.16.2 Bridge Alternatives C3-4 and F3

The bridge alternatives would avoid impacts to FEMA-mapped floodplains within the Borough, including those associated with Ketchikan Creek, Schoenbar Creek, Carlanna Creek, and Hoadley Creek. Both Alternative C3-4 and F3 would require construction within the SFHA Zone A associated with Tongass Narrows; however, the alternatives likely would not have a measurable impact to Tongass Narrows since no increase in base flood elevation would occur as a result of this project. Sections 4.14.1, 4.15.1, 4.15.3, and 4.15.4 describe the potential

effects of bridge pier placement on natural resources in the floodplain and intertidal areas. Impacts to natural and beneficial floodplain values would occur only in the area of the bridge pier footprint, as described in those sections. The natural and beneficial floodplain values associated with all of Tongass Narrows would not be affected by development of Alternative C3-4 or F3.

4.16.3 Ferry Alternatives G2, G3, G4, and G4v

All ferry alternatives would avoid impacts to FEMA-mapped floodplains associated with Ketchikan Creek, Schoenbar Creek, Carlanna Creek, and Hoadley Creek within the Borough. Ferry terminals would be placed at the shoreline, which is influenced by tides as well as tidal flooding. All ferry terminal facilities would require construction within the SFHA Zone A associated with Tongass Narrows. No impacts to the natural hydraulics of Tongass Narrows, including tides and flooding, are expected to result from development of any of the ferry alternatives. Sections 4.14.1, 4.15.1, 4.15.3, and 4.15.4 describe the potential effects of ferry terminal development on the shoreline to natural resources in the floodplain and intertidal areas. Impacts to natural and beneficial floodplain values would occur only in the area of the ferry terminal footprint, as described in those sections. Development of a ferry alternative would not affect the natural and beneficial floodplain values associated with Tongass Narrows.

4.17 Wild and Scenic Rivers

There are no national or state-designated wild or scenic rivers in the project area; therefore, no impacts to these resources would result from this project.

4.18 Coastal Barriers

There are no coastal barriers in the project area; therefore, no impacts to these resources would result from this project.

4.19 Coastal Zone Management

4.19.1 No Action Alternative

The No Action Alternative would not adversely effect coastal zone management.

4.19.2 All Action Alternatives

The ACMP expired by operation of AS 44.66.020 and 44.66.030 on June 30, 2011. Consequently, the ACMP was withdrawn from the National Coastal Management Program on July 1, 2011, and Alaska no longer has a Coastal Zone Management Act program. Because a federally approved coastal management program must be administered by a state agency, no other entity may develop or implement a federally approved coastal management program for the state.

As of July 1, 2011, the Coastal Zone Management Act federal consistency provision no longer applies to Alaska. Federal agencies no longer provide Consistency Determinations or Negative Determinations under the State of Alaska Coastal Zone Management Act as required by 16 USC 1456(c)(1) and (2), and 15 CFR part 930, subpart C. Persons or applicant agencies for federal authorizations or funding no longer provide Consistency Certifications to the State of Alaska Coastal Zone Management Act as required by 16 U.S.C. 1456(c)(3)(A), (B) and (d), and 15 CFR part 930, subparts D, E and F.

Although there is no state coastal consistency review process in place, the Borough still reviews projects to ensure compliance with its district plan. The following evaluation is based upon district enforceable policies in the *Ketchikan Coastal Management Plan*.

4.19.2.1 Coastal Development Enforceable Policies

The Coastal Development enforceable policies described in Section 3.19 are intended to guide the type and locations of development along the waterfront.

CD-1: Prioritization of Waterfront Land Use

The ferry terminals and bridges serve as intermodal transportation links for the transfer of goods and services between the marine transportation system and the road system and are water dependent uses. All action alternatives would be consistent with this policy.

CD-2: Structures Placed in Navigable Waters

Placement of piling-supported or floating structures for the bridge and ferry terminals would be consistent with the allowable uses on the adjacent uplands and would not be treated with creosote preservative coatings applied to the exterior. All action alternatives would be consistent with this policy.

CD-3: Tideland Fill below Mean High Water

The need to improve access to Gravina Island is documented in the SATP[279] and is described in Chapter 1.0 of this SEIS; the project is consistent with local plans. The action alternatives propose a minimum amount of fill, and the fill would be placed in a manner that would minimize impacts to adjacent uses, public access easements along the shoreline, and water views. All action alternatives would be consistent with this policy.

4.19.2.2 Recreation and Coastal Access Enforceable Policies

The Recreation and Coastal Access enforceable policies described in Section 3.19.2 are intended to provide recreational opportunities and access to the coastal areas while minimizing impacts and retaining the natural features of the area. The Gravina Shoreline Trail and Bostwick Lake Loop Trail are the only Designated Recreational Areas in the project area.

RCA-1: Management of Designated Recreational Areas

Under this policy, proposed uses or activities in the Designated Recreational Areas shall avoid or minimize direct and significant impacts upon the existing activities and the physical, biological, visual, or cultural features upon which the recreation depends. All action alternatives would add new structures and roads to the visual environment. The bridge (in Alternatives C3-4 and F3) would be the most substantial new visual element. If an action alternative were selected, design quality, art, and architecture would be taken into consideration during final project design and planning and the Alaska State Council on the Arts and the Ketchikan Area Arts and Humanities Council would be consulted during the final design phase (see Section 4.23). In addition, the alternatives would minimize impacts to the physical, biological, and cultural features of the Designated Recreational Areas to the extent practicable. All of the alternatives, including the No Action Alternative, would be consistent with this policy.

[279] DOT&PF. 2004. *Southeast Alaska Transportation Plan*.

RCA-5: Public Access to Coastal Water

This policy encourages increased public access from the uplands to coastal water within Designated Recreational Areas and along coastal waters through easements, dedications, or other means of conveyance, except where human health or safety would be at risk. The action alternatives are meant to provide transportation to and from Gravina Island. While access to coastal water would not be the primary intention of any of the action alternatives, increased access to Gravina Island would make shoreline recreational opportunities more accessible to greater numbers of residents. All of the alternatives, including the No Action Alternative, would be consistent with this policy.

RCA-6: Public Access in Designated Areas

This policy encourages increase water access for recreational use within Designated Recreational Areas, except where human health or safety would be at risk. The action alternatives would provide transportation to and from Gravina Island, and while they would not be designed specifically to encourage recreational use, increasing access to Gravina Island would make recreational opportunities more accessible to greater numbers of residents. All of the alternatives, including the No Action Alternative, would be consistent with this policy.

RCA-7: Waterfront Access

Under this policy, capital improvements on or adjacent to publicly owned waterfront property shall be designed to maximize pedestrian access, views to and along coastal waters, and to facilitate public enjoyment of coastal waters. The action alternatives incorporate improvements to facilitate public enjoyment (e.g., providing views along the water, shelters, and adequate roadway shoulders to accommodate bicycles and pedestrians). The action alternatives would be consistent with this policy.

4.20 Threatened and Endangered Species

A Biological Assessment for the Steller sea lion and humpback whale was prepared in accordance with Section 7 of the Endangered Species Act and sent to NMFS during preparation of the 2004 FEIS. The Biological Assessment addressed the potential adverse impacts of all of the reasonable alternatives to these species and concluded that "the proposed action will not likely affect listed [threatened and endangered] species or designated critical habitat." NMFS agreed with the "not likely to adversely affect" determination and provided a letter of concurrence on February 17, 2004.[280] In June 2012, FHWA and DOT&PF requested NMFS concurrence with the determination that the revised project "may effect, but is not likely to adversely affect" ESA-listed species under NMFS jurisdiction, namely humpback whales and Steller sea lion. NMFS provided concurrence with this determination on September 14, 2012 (see Appendix E).

4.20.1 Humpback Whales

4.20.1.1 No Action Alternative

Movements of humpback whales would continue to be slightly altered by ferry operations associated with the No Action Alternative.

[280] Balsinger, James. February 17, 2004. Letter from NOAA Fisheries to Bill Ballard, Environmental Coordinator, Statewide Design and Engineering Services Division, DOT&PF.

4.20.1.2 All Action Alternatives

The completed project likely would not have population-level effects on humpback whales in Tongass Narrows distinguishable from natural variations in population. Occasional individual passing whales could be exposed to increased noise from project operation (principally the approximate doubling of ferry engine/propeller operations); however, whales hear such noise in the area under existing conditions because Tongass Narrows is a busy shipping lane. The whales likely would move away from areas of excessive noise and disturbance. Because the whales do not stay in Tongass Narrows for extended periods, these disturbances would not have measurable impacts to the humpback whale population. Section 4.25.15 details impacts to humpback whales from construction activities.

4.20.2 Steller Sea Lions

4.20.2.1 No Action Alternative

There would be no new impacts to Steller sea lions under the No Action Alternative.

4.20.2.2 All Action Alternatives

No additional impact to the Steller sea lion population would occur due to operation of any of the action alternatives. The habitat and population of sea lion prey, principally off-bottom fish, would not be substantially affected. Sea lions could be exposed to increased noise from project operation (principally ferry engines) under Alternatives G2, G3, and G4, but this would be of the same character of noise already present in the Tongass Narrows shipping lanes and likely would not be distinguishable from daily and annual variations of activity to a degree that would affect Steller sea lions. Collision with vessels would be unlikely because marine mammals in general tend to move away from areas of excessive noise and disturbance and avoid collisions. Construction impacts are discussed in Section 4.25.15.

4.21 Historical and Archeological Preservation

Under Section 106 of the National Historic Preservation Act,[281] any impact, direct or indirect, "that alters any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity, location, design, setting, materials, workmanship, feeling, or association" of the property is an adverse effect. Cultural resources that have been evaluated and determined ineligible for inclusion in the NRHP were not considered in this analysis of project impacts.

The presence of historic properties within the APE for each alternative was established through background research, consultation, and field investigation (as discussed in Section 3.21). The level of effort to date has been completed in consultation with tribal governments and Native corporations, SHPO, and other Section 106 consulting parties.

The following paragraphs describe potential adverse impacts to those cultural sites that have been determined eligible for listing in the NRHP or that have not yet been formally evaluated for NRHP eligibility that are located within the APE for the proposed alternatives. All sites and their NRHP significance criteria are described in Section 3.21.4.

4.21.1 No Action Alternative

The No Action Alternative would have no effect on historic properties.

[281] National Historic Preservation Act, as amended (Executive Order 11593; 23 CFR 771; 36 CFR 60, 63, and 800).

4.21.2 Bridge Alternatives

4.21.2.1 Alternative C3-4

Physical changes caused by Alternative C3-4 would not affect any historic properties in that alternative's APE. One historic property, KET-1302, a historic building eligible under Criterion A for its association with homesteading and Ketchikan's early development, is located on the northern end of Pennock Island, and may be affected visually by the bridge. Visual simulations rendered to model visual effects to this property indicate that effects to the property's viewshed would be minor in scope and scale and would not affect the integrity or significance of the historic property.

Alternative C3-4 bridge as simulated in a view from the north end of Pennock Island, looking north.

4.21.2.2 Alternative F3

There are seven eligible or as yet unevaluated recorded resources that may be affected by Alternative F3.

On Revillagigedo Island, four historic properties and one unevaluated resource, KET-599, the USCG Buoy Tender Planetree, may be affected by the introduction of the Alternative F3 bridge to the viewshed. The four historic properties are: KET-279, the USCG Headquarters Building, eligible under Criterion A for its association with the development of transportation and commerce in Alaska; KET-549, the North Pyrotechnic Bunker, eligible under Criterion A for its association with Alaska's preparation for and involvement in World War II; KET-548, the Machine Gun Emplacement, eligible under Criterion A for its role in the defense of Base Ketchikan during World War II; and KET-974, the USCG Cutter *Acushnet,* eligible under Criteria A and C for its association with the maritime heritage of oceanographic research and search and rescue operations (A) and as the only extant cutter in its class in the USCG (C). The East Channel bridge may result in positive impacts to potential historic properties through the elimination of cruise ship traffic in the East Channel.

Alternative F3 bridge over East Channel as simulated in a view from USCG Station, looking south.

On Pennock Island, KET-774, a historic homesteadeligible under Criterion D for its information potential, is located on the East Channel near the Alternative F3 alignment. This property would not be physically disturbed by Alternative F3, as the bridge alignment is located 300 feet away and overhead from KET-774. On Gravina Island, KET-775, which consists of archeologically historic remains eligible under Criterion D for their information potential, is located near the West Channel bridge alignment and the Gravina Island Highway south of Clam Cove and may be physically disturbed by construction of the bridge. Construction impacts are described in Section 4.25.16.

Improved access to Gravina Island with Alternative F3 would induce growth and development on the island. The effects of induced growth are described in Section 4.26.14, Indirect Impacts. During consultation and earlier project development, concern for the locations of potential historic grave sites on the eastern side of Pennock Island were raised by the public and tribal entities;[282] however, further research and cultural resource surveys identified no graves located in the APE for any of the proposed alternatives. Increased access to Pennock Island under Alternative F3 could result in indirect impacts to grave sites and cemeteries on Pennock Island in the vicinity of the project. Indirect impacts of the project alternatives on cultural resources are discussed in Section 4.26.14.

4.21.3 Ferry Alternatives

4.21.3.1 Alternative G2

One historic property is located in the Alternative G2 APE (Figure 3.21): KET-1204, the Temsco Quonset Hut. KET-1204, which is eligible for listing in the NRHP under Criterion A for its association with aviation, is located adjacent to the proposed ferry terminal at Peninsula Point, and could be affected by improvements to the Peninsula Point access road and traffic pattern

[282] Cultural Resource Consultants and HDR Alaska, Inc. July 2003. Gravina Access Project, Cultural Sites and the Gravina Access Project, Summary and Compilation of Data, along with Proposed Determinations of Eligibility and Effect. Prepared for DOT&PF.

changes at its intersection with the North Tongass Highway. If selected, Alternative G2 would be designed to avoid direct physical impacts to KET-1204. Audible and visual impacts to the setting of KET-1204 could occur as a result of increased traffic as well as lighting, signage, and associated intersection improvements for Alternative G2. In consultation with SHPO and Section 106 consulting parties, minimization measures, such as vegetation buffers, would be identified during final design to reduce visual and audible impacts to KET-1204.

4.21.3.2 Alternative G3

There are no identified historic properties within the APE on Revillagigedo Island for Alternative G3. On Gravina Island, only KET-800, the unevaluated archaeological remains of numerous historic homesteads, may be affected. Preliminary design indicates KET-800 is located 300 feet from the alignment of the access road to the ferry terminal on Gravina Island. KET-800 may be directly affected through equipment operation and material stockpiling and storage during construction of the alignment and by induced foot traffic in the area due to increased access during construction and operation. Construction impacts are described in Section 4.25.16. If Alternative G3 is selected, final alignment would be designed to avoid construction impacts to KET-800.

4.21.3.3 Alternatives G4 and G4v

No historic properties are located within the APE on Gravina Island or Revillagigedo Island for Alternatives G4 and G4v. Therefore, this alternative would have no effect on historic properties.

4.21.4 Mitigation of Impacts to Historical and Archeological Resources

With the exception of Alternative G2, none of the alternatives would have a direct impact on historical and archeological resources. If selected, Alternative G2 would be designed to avoid direct physical impacts to KET-1204. Audible and visual impacts to the setting of KET-1204 may occur as a result of increased traffic as well as lighting, signage, and associated intersection improvements for Alternative G2. In consultation with SHPO and Section 106 consulting parties, minimization measures, such as vegetation buffers, would be identified during final design to reduce visual and audible impacts to KET-1204.

4.22 Hazardous Waste Sites

A preliminary analysis of hazardous waste sites that could affect project development was conducted for each of the project alternatives through review of federal and state databases. Known and potential hazardous waste sites within an approximate one-quarter mile distance of each project alternative are documented in Section 3.22 and displayed on Figure 3.19.

4.22.1 Known Sites

4.22.1.1 No Action Alternative

No new construction or ground-disturbing activities would occur under the No Action Alternative, and therefore no known hazardous waste site would be affected by the No Action Alternative.

4.22.1.2 All Action Alternatives

Refer to Section 3.22, Table 3-27, Table 3-28, and Table 3-29 for more information on the status of known hazardous waste sites and handlers of hazardous materials and the nearest potentially affect action alternative. The preliminary investigation identified 15 RCRA handlers of hazardous materials as being within approximately one-quarter mile of one or more action

alternatives. Of these, 12 handlers were conditionally exempt generators, one was a transporter of hazardous waste, and two were used oil handlers. Typically, conditionally exempt generators generate such small quantities of hazardous waste that they do not cause concern, unless the site has been identified by other means (recorded spill, site reconnaissance identifying potential releases) to be of concern. Likewise, the transporter and used oil handlers would not cause concern unless they were identified as contaminated sites. Thus, none of the RCRA handlers would have an impact to public health or the environment related to any of the action alternatives.

Within the same project area, three contaminated sites were identified from the statewide contaminated sites database, and eight were identified from the statewide LUST program database. The sites are listed in Table 3-27, Table 3-28, and Table 3-29 (see also Figure 3.19). Of these sites, none are listed as an open case, and three sites are listed as "cleanup complete with institutional controls": Westside Service Station, (Alternative G3), Bailey Power Plant (Alternative G4/G4v), and Harbor Point (Alternative G4/G4v). All of these sites have soil and/or groundwater with concentrations of fuel constituents above ADEC cleanup standards. Once an alternative is chosen, additional analysis will be required to determine whether these sites and associated contamination poses property acquisition or construction-related risks.

Three sites identified in Section 3.22 and shown in Figure 3.19 would be located within the action alternatives' proposed right-of-way. Temsco Helicopters, map ID 3 on Figure 3.19, is documented as a RCRA handler and located within the proposed Alterative G2 right-of-way. It is worth noting that the ADEC location coordinates are approximate; the Temsco property is located adjacent to the north of Peninsula Point and would not be affected by Alternative G2 right-of-way. Ketchikan Autobody and Glass, map ID 9, is also a RCRA handler and is located within the proposed Alternative C3-4 right-of-way. As noted above, neither of these sites poses a concern to public health or the environment. ADEC has documented the third site, Ketchikan Credit Union, map ID 19, as a known contaminated site, and it is located within the proposed Alternative G3 right-of-way. This site is listed as "cleanup complete" and does not pose a significant risk to human health or the environment.

Upon selection of a preferred alternative, further investigation into known and suspected contaminated sites would be necessary, including a Phase I Environmental Site Assessment in accordance with American Society for Testing and Materials Standard E1527-05 (most recent edition). The Phase I Environmental Site Assessment would include interviews with property owners, a review of historical sources, regulatory agency file reviews and consultation, and site reconnaissance. It would identify recognized environmental conditions that could affect the preferred alternative. If the Phase I Environmental Site Assessment were to identify a release of hazardous materials, a Phase II Site Investigation would be recommended. The investigation would determine the extent of the release, establish an approach to site design and construction to avoid contaminated environmental media to the extent possible, and recommend management strategies for unavoidable contaminated media.

4.23 Visual Impacts

The visual impacts of each project alternative were identified relative to the key views described in Section 3.23. The photographs in this section show a simulation of each of the project alternatives superimposed on a key view in the project area. The assessment of visual impacts resulting from the project alternatives has been based largely on these visual simulations.

The aesthetics and scenic qualities of an area—and any project-related impacts to those resources—are subjective, and based on the interests and values of the viewers. For this SEIS, an adverse impact to visual quality would result if a project alternative were to introduce a

substantial new visual element into a predominantly undeveloped existing view, or if a new visual element would substantially change an existing view (such as the introduction of a major new structure in a landscape or view featuring urban development).

In general, the bridge alternatives (Alternatives C3-4 and F3) would introduce a major new visual element into key views by adding a large structure across Tongass Narrows and adding roadways and/or structures to Revillagigedo and Gravina Islands. The ferry alternatives (Alternatives G2, G3, G4, and G4v) would add a minor new visual element to several key views in the form of added shoreline development and roadways to support ferry operations. None of the action alternatives would result in the removal of existing substantial structures that contribute to the visual environment.

Construction activities associated with the action alternatives would adversely affect the visual environment due to land clearing and the presence of construction equipment. These impacts are addressed in Section 4.25.18.

All action alternatives except Alternative G4 and G4v would provide new views of the landscape and Tongass Narrows to vehicles, pedestrians, and bicyclists using the new crossing.

If an action alternative were selected, design quality, art, and architecture would be considered during final project design and planning. The Alaska State Council on the Arts and the Ketchikan Area Arts and Humanities Council would be consulted during the final design phase if an action alternative were selected. Both entities are on the distribution list of this SEIS and invited to comment.

4.23.1 No Action

The No Action Alternative would not impact the visual environment in the project area.

4.23.2 Bridge Alternatives

4.23.2.1 Alternative C3-4

Alternative C3-4 would introduce a major new visual element to the project area—a high bridge across Tongass Narrows—and would adversely affect the scenic quality of the views from the Ketchikan area. The bridge would be visible from several key viewpoints: Pennock Island, the Shoreline Drive neighborhood, and Pioneer Heights Senior Housing complex (Key Views 3, 8, and 9, respectively, in Section 3.23.4 and shown below with simulated Alternative C3-4 Tongass Narrows bridge). The Alternative C3-4 bridge would present only a minor obstruction to views westward from Key View 3 on Pennock Island. Key Views 8 and 9 toward Tongass Narrows and Gravina Island would be partially obstructed by the presence of the bridge. In addition, this alternative includes 5,000 feet of new roadway along the hillside on Ketchikan that would require clearing and grading over approximately 15 acres, which would have adverse impacts to the visual environment.

Alternative C3-4 bridge as simulated in a view from the north end of Pennock Island, looking north (Key View 3).

Alternative C3-4 bridge as simulated in a view from Shoreline Drive neighborhood near Peninsula Point, looking south (Key View 8).

Alternative C3-4 bridge and a cruise ship as simulated in a view from Shoreline Drive neighborhood near Peninsula Point, looking south (Key View 8).

Alternative C3-4 bridge as simulated in a view from from Pioneer Heights Senior Housing toward Gravina Island , looking south (Key View 9).

Alternative C3-4 bridge and curise ship as simulated in a view from Pioneer Heights Senior Housing toward Gravina Island, looking south (Key View 9).

4.23.2.2 Alternative F3

The East Channel bridge across Tongass Narrows proposed under Alternative F3 would be approximately 60 feet above the water and would partially obstruct the views toward Tongass Narrows from Saxman, the USCG Station, and Knob Hill (Key View 1, 2, and 4 in Section 3.23.4; Key View 1, 2, and 4 shown below with a simulated Alternative F3 East Channel bridge). The bridge would partially obstruct views toward Tongass Narrows, Pennock Island, and Gravina Island from the key viewpoints.

Alternative F3 bridge over East Channel as simulated in a view from South Tongass Highway south of the USCG Station, looking north (Key View 1).

Alternative F3 bridge over East Channel as simulated in a view from USCG Station, looking south (Key View 2).

Alternative F3 bridge over East Channel as simulated in a view from Knob Hill, looking south (Key View 4).

The West Channel bridge would rise 200 feet above the water. Both bridges would be visible from mid-Tongass Narrows near the airport (Key View 6, shown below with simulated Alternative F3 East Channel and West Channel bridges). Because the bridges would be distant from this mid-Tongass Narrows location, they present only a minor obstruction to views southward from this viewpoint. Alternative F3 would also include a roadway on Pennock and Gravina Islands that would adversely affect the existing, generally undeveloped visual environment of these islands.

Alternative F3 bridges and Pennock Island as simulated in a view from mid-Tongass Narrows near the airport, looking south (Key View 6).

4.23.3 Ferry Alternatives

4.23.3.1 Alternative G2

The ferry terminals for this Alternative G2 would include new parking areas, and a new roadway would be built from Lewis Point to Seley Road. The proposed new ferry terminal on Gravina Island would adversely affect the visual environment by introducing new built elements into a generally undeveloped area. The ferry terminal would be visible from the Gravina Island shoreline near the airport, as shown in the simulation at Key View 7 (below). A new waiting area would be developed at the existing airport ferry terminal on Revillagigedo Island but would not detract from scenic views because the waterfront at this location is built up with shipping infrastructure. A new heavy freight dock would be built within the existing airport complex and would not affect the visual quality of the area. Ferry operation on the water would not affect the visual environment of Tongass Narrows.

Alternative G2 ferry as simulated in a view from Gravina Island shoreline near the northern end of the airport runway, looking north (Key View 7).

4.23.3.2 Alternative G3

The ferry terminal facilities in Ketchikan would involve redevelopment of an area with existing urban development and would not affect the visual quality of the terminal area (see Key View 5, shown below with simulated Alternative G3 ferry terminal on Revillagigedo Island). The addition of a ferry terminal and roadway on Gravina Island in this alternative would adversely affect the visual environment. A new heavy freight dock would be built within the existing airport complex and would not affect the visual quality of the area. A new waiting area would be developed at the existing airport ferry terminal on Revillagigedo Island but would not detract from scenic views because the waterfront at this location is built up with shipping infrastructure.

Alternative G3 ferry from the north parking area adjacent to Plaza Port West, looking northwest toward Gravina Island (Key View 5).

4.23.3.3 Alternative G4

Alternative G4 would add a new ferry terminal, a new waiting area at the airport ferry terminal, and a new heavy freight dock. It would also involve development of a ferry terminal, an access roadway in the vicinity of the airport, and a new waiting area at the existing airport ferry terminal on Revillagigedo Island. This alternative would not affect the visual environment of the project area because it would not introduce substantial new visual elements into the landscape. It would likewise not provide new viewing opportunities.

4.23.3.4 Alternative G4v

Alternative G4v would include a new waiting area at the airport ferry terminal and a new heavy freight dock. This alternative would not affect the visual environment of the project area, since it would neither introduce substantial new visual elements into the landscape, nor provide new viewing opportunities.

4.24 Energy

The transportation systems in this analysis rely on energy consumption for their function and mobility. This section estimates fuel consumption for cars and ferries resulting directly from implementation of the action alternatives. The availability of energy in the form of fuel (petroleum products) for motor vehicles, cruise ships, and ferry vessels would not change as a result of the Gravina Access Project alternatives.

The fuel consumption resulting from transportation activities would vary by alternative, vehicle type, and origin and destination points. Table 4-16 provides a general estimate by alternative of the amount of fuel that would be consumed annually in transportation between Revillagigedo and Gravina islands during the first years following the project opening (i.e., no growth in traffic). The estimates are based on several assumptions, which are explained in the table notes. Based on the estimates in this analysis, Alternative C3-4 would use the least amount of fuel annually, and Alternative G2 would use the greatest amount. Refer to Section 4.10 for information on emissions and other potential adverse impacts to air quality.

Table 4-16: Estimated Annual Fuel Consumption by Alternative

Alternative	Mode of Transportation	Approximate Distance Traveled per Trip (miles)	Estimated Annual Fuel Consumption (gallons)
No Action/G4v	Ferry	0.5	72,300
Bridge Alternatives			
C3-4	Vehicle	4.0	13,022
F3	Vehicle	10.0	37,949
Ferry Alternatives			
G2	Ferry	0.8	180,750
	Vehicle	7.0	26,044
	Total		206,794
G3	Ferry	0.8	180,750
	Vehicle	4.4	16,370
	Total		197,120
G4	Ferry	0.5	180,750

Notes:

- The number of annual vehicle trips is assumed to be the same for each alternative. In the early years following project opening, the airport would continue to be the primary destination on Gravina Island, although development of other lands on Gravina Island would begin to occur and draw traffic. The number of vehicle trips is based on a 10-year refined average (2000 through 2009) of vehicles that crossed Tongass Narrows on the airport ferry, which is documented in the 2012 *Traffic Forecast Report* prepared for the Gravina Access Project (Alaska Department of Transportation and Public Facilities, August 2012. *Gravina Access Project Supplemental EIS Traffic Forecast*. Prepared by HDR Alaska, Inc.).
- The distance of travel is based on the distance from the existing ferry terminal parking area on Revillagigedo Island to the existing ferry dock/airport terminal on Gravina Island.
- The ferry alternatives do not account for vehicles idling on board the ferry because vehicles are assumed to be turned off during transit. Fuel used by vehicles idling while waiting at the ferry terminal also is not included.
- Vehicle fuel consumption assumes uniform fleet average efficiency of 22.8 mpg (*source: Light-duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 through 2011," USEPA, Document EPA-420-R-12-001a, March 2012*).
- Annual ferry fuel consumption is based on airport ferry fuel receipts for September 2, 2011, through September 4, 2012: approximately 72,300 gallons/year (*source: pers.com. with Robin Kinney, Ketchikan International Airport secretary, October 17, 2012*).

4.25 Construction Impacts

Construction impacts are the temporary impacts on environmental resources in the project area that are caused by the activities associated with the construction of the project. These impacts are examined separately from the permanent impacts of a project from its ongoing existence and operation.

The major potential construction activities considered in the evaluation of construction impacts in this section for all action alternatives are:

- Preparing foundations for bridge piers and abutments at major stream crossings
- Pile driving
- Demolishing structures and disposing of debris
- Mining gravel and other borrow material (for aggregate fill)
- Material waste disposal and construction equipment staging
- Preparing roadway foundations (grading, filling, and compacting)/constructing roadways
- Temporarily rerouting traffic

- Temporary navigational restrictions

In addition, the bridge alternatives, Alternatives C3-4 and F3, would include the following construction activities:

- Drilling through rock and sediment
- Erecting shoring and framework to temporarily support structures during construction
- Installing piers and abutments to bridge Tongass Narrows
- Constructing bridge(s) and bridge approaches over Tongass Narrows
- Dredging in Tongass Narrows (Alternative F3 only)

The ferry terminal and facilities associated with the ferry alternatives, Alternatives G2, G3, G4, and G4v, would include the following construction activities:

- Constructing ferry terminals (Alternatives G2, G3, and G4 only)
- Dredging in Tongass Narrows (Alternatives G2, G3, and G4 only)
- Constructing parking lots, passenger facilities, and docks

The following sections describe the impacts of construction of the Gravina Access Project alternatives on the project area. There would be no construction impacts associated with the No Action Alternative; therefore, that alternative is omitted from this discussion.

4.25.1 Land Use

The existing land use of some parcels could be changed temporarily to stage construction equipment and supplies in all action alternatives. The locations of staging areas for each alternative have not been determined, and consequently specific parcels potentially affected by construction staging are not yet known. Where possible, Gravina Island and vacant land on existing construction yards likely would be used for staging areas to minimize disruption of businesses, residences, and the community. Any land affected during construction would be restored to approximate original condition after the completion of construction.

4.25.1.1 Bridge Alternatives

4.25.1.1.1 Alternative C3-4

Construction equipment movement adjacent to the Walmart parking lot would temporarily affect access to the parking lot. The movement of construction vehicles and equipment would also disrupt some commercial properties along Rex Allen Drive. On Gravina Island, the movement of construction vehicles and equipment would temporarily interrupt access to adjacent open space areas along the alignment that are used or provide access to subsistence activity, recreation, and hunting. These effects would be limited to a small corridor immediately adjacent to the construction activity.

4.25.1.1.2 Alternative F3

No land uses on Revillagigedo Island would be directly affected by construction vehicles and equipment. On Gravina and Pennock islands, the movement of construction vehicles and equipment would temporarily interrupt access to adjacent open space areas along the proposed alignment that are used for or provide access to subsistence activity, recreation, and hunting. These effects would be limited to a small corridor immediately adjacent to the construction activity.

4.25.1.2 Ferry Alternatives

4.25.1.2.1 Alternative G2

Construction would disrupt use commercial properties along the Peninsula Point access road on Revillagigedo Island through the movement of vehicles and equipment adjacent to and across the properties. Movement of construction equipment adjacent to the properties would affect access. On Gravina Island, the movement of construction vehicles and equipment would temporarily interrupt access to adjacent open space areas along the proposed alignment that are used for or provide access to subsistence activity, recreation, and hunting. These effects would be limited to a small corridor immediately adjacent to the construction activity.

4.25.1.2.2 Alternative G3

Under Alternative G3, construction would affect a residential condominium building and commercial shopping property near the proposed terminal on Revillagigedo Island. Use of these properties during construction would be disrupted by the movement of vehicles and equipment adjacent to and across the properties, which would also affect access. On Gravina Island, the movement of construction vehicles and equipment would temporarily interrupt access to adjacent open space areas along the proposed alignment that are used or provide access to subsistence activity, recreation, and hunting. These effects would be limited to a small corridor immediately adjacent to the construction activity.

4.25.1.2.3 Alternatives G4 and G4v

No land uses on Revillagigedo Island would be affected by movement of construction vehicles and equipment. On Gravina Island, the movement of construction vehicles and equipment would temporarily interrupt access to adjacent open space areas along the proposed alignment that are used or provide access to subsistence activity, recreation, and hunting. These effects would be limited to a small corridor immediately adjacent to the construction activity.

4.25.1.3 Mitigation of Construction Impacts to Land Use

4.25.1.3.1 Bridge Alternative C3-4

DOT&PF would work with the businesses and local residents to maintain property access throughout the construction phase using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be acquired and would be selected in a fashion that minimizes disturbance. Properties and land uses would be returned to preconstruction conditions to the maximum extent practicable. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.25.1.3.2 Bridge Alternative F3

DOT&PF would work with the property owners to maintain property access throughout construction using signs, temporary entrances, and traffic controls, as appropriate. Construction staging and movement would be constrained within construction easements. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.25.1.3.3 Ferry Alternative G2

DOT&PF would work with the commercial properties near Peninsula Point to maintain property access throughout construction using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be acquired and selected in a fashion that would minimize disturbance, and properties, and land uses would be returned to preconstruction conditions to the maximum extent practicable. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.25.1.3.4 Ferry Alternative G3

DOT&PF would work with the commercial and residential properties near the Revillagigedo Island terminal to maintain property access throughout construction using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be selected in a fashion that would minimize disturbance. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.25.1.3.5 Ferry Alternatives G4 and G4v

Construction easements would be selected in a fashion that would minimize disturbance. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.25.2 Social Environment

4.25.2.1 Population and Social Groups

None of the action alternatives would have an adverse construction impact on the size or composition of the general population, or on any distinct population group (i.e., minority, low-income, elderly, or handicapped).

4.25.2.2 Neighborhoods and Community Cohesion

Construction would have temporary and intermittent adverse impacts on travel patterns in neighborhoods near the action alternatives. Construction-related noise, vibration, and traffic would disrupt normal activities in these neighborhoods. Depending on the alternative, traffic might have to be diverted during construction, and travel patterns and community access might have to be altered to accommodate construction activities and heavy equipment. Noise and vibration impacts are specifically addressed in Section 4.25.9. Traffic impacts are specifically addressed in Section 4.25.5.3.

4.25.2.3 Community and Public Safety Facilities

Construction of the action alternatives could affect traffic patterns temporarily near schools, medical facilities, fire stations, or the provision of public safety services in the Borough.

Construction of any of the action alternatives would adversely affect traffic on Tongass Avenue near the alternative's intersection with and/or crossing of Tongass Avenue and at the airport, which could result in delays for emergency vehicles, depending on the location of the emergency and the routes available. Traffic impacts are specifically addressed in Section 4.25.5.3.

4.25.2.4 Recreation

Construction of the action alternatives would not affect the use of recreational areas, parks, and facilities in Ketchikan. Construction could affect fishing, hunting, hiking, and bicycling activities that might otherwise occur within or immediately adjacent to construction areas on Revillagigedo, Gravina, and Pennock islands.

Recreational boating in the immediate in-water and shorefront construction zones of the project action alternatives would be prohibited by the construction contractor as a safety precaution for the general public. However, the overall opportunity for such recreation activities would not be affected during construction. Similarly, recreational fishing, hunting, hiking, and bicycling on Revillagigedo, Gravina, and Pennock islands would be prohibited in construction zones, though the overall opportunity for such recreation activities would not be affected during construction.

4.25.2.5 Accessibility

Construction activities could alter access to properties in and near construction zones under all action alternatives.

4.25.2.6 Mitigation of Construction Impacts to the Social Environment

4.25.2.6.1 Community and Public Safety Facilities—All Action Alternatives

Vehicle access to all community and public safety facilities would be maintained throughout construction.

4.25.2.6.2 Accessibility—All Action Alternatives

DOT&PF contractors would be required to work with the businesses and local residents to maintain property access throughout the construction phase, using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be acquired and selected in a fashion that would minimize disturbance, and properties, and land uses would be returned to preconstruction conditions to the maximum extent practicable. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.25.3 Relocation Impacts

Project construction activities would not require any temporary relocation of homes or businesses.

4.25.4 Economy and Economic Resources

4.25.4.1 Construction Effects on the Economy

Table 4-17 shows the estimated total construction spending for each action alternative, and the number of direct jobs related to that spending. The spending and jobs shown in this table include jobs that may be held by local residents, as well as persons who migrate to the community on a temporary basis for employment during construction. In the following discussions and tables, the total number of jobs is by year; e.g., if a job lasts three years, the analysis considers it to be three jobs.

A substantial portion of the materials for construction would be purchased outside of the Borough, and a number of the skills required for construction may not be available within the local Ketchikan labor force. As a result, only a portion of the spending and jobs would directly accrue to local businesses and residents (see Table 4-18). Alternative F3 would have the highest local construction spending, although the ferry alternatives (Alternatives G2, G3, and G4) would retain a higher percentage of overall construction spending in the local economy.

Table 4-17: Estimated Construction Spending and Construction Jobs[a]

Alternatives	Construction Spending (Millions of 2011$)				Construction Jobs	
	Labor	Materials	Equipment	Total	Total	Annual
Bridge Alternatives						
C3-4	92.5	64.8	27.7	**185.0**	**1,560**	520
F3	116.8	81.8	35.0	**233.6**	**1,780**	590
Ferry Alternatives						
G2	33.5	23.4	10.0	**66.9**	**470**	160
G3	28.8	20.2	8.6	**57.6**	**510**	170
G4	25.8	18.0	7.7	**51.5**	**470**	160
G4v	9.0	6.3	2.7	**18.0**	**120**	40

[a] Based on *Gravina Access Project Economic Impact Assessment*, prepared by Northern Economics, Inc., April 2003 with modification to represent revised and new alternatives, updated alternative costs, and 2011 dollars.

Table 4-18: Estimated Local Construction Spending and Construction Jobs in the Ketchikan Gateway Borough[a]

Alternatives	Construction Spending (Millions of 2011$)			Construction Jobs	
	Labor	Materials and Equipment	Total	Total	Annual
Bridge Alternatives					
C3-4	29.1	14.7	43.8	**390**	130
F3	43.0	22.1	65.1	**460**	150
Ferry Alternatives					
G2	32.3	9.1	41.4	**250**	80
G3	26.6	8.1	34.7	**270**	90
G4	25.3	7.1	32.4	**250**	80
G4v	8.8	2.8	11.6	**75**	25

[a] Based on *Gravina Access Project Economic Impact Assessment* prepared by Northern Economics, Inc., April 2003 with modification to represent revised and new alternatives, updated alternative costs, and 2011 dollars.

Construction spending associated with any action alternative would directly benefit the Ketchikan economy. The spending discussed here is money that would be spent within the Borough and does not include any indirect or multiplier effects of the spending in the local area. These indirect effects (including the economic development that could result because of improved access) are discussed in Section 4.26.

4.25.4.2 Acquisition and Relocation Effects on the Economy

Technically, the acquisition of real estate for project right-of-way is a mitigation measure. It is required by federal and state law. The money spent on property acquisition would benefit the Ketchikan economy, although the amount of private land and associated property tax revenues within the Borough and the City of Ketchikan would decrease as the rights-of-way are converted to public lands. However property values on Gravina Island (and on Pennock island, if Alternative F3 were selected) likely would increase with improved access and infrastructure, causing property taxes assessed on those lands to increase (see Section 4.26.3.5). This assessment of the acquisition and relocation effects is based on acquisition of rights-of-way for

the proposed routes in the action alternatives. A summary of the cost of land and buildings that would need to be acquired is shown in Table 4-19.

The estimated acquisition costs in Table 4-19 include the cost of land and buildings that would need to be acquired for right-of-way under each alternative.[283] Most public lands (state and Borough) are assumed to be available at no cost to the project; this assumption applies to all airport land needed for the project, including the airport seaplane facility.[284] Mental Health Trust Authority lands would have to be purchased. All property owners would be compensated in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.[285]

Table 4-19: Estimated Acquisition Costs

Alternative	Amount of Land Acquired (acres)	Tax Assessor's Database/Unmodified Acquisition Value ($2010)	Market Value ($2010)[a]
Bridge Alternatives			
C3-4	99.9	4,241,000	4,666,100
F3	79.9	84,526	92,979
Ferry Alternatives			
G2	42.8	1,143,400	0
G3	40.1	871,772	958,949
G4	38	0	0
G4v	38	0	0

[a] Market Value equals 1.1X the Unmodified Acquisition Value.

4.25.4.3 Employment

Construction of any of the Gravina Access Project action alternatives would have a positive economic impact on employment. Construction of the project would require a total of roughly 40 to 590 additional workers annually (i.e., over a 3-year construction period) and 25 to 150 from the Ketchikan labor force, depending on the action alternative selected (see Table 4-17 and Table 4-18). Many of the construction jobs would require skilled specialists to be brought in from outside of the Ketchikan area. For Alternatives G2, G3, and G4, the analysis assumes new ferries would be constructed at Alaska Ship and Drydock, Inc., in Ketchikan, which would result in a higher percentage of local jobs (e.g., approximately 25 percent of the construction jobs for Alternative F3 would be local, whereas approximately 53 percent of the construction jobs for Alternative G4 would be local).

Construction activity would increase the need for support industries (e.g., retail, trade, hospitality), which would create some additional local jobs in the retail and service sectors. This

[283] To determine private land values, the fraction of each parcel of land to be acquired for the right-of-way is multiplied by the assessed value of the unimproved land. Once the land value is determined, maps of the rights-of-way are consulted to determine if structures would be affected by the rights-of-way. The values of any affected structure are then added to the land value. For property with structures within a right-of-way, it is always assumed either none or all of the structure would be acquired. In cases where the right-of-way acquisition would take a large portion of the parcel, an attempt is made to determine whether the remaining section(s) has usefulness to the original owner. If the remaining portion is determined not to be useful to the owner, then it is assumed that DOT&PF would acquire the entire property.

[284] The value of the public lands is included in benefit-cost analyses in consideration of the opportunity cost for using the lands for transportation instead of some other use.

[285] The Uniform Relocation Assistance and Real Property Acquisition Policies Act ensures the fair and equitable treatment of persons whose real property would be acquired or who would be displaced as a result of a federal or federally assisted project. Government-wide regulations provide procedural and other requirements (appraisals, payment of fair market value, notice to owners, etc.) in the acquisition of real property and provide for relocation payments and advisory assistance in the relocation of persons and businesses.

would result in additional positive economic effects for the area. The actual number of support jobs created as a result of construction would depend on which action alternative was selected, what supplies would be needed for its construction, the number of construction workers, and the personal preferences of the workers (i.e., where they decide to spend their money). These indirect impacts are discussed in Section 4.26.3.1.

4.25.5 Transportation

4.25.5.1 Aviation

4.25.5.1.1 Bridge Alternative C3-4

Fixed-wing aircraft operating from Ketchikan International Airport runways would not be affected during construction of Alternative C3-4, though construction would affect seaplane operations. During construction of the bridge, large cranes and other heavy equipment in the channel would present a physical obstruction to seaplanes operating in the Tongass Narrows airspace and on the water.

As noted in Section 4.7.1.2, construction of the bridge approach to Gravina Island would impair access to the airport seaplane base and may require that the base facilities be temporarily relocated. The need to temporarily relocate the airport seaplane facilities would be determined during final design of Alternative C3-4, if it were selected. A possible temporary location would be the small cove at the end of the airport service road. Any relocation effort would be coordinated with seaplane operators and would be planned to minimize disruption of operations. The relocation activities would occur concurrently with bridge construction and would likely be contained within the same disturbance area, creating no or very few additional environmental effects.

4.25.5.1.2 Bridge Alternative F3

Fixed-wing aircraft operating from Ketchikan International Airport would not be affected during construction of Alternative F3. During construction of the bridge, large cranes and other heavy equipment in the channel could interfere with aircraft operations because of the physical obstruction they would present to aircraft operating in the Tongass Narrows airspace and to seaplanes on the water. Because the bridges associated with this alternative would be south of most seaplane facilities, including existing seaplane waterways, construction would affect few seaplane operations.

4.25.5.1.3 Ferry Alternatives G2, G3, G4, and G4v

The operations of fixed-wing aircraft, including seaplanes in the project area, would not be affected by construction of any the ferry alternatives.

Temsco Helicopters, Inc., and Alpine Helicopters, Inc., operate from Peninsula Point, the site of the Alternative G2 ferry terminal on Revillagigedo Island. Construction of the ferry terminal on Peninsula Point could temporarily disrupt helicopter operations at these facilities, primarily due to constrained access to the site and not a restriction on airspace affecting actual helicopter operations.

4.25.5.1.4 Mitigation of Construction Impacts to Aviation

Bridge Alternative C3-4

DOT&PF would work with helicopter and seaplane operators to minimize disruption of service to the maximum extent practicable during the construction period. Airport access would be maintained to the terminal during construction. The ramps and floats at the airport seaplane base would need to be relocated during construction, and may need to be permanently

relocated. Throughout construction, DOT&PF would provide continued access to seaplane service for seaplane customers at the airport. The need to temporarily or permanently relocate the airport seaplane facilities would be determined during final design of Alternative C3-4, if it were selected. A possible future location would be the small cove at the end of the airport perimeter road.

Bridge Alternative F3 and Ferry Alternatives G2, G3, G4, and G4v

DOT&PF would work with helicopter and seaplane operators to minimize disruption of service to the maximum extent practicable during the construction period.

4.25.5.2 Marine Navigation

4.25.5.2.1 Bridge Alternative C3-4

The mooring buoys and construction equipment would be present in Tongass Narrows around and under bridge piers and spans as the bridge was constructed. During bridge construction in Tongass Narrows, cruise ships and other vessels traveling through the construction area likely would be required to decrease their speed near the construction area, adjust their routes, and possibly adjust their schedules to avoid construction equipment. During bridge construction, ship passage under the bridge would be prohibited during the 24-hour period in which bridge segments were being lifted from barges on the water into position on the bridge.

4.25.5.2.2 Bridge Alternative F3

The Tongass Narrows main channel would remain open to marine traffic throughout construction of Alternative F3. Construction of the bridges over the East and West channels would limit ship passage at various phases of the construction. Vessels traveling through West Channel during construction of that bridge would likely be required to decrease their speed near the construction area, and adjust their routes and possibly schedules to avoid mooring buoys and construction equipment. During West Channel bridge construction, ship passage under the bridge would be prohibited for the 24 hours in which bridge segments were being lifted from barges on the water into position on the bridge. Once construction of the bridge piers adjacent to the main shipping channel in East Channel began, ships requiring a vertical clearance greater than 60 feet would permanently be routed around the west side of Pennock Island. Vessels requiring 60 feet of vertical clearance or less would either move temporarily to West Channel or likely be required to decrease their speed near, and adjust their routes and possibly schedules to avoid construction equipment in East Channel.

Modification of the West Channel subsurface would require the placement of a working barge in the channel for drilling, blasting, and dredging activities. The channel modification work would be scheduled to occur prior to bridge construction in the East and West channels, and marine traffic would be routed through East Channel while the channel modification work was underway. Disposal of the dredged material would require the use of tugs and tows to transport dredged materials into and out of Tongass Narrows to an ocean disposal site, which would create additional marine traffic in the area.

4.25.5.2.3 Ferry Alternatives G2, G3, G4 and G4v

Construction of Alternatives G2, G3, G4, and G4v would have little or no effect on marine navigation. Small boats and watercraft using nearshore areas would be diverted around construction areas. Construction areas would be relatively small, and the diversion would not materially add to the travel time of small boats.

4.25.5.2.4 Mitigation of Construction Impacts to Marine Navigation

Bridge Alternative C3-4

Impacts to ships transiting Tongass Narrows would be minimized by scheduling bridge construction activity, to the extent practicable, during times of the year when the marine traffic in Tongass Narrows is low (i.e., outside of the tourist and cruise ship season). DOT&PF would work with cruise ship and other marine vessel operators to facilitate marine navigation during construction. When bridge segment placement requires limiting vessel traffic, DOT&PF would issue notification of such closures to reduce conflicts with marine navigation activities.

Bridge Alternative F3

For this alternative, impacts to navigation could be minimized by constructing each bridge in a separate phase so that one of the two channels would always be unaffected by construction activities, including channel dredging in Alternative F3. DOT&PF would work with cruise ship and marine vessel operators to facilitate marine navigation during construction. During bridge segment placement DOT&PF would issue notification to residents and vessel operators of such closures to reduce conflicts with marine navigation.

4.25.5.3 Vehicle Traffic

4.25.5.3.1 Bridge Alternative C3-4

Construction activities (i.e., vehicle and equipment movement) could temporarily disrupt traffic patterns and cause delays where this alternative would connect to Rex Allen Drive, and at the intersection of Signal Road and Rex Allen Drive. Construction of the bridge over Tongass Avenue could also cause short-term road closures and traffic delays in that corridor.

Construction in the vicinity of the airport could require temporary changes to the airport circulation road and permanent elimination of the adjacent parking to accommodate construction vehicles and the new ramp location.

4.25.5.3.2 Bridge Alternative F3

Construction could delay traffic on South Tongass Highway where the alternative would intersect the highway south of the USCG Station. South Tongass Highway would have to be slightly elevated to accommodate construction of Alternative F3. This elevation could require that the project reduce the South Tongass Highway to one lane and close the highway for short periods of time during construction.

Construction of the airport access road near the airport terminal could require temporary changes to the airport circulation road and temporary elimination of adjacent parking to accommodate construction vehicles.

4.25.5.3.3 Ferry Alternatives G2, G3, G4, and G4v

Movement of construction vehicles and equipment in and out of the ferry terminal construction sites on Revillagigedo Island could affect traffic movement along Tongass Avenue and cause delays.

Construction of the terminal for Alternative G3 would affect access, circulation, and parking in the vicinity of the Jefferson Street right-of-way north of the Plaza Mall.

Construction in the vicinity of the airport could require temporary changes to the airport circulation road and temporary elimination of adjacent parking to accommodate construction vehicles.

4.25.5.3.4 Mitigation of Construction Impacts to Vehicle Traffic—All Action Alternatives

Under any action alternative, the construction contractor would develop a traffic maintenance and parking plan to minimize impacts to vehicle travel on Ketchikan roadways and at the airport. Construction that might cause lane closures would be timed for low-traffic periods. Temporary roads and driveways would be employed where necessary to ensure continued mobility during construction. Construction of temporary roadways might be required to maintain access to the airport facilities. For Alternative F3, construction to elevate a portion of South Tongass Highway, which would include road closure and restricting traffic to one lane, would be done during off-peak hours to the extent possible to minimize the impacts on vehicle traffic. Access to the USCG Station and other affected property would be accommodated during construction through temporary driveways.

4.25.6 Pedestrians and Bicyclists

4.25.6.1 Bridge Alternative C3-4

Construction activities near the airport and Tongass Avenue could temporarily disrupt pedestrian and bicycle travel patterns. Overhead construction on Tongass Avenue, during which temporary closures of the roads, sidewalks, or bike paths would be necessary, would impede pedestrian and bicycle access. Construction at the airport would require rerouting pedestrian pathways between the ferry terminal, airport terminal, and seaplane dock.

4.25.6.2 Bridge Alternative F3 and Ferry Alternatives G2, G3, G4, and G4v

Alternatives F3, G2, G3, G4, and G4v would temporarily disrupt pedestrian and bicycle travel patterns. Construction activities associated with Alternatives F3, G2, G3, G4, and G4v would require rerouting of pedestrians and bicyclists where the alternatives intersect Tongass Avenue. Construction at the airport would require rerouting pedestrian and bicycle pathways between the ferry terminal, airport terminal, and seaplane dock.

4.25.6.3 Mitigation of Construction Impacts to Pedestrians and Bicyclists—All Action Alternatives

The traffic maintenance and parking plan would include provisions for maintaining pedestrian and bicycle traffic and safety through construction areas. The project would avoid obstructing or affecting roads, sidewalks, and bike paths whenever possible to maintain access. If obstructing access was unavoidable, the project would establish temporary detour routes.

4.25.7 Geological Resources

Construction-related soil disturbance could include compaction and/or erosion in temporary staging areas and permanent and construction right-of-way areas as a result of movement of construction equipment. The total area of temporary soil disturbance would be between 5 and 18 acres, depending on the alternative (see Table 4-20). The estimates for upland soil disturbance are conservative estimates and may include areas that have been previously disturbed (i.e., areas where previous disturbance has adversely affected the upland soil and where construction activity associated with this project would have little or no additional effect to soils).

Table 4-20: Areas of Potential Temporary Soil Disturbance (acres)

	Bridge Alternatives		Ferry Alternatives			
Disturbance Type	**C3-4**	**F3**	**G2**	**G3**	**G4**	**G4v**
Upland soil disturbance	3	2	1	1	1	1
Wetland soil disturbance	5	16	13	9	4	4
Total soil disturbance	**8**	**18**	**14**	**10**	**5**	**5**

4.25.7.1 Mitigation of Construction Impacts to Geological Resources—All Action Alternatives

Impacts to wetland soils would be minimized by placing geotextile mats or equivalent on top of wetland soils in areas that would be temporarily disturbed by construction equipment (see Section 4.25.11).

The construction contractor would be responsible for developing an erosion and sediment control plan associated with upland and wetland areas to meet ADEC and EPA requirements of the Clean Water Act. A registered engineer would prepare the erosion and sediment control plan, and the construction contractor would implement it to minimize soil disturbance during construction. The erosion and sediment control plan would provide guidance to construction contractors to reduce construction impacts, particularly those that would result in the destabilization of adjacent slopes. Disturbed areas within the construction easement would be restored to preconstruction conditions to the extent possible.

4.25.8 Air Quality

Construction of any action alternative would not noticeably affect regional air quality. Emissions of carbon monoxide and nitrogen oxides from the operation of construction equipment and vehicles would temporarily increase overall concentrations of these pollutants at construction sites but would not affect the attainment status of the area with respect to the NAAQS. The amount of airborne particulate matter (dust) up to 10 microns in size (PM_{10}) could be temporarily increased in the immediate vicinity of the construction sites by construction activities such as grading, placement of fill, hauling of materials, and cutting through rock. Because of the frequency of rain in the Ketchikan area, weather conditions likely would limit the amount of dust raised by construction to negligible amounts.

GHG emissions would result from manufacture of paving materials, exhaust from construction equipment and vehicles, and temporary traffic delays that reduce travel speeds. Traffic delays would occur intermittently on some roads during construction and potentially along detour or construction haul routes. Traffic delays would increase idling times and reduce travel speeds, which would result in decreased fuel efficiency and increased vehicle emissions during the construction period. These construction sources would result in a temporary increase in GHG emissions for the area.

4.25.8.1 Mitigation of Construction Impacts to Air Quality—All Action Alternatives

The project would implement measures to control dust (PM_{10}) at construction sites. Measures, as needed, would include use of a water truck within construction areas, covering of soil and material stockpiles, and adhering to a designated construction speed limit to reduce generation of dust. The construction contractor would implement measures to minimize emissions from construction equipment and minimize construction-related traffic delays to reduce GHG emissions.

- To reduce impacts associated with construction delays and changes in traffic flow, the construction contractor would be required to create and execute a Transportation Management Plan (TMP), which would minimize construction-related congestion and would maintain traffic flow throughout the construction site.
- To reduce impacts associated with construction equipment, unnecessary idling of construction vehicles, trucks, and heavy equipment would be prohibited.
- The construction contractor would be required to routinely maintain and service all construction vehicles, trucks, and equipment to ensure they are in proper working condition, and therefore running as efficiently as possible.
- To reduce energy use to retrieve construction materials, construction equipment and material would be located as close to project construction sites as possible to reduce hauling distances and energy consumption.

4.25.9 Noise and Vibration

The majority of the potential construction area is primarily open space on Gravina and Pennock islands. On Revillagigedo Island, the construction area 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.

4.25.9.1 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 4-21).

Table 4-21: 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	Pneumatic wrenches	83-88
	Rock drills	81-98
	Blasting[1]	94-100
	Pile Driver[1]	95-101
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, 2006. Roadway Construction Noise Model User's Guide.

4.25.9.1.1 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 North 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.

4.25.9.1.2 Ferry Alternatives G2, G3, G4 and 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.

4.25.9.1.3 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.

4.25.9.2 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.

4.25.9.2.1 Bridge 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.

4.25.9.2.2 Bridge 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 are described in Sections 4.25.12.3 and 4.25.15.

4.25.9.2.3 Ferry 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 are described in Sections 4.25.12.3 and 4.25.15.

4.25.9.2.4 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.

4.25.10 Water Quality

All action alternatives would affect water quality through in-water and on-land construction activities that remove vegetation and expose soils; disturb creek and marine sediments; divert short segments of creeks; and release fuels, chemicals, construction debris, and other pollutants to the ground surface and water bodies. Runoff from construction sites could transport sediment and pollutants to Tongass Narrows, its tributaries, and lands adjacent to work sites. The potential for water quality impacts would be proportional to the time spent constructing close to and within water bodies and wetlands and the amount of surface runoff that occurs during construction. Disturbance of creek and marine sediments during in-water work, such as blasting or dredging, would suspend these sediments within water bodies. Similarly, disposal of dredged materials associated with channel widening (Alternative F3) would cause temporary suspension of sediments at the disposal location. These construction impacts would be avoided and minimized with the use of BMPs discussed below.

4.25.10.1 Mitigation for the Construction Impacts to Water Quality from All Action Alternatives

Construction of all water body and wetland crossings would adhere to applicable state and federal permit conditions. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC and EPA requirements of the Clean Water Act and minimize impacts to water quality. BMPs would be used to control runoff from the construction area to minimize erosion and transport of sediment, to prevent any accidental leaks of oil or fuel from equipment from contaminating creeks or Tongass Narrows, and to contain any such leaks**.**

Construction-related BMPs would include:

- Staking the planned outside limits of disturbance prior to construction to ensure that impacts are limited to that area
- Limiting clearing and grubbing outside of the fill footprint to the extent practicable to control physical disturbance of wetlands and habitats
- Installing sediment barriers adjacent to waterways just beyond the estimated toe of fill to capture fine-grained material contained in runoff
- Installing ditch checks to reduce bank erosion
- Employing sedimentation basins, as necessary (based on the potential volume of stormwater runoff), to limit sedimentation of adjacent wetlands and other waters and habitats

- Locating all staging, fueling, and equipment-servicing operations at least 100 feet away from all streams and wetlands
- Having spill response equipment readily available and ensuring that construction personnel are trained in spill response to contain accidental leaks of oil or fuel from construction equipment

Sections 4.12, 4.14.1, 4.15.1 through 4.15.4, 4.25.11, and 4.25.12 contain additional BMP-related discussion. DOT&PF would hold meetings at the beginning of construction with the construction contractor and agencies to ensure implementation of BMPs and other mitigation commitments.

4.25.11 Wetlands

Each action alternative's construction-related impacts on fresh water wetlands could include temporary fill, vegetation removal, and degraded water quality. Such impacts would occur at staging areas (i.e., areas used for temporary storage and maneuvering of construction equipment) and in the area approximately 20 feet beyond the cut and fill prism of the new facilities (i.e., areas where construction equipment would need to operate outside of the permanent area of impact). For Alternatives C3-4 and F3, temporary impacts likely would occur within a circular area with a radius of approximately 150 feet around bridge piers or abutments that occur on land. There would be no temporary impacts on marine wetlands. Table 4-22 identifies the estimated volume and acreage of fresh water wetlands expected to be temporarily affected by construction of each of the action alternatives.

Table 4-22: Estimated Temporary Construction Impacts on Fresh Water Wetlands

	Bridge Alternatives		Ferry Alternatives			
Disturbance Type	**C3-4**	**F3**	**G2**	**G3**	**G4**	**G4v**
Volume of temporary fill (cubic yards)	27,000	57,000	9,000	9,000	12,000	12,000
Temporary fill (acres)	5	16	13	9	4	4

At present, the locations and extent of construction staging areas have not been determined, though each action alternative likely would require one staging area on Revillagigedo Island and one to two staging areas on Gravina Island. Each of these staging areas would cover an area of 3 to 5 acres. In addition, Alternative F3 would require two 1.5-acre staging areas on Pennock Island. The staging areas on Revillagigedo Islands would likely be located on uplands and would have no effect on wetlands. The staging areas on Pennock Island for Alternative F3 likely would be located in wetlands. Staging areas on Gravina Island would be located in both uplands and wetlands. A staging area near Airport Creek for the bridge replacement associated with all alternatives would be within wetlands. The other staging area on Gravina Island would differ slightly in each alternative but would take advantage of the upland areas near the airport for Alternatives C3-4, G2, G3, G4, and G4v. Alternative F3 would use the Gravina Island Highway to the extent practicable but the staging area on Gravina Island near the bridge approaches likely would require placement within a wetland.

Alternatives C3-4 and F3 would also require the construction of temporary access roads in wetlands. Temporary access roads would be required to move construction equipment from the shoreline to the interior of the islands where new road or bridge construction would take place. The footprint of temporary access roads would be approximately 55 feet wide and would vary in length for each action alternative. Temporary access roads would require temporary fill in wetlands. Temporary fill might be in place for up to 3 years and without mitigation measures

would have long-term effects on wetlands as a result of erosion and/or compaction, depending on the activities undertaken in the staging areas.

Most of the temporary impacts to wetlands in the action alternatives would involve vegetation removal only. These impacts would occur in the area approximately 20 feet beyond the cut and fill prism of new roadway and other facilities. Such disturbance would occur in increments along the roadway as it was being constructed (i.e., over an anticipated 3-year construction period). Removal of wetland vegetation would expose soils to erosive forces and/or compaction, which could limit their ability to recover from the disturbance without mitigation measures in place.

The contractor would be required to dispose of waste in an approved location and would be responsible for securing all permits and approvals. The contractor will set the location for disposal of waste material to meet the following conditions of approval by DOT&PF: the site must be an upland location resulting in no fill placement in wetlands, and measures to reduce impacts to water quality and adjacent wetlands from potential runoff associated with waste material disposal sites must be addressed in the SWPPP. Waste disposal would occur in uplands with the exception of the staging areas in wetlands on Pennock Island for Alternative F3.

Specific impacts to wetlands relative to each action alternative are described in the following sections.

4.25.11.1.1 Bridge Alternative C3-4

Construction of Alternative C3-4 would require the temporary disturbance of wetland vegetation 20 feet beyond the fill prism for the new and improved roadways on Gravina Island (see Table 4-22). Additionally, Alternative C3-4 would require the placement of temporary fill into wetlands that exist around the proposed on-land bridge piers (see Table 4-22). Alternative C3-4 would require temporary construction roads in wetlands on portions of Revillagigedo and Gravina islands.

4.25.11.1.2 Bridge Alternative F3

Construction of Alternative F3 would require the temporary disturbance of wetland vegetation 20 feet beyond the cut and fill prism on Revillagigedo, Pennock, and Gravina islands (see Table 4-22). In addition, Alternative F3 would require the placement of temporary fill into wetlands that exist around the proposed on-land bridge piers and in staging areas on Pennock Island (see Table 4-22). The total size of staging areas on Pennock Island would be approximately 3 acres (all of which would be located in wetlands). Alternative F3 would require temporary construction roads in wetlands on portions of Pennock and Gravina islands.

4.25.11.1.3 Ferry Alternatives G2, G3, G4, and G4v

Construction of Alternatives G2, G3, G4, and G4v would require the temporary disturbance of wetland vegetation 20 feet beyond the fill prism for new roadway on Gravina Island (see Table 4-22). None of the ferry alternatives would require the placement of temporary fill into wetlands.

4.25.11.1.4 Mitigation of Construction Impacts to Wetlands—All Action Alternatives

Use of wetlands for construction activities would be minimized to the extent practicable. DOT&PF requirements to operate construction equipment on geotextile mats would allow complete removal of the mat without further soil disturbance upon completion of construction, which would protect wetland soils in the construction easement (including staging areas for Alternative F3, construction access roads, and temporary access areas). After construction activities, shrubs and herbs likely would recover naturally, but the disturbed areas would be reseeded after construction to minimize erosion. Seeding of the disturbed areas would conform to Section 618 of the DOT&PF Standard Specifications for Seeding. Materials used for seeding

would conform to DOT&PF Standard Specification Section 724 (Seed), Section 725 (Fertilizer), and Subsection 712-2.01 (Water).[286]

DOT&PF also would require the construction contractor to place temporary fill on geotextile mats or other suitable materials of sufficient thickness to facilitate the removal of the fill and the materials to the maximum extent practicable when they are no longer needed for construction. No natural earthen material would be removed from under the geotextile mat (or equivalent materials) when the temporary fill was removed. Wetlands would be stabilized against erosion once construction equipment and protective mats were removed. DOT&PF would restore wetlands that had been temporarily filled by reseeding and revegetating the disturbed areas.

Detailed mitigation measures would be developed and followed as conditions of the required federal permits.

4.25.12 Water Body Modification and Wildlife

4.25.12.1 Water Body Modification

Construction activities associated with any of the action alternatives within and along Tongass Narrows would not modify the channel or its shoreline to such an extent that water flow or overall channel hydrology would be affected. For all action alternatives, roadway development or improvements would require crossings of streams on Gravina Island. Temporary diversions of these water bodies may be required during culvert and possibly bridge placement, which would temporarily alter the configurations of creek banks and beds. Diversion structures might include cofferdams, dams and pumps, pipes, and flumes. Temporary work in streams would be addressed in the USACE Section 404 permit and subject to permit stipulations.

4.25.12.1.1 Mitigation of Construction Impacts to Water Bodies—All Action Alternatives

Construction activity in any water body would adhere to applicable state and federal permit conditions. Temporary diversions would be designed so that the flow of the water body was not impeded. Any creek banks or beds affected by diversion structure placement would be restored to preconstruction conditions to the maximum extent practicable.

4.25.12.2 Marine Habitat

Without implementation of minimization and mitigation measures, bridge pier placement (Alternatives C3-4 and F3), channel modification (Alternative F3), dredging (Alternatives G2, G3, and G4), or ferry dock construction (Alternatives G2, G3, and G4) in Tongass Narrows could degrade marine habitat outside the project footprint by causing increased erosion, suspension of sediments, and turbidity.

Construction disturbance (blasting and dredging) in West Channel associated with the channel widening for Alternative F3 would reduce the primary and secondary productivity of West Channel during construction for 1 to 2 years following channel dredging. Plants and algae produced in the West Channel are food for fish that, in turn, are prey for larger organisms on either end of the channel, and Alternative F3 channel modification would temporarily reduce the food source for those prey species. This effect would be short-term and likely would be immeasurable, since few organisms would depend solely on prey produced in the affected area.

Eelgrass beds (which occur in subtidal areas) likely would not be affected by erosion and turbidity because the currents would flush out finer-grained sediments. Turbidity and

[286] Alaska Department of Transportation and Public Facilities. 2004. *Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction*. <http://www.dot.state.ak.us/stwddes/dcsspecs/assets/pdf/hwyspecs> Accessed December 29, 2011.

sedimentation from erosion are part of the natural cycle in marine systems, and most marine plants and animals would adapt to short-term changes in these parameters. If, however, sediment loads under Alternatives F3 or G3 were unusually high, lasted for extended periods of time, or occurred at unusual times of the year, adverse impacts to marine habitats could occur. The maximum potential area that would be directly affected by construction required for each of these alternatives is provided in Section 4.15.4.4 (Table 4-17).

4.25.12.2.1 Mitigation of Construction Impacts to Marine Habitat—All Action Alternatives

The construction contractor would be required to adhere to all applicable state and federal permit conditions throughout the construction phase of any action alternative. To minimize these potential adverse impacts, the DOT&PF would ensure that construction BMPs, an erosion and sedimentation control plan, and a spill prevention plan were all implemented during project construction. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC and EPA requirements of the Clean Water Act.

4.25.12.3 Wildlife—Marine Mammals, Anadromous Fish, Marine Fish, and Essential Fish Habitat

Construction during any of the action alternatives would affect aquatic animals as a result of increased erosion and sediment suspension, noise, vibration, and direct displacement during construction activities unless mitigation and minimization measures were followed during construction. The discussion below applies to marine mammals, fish, and essential fish habitat. Section 4.25.15 presents further information on potential construction impacts specific to marine mammals protected under the Endangered Species Act and proposed mitigation measures.

4.25.12.3.1 Bridge Alternative C3-4

Erosion and the movement of sediment and rock to install in-water piers would cause turbidity in Tongass Narrows. The distance the turbidity plume moved from the point of origin would be dependent on tides, currents, nature of the substrate, and other factors. The strong tidal current would quickly carry turbidity plumes away, dissipating them quickly with minimal effect on biota. Although sediment samples have not been collected, underwater video and side scan sonar surveys in the areas of proposed drilling indicate that sediments to be disturbed would range from silts and silty sand to coarse gravel and sand.

The proposed road improvements associated with this alternative could also result in potential erosion and sedimentation during construction that may cause turbidity in streams on Revillagigedo and Gravina islands. Placement of culverts in fish-bearing streams could temporarily impact anadromous fish by directly eliminating eggs incubating in the streambed, or by creating highly turbid water. Without mitigation or appropriate construction techniques, deposition of material downstream on incubating eggs could destroy them, and turbid water could interfere particularly with juvenile salmon. Therefore, any kind of in-stream work would be undertaken during work windows (June 15 to August 7) to avoid critical times in the salmon life cycle.

Bridge construction would transmit in-water noise and vibration generated by pile driving, drilling, and movement of construction barges. While blasting is not anticipated for this alternative, minor blasting to properly seat the pier casings might be necessary. Bridge foundation construction would require four to six shafts to be drilled to support each pier. Each shaft would take approximately 1 week to complete. Drilling activities for bridge foundations could last 9 to 12 months. Construction noise generated above the water could also be transmitted into the water through steel or concrete structures. All of these noise sources would temporarily elevate noise levels above the existing background noise levels. To minimize the effects to fish and aquatic species, the construction contractor would use a reverse rotary drill or

vibratory hammer instead of an impact hammer. A vibratory hammer would be used to advance the steel pile or casing through the existing sediment until it reached bedrock; drilling then would be employed to penetrate the rock and/or install the piling or rock anchors in the rock formation. Construction noise and vibration from drilling likely would not have long-term or permanent effects on marine and anadromous fish or marine mammals. Effects would be short-term and localized.

In-water work would cause the temporary displacement of marine wildlife from the area around the construction activities. Because of the abundance of similar habitat in Tongass Narrows, it is unlikely that the temporary impacts of construction on fish habitat would have a lasting effect on these species. Construction activities in Tongass Narrows would last for approximately 2 to 3 years. During this time, construction barges would be present in Tongass Narrows.

4.25.12.3.2 Bridge Alternative F3

Dredging and blasting associated with Alternative F3 would cause turbidity by the movement of sediments and rock in the East and West channels. These activities would suspend fine silts in the water column, and tides, currents, the nature of the substrate, and other factors would determine the distance the turbidity plume moved from the point of origin. The strong tidal current would carry turbidity plumes quickly away, dissipating plumes quickly with minimal effect on biota. Although sediment samples have not been collected, underwater video and side scan sonar surveys in the areas of proposed dredging and/or blasting indicate that sediments to be dredged would range from silts and silty sand to coarse gravel and sand.

The proposed road improvements associated with this alternative could also result in erosion and sedimentation during construction that may cause turbidity in streams on Revillagigedo and Gravina islands. Culvert placement in fish-bearing streams could impact anadromous fish temporarily by directly eliminating eggs incubating in the streambed, or by creating highly turbid water. Without mitigation or appropriate construction techniques, deposition of material downstream on incubating eggs could destroy them, and turbid water could interfere particularly with juvenile salmon. Therefore, any kind of in-stream work would be undertaken during work windows (June 15 to August 7) to avoid critical times in the salmon life cycle.

Bridge construction would transmit in-water noise and vibration generated by dredging, fill placement, pile driving, drilling, blasting, and movement of construction barges. Construction of bridge foundations would require four to six shafts to be drilled to support each pier. Each shaft would take approximately 1 week to complete. Drilling activities for bridge foundations could last 9 to 12 months. Construction noise and vibration from blasting for Alternative F3 could last 1 to 3 months. Construction noise generated above the water could also be transmitted into the water through steel or concrete structures. All of these noise sources would temporarily elevate noise levels above the existing background noise levels. To minimize the affects to fish and aquatic species, the construction contractor would use a reverse rotary drill or vibratory hammer instead of an impact hammer. Geophysical surveys suggest that soil sediment in Tongass Narrows might be 20 feet thick in some locations. A vibratory hammer would be used to advance the steel pile or casing through the existing sediment until it reached bedrock; drilling then would be employed to penetrate the rock and/or install the piling or rock anchors in the rock formation. Pile driving for ferry alternatives would occur during low tide to further minimize noise impacts to aquatic species. Construction noise from drilling likely would not have long-term or permanent effects on marine and anadromous fish or marine mammals. Effects would be short-term and localized.

Blasting, dredging, and pile driving would occur during fall and winter months based on allowed in-water work windows. Humpback whales have generally migrated south to wintering grounds by the fall and likely would not be present during blasting activities. Steller sea lions, which are

present year round in the project area, are unlikely to be affected by underwater noise associated with project construction activities because they have higher thresholds for noise disturbance and are able to raise their heads out of the water to avoid noise transmission. Nonetheless, blasting, dredging, and pile driving would be scheduled for fall and winter, between late summer salmon runs and spring herring runs that attract sea lions.

In-water work would cause the temporary displacement of marine wildlife from the area around the construction activities. Drilling would last 9 to 12 months, and blasting in the West Channel would last 1 to 3 months. Channel modification work would occur up to 7 days a week with almost daily disturbance from dredging and intermittent disturbance from blasting. Construction activities in eelgrass beds could eliminate important feeding and refuge areas for several species of fish and shellfish, thereby displacing these species. Because of the abundance of similar habitat in Tongass Narrows, it is unlikely that the temporary impacts of construction on fish habitat would have a lasting effect on these species.

Construction activities in Tongass Narrows would last for 2 to 3 years. During this time, construction barges would be present in Tongass Narrows. It is expected that construction disturbance (blasting and dredging) would reduce the productivity of the West Channel for 1 to 2 years following construction. Plants and algae produced in the West Channel are food for fish that, in turn, are prey for larger organisms on either end of the channel, and Alternative F3 channel modification would temporarily reduce the food source for those prey species,. This effect would be short-term and likely would be immeasurable, since few organisms would depend solely on prey produced in the impacted area. Dredging would be completed using a clamshell dredge. It is generally accepted that clamshell dredges do not have the potential to capture (entrap) fish, including salmon.

4.25.12.3.3 Ferry Alternatives G2, G3, and G4

Dredging would cause turbidity by the movement of sediments and rock in Tongass Narrows. Dredging activities would suspend fine silts in the water column, and tides, currents, the nature of the substrate, and other factors would determine the distance the turbidity plume moved from the point of origin. The strong tidal current would quickly carry turbidity plumes away, dissipating them quickly with minimal effect on biota. Although sediment samples have not been collected, underwater video and side scan sonar surveys in the areas of proposed dredging and blasting indicate that sediments to be dredged would range from silts and silty sand to coarse gravel and sand.

The proposed road improvements associated with this alternative would also result in potential erosion and sedimentation during construction that may cause turbidity in streams on Revillagigedo and Gravina islands. Culvert placement in fish-bearing streams could temporarily impact anadromous fish by directly eliminating eggs incubating in the streambed, or by creating highly turbid water. Without mitigation or appropriate construction techniques, deposition of material downstream on incubating eggs could destroy them, and turbid water could interfere particularly with juvenile salmon. Therefore, any kind of in-stream work would be undertaken during work windows (June 15 to August 7) to avoid critical times in the salmon life cycle.

Construction of the ferry terminals would transmit in-water noise and vibration generated by dredging, fill placement, pile driving, drilling, and movement of construction barges. Construction noise generated above the water could also be transmitted into the water through steel or concrete structures. All of these noise sources would temporarily elevate noise levels above the existing background noise levels. To minimize the affects to fish and aquatic species, the construction contractor would use a reverse rotary drill or vibratory hammer instead of an impact hammer. Geophysical surveys suggest that soil sediment in Tongass Narrows might be 20 feet thick in some locations. A vibratory hammer would be used to advance the steel pile or casing

through the existing sediment until it reached bedrock; drilling then would be employed to penetrate the rock and/or install the piling or rock anchors in the rock formation. Construction noise from drilling likely would not have long-term or permanent effects on marine and anadromous fish or marine mammals. Effects would be short-term and localized. If blasting were necessary for the ferry alternatives, it would last 2 to 3 days and would have relatively small, localized impacts in relation to the large areas of similar habitats available in Tongass Narrows.

With the exception of Alternative G4v, the remaining ferry alternatives would require minor dredging in Tongass Narrows to produce adequate water depths for ferry docking at all tidal stages. Use of a clamshell dredge is the most likely method of dredging for the ferry alternatives. It is generally accepted that clamshell dredges do not have the potential to capture (entrap) fish, including salmon. Dredging for the ferry alternatives might require a small amount of blasting.

4.25.12.4 Mitigation of Construction Impacts to Marine Mammals, Anadromous Fish, Marine Fish, and Essential Fish Habitat—All Action Alternatives

Construction of this project would require a Title 41 Fish Habitat Permit and a USACE Permit for fill in waters of the United States. Coordination with NMFS has been ongoing during the planning of this project. The following conservation measures would be incorporated to avoid, minimize, and mitigate impacts to marine species and EFH:

- Recontour stream banks at all stream crossings (both culverts and bridge crossings) to approximate original conditions, using native seed and annual rye as recommended in the DNR *Alaska Coastal Revegetation and Erosion Control Guide*[287] to minimize erosion
- Employ BMPs to minimize the introduction of sediment to ponds and streams during adjacent fill placement and during culvert placement
- Design all anadromous fish stream crossings to provide passage for the salmon present in any given stream, per DOT&PF's memorandum of agreement with ADF&G
- Restrict in-water work in Tongass Narrows as follows:
    - General use of boats and barges could occur year round for general survey and work on bridge structures above water
    - Except for blasting, dredging, and pile driving, other work in marine waters could occur between July 1 and February 28
    - As further described below, blasting, dredging, and pile driving could occur only November 1 through February 28, with the possible exception of mid-channel locations, based on further consultation with the DNR, NMFS, USACE, and USFWS
- When pile driving in Tongass Narrows, use a vibratory hammer to drive steel pilings instead of an impact hammer, and drive pilings during low tide when in intertidal and subtidal areas
- Conduct all construction in and around anadromous fish streams when stream disturbances would have the least impact on anadromous fish species:
    - In-stream construction work in the Ketchikan area is generally between mid-June and early August
    - Isolate in-water work areas, except for stream crossings by construction equipment, from flowing waters of all anadromous fish streams
- Require the contractor to prepare a blasting plan prior to any blasting activities, to include:

[287] Wright, Stoney J., and Philip K. Czapla. 2011. *Alaska Coastal Revegetation and Erosion Control Guide*. Palmer, Alaska: Alaska Department of Natural Resources, Division of Agriculture, Plant Materials Center.

  - Submit the blasting plan to be reviewed by NMFS for both EFH and marine mammal impacts
  - Implement a fish and invertebrate monitoring program for any proposed blasting activities
  - Conduct any blasting during typical daylight hours (i.e., generally 7:00 a.m. to 7:00 p.m.)
  - Conduct a pre-blasting survey to ensure that no fish schools are in the vicinity of the blasting area; if fish schools are detected, delay blasting until they leave
  - Employ a biologist to record any kills within 100 feet up-current and 300 feet down-current of the blast area after blasting is completed
  - Consider monitoring the dredge materials as a method for documenting organisms injured or killed in the blasting
  - Consider measures such as covering the rock to be blasted with sand to dampen blast impact
  - Conduct in-water blasting between November 1 and February 28 to avoid juvenile and adult salmon
- Except for Alternative F3, place dredged debris onto a barge where it would enter a settling basin and be disposed of on land. Alternative F3, which could require substantial removal of sediment and rock, would require ocean disposal. Ocean disposal would require permitting by USACE under Section 404 of the Clean Water Act and may require a USACE permit under Section 102 and 103 of the Marine Protection, Research, and Sanctuaries Act (see Section 4.13).
- Conduct fueling and servicing operations at least 100 feet away from all streams and water bodies, and store fuel at least 100 feet away from all wetlands and water bodies
- Obtain all necessary permits and agency approvals prior to construction
- Incorporate any permit stipulations into the construction contract specifications
- Require that the perimeter of the disturbance area be staked prior to construction to ensure that there is no additional impact from construction activities
- Use sediment control barriers adjacent to EFH stream channels, just beyond the estimated toe of fill
- Use gravels and streambed material in the bottoms of fish passage culverts to emulate natural streambed conditions
- Provide stream bank stabilization as necessary to maintain stream bank integrity, and include the use of bioengineering techniques to improve habitat value of the riprap, by incorporation of willow stakes or other locally available vegetation

These are general measures that would be refined to specifically address details of the selected alternative through further coordination with the agencies during design.

4.25.12.5 Wildlife—Amphibians, Birds, and Land Mammals

Construction activities would have a temporary effect on terrestrial wildlife for all action alternatives. Noise associated with construction activities (e.g., clearing and grading, excavation) and construction equipment moving to and from project sites would affect wildlife under each action alternative.

The sound produced by conventional construction equipment ranges from about 80 to 90 dB, pile driving between 95 and 115 dB, and blasting averaging 98 dB.[288] Ambient noise levels in the project area would be typical of a rural area (35 to 40 dB) for Gravina Island with levels greater than 88 dB during landing and take off of jet aircraft at the airport. The noise levels in the urban areas on Revillagigedo Island likely range from 60 to 65 dB.[289] While sound does attenuate over distance, a bulldozer operating at the construction site could be heard above ambient noise as much as 1.2 miles away on Gravina Island and 400 feet away on Revillagigedo Island. Pile driving would be heard for several miles on Gravina and Revillagigedo islands.

The increased sound levels due to construction would be temporary, and would be minimally higher than ambient levels. Animals likely would either avoid a noisy construction area or would have already adapted to the increased noise levels from existing development.

Vegetation clearing as part of construction would also displace wildlife species and habitat. Habitat features that could experience impacts include wildlife foraging, cover, nesting, and migratory species staging. Temporary vegetation removal would be similar among the varying action alternatives with the greatest removal occurring with Alternative F3 (18 acres) and the least with Alternative G4 and G4v (5 acres). Wildlife displaced during construction would likely use the project area upon completion of the project as vegetation reestablished itself on disturbed soils. Mobile animals (such as deer and birds) likely would avoid the immediate area temporarily, while localized species that are less mobile (such as mice) may be injured or killed as a result of clearing, grading, excavation, and disposal of excavated materials.

Construction traffic may result in wildlife mortality from vehicle impact, though construction vehicles would generally travel at relatively low speeds to the work areas. Use of lighting at night during construction may disturb wildlife feeding and movement, particularly among nocturnal birds and mammals. Impacts from these activities would be limited to the vicinity of staging and construction limits.

4.25.12.6 Mitigation of Construction Impacts to Amphibians, Birds, and Land Mammals —All Action Alternatives

To mitigate for construction impacts to wildlife, temporary areas of vegetation removal would be minimized to the extent practical. Prior to construction, specific trees and vegetation to be preserved would be identified. Throughout construction, BMPs would be used to minimize sedimentation, erosion, or other impacts to wildlife. Clearing of nests for species protected under the Migratory Bird Treaty Act will be conducted prior to construction and outside of the nesting season (typically March through July).

4.25.12.7 Bald Eagles

All proposed action alternatives have the potential to disturb eagles during the breeding season due to the proximity of the alternatives to known nests (see Section 3.15.6 for information on eagle distribution). No bald eagle nest trees would need to be removed as part of construction activities for any alternative. Under the National Bald Eagle Management Guidelines,[290] nest sites require a 660-foot buffer from road construction and clearing activities, whether the

[288] Washington Department of Transportation. 2010. *Advanced Training Manual: Biological Assessment Preparation*. Version 02-2010. Olympia, Washington.

[289] Washington Department of Transportation. 2010. *Advanced Training Manual: Biological Assessment Preparation*. Version 02-2010. Olympia, Washington.

[290] U.S. Fish and Wildlife Service. May 2007. *National Bald Eagle Management Guidelines.* Available online at http://www.fws.gov/pacific/eagle/National Bald Eagle Management Guidelines.pdf.

activities would be visible or not visible from the nest. Within this buffer, no construction or clearing activities can occur during the breeding season. In addition, no blasting can occur within one half mile of nest sites during the breeding season.

Alternative G2 would be located 175 feet from an inactive bald eagle nest at the proposed terminal on Gravina Island, and 685 feet from an active nest near Lewis Point. Because of topography, the Alternative G2 alignment could not be relocated to create a 660-foot buffer between the road and nest at the proposed terminal. Construction activities could disrupt nesting activities associated with this nest site, which likely would result in displacement of nesting eagles, although eagles have nested close to human activity elsewhere in Alaska.

The ferry terminal on Gravina Island for Alternative G3 would be located within 835 feet of a bald eagle nest. This nest was noted as inactive during the 2008 surveys and would be outside the recommended buffer of 660 feet. Given the activity of the airport nearby, construction activities likely would not disturb the eagles using this nest site.

Common to Alternatives G2, G3, and F3, improvements at the intersection of the Airport Access Road, Lewis Reef Road, and Gravina Island Highway would occur within 200 feet of a bald eagle nest, which would be within the 660-foot buffer for each of these alternatives. Construction activities could disrupt nesting activities associated with this nest site. In addition, blasting during construction of Alternative F3 would occur within ½ mile of the West Channel, with potential to disturb several nests.

Without mitigation, construction activity under all alternatives likely would result in displacement of nesting eagles as a result of construction activities including blasting associated with Alternative F3.

4.25.12.8 Mitigation of Construction Impacts to Bald Eagles—All Action Alternatives

If the selected alternative were to come within 660feet of a bald eagle nest, DOT&PF would be required to obtain a Bald Eagle Take Permit. This permit would require development of mitigation measures with USFWS. Mitigation measures may require biologists to monitor construction activities around the area that would potentially affect eagle nests, and would limit certain construction activities, such as blasting, during the nesting season (typically February through August).Topography would constrain Alternative G2, and it may not be practical to shift the alignments to more than 660 feet away to create a buffer between the road and nest. In addition, improvements at the intersection of the Airport Access Road, Lewis Reef Road, and Gravina Island Highway could not be moved to create an adequate buffer between the road and nest.

4.25.13 Floodplains

Construction activities would have no adverse effect on mapped floodplains.

4.25.14 Coastal Zone Management

Temporary construction activities related to any of the action alternatives would not affect coastal zone management. Impacts to the resources protected by the Borough *Coastal Management Plan would* be minimized through erosion and sediment control and other BMPs for reducing impacts to water quality, wetlands and other water bodies, marine habitat and biota, and threatened and endangered species (see Sections 4.25.10, 4.25.11, 4.25.12, and 4.25.15).

4.25.15 Threatened and Endangered Species

Construction of the project under any action alternative would create noise and vibration that could disturb Steller sea lions or humpback whales if the noise and vibration were to occur while these mammals were present. Activities that would disturb sea lions or humpback whales include:

Reverse rotary drilling in submerged rock and pile driving with a vibratory hammer in substrate for placement of pier foundations for all action alternatives

Underwater blasting and dredging in West Channel (Alternative F3)

Nearshore underwater blasting dredging for ferry terminal construction (Alternatives G2, G3, and G4)

Minor in-water blasting (possible for any of the action alternatives)

Steller sea lions would be less likely to be affected by underwater noise and vibration associated with project construction activities because they have higher thresholds for disturbance and are able to raise their heads out of the water to avoid noise transmission.[291] See Section 4.25.12.3 for additional information regarding construction impacts to marine habitat and species.

4.25.15.1.1 Mitigation of Construction Impacts to Threatened and Endangered Species—All Action Alternatives

To ensure no injury to or harassment of Steller sea lions, humpback whales, or other marine mammals, DOT&PF and FHWA are committed to the measures listed below:

Conducting dredging and in-water blasting only in the period from November 1 to February 28, unless pre-approved by NMFS, to avoid runs of salmon and herring, on which humpback whales and Steller sea lions feed, and so that dredging and blasting occurred after most humpback whales had left Southeast Alaska for wintering grounds near Hawaii

- Requiring, via the construction contract, a blasting plan for Alternative F3, approved by NMFS (if blasting amounts are minor, and if agreed by the agencies, monitoring may not be required)
- Obtaining NMFS approval for a dredging plan for Alternatives F3, G2, G3, and G4 and ensuring that, during blasting and dredging, the project would use trained and NMFS-approved observers to indicate when marine mammals were within a 164-foot (50-meter) zone around pier work or other in-water work, and delaying or ceasing work until the animals moved out of the area
- Issuing an in-water warning sound prior to blasting to allow any marine mammals to voluntarily move to a comfortable distance
- Acquiring all necessary permits and agency approvals prior to construction, and incorporating stipulations into contract specifications
- Obtaining any necessary incidental harassment authorization from NMFS
- Finalizing mitigation measures during the permitting process with input from DNR, NMFS, USACE, and USFWS

These mitigations are designed to be compatible with EFH mitigation measures for the project (see Section 4.25.12.3). All project-related activities would conform to the pertinent provisions of the Marine Mammal Protection Act and the Endangered Species Act.

[291] Ballard, Bill. January 26, 2004. Letter from DOT&PF to Kaja Brix, NOAA Fisheries; Balsinger, James. February 17, 2004. Letter from NOAA Fisheries to Bill Ballard, DOT&PF.

4.25.16 Historic and Archeological Preservation

Historic properties are extant within the APEs of Alternatives F3, G2, and G3 (see Section 4.21.3). Historic properties will be considered and avoided during final design of the selected alternative. For Alternative F3, archeological historic remains located near the West Channel bridge alignment and the Gravina Island Highway south of Clam Cove (site KET- 774) may be physically disturbed by construction of the bridge. For Alternative G3, the remains of historic homesteads near the Gravina Island ferry terminal (site KET-800) may be directly affected by equipment operation and material stockpiling and storage during construction of the ferry access road. Other archeological sites are known to exist in the Tongass Narrows area, and previously unknown subsurface sites could be discovered during construction of any alternative.

4.25.16.1 Mitigation of Construction Impacts to Historic and Archeological Preservation—All Action Alternatives

Once an alternative is selected, historic and archaeological sites in the vicinity of construction areas will be identified for the construction contractor to avoid.

In general, under all alternatives, FHWA and DOT&PF would continue coordination with the SHPO through design. Once the alignment was staked during design and prior to construction, a qualified archaeologist would be sent into the field to ensure that no cultural sites were present that might have been missed in previous field surveys. If cultural resources were discovered during construction, construction at that location would halt for site evaluation. DOT&PF would consult with the SHPO about the appropriate course of action. Protocol and contact information for construction contractors in the event of an inadvertent cultural resource or human remains discovery will be developed by DOT&PF in coordination with FHWA and the Alaska SHPO and NHPA Section 106 consulting parties prior to commencement of construction.

4.25.17 Hazardous Waste Sites

Construction activities associated with any of the action alternatives would not affect any known hazardous waste sites. Sites recognized as potential hazardous waste sites within the construction right-of-way (see Section 4.22) would be investigated prior to construction and any waste found would be removed in accordance with state and federal regulations.

Hazardous materials that would be used, transported, or stored within the project right-of-way as part of the construction activities could adversely affect the environment if they were not properly handled and contained. Materials would include asphalt, concrete, cable lubricants, and fuel and lubricants for vehicles and other equipment.

4.25.17.1 Mitigation of Construction Impacts to Hazardous Waste Sites—All Action Alternatives

Construction contractors would be required to meet all federal, state, and local regulatory requirements regarding the discovery and use of hazardous materials. These regulatory requirements include worker right-to-know and safety training for the discovery and use of hazardous materials. Construction contractors on site must be trained to meet federal, state, and local regulatory requirements in recognizing and reporting discovery of unknown contamination, and proper use and handling of hazardous materials during construction. If unknown hazardous materials were encountered during construction, the contractor would be expected to isolate the area and prevent migration of any contaminants. A spill prevention and response plan would be developed for the selected alternative. Cleanup would occur in accordance with state and federal regulation and in consultation with ADEC. Hazardous

materials used during project construction would be stored and handled according to state and federal regulations. Material Safety Data Sheets would be available for all hazardous materials on the site. Construction vehicles will contain spill prevention kits in case of minor hazardous materials or chemical spills during construction.

4.25.18 Visual Environment

4.25.18.1 Bridge Alternatives C3-4 and F3

Temporary visual impacts resulting from the construction process could include the presence and use of equipment (e.g. trucks, barges, cranes) and materials (e.g. spoil piles, cones). Construction of the bridge alternatives would temporarily vary the current views of natural features with the introduction of large cranes, barges, and other operating equipment in the channel. Because of the industrial character of the Ketchikan waterfront, the impact to the visual environment of that shoreline would be minor. As the bridge construction work progressed into Tongass Narrows (Alternative C3-4) or the East and West channels (Alternative F3), construction equipment would intrude upon views of predominantly natural features.

Construction of roadways and bridge approaches would adversely affect the visual character of the area immediately surrounding the construction zones. This visual effect would be temporary and therefore minor in the long term. Construction of roadways and bridge approaches on Gravina and Pennock islands would not be visible from most areas of Ketchikan.

4.25.18.2 Ferry Alternatives G2 and G3

Construction of the new ferry terminals, access road, and ancillary facilities for Alternatives G2 or G3 on Gravina Island, amid the existing natural features, would have impact views of the shoreline. An uninterrupted natural shoreline view would be temporarily converted to a view of a segmented shoreline with construction equipment.

Construction of a ferry terminal and ancillary facilities for Alternatives G2 and G3 on Revillagigedo Island would not dramatically change the visual setting due to the industrial and commercial character, respectively, of the terminal sites.

Construction of roadways and bridge approaches on Gravina Island would not be visible from most areas of Ketchikan.

4.25.18.3 Ferry Alternatives G4 and G4v

The construction of these ferry terminals and ancillary facilities on Gravina and Revillagigedo islands would occur in industrial areas. Construction of roadways and bridge approaches on Gravina Island would not be visible from most areas of Ketchikan. Construction equipment and activity, therefore, would not have a substantial visual impact in Alternatives G4 and G4v.

4.25.18.4 Mitigation of Construction Impacts to the Visual Environment—All Action Alternatives

All construction equipment and debris would be removed after construction was completed. Reseeding would repair bare soil areas. These efforts would repair the visual impacts of construction after the construction process was finished but would not affect

4.25.19 Energy

Energy consumption related to each of the action alternatives would depend on the duration of construction and the types of construction equipment required by that alternative. A temporary increase in energy consumption would occur during construction of the project. Energy would be consumed by diesel-fueled heavy machinery, electrical- or gas-powered hand tools, and

electrical lighting and safety signals. Fuel for vehicles and handheld tools would be replenished with local supplies. Electricity and diesel fuel are available to meet temporary energy needs, and no substantial impact to energy supplies seems likely.

4.25.20 Utilities

Construction of any of the project alternatives might result in short-term temporary interruption of existing utility services. Specific need for service interruptions would be identified and characterized during the design phase.

4.25.20.1 Mitigation of Construction Impacts to Utilities—All Action Alternatives

Affected customers would be given advance notice of any service interruptions. For longer outages, temporary facilities would be provided to ensure maintenance of service to affected customers.

4.26 Indirect Impacts

In addition to the direct and construction impacts described above, this analysis identifies indirect impacts of the Gravina Access Project. NEPA defines indirect effects as,

> [effects that are] caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. (40 CFR 1508.8)

An important component of secondary impact analysis for the Gravina Access Project is the estimate of the potential development that would be induced by the improved access to Gravina Island within a foreseeable planning horizon. According to the FHWA position paper on *Secondary and Cumulative Impact Assessment in the Highway Project Development Process*:[292]

> New access to undeveloped locations can contribute to subsequent development activity. In some instances, the stated purpose for proposed projects may be to promote economic development in depressed areas needing overall infrastructure improvement. In cases like these, a discussion of the indirect effects should be included in the project environmental analysis. Without it the project purpose and need will be difficult to defend and any decisions to proceed with the project may likely be challenged.

Part of the stated purpose and need of the Gravina Access Project (in Chapter 2.0) is to improve access to Borough land and other developable or recreation lands on Gravina Island to support the adopted land use plans of the Borough, and to promote environmentally sound, planned long-term economic development on Gravina Island. The degree of development that could occur on Gravina Island is based on projections for population growth in the Borough as well as Gravina Island land ownership patterns; the plans of federal, state, and Borough landowners; economic growth potential for the region; and current development patterns. Economists and planners have analyzed each Gravina Access Project Alternative for its level of convenience, user cost, and location to determine how it might influence development on Gravina Island. They have worked with the Borough planners who developed the *Gravina Island Plan* to characterize potential development patterns on Gravina Island.

[292] Federal Highway Administration. April 1992. *Secondary and Cumulative Impact Assessment in the Highway Project Development Process*.

Table 4-23 presents development scenarios that could occur under each project alternative. The Gravina Island development forecasts have been projected through 2033.[293] These forecasts are largely based on assumptions made in the 2002 Traffic Model, which also formed the basis of the 2011 Updated Traffic Model used in the *Gravina Access Project SEIS Traffic Forecast;*[294] background information from the *Gravina Island Plan*; population forecasts developed by the State of Alaska,[295] and input from Borough representatives.

For the bridge alternatives, the addition of a toll would reduce the desirability of living or doing business on Gravina Island, when compared to free passage across the bridge, and in turn would reduce the amount of development on that island. The *Gravina Access Project SEIS Traffic Forecast*[296] examined three toll options for each of the two bridge alternatives. Toll Option 1 represents a high toll that would be approximately equivalent to the existing ferry crossing fee of $16 round trip ($6 for one car and $5 each for two passengers), Toll Option 2 would be a toll of $5 per vehicle round trip, and Toll Option 3 would be a toll of $2 per vehicle round trip. All tolls were assumed to be collected electronically: rather than drivers stopping to pay the toll, vehicle information would be collected via a transponder or license plate scan and then used to bill the driver directly.

A bridge toll would reduce residential development on Gravina Island, compared to a bridge with no toll, because the cost of living on the island would increase. Tolls also would also affect retail development on Gravina Island: retail developments that may depend on a Borough-wide customer base are unlikely to locate on Gravina Island if a substantial toll were in place. The analysis for Gravina Island development forecasts assumes that a toll of $5 or more would be incompatible with any retail development on Gravina Island. Industrial development would be reduced with a toll, but would not be incompatible. Table 4-24 presents the 2033 development scenarios associated with the three toll options for the bridge alternatives.

As indicated in Table 4-24, implementing a toll would reduce the amount of development on Gravina Island compared to a toll-free bridge. The cost of the toll would be inversely proportional to the amount of development; i.e., the higher the toll, the lower the amount of development.

[293] The forecast to 2033 represents a 15-year planning horizon from the date an action alternative would become operational.

[294] Alaska Department of Transportation and Public Facilities. 2012. *Gravina Access Project SEIS Traffic Forecast.* Prepared by HDR.

[295] Alaska Department of Labor and Workforce Development, Research and Analysis Section. February 2011. *Alaska Population Projections 2010–2034*.

[296] Alaska Department of Transportation and Public Facilities. 2012. *Gravina Access Project SEIS Traffic Forecast.* Prepared by HDR.

Table 4-23: Development by 2033 Assumed for Gravina and Pennock Islands in the Secondary Impact Analysis

Project Alternatives	Type and Location of New Development by 2033
No Action Alternative and Alternative G4v	Gravina Island 3 acres developed for industrial use 13 acres developed for residential use Pennock Island No additional development anticipated
Alternative C3-4 – Airport Bridge	Gravina Island 7 acres developed for limited retail 16 acres developed for industrial use 306 acres developed for residential use 2 acres dedicated to community use Pennock Island No additional development anticipated
Alternative F3 – Pennock Island Bridges	Gravina Island 7 acres developed for limited retail 16 acres developed for industrial use 306 acres developed for residential use 2 acres dedicated to community use Pennock Island 12 acres developed for residential use
Ferry Alternatives G2, G3, and G4	Gravina Island 3 acres developed for industrial use 40 acres developed for residential use Pennock Island No additional development anticipated

Source: DOT&PF. 2012. *Gravina Access Project SEIS Traffic Forecast*. Prepared by HDR.

Table 4-24: Development by 2033 for Gravina and Pennock Islands for Bridge Alternatives with Tolls

Bridge Alternatives	Type and Location of New Development by 2033		
	Toll Option 1: $16 toll	**Toll Option 2: $5 toll**	**Toll Option 3: $2 toll**
Alternative C3-4	Gravina Island No retail development 12 acres industrial development 236 acres residential development 1 acre community use Pennock Island No additional development anticipated	Gravina Island No retail development 14 acres industrial development 274 acres residential development 1 acre community use Pennock Island No additional development anticipated	Gravina Island 7 acres retail development 15 acres industrial development 284 acres residential development 2 acres community use Pennock Island No additional development anticipated
Alternative F3	Gravina Island No retail development 12 acres industrial development 223 acres residential development 2 acres community use Pennock Island 8 acres for residential use	Gravina Island No retail development 14 acres industrial development 268 acres residential development 2 acres community use Pennock Island 11 acres for residential use	Gravina Island No retail development 15 acres industrial development 280 acres residential development 2 acres community use Pennock Island 11 acres for residential use

Source: DOT&PF. 2012. *Gravina Access Project SEIS Traffic Forecast*. Prepared by HDR.

For purposes of assessing indirect impacts of the project alternatives on most resources, the higher projected development level (i.e., no toll) was used. The tolling options have a more notable impact on indirect impacts to land use (Section 4.26.1), economics (Section 4.26.3), and vehicle traffic (Section 4.26.4.3), and the analysis of impacts related to these resources takes tolling into account.

4.26.1 Land Use Impacts

The development scenarios, in combination with the Borough's *Gravina Island Plan*, were used to determine where the land use changes would likely occur. The *Gravina Island Plan* identifies five areas for planning purposes: North Gravina (which includes Rosa Reef), Central Gravina and Airport Reserve, Clam Cove and Blank Inlet, Vallenar Bay, and Tongass National Forest (see Figure 3.4). The Borough completed detailed area plans of three of these areas: North Gravina, Central Gravina and Airport Reserve, and Clam Cove and Blank Inlet. These area plans outline proposed future development on Gravina Island—including residential, commercial, industrial, and recreational development. Key elements of these area plans as they relate to the Gravina Access Project alternatives are illustrated on Figure 4.5. The locations of future development on Gravina Island described below are based on the Borough plans for these five areas relative to the location of the alternative under consideration. The Borough will likely update the Gravina Island Plan once an alternative has been selected.[297]

[297] Williams, Tom. December 6, 2011. Personal communication between Ketchikan Gateway Borough Planning Director and HDR.

4.26.1.1 No Action Alternative and Alternative G4v

Overall development in the Borough would continue under the No Action Alternative and Alternative G4v in response to needs for new housing and new commercial, industrial, or public facilities. Gravina Island, without improved access, would experience a small portion of the region's future development. By 2033, Gravina Island would add 3 acres of industrial development and 13 acres of residential development. Industrial development likely would occur within the Central Gravina and Airport Reserve area, whereas residential development could occur in the North Gravina or the Clam Cove areas. Water-based industrial facilities would potentially be developed in the Conceptual North Gravina Industrial Park or Conceptual South Gravina Fisheries Industrial Park (see Figure 4.5). The land use in any of these areas would be converted from open space and forested areas to developed land.

Considering the projected decline in Borough population, the rate of development on Revillagigedo and Pennock Islands would decline compared with the past 10 years. On Pennock Island, no new development is anticipated through 2033. On Revillagigedo Island, any new residential development likely would occur in existing residential developments. Industrial and commercial lands along the waterfront would continue to be areas of potential development.

Land development would continue to be constrained on Revillagigedo Island, where mostly marginal lands (steep or wet) remain available for development. Access to Borough, Airport Reserve, and Mental Health Trust lands on Gravina Island has been enhanced by development of the Gravina Island Highway. Under the No Action Alternative, however, development on Gravina Island would continue to be constrained by the airport ferry schedule and load restrictions. Alternative G4v would include a heavy freight dock, which would reduce the constraint presented by load restrictions, but general transportation using the airport ferry would remain a constraint.

4.26.1.2 Bridge Alternatives C3-4 and F3

With improved access to Gravina Island under Alternatives C3-4 and F3, future industrial and commercial development is projected to occupy approximately 23 acres of Gravina Island land, currently open space and forested areas along the Tongass Narrows waterfront, that is zoned for industrial/commercial development. The commercial and industrial development likely would be distributed between the conceptual industrial parks north and south of the airport (shown on Figure 4.5). The Conceptual South Gravina Fisheries Industrial Park might see more development than the Conceptual North Gravina Industrial Park because it would be closer to the bridge access of Alternatives C3-4 and F3.

By 2033, Alternatives C3-4 and F3 is projected to lead to the conversion of approximately 306 acres of open space and forested land on Gravina Island for use as residential or community development and 2 acres for community use. The new residential development likely would be in the North Gravina and Clam Cove and Blank Inlet areas, accessible via gravel roads connecting to the Gravina Island Highway, Lewis Reef Road, and Seley Road. Most residential development likely would occur in the Conceptual Clam Cove Community Development area (see Figure 4.5) because it would be closer to the bridge access of Alternatives C3-4 and F3 than other residential areas identified in the *Gravina Island Plan*.

The change in land use on Gravina Island associated with this level of development would be consistent with the planned and existing land uses (i.e., existing residential development north of the airport and at Clam Cove; industrial development on the Airport Reserve property and north of the airport) on the island.

Forecasts indicate that Alternative F3 would spur 12 additional acres of residential development on Pennock Island. Most development likely would occur along the waterfront in areas that are

currently undeveloped and used as open space and forested land. The *Pennock and Gravina Island Neighborhood Plan*, adopted May 6, 1985, anticipated much more development on Pennock Island.

Owners of land on Gravina Island with significant timber resources were contacted to determine how improved access associated with the project alternatives would affect their plans for future timber harvests.[298] The transportation improvements under Alternative C3-4 would not affect timber harvests on USFS, DNR, or Alaska Mental Health Land Trust lands. Facilities associated with Alternative C3-4 would not be adjacent to areas of commercial-quality timber. Improved access via a bridge could make timber sale opportunities available to more parties, allowing transport of harvested timber by truck to processing or shipping facilities on Revillagigedo Island. Currently, there are no timber processing facilities on Revillagigedo Island; however, there was a wood products industry at Ward Cove as recent as 2002.

Adding a toll to Alternative C3-4 or F3 would reduce development on Gravina Island relative to having no toll, as noted in Table 4-23 and Table 4-24. This reduced development likely would reduce land use benefits to the Ketchikan community. Toll Option 1, having the highest toll rate would have the least land use benefit to Ketchikan because it would deter travelers from crossing Tongass Narrows.

4.26.1.3 Ferry Alternatives G2, G3, and G4

Improved ferry service in Alternatives G2, G3, and G4 would not induce industrial development on Gravina Island; i.e., the amount of industrial development would be the same as for No Action and Alternative G4v. Industrial development (3 acres) would likely occur within the Central Gravina and Airport Reserve areas on land currently used for open space and forest land.

An improved ferry alternative would induce approximately 40 acres of residential development. Alternative G2 could lead to more residential development in the North Gravina area, whereas Alternative G3 could lead to more residential development in the Clam Cove and Blank Inlet area. Most of the new land development would be accessed via gravel roads connecting to the Gravina Island Highway, Lewis Reef Road, and Seley Road. The change in land use on Gravina Island associated with this level of development would be consistent with the planned and existing land uses (i.e., existing residential development north and south of the airport; industrial development on the Airport Reserve property, and north of the airport) on the island.

As noted above, owners of land on Gravina Island with significant timber resources were contacted to determine how improved access associated with the project alternatives would affect their plans for future timber harvests.[299] The transportation improvements under the ferry alternatives would not affect timber harvests on USFS, DNR, or Alaska Mental Health Land Trust lands. No facilities associated with these alternatives would be adjacent to areas of commercial quality timber. With a heavy freight dock, timber could be shuttled to Revillagigedo Island for processing and shipment, although there are currently no timber processing facilities on Revillagigedo Island.

[298] Palkovic, Pat. November 3, 2010. Personal communication between DNR Area Forester and Carol Snead, HDR; Tlachac, Adam. November 4, 2010. Personal communication between USFS Tongass National Forest Forester and Carol Snead, HDR; Montgomery, Mari. November 11, 2010. Personal communication between Director of Alaska Mental Health Land Trust and Carol Snead, HDR.

[299] Palkovic, Pat. November 3, 2010. Personal communication between DNR Area Forester and Carol Snead, HDR; Tlachac, Adam. November 4, 2010. Personal communication between USFS Tongass National Forest Forester and Carol Snead, HDR; Montgomery, Mari. November 11, 2010. Personal communication between Director of Mental Health Land Trust and Carol Snead, HDR.

4.26.2 Social Impacts

The indirect impacts on the social environment would result primarily from changes in access to and new development on Gravina Island. The State of Alaska projects that the Borough population most likely will decrease over the projection period, from 12,984 residents in 2009 to 9,878 residents in 2033.[300] In addition, the population is aging. By 2033, the number of people over 65 is expected to double. It is expected that the age group from 45 to 60 will decrease beyond other age groups. With population growth in the age group that include those over 65 and a decline in the 45-to-60 age group, the working population will likely decrease. These population and employment forecasts were used to assess the effects of the Gravina Access Project alternatives on socioeconomic conditions. The population values reported in this section were incorporated into the model used to generate the development scenarios that form the basis of the indirect impacts analysis (see Table 4-23).

4.26.2.1 No Action Alternative and Alternative G4v

The No Action Alternative and Alternative G4v would not change the social environment of Ketchikan because neither alternative would improve access to developable lands or affect neighborhoods or social groups. Continued restrictions on access to available developable land with the existing ferry service would adversely impact the Ketchikan community by limiting development primarily to Revillagigedo Island. Constraints on access to industrial land would limit the types of industry that could be developed in the Ketchikan region, which could limit the availability of employment opportunities to those available today or similar opportunities.

The restricted access to Gravina Island (via the existing airport ferry) also would continue to limit recreational use of the island.

On Gravina Island, any new residential development could result in the formation of one or more new small neighborhoods. New industrial/commercial and residential developments on Gravina Island would rely on existing community services and facilities available from Revillagigedo Island.

Competition for subsistence resources on Gravina and Pennock Islands would not be affected by the No Action Alternative or Alternative G4v.

4.26.2.2 Bridge Alternatives

4.26.2.2.1 Alternative C3-4

By providing round-the-clock access to Gravina Island, Alternative C3-4 would promote growth and development on the island. The accessibility of developable land in more areas across the Borough would increase, with fewer constraints than under the No Action Alternative. Some industrial development could shift to Gravina Island, leaving more opportunities for other types of development (e.g., residential and commercial/retail) on Revillagigedo Island, particularly along the waterfront. The residential development on Gravina Island could occur in cluster areas, such as Clam Cove, which could lead to neighborhood structure and cohesiveness. Improved access to Gravina Island would also increase recreational opportunities in the Ketchikan area.

Competition for Gravina Island subsistence resources could increase as a result Alternative C3-4, adversely affecting current users of these resources. Residents of Saxman and Metlakatla harvest salmon and non-salmon fish (halibut, rockfish), deer, seal, birds and

[300] Alaska Department of Labor and Workforce Development, Research and Analysis Section. February 2011. *Alaska Population Projections.2010–2034.* The population projections for the Borough are based on historical data regarding the Borough's population size, and rates of fertility, mortality, and migration.

eggs (ducks, geese, and seabirds), marine invertebrates (Dungeness crab, clams, octopus, and cockles), plants and berries (seaweed, kelp. and various berries) in substantial quantities. Bridge access could attract more subsistence users to the island, benefitting the new users but increasing competition for resources and potentially lowering takes for existing users.

The projected development on Gravina Island would increase the need for community services and facilities. Revillagigedo Island would continue to provide most services (e.g., those provided by schools, libraries, and medical facilities), though emergency response services on Gravina Island (e.g., fire protection and ambulance service) would likely be enhanced as the amount of development increases.

With a toll, Alternative C3-4 would generate less traffic and less development on Gravina Island and fewer visitors than without a toll. The overall effect of this alternative on the social environment, however, would be relatively the same with or without a toll.

4.26.2.2.2 Alternative F3

By providing round-the-clock access to Gravina and Pennock islands, Alternative F3 would promote growth and development on those islands. The accessibility of developable land in the Borough would increase, with fewer location constraints than under the No Action Alternative. Some industrial development could shift to Gravina Island, leaving more opportunities for other types of development (e.g., residential and commercial/retail) on Revillagigedo Island, particularly along the waterfront. The residential development on Gravina Island could occur in cluster areas, such as Clam Cove, which could lead to neighborhood structure and cohesiveness. Improved access to Gravina Island would also increase recreational opportunities in the Borough.

Bridge access to Pennock Island could substantially change its neighborhood character. The Borough would likely revise the *Pennock and Gravina Island Neighborhood Plan*[301] to respond to the change in access to Pennock Island and ensure that the future development of the island would occur within an appropriately planned framework.

Competition for subsistence resources on Gravina and Pennock islands could increase as a result of the implementation of Alternative F3 and have an adverse effect on users of these resources. Similar to Alternative C3-4, bridge access under Alternative F3 could attract more subsistence users to the islands, increase competition for resources, and result in benefits to new users but lower takes for existing users.

The projected development on Gravina and Pennock islands would increase the need for community services and facilities. Revillagigedo Island would continue to provide most services (e.g., those provided by schools, libraries, and medical facilities), but emergency response services on Gravina and Pennock Islands (e.g., fire protection and ambulance service) likely would be enhanced as the amount of development increases.

With a toll, Alternative F3 would generate less traffic and development on Gravina and Pennock Islands and fewer visitors than without a toll. The overall effect of this alternative on the social environment, however, would be relatively the same with or without a toll.

4.26.2.3 Ferry Alternatives G2, G3, and G4

The new ferry access to Gravina Island associated with these alternatives would promote modest amounts of growth and development on the island (30 additional acres of residential development compared with No Action and Alternative G4v). The improved access offered by the additional ferry would not significantly relieve the development constraints on Revillagigedo

[301] Ketchikan Gateway Borough Planning Department. May 6, 1985. *Pennock and Gravina Island Neighborhood Plan.*

Island because some of the community would still perceive access to Gravina Island as inconvenient.

No new industrial or commercial development would occur on Gravina Island, compared to development under the No Action Alternative or Alternative G4v.

While Alternatives G2, G3, and G4 would benefit recreational users by making access to Gravina Island more convenient than the existing ferry, the benefit would not be as great as with any of the hard link (bridge) options.

On Gravina Island, any new residential growth could result in the formation of one or more new small neighborhoods. New industrial and residential developments on Gravina Island would primarily rely on existing community services and facilities available from Revillagigedo Island, but would not adversely affect these facilities given the relatively low level of projected development.

As noted for the bridge alternatives, competition for Gravina Island subsistence resources could increase as a result of Alternatives G2, G3, and G4, and result in benefits to new users but lower takes for existing users.

4.26.3 Economic Impacts

The project's indirect impacts on the economy and economic development would be related to:

- The ability of the construction industry in the Borough to participate in constructing the alternatives
- Changes in spending associated with project operations
- The effect of regional economic activity on development on Gravina and Pennock islands
- Fiscal impacts on the local economy and government services

While construction income and construction jobs would create a direct impact on the economy (discussed in Section 4.25.4), the spending by construction workers in the community would have a secondary or indirect effect on the economy. Construction workers' spending on goods and services could also induce growth in jobs and income in the local economy. Another factor that could affect the local economy would be the potential reduction in cost associated with accessing Gravina Island: both the cost of a toll and the cost associated with time spent in transit from one island to the other. These impacts are addressed in the following sections.

The Gravina Access Project would not substantially affect the amount of timber harvested from Gravina Island. Specifically, reducing the cost of accessing the island would not necessarily increase the likelihood of a timber harvest, or the volume of timber harvested from timber land owned by USFS, DNR, or Alaska Mental Health Trust on Gravina Island.

4.26.3.1 Indirect and Induced Construction Spending

When a construction firm is contracted for a project, it buys supplies and hires workers to complete the work. Suppliers and project workers then make additional purchases with this income. Purchases made with construction income are referred to as "induced construction spending." These purchases increase revenues for the suppliers, create jobs, and increase revenue for the local government through taxes and other fees. Indirect employment effects are measured relative to full-time and part-time jobs created as a result of spending by businesses, households, and local governments that directly support the project. Government revenues include taxes paid by businesses, such as excise taxes, property taxes, fees, licenses, and sales taxes; payments by households to state and local governments for estate and gift taxes,

motor vehicle licenses, property taxes, fishing and hunting fees; and unemployment taxes from both businesses and households.

If Alaska-based firms were unable to supply material for the project, project funds would be transferred out of the state economy. In areas without a mature construction industry, a large share of purchases might "leak out" of the local economy through out-of-state purchases. These additional rounds of spending caused by construction firm expenditures are part of the subsequent indirect and induced effects and are collectively referred to as secondary effects.

4.26.3.1.1 No Action Alternative

There would be no construction directly associated with the No Action Alternative. A new ferry, however, would be needed every 35 years to replace the existing ferry. Assuming the replacement ferry would be constructed at Alaska Ship and Drydock, Inc., there would be an indirect benefit to the company and to the local community from construction spending in the future. The level of induced construction spending would be slightly above existing levels because ship building is an ongoing industry in the community.

4.26.3.1.2 Bridge Alternatives C3-4 and F3

The bridge alternatives would have a greater capital cost and employ about three times more construction workers than the ferry alternatives (see Section 4.25.4.1). The greater capital cost and construction requirements would generate greater supplier spending and have a greater benefit to the regional economy. With more construction workers, the bridge alternatives would generate more secondary jobs than the ferry alternatives, though many of the construction jobs created by the bridge alternatives would employ skilled laborers from outside the Ketchikan Gateway Borough. Induced construction spending by outside workers would include lodging and meal purchases, as well as other goods and services purchased within the local community. Local service providers, restaurants, hotels, grocers, and retailers would benefit from the influx of employed individuals. Government revenues would be higher under the bridge alternatives than the ferry alternatives as a result of taxes and fees on increased purchases and service providers.

4.26.3.1.3 Ferry Alternatives G2, G3, and G4

The ferry alternatives would have a lower capital cost and, therefore, lower induced construction spending than the bridge alternatives. Assuming that two new ferry vessels would be built at the Alaska Ship and Drydock, Inc., much of the direct construction spending would occur in the local economy and most of the induced construction spending would be local. The improved ferry alternatives also would include replacement of an existing ferry vessel every 35 years, which would create some induced construction spending, as noted for the No Action Alternative. With ferry construction in Ketchikan, the local industrial base would be strengthened, which could induce additional jobs and spending.

4.26.3.1.4 Ferry Alternative G4v

Similar to the No Action Alternative and ferry alternatives, Alternative G4v would require a replacement ferry built in Ketchikan every 35 years, which would create some induced construction spending in the future. Construction spending associated with the other improvements associated with Alternative G4v (e.g., passenger waiting facility, heavy freight dock) would have a more immediate impact on induced construction spending; however, the overall benefit would be relatively minor given the very low capital cost associated with this alternative.

4.26.3.2 Changes in Spending Associated with Project Operations

Secondary spending associated with long-term operations and maintenance of the project alternatives would result from employment, product purchases, property-type income (such as rents), and indirect business taxes, and could affect the local and regional economy. Changes in discretionary spending due to the presence or absence of tolls for the various alternatives could also have secondary effects on the local economy. Effects on state and local revenues from long-term use of the project are described in Section 4.26.3.3.

The action alternatives would have minimal effects on secondary spending associated with employment, product purchases, property-type income, and taxes. Tolls, in the case of bridge alternatives with tolls, and ferry fees, in the case of the No Action and ferry alternatives, would somewhat offset the O&M costs of each of those alternatives. Tolls would reduce the discretionary spending available to users and reduce the amount that can be spent elsewhere in the local economy.

4.26.3.3 Fiscal Impact on the Ketchikan Gateway Borough, City of Ketchikan, and City of Saxman

4.26.3.3.1 No Action Alternative and Alternative G4v

The No Action Alternative and Alternative G4v would have no impact on property tax revenues or business and sales tax revenues for the Borough, City of Ketchikan, or City of Saxman.

4.26.3.3.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

Improved access to Gravina Island (and, with Alternative F3, Pennock Island) would result in increased property values on those two islands, thus generating greater property tax revenue for the Borough. This would be particularly true for the more convenient and toll-free bridge options. Offsetting this effect, at least to some extent, would be probable decreases in property values on Revillagigedo Island as the availability of additional land on Gravina and Pennock islands reduced demand for Revillagigedo Island land. The net effect on property tax revenue from this change in land value is uncertain.

Private lands would be acquired for Alternatives C3-4, F3, and G3 (see Section 4.25.4 and Table 4-19). When private property is acquired for public right-of-way, it is removed from the tax rolls for the Borough and the City of Ketchikan, if located within the city limits. None of the action alternatives would require lands located within the City of Saxman. The conversion of private lands to public rights-of-way for Alternative C3-4, F3, or G3 would reduce the associated property tax revenues in the Borough and in the City of Ketchikan by less than 1 percent.

Business and sales tax revenues for the Borough, City of Ketchikan, and City of Saxman would not be substantially affected by Alternatives C3-4, F3, G2, G3, and G4.

4.26.3.4 Additional Infrastructure and Government Services

4.26.3.4.1 No Action Alternative and Alternative G4v

With the No Action Alternative and Alternative G4v, a greater portion of regional economic development likely would occur on Revillagigedo Island. Current development on the periphery of Ketchikan would likely continue. Such development would also require additional government services and infrastructure. Limited development would be expected on Gravina Island in the future under the No Action Alternative and Alternative G4v, so infrastructure requirements and needs for government services on the island would be limited.

4.26.3.4.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

Development on Gravina or Pennock islands would primarily be a transfer of growth that would have otherwise occurred on Revillagigedo Island. As a result, the location of additional infrastructure and where government services are provided within the Borough would change, but the total amount of such infrastructure and services would not be substantially affected.

With any of the action alternatives, development on Gravina Island would require infrastructure and government services. Again, these effects would depend on the nature and scale of the development. For example, a high-density residential development would probably require street lighting and sewage services, whereas a low-density development probably would not. However, an expansion of police, fire, and other emergency services would almost certainly be necessary after a sufficient amount of residential and commercial development occurred. Since the bridge alternatives would result in higher levels of development than the ferry alternatives, the provision of infrastructure and government services on Gravina Island would be required sooner with the bridge alternatives than with the ferry alternatives. The City of Ketchikan and the Borough would determine when those services would be provided in the future.

4.26.3.5 Regional Economic Development

4.26.3.5.1 No Action Alternative and Alternative G4v

Based on the medium economic growth forecast for the Borough summarized in *Ketchikan Gateway Borough Economic Forecasts,*[302] prepared for this project, the sectors of highest growth in the foreseeable future likely would be in the trade and services sector, which is driven primarily by tourism activity. Tourism is expected to continue to be a major component of the regional economy, with Ketchikan being a frequent port of call for cruise ships.

4.26.3.5.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

Development of one of the action alternatives could shift some economic activity to Gravina Island from Revillagigedo Island. According to the development scenarios presented in Table 4-23, a bridge alternative would result in more interest in Gravina Island housing than improved ferry service because of the greater convenience that a bridge would offer. However, development of additional roads and other infrastructure by the Borough would be necessary to achieve more than very modest levels of economic development on Gravina Island by 2033. Without the Borough support for expansion of the road and utilities networks on the island, development would be constrained.

Anticipated population decline could lower regional land prices and housing costs in the Borough, a trend that could be exacerbated by improved access to developable land on Gravina Island.[303] Lower housing costs might expand the pool of qualified buyers at all price levels and stimulate some purchases that would not otherwise be made. This effect on housing costs would benefit potential buyers. However, each market transaction requires a seller, too, and landowners may receive lower prices when selling their properties. As noted previously, much of the growth on Gravina or Pennock islands would represent a transfer of development that would have occurred on Revillagigedo Island.

[302] Alaska Department of Transportation and Public Facilities. August 2002. *Gravina Access Project*, *Ketchikan Gateway Borough Economic Forecasts Technical Memorandum*. Prepared for HDR by Northern Economics.

[303] The magnitude of the effect on land prices would depend, in part, on how much additional land becomes available. Although, overall, regional land prices are likely to fall, initially, land prices on Gravina Island would be expected to rise. At present, there are no clear indications how Gravina Island property owners might react to higher prices, thus there are no indications of the amount of land that might be made available.

None of these alternatives would affect cruise ship port calls in Ketchikan. The number of cruise ships passengers stopping in Ketchikan would not change as a result of implementation of a bridge or ferry alternative; therefore, there would be no change to the tourism economy associated with cruise ship operations.

4.26.3.6 Economic Benefits to Users of the Bridge or Ferry

The benefits to users of the Gravina Access Project alternatives would arise in two principal categories: those associated with existing trips, and those associated with new demand for trips.

The first category includes potential time savings for existing trips (representing the current level of travel across Tongass Narrows, primarily trips to the airport) and the improved standard of living and productivity gains associated with those savings. The benefit to existing users also considers the change in out-of-pocket costs such as tolls (also addressed in Sections 4.5 and 4.26.3.2) and vehicle operating costs, and, statistically, a change in accident probability rates due to a shift from one transportation mode or LOS to another.

Benefits in the second principal category would arise in the form of additional trips to and from Gravina Island by travelers for whom the costs and inconvenience of access under the existing ferry system were outweighed by the value of opportunities on Revillagigedo Island, such as access to shops, work places, and social and recreational activities. With potential development induced by the Gravina Access Project, opportunities such as new retail outlets would emerge in response to the new cost-to-value travel equation, leading to additional demand for travel between Gravina and Revillagigedo islands. The new opportunities could be followed by or led by new residential and workplace development.

Table 4-25 provides a summary of the user benefits associated with bridge alternatives, and Table 4-26 provides the same summary for ferry alternatives. The benefits are shown in 2012 dollars and are a compilation of savings over 75 years (2012 to 2086), and these are further explained for each alternative following the tables. The environmental impacts of each alternative affect the overall benefit to users. For purposes of this analysis, environmental costs (shown as negative environmental benefits) are based on annual emissions calculated per vehicle mile traveled for each of the alternatives.

Table 4-25: User Economic Benefits of Bridge Alternatives Relative to the No Action Alternative 2012—2086 (2012 $Million)

	Bridge Alternatives							
	Alternative C3-4 (by toll rate)				Alternative F3 (by toll rate)			
	None	$2	$5	$16	None	$2	$5	$16
Existing Trips[a]								
Travel time savings	15.3	15.3	15.3	15.3	6.4	6.4	6.4	6.4
Operating cost savings	35.5	33.8	33.8	33.8	33.4	33.4	33.4	33.4
Accident cost savings	1.1	1.1	1.1	1.1	0.3	0.3	0.3	0.3
Emissions costs	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0
Existing trip benefits	***53.0***	***51.4***	***51.4***	***51.4***	***41.4***	***41.4***	***41.4***	***41.4***
New Trips[b]								
Travel time savings	20.8	18.9	11.2	9.2	20.0	18.0	10.0	8.0
Emissions costs	(1.2)	(1.2)	(0.7)	(0.6)	(1.3)	(1.3)	(0.9)	(0.8)
New trip benefits	***19.6***	***17.7***	***10.5***	***8.6***	***18.9***	***16.8***	***9.2***	***7.4***
Environmental costs (habitat losses)	***(2.3)***	***(2.3)***	***(2.3)***	***(2.3)***	***(2.7)***	***(2.7)***	***(2.7)***	***(2.7)***
Total project benefits	**70.3**	**66.7**	**59.5**	**57.7**	**57.6**	**53.8**	**46.3**	**44.5**

Note: Numbers in parentheses represent negative values. Rounding affects total values; total benefits may not equal column totals.

Source: HDR. 2012. *Cost-Benefit Analysis of Gravina Access Project Alternatives*

[a] Existing trips are based on forecasts of passenger trips under the No Action Alternative.

[b] New trips are trips induced by improved access; i.e., trips that occur as a result of growth and development associated with the action alternative.

Table 4-26: User Economic Benefits of Ferry Alternatives Relative to the No Action Alternative 2012—2086 (2012 $Million)

	Ferry Alternatives			
	G2	G3	G4	G4v
Existing Trips[a]				
Travel time savings	0.1	0.1	2.3	0.0
Vehicle operating cost savings	(25.3)	(25.1)	(25.2)	(0.2)
Accident cost savings	0.0	0.0	0.0	0.0
Emissions costs	0.0	0.0	0.0	0.0
Existing trip benefits	***(25.2)***	***(25.0)***	***(22.9)***	***(0.2)***
New Trips[b]				
Travel time savings	0.2	0.2	0.0	0.0
Emissions costs	(2.3)	(2.4)	(1.1)	0.0
New trip benefits	***(2.1)***	***(2.2)***	***(1.1)***	***0.0***
Environmental costs (habitat losses)	***(2.1)***	***(1.9)***	***(1.2)***	***(1.2)***
Total project benefits	**(29.5)**	**(29.2)**	**(25.2)**	**(1.5)**

Note: Numbers in parentheses represent negative values. Rounding affects total values; total benefits may not equal column totals.

Source: HDR. 2012. *Cost-Benefit Analysis of Gravina Access Project Alternatives*

[1] Existing trips are based on forecasts of passenger trips under the No Action Alternative.

[2] New trips are trips induced by improved access; i.e., trips that occur as a result of growth and development associated with the action alternative.

4.26.3.6.1 No Action Alternative

User benefits are calculated as the change from the No Action Alternative, so by definition, the No Action Alternative would not have any impacts.

4.26.3.6.2 Bridge Alternative C3-4

For the bridge alternative located near the airport, the majority of user benefits would be realized from existing trips, because this alternative would provide for shorter trip times to the airport. Bridge tolls would not greatly affect existing trips because users pay a toll, in the form of a fare, for the ferry now.[304] The benefits realized from new demand also could be substantial for similar reasons, but would be influenced by a toll. The increased vehicle operating costs, accident costs, and emission costs due to increased roadway vehicle use (access by driving on a roadway and bridge rather than crossing by ferry) would offset these user benefits. Compared with the other action alternatives, Alternative C3-4 would provide the greatest user benefits, with total benefits in the range of $51 million to $63 million over 75 years.

4.26.3.6.3 Bridge Alternative F3

Like Alternative C3-4, the user benefits from Alternative F3 would be derived primarily from existing trips to Gravina Island, although the benefits related to existing trips would be smaller because more roadway travel would be required and the time savings would be less. As with Alternative C3-4, benefits associated with existing trips would be about the same with or without a toll, though a toll would influence new trip benefits. Also similar to Alternative C3-4, offsets to user benefits with Alternative F3 would be the increased vehicle operating costs, accident costs,

[304] Alaska Department of Transportation and Public Facilities. November 2002. *Gravina Access Project, Quantification of User Economic Benefits Technical Memorandum*. Prepared for HDR by HLB Decision Economics, Inc.

and emission costs due to increased roadway vehicle use. Overall, Alternative F3 would provide total benefits in the range of $40 million to $51 million over 75 years.

4.26.3.6.4 Ferry Alternatives G2, G3, G4, and G4v

The ferry alternatives maintain use of the existing airport ferry with additional service at other locations (Alternatives G2 and G3), additional service at an adjacent location (Alternative G4) or no additional service. For Alternatives G2, G3, and G4, substantial economic impacts associated with existing trips would result from operations and maintenance costs of the new ferry. Emissions costs would be the same as No Action, and other environmental costs would be smaller than those of the bridge alternatives. Travel time savings from existing and new trips for the ferry alternatives would not offset the O&M costs or environmental costs. More frequent service at the existing airport ferry location under Alternative G4 would result in benefits greater than the other improved ferry alternatives because of the travel time savings for airport travelers, but much less than the bridge alternatives.

The new facilities associated with Alternative G4 do not provide enough of an economic benefit to differentiate it from the No Action Alternative.

4.26.4 Transportation Impacts

4.26.4.1 Aviation Impacts

4.26.4.1.1 No Action Alternative and Alternative G4v

The No Action Alternative would have no indirect impacts to aviation.

4.26.4.1.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

With the exception of Alternative G4v, the traffic projections associated with the action alternatives (Table 4-27) indicate a secondary impact could be a lack of sufficient parking at the airport by 2033. In the 2004 FEIS, all alternatives (bridges and ferries) included a parking structure adjacent to the airport terminal to accommodate anticipated future needs for airport travelers. This feature was removed from the alternatives evaluated in this SEIS because FHWA and DOT&PF determined that future development of parking facilities would occur when warranted and when funding became available. The type and extent of parking facilities at the airport would be determined based on future demand, which is unknown at this time. The funding source likely would be the FAA rather than FHWA because parking is an airport function. DOT&PF considers the future expansion of parking facilities on Gravina Island at the airport as a reasonably foreseeable future action and provides an assessment of impacts in Section 4.27, Cumulative Impacts.

4.26.4.2 Marine Navigation Impacts

4.26.4.2.1 No Action Alternative and Alternative G4v

Neither the No Action Alternative nor Alternative G4v would have indirect impacts to marine navigation. Any water-based facilities developed on Gravina Island under these two alternatives likely would not create enough marine traffic to affect marine navigation in Tongass Narrows.

4.26.4.2.2 Bridge Alternatives C3-4 and F3

These bridge alternatives could have long-term secondary effects on marine navigation because of increased risk and the requirement for one-way passage of ships transiting under a bridge could require schedule changes and/or speed adjustments for cruise ship operators. These changes could be made within a reasonable range of modifications to operations similar to those that occur now to account for tide and weather changes.

For both bridge alternatives, the potential development of water-based facilities in the North Gravina Industrial Park (see Figure 4.5) likely would not affect marine navigation in Tongass Narrows because the width of Tongass Narrows at this location could accommodate higher volumes of marine traffic. For Alternative F3, the potential development of water-based facilities in the South Gravina Fisheries Industrial Park and Clam Cove Community Development (see Figure 4.5) could affect marine navigation by adding congestion to West Channel of Tongass Narrows, which would be the primary travel corridor for all ships in excess of 60 feet in height.

4.26.4.2.3 Ferry Alternatives G2, G3, and G4

Alternatives G2, G3, and G4 would have negligible indirect impacts to marine transportation. The potential development of water-based facilities in the North Gravina or South Gravina Fisheries industrial parks (see Figure 4.5) likely would not affect marine navigation in Tongass Narrows because the width of Tongass Narrows at these locations could accommodate higher volumes of marine traffic.

4.26.4.3 Vehicle Traffic Impacts

The secondary effects of the Gravina Access Project on vehicle traffic are based on traffic projections developed for the 2004 FEIS and updated projections developed in the 2011 Traffic Model, which was used in the *Gravina Access Project SEIS Traffic Forecast*. The 2004 FEIS (based on a 2002 traffic model) presented traffic volumes projected to 2025, and the 2011 Traffic Model presented traffic volumes projected to 2033. The 2011 model was based on a 20-year forecast starting in 2013, assuming construction would be complete by then. These projections are shown in Table 4-27. Table 4-27 also shows traffic projections for the bridge alternatives with the three toll options. The values in Table 4-27 show how tolls affect traffic volumes, with decreasing traffic corresponding to increasing tolls. Table 4-27 also shows lower traffic volumes overall in the 2011 Traffic Model results relative to 2002 Traffic Model results. This can be attributed in part to the use of more current (2010 Census) population data in the Gravina Island development projections. In both cases (2002 and 2011 model results), the analysis indicates the bridge alternatives would induce greater development on Gravina Island, which would create a demand much greater than the projected demand under the No Action or ferry alternatives. Based on a revised project schedule, construction may not be completed until 2018, in which case the 20-year planning horizon would shift to 2038. Based on population forecasts, growth in the Ketchikan Gateway Borough is likely to slow and remain stagnant by 2033. There is no evidence to indicate population in the Borough would grow after 2033. Because population is expected to remain stagnant after 2033 and for purposes of this analysis, the traffic forecast for 2033 is considered representative of anticipated traffic in 2038.

Table 4-27: Traffic Projections For Project Alternatives

Alternative	2025 Average Daily One-way Trips Across Tongass Narrows based on 2002 Traffic Model[a]	2033 Average Daily One-way Trips Across Tongass Narrows based on 2011 Traffic Model[b]	
	Vehicles	People	Vehicles
No Action and Alternative G4v	1,350	865	208
Bridge Alternatives			
Alternative C3-4, no toll	4,300	3,930	2,611
Toll Option 1 ($16)	NA	2,190	1,369
Toll Option 2 ($5)	NA	2,514	1,606
Toll Option 3 ($2)	NA	3,618	2,388
Alternative F3, no toll	5,100	4,092	2,730
Toll Option 1 ($16)	NA	2,323	1,471
Toll Option 2 ($5)	NA	2,699	1,749
Toll Option 3 ($2)	NA	3,756	2,495
Ferry Alternatives			
Alternatives G2, G3, and G4	1,600	1,060	282

[a] 2004 FEIS

[b] DOT&PF. 2012. *Gravina Access Project SEIS Traffic Forecast.* Prepared by HDR.

Level of Service (LOS)[305] estimates for the 12 study area intersections and the approaches to the alternatives presented in the 2004 FEIS can be applied to the SEIS alternatives. Alternatives F3, G2, G3, and G4 are in identical locations as those presented in the 2004 FEIS and would affect the same study area intersections. Alternative C3-4 would affect the same intersections as FEIS Alternative C3(a). The traffic volumes presented in the 2004 FEIS, which relied on the 2002 Traffic Model, are much higher than those determined in the updated 2011 Traffic Model; therefore, using the LOS estimates from the 2004 FEIS provides a conservative estimate of LOS impacts for the SEIS alternatives. Note that the LOS analysis in the 2004 FEIS used projections to 2025. Those results are presented here for the SEIS alternatives.

The analysis was conducted for the afternoon peak hour, as this time period places the greatest demands on the roadway system. Intersections with a LOS E or F are considered to have traffic impacts deemed "unacceptable" from a traffic engineering perspective.

Traffic projections and the LOS analysis for the No Action Alternative represent baseline traffic conditions. Alternative G4v would not measurably affect traffic volumes; therefore LOS under Alternative G4v is the same as the No Action Alternative. Based on traffic projections associated with the improved ferry alternatives (Alternatives G2, G3, and G4), these alternatives would not significantly affect the background traffic conditions on the local roadway system; therefore, LOS was calculated only for the intersections associated with the new and existing ferry terminal access points for these alternatives. Table 4-28 provides the projected LOS for the No Action Alternatives and the bridge alternatives (Alternatives C3-4 and F3) at the analyzed intersections. Table 4-29 provides the projected LOS for the ferry alternatives where the ferry terminal access points intersect Tongass Avenue. Note that the *Highway Capacity Manual* methodology provides a composite LOS for signalized intersections and for the LOS for each minor move (individual approaches) at unsignalized intersections.

[64]The LOS describes the quality of traffic operations, ranging from A (least congested, least delay) to F (most congested, most delay).

Table 4-28: Level of Service at Project Area Intersections—No Action and Bridge Alternatives (Projections for 2025)

Intersection with Tongass Avenue (existing type of control)	Alternatives					
	No Action Alternative		Bridge Alternatives			
			C3-4		F3	
	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)
Deermount (stop sign)						
Eastbound left turn	A	9.1	A	9.2	A	9.7
Southbound left turn	F	55.5	F	72.3	F	142.4
Southbound right turn	B	14.2	C	15.0	C	17.1
Bawden (stop sign)						
Northbound left turn	A	8.5	A	8.6	A	8.9
Southbound left and right turns	A	9.1	A	9.4	A	9.6
Westbound left and right turns	F	209.1	F	344.1	F	557.4
Eastbound left turn	F	112.4	F	172.0	F	327.0
Eastbound right turn	C	24.7	D	28.7	E	37.0
Main (stop sign)						
Northbound left turn	A	8.8	A	9.0	A	9.3
Southbound left and right turns	A	8.4	A	8.6	A	8.7
Westbound left and right turns	D	26.7	D	34.6	E	45.1
Eastbound left and right turns	E	40.1	F	54.3	F	87.0
Mission (stop sign)						
Northbound left turn	B	11.5	B	12.1	B	12.8
Dock (signal sign)	A	5.1	A	5.2	A	5.4
Schoenbar (stop sign)						
Eastbound left turn	C	18.5	C	20.2	C	21.4
Westbound left turn	B	11.0	B	11.4	B	11.5
Northbound left and right turns	F	**	F	**	F	**
Southbound left turn	F	**	F	**	F	**
Southbound right turn	F	169.2	F	224.8	F	249.1
Washington (signal)	A	9.4	B	10.3	B	11.1
Jefferson (signal)	B	16.8	B	18.2	B	18.5
Third (stop sign)						
Eastbound left turn	B	13.7	B	14.8	B	14.3
Southbound left turn	F	261.5	F	401.7	F	330.7
Southbound right turn	C	15.3	C	16.5	C	15.9

Intersection with Tongass Avenue (existing type of control)	Alternatives					
	No Action Alternative		Bridge Alternatives			
			C3-4		F3	
	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)
Carlanna (signal)	E	57.3	E	68.7	E	68.7
Bryant (stop sign)						
Eastbound left turn	A	10.0	B	10.5	B	10.2
Southbound left turn	F	168.5	F	326.9	F	305.2
Southbound right turn	C	17.5	C	20.4	C	18.4
Airport Ferry Access Point (stop sign)						
Westbound left turn	B	10.8	—	—	—	—
Northbound left and right turns	F	91.6	—	—	—	—
Alternative C3-4 Access (Tongass Avenue at Signal Road)						
Eastbound left turn	—	—	B	10.6	—	—
Southbound left turn	—	—	F	986.0	—	—
Alternative F3 Access						
Westbound left turn	—	—	—	—	A	9.9
Northbound left turn	—	—	—	—	A	321.2

** Delay greater than 1,000 seconds per vehicle.
— Intersection does not exist in this alternative.

Table 4-29: Level of Service at Project Area Intersections—Ferry Alternatives (Projections for 2025)

Intersection with Tongass Avenue (type of control)	Ferry Alternative							
	G2		*G3*		*G4*		*G4v*	
	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)
Jefferson Street (signal)								
Alternative G3 Access	—	—	C	22.9	—	—	—	—
Existing Airport Ferry Access Point (stop sign)								
Westbound left turn	B	10.6	B	10.3	B	10.9	B	10.8
Northbound left and right turns	D	26.1	E	38.5	F	125.9	F	91.6
Alternative G2 Access (stop sign)								
Westbound left turn	B	10.3	—	—	—	—	—	—
Northbound left and right turns	D	29.5	—	—	—	—	—	—

— Intersection does not exist in this alternative.

4.26.4.3.1 No Action Alternative

Traffic projections show that, under the No Action Alternative, the LOS would decrease from existing acceptable levels to unacceptable levels (i.e., E or F), resulting in corresponding traffic congestion and vehicle delays, for one or more turning movements at the following seven project area intersections:

- Deermount Street and Stedman Street/Tongass Avenue

- Bawden Street and Front Street/Tongass Avenue
- Main Street and Front Street/Tongass Avenue
- Schoenbar Road and Tongass Avenue
- Carlanna Lake Road and Tongass Avenue
- Bryant Street and Tongass Avenue
- Airport ferry access point and Tongass Avenue

These intersections would require traffic signal operation to attain acceptable traffic conditions in the future, regardless of the project. With the exception of the Third Avenue southbound left turn movement, traffic at the remaining five intersections included in the analysis would not be affected by future (2025) traffic conditions because the length of delay would not increase by more than a few seconds and the intersections would continue to operate at LOS C or better. The Third Avenue southbound left turn movement would continue to operate at LOS F, and the delay would increase from 65 seconds (existing, see Table 3-17) to approximately 262 seconds (2025).[306]

4.26.4.3.2 Bridge Alternative C3-4

With Alternative C3-4, the intersection of North Tongass Highway and Signal Road would operate at unacceptable levels (i.e., LOS F) for turning movements from Signal Road onto Tongass Avenue. Vehicle travel between the bridge and Tongass Avenue would be adversely affected by long delays at that intersection. Most traffic from the bridge to Tongass Avenue likely would use the signalized Don King Road/Tongass Avenue intersection. The timing of this signal could be adjusted to accommodate hours of peak traffic flow to ensure acceptable LOS.

The LOS at the intersections of Tongass Avenue with Deermount Street, Bawden Street, Main Street, Washington Street, and Bryant Street would be adversely affected for certain turning motions by 2025.

Mitigation

DOT&PF would closely monitor the intersections of Tongass Avenue with Deermount Street, Bawden Street, Main Street, Washington Street, and Bryant Street, and a corrective action (e.g., installation of traffic signals) would be taken to avoid any LOS reduction.

4.26.4.3.3 Bridge Alternative F3

The intersection of Alternative F3 with South Tongass Highway would operate at unacceptable levels (i.e., LOS F). Long delays would adversely affect vehicle travel between the F3 alignment and South Tongass Highway.

A traffic signal would be installed at the Alternative F3 access to South Tongass Highway to reduce traffic congestion and vehicle delays, and to restore operating conditions to acceptable levels of service. Pedestrian signals would be included as part of the signal installation. The traffic signal itself would cause some off-peak traffic delays. However, if no signal were installed, the additional peak hour traffic expected by 2025 would delay traffic even more and exacerbate LOS problems.

The LOS for certain turning motions at the intersections of Tongass Avenue with Bawden Street, Main Street, Washington Street, and Bryant Street would be adversely affected by 2025.

[306] The amount of delay is exaggerated; however, due to an anomaly in the analysis methodology that allows a single left turn to disproportionately affect delay. The projected number of left turns is limited to one for all analysis cases. As such, improvements were not investigated at this location.

Alternative F3 would affect traffic entering and exiting the USCG Station because most Alternative F3 traffic would have to pass the entrance to the station. Vehicles entering and exiting the USCG Station would likely experience delays during the peak hours.

Mitigation

DOT&PF would closely monitor the intersections of Tongass Avenue with Bawden Street, Main Street, Washington Street, and Bryant Street and a corrective action (e.g., installation of traffic signals) would be taken to avoid any reduction in LOS.

4.26.4.3.4 Ferry Alternative G2

Under Alternative G2, LOS at project area intersections would be no worse than under the No Action Alternative. Both the existing airport ferry access point and the Peninsula Point ferry access point would operate at LOS D. Background traffic levels resulting in unacceptable LOS at the intersections of Tongass Avenue with Deermount Street, Bawden Street, Main Street, Schoenbar Road, Carlanna Lake Road, and Bryant Street would not be affected by Alternative G2. The new ferry terminal at Peninsula Point would reduce traffic at the existing airport ferry access point, and improve the LOS to D as compared with the background LOS of F. This alternative would therefore have a slight beneficial effect on traffic.

4.26.4.3.5 Ferry Alternative G3

Under Alternative G3, LOS at project area intersections would be no worse than under the No Action Alternative. Turning movements onto Tongass Avenue from the existing airport ferry access point would experience delay at LOS E, which would be an improvement compared with the background level (F), but would still be unacceptable. The new ferry access point at Jefferson Street would operate at LOS C. Background traffic levels resulting in unacceptable LOS at the intersections of Tongass Avenue with Deermount Street, Bawden Street, Main Street, Schoenbar Road, Carlanna Lake Road, and Bryant Street would not be affected by Alternative G3.

Mitigation

DOT&PF would closely monitor the intersection of Tongass Avenue with the existing airport ferry access point and take corrective action (e.g., installation of traffic signals, pedestrian signals) should LOS become unacceptable.

4.26.4.3.6 Ferry Alternatives G4 and G4v

Under Alternatives G4 and G4v, LOS at project area intersections would be no worse than under the No Action Alternative. Turning movements onto Tongass Avenue from the existing airport ferry access point would experience delay at LOS F, the same LOS anticipated for future background levels. The LOS at this intersection would be unacceptable. Alternatives G4 and G4v would not affect background traffic levels resulting in unacceptable LOS at the intersections of Tongass Avenue with Deermount Street, Bawden Street, Main Street, Schoenbar Road, Carlanna Lake Road, and Bryant Street.

Mitigation

DOT&PF would closely monitor the intersection of Tongass Avenue with the existing airport ferry access point and take corrective action (e.g., installation of traffic signals, pedestrian signals) should LOS become unacceptable.

4.26.5 Pedestrians and Bicyclists

4.26.5.1 No Action Alternative

Based on the LOS traffic analysis for the 12 study area intersections described in Section 4.26.4.3, seven project area intersections would have acceptable traffic conditions in the future. These intersections are:

- Deermount Street and Stedman Street/Tongass Avenue
- Bawden Street and Front Street/Tongass Avenue
- Main Street and Front Street/Tongass Avenue
- Schoenbar Road and Tongass Avenue
- Carlanna Lake Road and Tongass Avenue
- Bryant Street and Tongass Avenue
- Existing ferry terminal and Tongass Avenue

Under future conditions, with no new traffic control measures, pedestrian and bicyclist safety would be compromised. If new signals were added to these intersections, they would likely include pedestrian phasing to improve pedestrian and bicyclist safety.

4.26.5.2 Bridge Alternative C3-4

Improvements or changes to the signal at the Don King Road/Tongass Avenue intersection would include accommodations for pedestrians and bicycles, including pedestrian signals and cross walks. Pedestrian and bicycle safety would be maintained.

4.26.5.3 Bridge Alternative F3

Based on the projected traffic levels, the new intersection formed by the bridge intersection with Tongass Avenue would require traffic signal operation to achieve acceptable conditions. In addition to the other intersections requiring traffic signals for the No Action Alternative, the new intersection would be equipped with pedestrian signals, providing another safe crossing of Tongass Avenue for pedestrians and bicyclists. Pedestrian and bicycle safety would be maintained.

4.26.5.4 Ferry Alternatives G2 and G3

The new intersection formed by the intersection of the new ferry terminal access point with Tongass Avenue would operate at acceptable levels under projected traffic conditions; therefore, no new traffic signal on Tongass Avenue would be required. There would be no pedestrian signals and no additional safe crossing of Tongass Avenue for pedestrians and bicyclists. Pedestrian and bicycle turning movements may conflict with vehicles, creating a safety concern near the new ferry terminals.

4.26.5.5 Ferry Alternatives G4 and G4v

The existing intersection formed by the ferry terminal access point with Tongass Avenue would operate at unacceptable levels under projected traffic conditions, and could require a new traffic signal on Tongass Avenue to reduce pedestrian and bicyclist impacts. A new traffic signal at this intersection would be expected to include pedestrian phasing, which would increase pedestrian and bicyclist safety over existing conditions with no traffic signals.

4.26.6 Air Quality Impacts

Increased vehicle traffic associated with the projected development would increase emissions of air pollutants of concern that includes carbon monoxide, PM_{10}, and $PM_{2.5.}$; however, because the project area has always been in attainment with respect to the NAAQS and because the projections for increased traffic volumes associated with the Gravina Access Project alternatives would be fewer than 3,000 vehicles per hour, no air quality conformity analysis or detailed modeling is required.

Based on the air quality analysis presented in the 2004 FEIS, the PM_{10} and $PM_{2.5}$ concentrations associated with projected 2025 traffic levels would each be less than half of both the NAAQS 24-hour and annual averages. Traffic volumes projected in the 2004 FEIS are greater than the updated traffic volumes presented in this SEIS (see Table 4-27). Consequently, PM_{10} and $PM_{2.5}$ concentrations would be lower than calculated in the 2004 FEIS. In addition, paved roads generally contribute to only a small fraction of the total particulate matter concentration at any location (the majority is anticipated to be caused by other sources such as fuel combustion and sea salt in this coastal region), and an increase in traffic on paved roads would not mean a proportionate increase in PM_{10} and $PM_{2.5}$ concentrations. Therefore, none of the project alternatives would cause or contribute to violations of the NAAQS for PM_{10} and $PM_{2.5}$.

Based on a comparison to air quality in Juneau, Alaska, the traffic projections associated with the project alternatives would not exceed NAAQS for carbon monoxide in the Ketchikan area. With continued improvement in automobile engineering to reduce carbon monoxide emissions, carbon monoxide concentrations per vehicle likely would continue to decline. Traffic projections associated with the Gravina Access Project would not substantially affect ambient concentrations of carbon monoxide.

4.26.7 Noise 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. Existing and future noise levels were modeled using the FHWA Traffic Noise Model (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).

Future (2025) noise levels were modeled at the 122 receptors (noise prediction sites) within the study area (see Figure 3.15). Modeled future noise levels at noise prediction sites described in the sections below.[307]

4.26.7.1 No Action Alternative

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 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. Compared with existing conditions, this represents impacts at 4 additional residential and 6 additional commercial properties. See Table 4-30.

Table 4-30: Properties that Would Experience Noise Impacts under the No Action Alternative

Land Use/ Category	Number of Receptors	Total Number of Properties	Noise Abatement Criteria (dBA)	Number of Properties With Noise Levels Equal to or in Exceedance of the NAC, or Having Substantial Increase in Noise	
				Existing Condition	Future (2025) with No Action Alternative
Residential/B	69	164	66	35	39
Commercial/E	46	72	71	4	10
Church/B	1	2	66	0	0
Motel/B	1	1	66	0	0
Airport/F	2	2	-	0	0
USCG/E, F	3	3	71	0	0

Source: Alaska Department of Transportation and Public Facilities, January 2013. *Gravina Access Project Supplemental EIS Traffic Noise Memorandum*. Prepared by HDR Alaska, Inc.

4.26.7.2 Bridge Alternative C3-4

The TNM model was used to predict traffic noise levels at receptors potentially affected by traffic noise on the new road and bridge associated with Alternative C3-4 (Table 4-31). Under Alternative C3-4, increases in noise levels are predicted to range from 2 to 18 dBA over existing conditions; and 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.

There are 31 receptors associated with Alternative C3-4 representing 56 properties: 33 residences, 21 commercial properties, one motel, and the airport. Under Alternative C3-4, 22 residential properties, 10 commercial properties, and 1 airport property are predicted to

[307] Alaska Department of Transportation and Public Facilities, January 2013. *Gravina Access Project Supplemental EIS Traffic Noise Memorandum*. Prepared by HDR Alaska, Inc.

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 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. See Table 4-31.

Table 4-31: Properties that Would Experience Noise Impacts under Alternative C3-4

Land Use/ Category	Number of Receptors	Total Number of Properties	Noise Abatement Criteria (dBA)	Number of Properties With Noise Levels Equal to or in Exceedance of the NAC, or Having Substantial Increase in Noise	
				No Action Alternative	Alternative C3-4
Residential/B	17	33	66	10	22
Commercial/E	12	21	71	9	10
Motel/B	1	1	66	0	0
Airport/F	1	1	-	0	1

Source: Alaska Department of Transportation and Public Facilities, January 2013. *Gravina Access Project Supplemental EIS Traffic Noise Memorandum*. Prepared by HDR Alaska, Inc.

4.26.7.3 Bridge Alternative F3

The TNM model was used to predict traffic noise levels at receptors potentially affected by traffic noise on the new road and bridge associated with Alternative F3. 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. Changes in noise levels are due to changes in travel pattern, new roadway alignment, changes in shielding, and decibel rounding.

There are 24 receptors associated with Alternative F3 representing 55 properties: 51 residences, 1 commercial property, and 3 USCG properties. Under Alternative F3, 6 residential properties are predicted to experience noise levels greater than or equal to the DOT&PF NAC. No substantial noise increases are predicted under this alternative. See Table 4-32.

Table 4-32: Properties that Would Experience Noise Impacts under Alternative F3

Land Use/ Category	Number of Receptors	Total Number of Properties	Noise Abatement Criteria (dBA)	Number of Properties With Noise Levels Equal to or in Exceedance of the NAC, or Having Substantial Increase in Noise	
				No Action Alternative	Alternative F3
Residential/B	20	51	66	3	6
Commercial/E	1	1	71	0	0
USCG/E, F	3	3	66	0	0

Source: Alaska Department of Transportation and Public Facilities, January 2013. *Gravina Access Project Supplemental EIS Traffic Noise Memorandum*. Prepared by HDR Alaska, Inc.

4.26.7.4 Ferry Alternative G2

The TNM model was used to predict ferry and traffic noise levels at receptors potentially affected by traffic noise in the vicinity of the new ferry terminal on Revillagigedo Island

associated with Alternative G2. Noise levels under Alternative G2 are predicted to increase by 1 to 6 dBA over existing conditions; and 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 travel pattern, additional ferry noise, and decibel rounding.

There are 23 receptors associated with Alternative G2 representing 51 properties: 40 residential and 11 commercial properties. Under Alternative G2, 22 residential 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 commercial properties would experience noise impacts. No substantial noise increase impacts are predicted as a result of Alternative G2.

4.26.7.5 Ferry Alternative G3

The TNM model was used to predict ferry and traffic noise levels at receptors potentially affected by traffic noise in the vicinity of the new ferry terminal on Revillagigedo Island associated with Alternative G3. Under Alternative G3, increases in noise levels are predicted to range from 2 to 20 dBA over existing conditions; and 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 travel pattern, additional ferry noise, and decibel rounding.

There are 28 receptors associated with Alternative G3, representing 55 properties: 28 residences, 25 commercial properties, and 2 churches. Under Alternative G3, 7 residential properties 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 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. See Table 4-33.

Table 4-33: Properties that Would Experience Noise Impacts under Alternative G3

Land Use/ Category	Number of Receptors	Total Number of Properties	Noise Abatement Criteria (dBA)	Number of Properties With Noise Levels Equal to or in Exceedance of the NAC, or Having Substantial Increase in Noise	
				No Action Alternative	Alternative G3
Residential/B	11	28	66	6	7
Commercial/E	16	25	71	0	1
Church/B	1	2	66	0	0

Source: Alaska Department of Transportation and Public Facilities, January 2013. *Gravina Access Project Supplemental EIS Traffic Noise Memorandum*. Prepared by HDR Alaska, Inc.

4.26.7.6 Ferry Alternatives G4 and G4v

The TNM model was used to predict ferry and traffic noise levels at receptors potentially affected by traffic noise in the vicinity of the new and existing ferry terminals on Revillagigedo Island associated with Alternative G4. Under Alternative G4, 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.

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

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

4.26.7.7 Mitigation of Noise Impacts

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. DOT&PF policy is that abatement measures 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. Reasonableness is based on a number of factors, not just one criterion. FHWA noise regulations and DOT&PF policy define three mandatory reasonableness factors that must be evaluated for a noise abatement measure to be considered reasonable:

1. Viewpoints of the property owners and residents that benefit from noise abatement measures. At least 60 percent of benefited households and property owners surveyed must want the noise abatement measure.
2. 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.
3. Noise Reduction Design Goal. Fifty percent or more of the benefitted receptors in the first row of structures must achieve noise reduction by a minimum of 7 dBA for the noise abatement to be considered reasonable.

The following reasonableness factors are also used by DOT&PF to evaluate mitigation on state-funded projects:

1. Development vs. Highway Timing. More consideration is given to developments that were built before the highway was built.
2. Development Existence. More consideration is given to residents who have experienced traffic noise impacts for long periods of time.
3. Absolute Predicted Build Noise Level. More consideration should be given to areas with higher absolute traffic noise levels.
4. Relative Predicted Build Noise Level. More consideration is given to areas with larger increases (at least 10 dBA) over existing noise levels.

5. Action vs. No Action Noise Levels. More consideration is given to areas where larger changes in traffic noise levels (at least 5 dBA increase) 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.

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

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.

4.26.7.7.1 Bridge Alternative C3-4

Under Alternative C3-4, noise barriers were considered for the 22 residential and 10 commercial properties where noise levels would substantially increase or meet or exceed the NAC.

For six of the residences, barriers would not be effective at mitigating highway noise because of the need to maintain direct access onto North Tongass Highway (i.e., the wall would require breaks to allow access to the properties). For four of the residential properties, a barrier would not be effective at mitigating highway noise because of a combination of direct access points onto North Tongass Highway and the elevation of the residences relative to the highway. 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. Very large walls often have constructability issues and are not cost effective.

For the 12 residences at Pioneer Heights Senior Housing, a barrier would not be able to provide the minimum noise reduction at these properties and comply with the cost-effectiveness criterion. A barrier was not effective in this location because the residences 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 the affected commercial properties, a combination of direct access points and proximity to the roadway precludes effective siting of a noise barrier for these commercial properties.

Based on this analysis, noise mitigation is not recommended under Alternative C3-4.

4.26.7.7.2 Bridge Alternative F3

Under Alternative F3, noise barriers were considered for the six residential properties where noise levels would be equal to or exceed the NAC.

For three of the residences, a barrier would not be able to provide the minimum noise reduction at these properties and comply with the 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 would require breaks to allow access to the properties), and because the residences represented are elevated approximately 20 feet above the roadway.

A barrier for the other three residences would not provide the minimum noise reduction at these properties comply with the cost-effectiveness criterion. A barrier would not be effective in this location because the residences 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.

Based on this analysis, noise mitigation is not recommended under Alternative F3.

4.26.7.7.3 Ferry Alternative G2

Under Alternative G2, 22 residential properties are predicted to experience noise levels equal to or above the DOT&PF NAC. In all cases, barriers would not be effective at mitigating highway noise because of the need to maintain direct access onto North Tongass Highway (i.e., the wall would require 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.

Based on this analysis, noise mitigation is not recommended under Alternative G2.

4.26.7.7.4 Ferry Alternative G3

Noise barriers were considered for the seven residential properties and one commercial property predicted to experience either noise levels equal to or above the DOT&PF NAC, or substantial increases over existing noise levels under Alternative G3. A barrier to mitigate highway noise at four of the properties would not be effective because of the need to maintain direct access onto Tongass Highway (i.e., the wall would require breaks to allow access to the properties). Barriers for another two residential properties 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 the two properties that are predicted to experience substantial increases over existing noise levels 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.

Based on this analysis, noise mitigation is not recommended under Alternative G3.

4.26.8 Water Quality Impacts

The secondary effects of project-induced development on water quality in both fresh water and marine environments would be primarily caused by land-clearing activities that would increase the potential for surface water runoff and erosion, which could lead to increased sedimentation in streams and nearshore areas, as well as increased water turbidity (cloudiness). Runoff also would increase as a result of the increase in impervious area associated with new structures and the access roads extended from main roads to the new development. Increased human activity on Gravina Island could increase the potential for pollutants (e.g., trash, petroleum products from cars, and household and industrial wastes) to enter streams on Gravina Island. Industrial development along the Gravina Island shoreline would introduce a greater risk of pollutant releases to the marine environment than currently exists.

4.26.8.1 No Action Alternative and Alternative G4v

The No Action Alternative and Alternative G4v could have adverse effects on water quality in the North Gravina and Clam Cove areas from residential development, which could occur adjacent to wetlands, small streams, and the marine environment of Tongass Narrows. Because

development in these areas would be limited (e.g., 13 acres total) and would not involve the creation of extensive impervious surfaces, the impacts would be minor. Water-based industrial facilities in the North Gravina or Conceptual South Gravina Fisheries industrial parks could have an adverse effect on water quality in those areas of Tongass Narrows. Industrial use in the Central Gravina and Airport Reserve area could adversely affect the nearshore marine environment as a result of potential accidental industrial releases and an increase in impervious area, which would result in increased runoff.

4.26.8.2 Bridge Alternative C3-4 and Ferry Alternatives G2, G3, and G4

Under Alternatives C3-4, G2, G3, and G4, adverse effects on water quality would occur on Gravina Island in the North Gravina and Clam Cove areas from potential residential development adjacent to wetlands, small streams, and the marine environment of Tongass Narrows. Industrial use in Central Gravina and the Airport Reserve area could adversely affect water quality in the nearshore marine environment as a result of potential accidental industrial releases and an increase in impervious area, which would result in increased runoff. Water-based industrial facilities in the North Gravina or Conceptual South Gravina Fisheries industrial parks could have an adverse effect on water quality in those areas of Tongass Narrows.

4.26.8.3 Bridge Alternative F3

Alternative F3 would adversely affect water quality due to residential development on Pennock Island and on Gravina Island in the North Gravina, Clam Cove, and Blank Inlet areas. Residential development in these areas could occur adjacent to wetlands, small streams, and the marine environment of Tongass Narrows. Human activity in these areas could adversely affect water quality. Industrial development and use in the Central Gravina and Airport Reserve area could have an adverse effect on water quality in the nearshore marine environment as a result of potential accidental industrial releases and an increase in impervious area, which would result in increased runoff. Water-based industrial facilities in the Conceptual South Gravina Fisheries and North Gravina industrial parks and development in the Clam Cove and Blank Inlet Area (i.e., Conceptual Clam Cove Community Development) could have an adverse effect on water quality in local areas of Tongass Narrows.

4.26.9 Wetland and Vegetation Impacts

Development in the Ketchikan area would inevitably result in loss of wetlands because so much of the developable land is wet. As wetlands were cleared and filled to provide foundations for roads, homes, and businesses, the functions of the wetlands would be permanently lost. These functions include:

- Maintaining natural hydrologic regimes and moderating stream flows
- Producing plant material that supports onsite and offsite ecosystems
- Providing wildlife habitat and travel corridors
- Supporting fish habitat by providing stream cover and structure and food sources
- Providing subsistence and recreational areas for humans

In addition to function loss from clearing and filling, wetlands adjacent to development are affected by increased and polluted runoff, by channelized runoff, and by the human activity. Runoff from roads, yards, and gardens likely would carry with it nutrients (e.g., phosphorous and nitrogen) and sediments that alter the types of plants and animals that occupy the wetlands. Impervious surfaces created by building pads and roads would result in increased runoff, which may alter the remaining hydrologic regimes of adjacent wetlands and streams and cause

erosion. Human and pet activity would degrade the quality of habitat on adjacent lands and displace sensitive animals.

Development entails vegetation removal in uplands as well as wetlands, which results in a loss of wildlife habitat and increased runoff and potential for erosion.

The discussion below for each alternative provides a projected acreage of secondary impact to wetlands on each island. The context for these impacts, based on the NWI mapping of wetlands, includes approximately 10,000 acres of wetlands on the portion of Gravina Island that drains to Tongass Narrows and just under 1,000 acres of wetlands on Pennock Island.

4.26.9.1 No Action Alternative and Alternative G4v

The No Action Alternative would have adverse effects on wetlands on Gravina Island in the North Gravina, Central Gravina and Airport Reserve, and Clam Cove areas from industrial and residential development; almost all lands that would be developed are wetlands. Development in these areas would be relatively limited in extent (16 acres total; see Table 4-23 at the beginning of Section 4.26, Indirect Impacts), so the effects would not likely be substantial.

4.26.9.2 Bridge Alternative C3-4

Under Alternative C3-4, wetlands would be replaced by human developments on Gravina Island: in the North Gravina and Clam Cove and Blank Inlet areas by residential development, and in the Central Gravina and Airport Reserve area by industrial and commercial development. Most of the 331 acres of anticipated development (see Table 4-23) would occur in wetlands because relatively little upland exists in those areas. The adverse effects of the wetland loss and increase of human activity within wetlands are as described at the beginning of this section.

4.26.9.3 Bridge Alternative F3

Under Alternative F3, adverse effects on wetlands would occur on Pennock Island and on Gravina Island in the North Gravina, Clam Cove, and Blank Inlet areas from residential development. Almost all of the expected development—331 acres on Gravina Island and 12 acres on Pennock Island (see Table 4-23)—would occur in wetlands because those areas lack sufficient uplands to support development. The adverse effects of the wetland loss and increase of human activity within wetlands are as described at the beginning of this section.

4.26.9.4 Ferry Alternatives G2, G3, and G4

Under these alternatives, adverse effects on wetlands are anticipated on Gravina Island in the North Gravina and Clam Cove areas from residential development and in the Central Gravina and Airport Reserve area from industrial and commercial development. The 43 acres of anticipated development (see Table 4-23) would mostly occur in wetlands because those areas lack sufficient uplands to support development. The adverse effects of the wetland loss and increase of human activity within wetlands are as described at the beginning of this section.

4.26.10 Water Body Modification and Wildlife Impacts

4.26.10.1 Water Body Modification

Stream and wetland hydrology could be adversely affected by changes in the hydrologic regime as a result of increased sedimentation, increased impervious area, channelization, and soil compaction. The type, amount, and specific location of development relative to water bodies would dictate the magnitude of adverse indirect impacts on these resources.

4.26.10.1.1 No Action Alternative and Alternative G4v

Projected development associated with the No Action Alternative and Alternative G4v would be relatively limited (16 acres; see Table 4-23 at the beginning of Section 4.26, Indirect Impacts) and would not involve the creation of extensive impervious surfaces.

4.26.10.1.2 Bridge Alternative C3-4

Under Alternative C3-4, modifications of water bodies could occur on Gravina Island in the North Gravina, Central Gravina and Airport Reserve, and Clam Cove areas from residential development (306 acres) and from industrial/commercial/community use (25 acres; see Table 4-23).

4.26.10.1.3 Bridge Alternative F3

Under Alternative F3, modifications of water bodies could occur on Pennock Island from residential/community development (12 acres) and on Gravina Island in the North Gravina, Central Gravina, Airport Reserve, Clam Cove, and Blank Inlet areas from residential development (306 acres) and from industrial/commercial/ community use (25 acres; see Table 4-23).

4.26.10.1.4 Ferry Alternatives G2, G3, and G4

Under these alternatives, modifications of water bodies could occur on Gravina Island in the North Gravina, Vallenar Bay, and Central Gravina and Airport Reserve areas from residential development (40 acres) and from industrial/commercial/community use (3 acres; see Table 4-23).

4.26.10.2 Wildlife Impacts

Adverse indirect impacts on fish and wildlife would occur as a result of loss or disruption of habitat associated with development. Aquatic habitat would be adversely affected by in-water construction and development, and by activities that affect water quality. Increased human access might also increase risk of harassment of spawning salmon. Terrestrial species would be adversely affected by habitat losses associated with future development, as well as increased human activity and noise that would disturb wildlife. Increased wildlife losses on Gravina Island likely would result from improved access for hunters.

4.26.10.2.1 No Action Alternative and Alternative G4v

Adverse indirect impacts of the No Action Alternative and Alternative G4v on fish and wildlife habitat would be limited to small areas of development and human activity that are primarily accessible by gravel road. Animals displaced by human activity, especially larger animals, could relocate to nearby similar habitat with negligible loss of life.

4.26.10.2.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

The predominant habitat type potentially affected by development associated with the bridge and improved ferry alternatives would be wetlands, which could adversely affect animals that use wetlands for feeding and shelter. With commercial and industrial development of the shoreline, animal use of the area would be reduced further. Loss of habitat would lead to reduced populations of game and non-game species, and long-term wildlife loss resulting from reduced carrying capacity.

Hunters, trappers, fishermen, and other recreationists would have improved access that would affect wildlife resources on Gravina Island and, in the case of Alternative F3, on Pennock Island. Some animals would change their routes and foraging areas to avoid areas of increased human activity. Some animals, mainly bears and other scavengers, might be attracted to areas

frequented by humans if people were to leave garbage and other attractants behind. Increases in bear-human encounters would likely increase bear mortality.

The increase in human activity in the area could also lead to increased harvest or over harvest of certain species. Small populations, such as the wolf pack on Gravina Island, might be especially vulnerable to decline because of improved access for hunters who kill wolves and their prey, the deer. The Alaska Board of Game and ADF&G have the authority and responsibility to set hunting regulations to manage wildlife populations, and such increased hunting pressure would affect the management needs in this area.

Habitat fragmentation and barriers to wildlife movement would occur as a result of road construction and the associated development activities. Possible adverse impacts could include the isolation of smaller, less mobile species; loss of genetic integrity within species or populations; and a decrease in usable ranges.

Alternatives C3-4 and F3

The bridge alternatives could have adverse indirect impacts on fish and wildlife habitat on Gravina Island. The combination of residential and industrial development in the North Gravina, Central Gravina and Airport Reserve, and Clam Cove and Blank Inlet areas (i.e., as much as 306 acres residential/community and 25 acres industrial/commercial by 2033) would alter animal activity in those areas and potentially result in population declines due to increased harvest, habitat loss, and unwanted human encounters (e.g., vehicle collisions). There are also several EFH streams, including Airport Creek, Government Creek, and the unnamed creek in the Clam Cove watershed, that could be affected by development in those areas. The development areas identified in the *North Gravina Area Plan* are within high-density deer wintering habitat and important upland habitats identified by the Borough.[308]

Alternatives G2, G3, and G4

The ferry alternatives could have adverse indirect impacts to fish and wildlife habitat on Gravina Island. Development in the North Gravina Area could reduce the amount and quality of important upland habitat and high-density deer wintering habitat.[309] The development areas identified in the *North Gravina Area Plan* are within high-density deer wintering habitat and important upland habitats identified by the Borough. There are also several EFH streams north of the airport that could be affected by roadway, residential, and industrial development in that area. The combination of residential and industrial development under these alternatives (i.e., as much as 40 acres residential and 3 acres industrial by 2033) would alter animal activity in relatively small areas and would not likely result in population declines.

4.26.11 Floodplain Impacts

None of the project-induced development is expected to occur within stream floodplains. Other than waterfront facilities, most new development would likely be located above the 100-year flood elevation. No alteration to the hydraulic regime of floodplains is expected to occur as an indirect result of any of the project alternatives; therefore, no adverse impacts to floodplains would be expected.

[308] Ketchikan Gateway Borough Department of Planning and Community Development. December 2003. *Gravina Island Plan.* Final Public Review Draft.

[309] Ketchikan Gateway Borough Department of Planning and Community Development. December 2003. *Gravina Island Plan.* Final Public Review Draft.

4.26.12 Coastal Zone Impacts

Indirect impacts to resources described in other sections would occur within the coastal zone for the Borough and would be subject to review under the Borough's coastal management program. Reviews should ensure consistency with the coastal management plan, but this is outside the purview of this project.

4.26.13 Threatened or Endangered Species Impacts

4.26.13.1 No Action Alternative and Alternative G4v

No adverse indirect impacts on Steller sea lions and humpback whales would occur as a result of the No Action Alternative or Alternative G4v because most development and human activity would be within the range of existing conditions.

4.26.13.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

The action alternatives likely would not have adverse indirect impacts on Steller sea lions and humpback whales because most development and human activity induced by these alternatives would be limited to small areas on land, primarily accessible by gravel road. Increased disturbance from manmade noise, increased development and access along shorelines, and pollution carried in runoff from development on land are possible with or without the project. The limited amount of shoreside development projected under any of the alternatives likely would not have a material effect on sea lions or whales.

4.26.14 Historic and Archeological Preservation

Indirect impacts to cultural resources could result from development of residential, commercial, or industrial properties along the shorelines of Gravina and Pennock islands under the No Action Alternative or any of the action alternatives. There is no current or immediate plan to develop specific areas if one of the alternatives were built. Some development of properties along the Gravina Island and Pennock Island shorelines likely would occur regardless of the outcome of this project (i.e., under the No Action Alternative). To the extent that the alternatives improve accessibility to and development of shoreline areas, known and as-yet-undiscovered historic and archaeological sites could be affected. Additionally, improved public access to areas that have cultural resources could result in the destruction of these resources or their removal by visitors. The exact locations of possible secondary development are not known. In certain areas, not known at this time, it is possible that greater development could lead to better cataloging and preservation of cultural features than would otherwise occur under the No Action Alternative.

4.26.14.1 No Action Alternative and Alternative G4v

Under the No Action Alternative or Alternative G4v, development along the Tongass Narrows shoreline of Revillagigedo Island and Gravina Island in the North Gravina Area, the Central Gravina and Airport Reserve Area, and the Clam Cove and Blank Inlet Area could affect archaeological and historic resources in those areas, if construction occurred at or near cultural sites. Early homesteading occurred north of the airport and in the vicinity of Clam Cove, indicating a likelihood of historic sites in those areas. Because the amount of development on Gravina Island would be approximately 16 acres (see Table 4-23) and the access would be inconvenient, the potential effects on cultural resources would be relatively low.

4.26.14.2 Bridge Alternative C3-4

Development along the shorelines of Gravina Island in the North Gravina, Central Gravina and Airport Reserve, and Clam Cove and Blank Inlet areas could result in the physical destruction of cultural resources from induced construction activities and from increased access that generated increased human activity, if construction occurred at or near cultural sites. With about 331 acres of development projected by 2033 (see Table 4-23 at the beginning of Section 4.26, Indirect Impacts), the secondary impact potential is greater than under the No Action Alternative.

4.26.14.3 Bridge Alternative F3

Development along the shorelines of North Gravina, Central Gravina and Airport Reserve, and Clam Cove and Blank Inlet areas, as well as on Pennock Island, could result in the physical destruction of cultural resources from induced construction activities and from increased access that generated increased human activity, if they were to occur at or near cultural sites. With approximately 331 acres of development projected on Gravina Island and 12 acres on Pennock Island (see Table 4-23), the potential to affect cultural sites is greater than under the No Action Alternative. Pennock Island was used as a burial site for tribal communities on Revillagigedo and Annette islands in the late nineteenth and early twentieth centuries. Disturbance of these sites would be of concern to tribal communities and could affect their cultural practices.

Recorded resources on Pennock Island, and particularly the two historic cemeteries (KET-055 and KET-801), may be affected through disturbance resulting from improved access to the island. Recorded resources on Gravina Island may also be affected through disturbance resulting from improved access to the island.

4.26.14.4 Ferry Alternatives G2, G3, and G4

Development along the shoreline of Gravina Island in the North Gravina and Central Gravina and Airport Reserve areas, and in the Clam Cove and Blank Inlet area, could result in the physical destruction of cultural resources from construction activities and from increased access that generated increased human activity, if construction occurred at or near cultural sites. Because the amount of development projected is only 43 acres (see Table 4-23) and the convenience of access would not be as improved as much as it would be under a bridge alternative, the potential adverse impacts to cultural resources would be only slightly greater than with the No Action Alternative.

4.26.15 Visual Impacts

4.26.15.1 No Action Alternative and Alternative G4v

Development on Gravina Island is projected to occur on 16 acres of land (see Table 4-23 at the beginning of Section 4.26, Indirect Impacts), and this development would occur in areas that are not dominant in views from the populated areas of Revillagigedo Island (i.e., North Gravina, and Central Gravina and Airport Reserve areas). Therefore, minimal visual impact would be expected under the No Action Alternative.

4.26.15.2 Bridge Alternatives C3-4 and F3

Induced development on Gravina Island could affect views from Revillagigedo Island; however, most of the development (i.e., 306 acres of the 331 total acres; see Table 4-23) would be residential, small in scale, and in isolation or small clusters, which would not create a substantial change in the viewshed. Development in the North Gravina Areas would not be dominant in views from the populated areas of Revillagigedo Island. Clam Cove and the Central Gravina

and Airport Reserve areas are within the viewshed of populated areas of Revillagigedo Island. Small scale residential development in these areas would not likely create a visual impact.

Development on Pennock Island under Alternative F3 would be visible from downtown Ketchikan and Saxman because of the relative proximity of Pennock Island to these populated areas. Most of the development on Pennock Island would be residential and would occur along the shoreline. The predominantly natural viewsheds from downtown Ketchikan and Saxman would not be substantially altered.

4.26.15.3 Ferry Alternatives G2, G3, and G4

Induced development on Gravina Island is projected to occur on 43 acres under the ferry alternatives (see Table 4-23) and would occur in areas that are not dominant in views from the populated areas of Revillagigedo Island (i.e., the North Gravina and Central Gravina and Airport Reserve areas) or within the Clam Cove area, which can be viewed from Ketchikan. Most of the development (i.e., 40 acres) would be residential, small in scale, and in isolation or small clusters, which would not create a noticeable change in the viewshed. Industrial development (3 acres) would likely occur within the Central Gravina and Airport Reserve areas on land currently used for open space and forest land, but adjacent to existing industrial facilities. Therefore, no substantial visual impact is expected under the ferry alternatives.

4.26.16 Energy Impacts

Although all of the project alternatives would result in additional development in the Borough, and although this development would require more energy to operate, none of the additional energy need is expected to be beyond the current capacity of the Borough and other suppliers.

4.26.17 Utility Impacts

New development in outlying areas of Ketchikan could spur the extension of existing utility services to reach areas north and south of the existing service areas.

Future development on Gravina Island and, for Alternative F3, Pennock Island, would likely include provision of water, sewer, electric, and telephone facilities. The existing utility systems have adequate capacity to supply these utilities to development areas on Gravina and Pennock islands under any of the alternatives. Impacts to the utilities would be related primarily to the cost of construction and maintenance of new utility transmission line corridors.

4.26.17.1 No Action Alternative and Alternative G4v

It is unlikely that KPU would construct new water transmission lines and new water storage facilities on Gravina Island for the 16 acres of development expected to occur there under the No Action Alternative and Alternative G4v (see Table 4-23). Wastewater would likely be handled by “on-lot” disposal systems for low-density residential and industrial development, having no adverse effect on the utility system.

Electricity would likely be obtained by onsite generators, having no impact on the electrical utility system. Telephone connection for the new development would be unlikely.

4.26.17.2 Bridge Alternatives C3-4 and F3, and Ferry Alternatives G2, G3, and G4

With the anticipated development on Gravina Island under the action alternatives, new transmission lines may be needed to transport water to Gravina Island, and water storage facilities on the island would be needed to meet fire flow needs. These facilities would require additional land clearing, which could affect fish and wildlife habitat. The transmission line

corridors likely would follow roadway corridors where practicable to reduce the amount of construction in pristine habitat and reduce cost of construction. In areas where the water transmission corridor would not follow the roadway, the transmission corridor would be maintained in low vegetation coverage. This routing would not preclude animal use of the transmission corridor, but would alter the habitat type. It is unlikely that the 12 acres of development on Pennock Island under Alternative F3 (see Table 4-23) would warrant construction of water distribution lines. Pennock Island residents would likely continue to obtain water from cisterns on individual properties.

Although the existing wastewater treatment plant would have the capacity to treat wastewater from Gravina and Pennock islands under the action alternatives, it might be more cost-effective to establish "on-lot" disposal systems for low-density residential development and, for core area developments of commercial and/or industrial facilities, a small "package" wastewater treatment plant and outfall. Such systems constructed by city or borough governments are established within the requirements of the Clean Water Act to mitigate the potential adverse effects of discharge from the outfall.

The electrical system would have sufficient capacity to support the additional development on Gravina and Pennock islands under any of the action alternatives. Bridge designs would include provisions for attaching cables to the bridge(s). The ferry alternatives, however, would have no such provision and connection to the grid would likely be made through a submarine cable across Tongass Narrows. If a submarine cable were placed along the channel bottom, it would affect a very small area and its location could be selected to avoid sensitive resources. When development on Gravina Island reaches a level that makes development of an electrical connection reasonable, a new substation in Ketchikan and a new substation on Gravina Island would be required for proper distribution from the feeder cable. Substations could be mounted on 8-foot square cement pads adjacent to a roadway to minimize additional impact on environmental resources. New transmission lines on Gravina and Pennock islands would require additional clearing of wildlife habitat. The electric transmission line corridors would likely follow roadway corridors where practicable to reduce the amount of construction in pristine habitat. In areas where the transmission corridor would not follow the roadway, the transmission corridor would be maintained in low vegetation coverage, which would provide an alternate habitat type.

The connection to the existing telephone system on Revillagigedo Island from Gravina Island and Pennock Island would entail a new fiber optic cable across Tongass Narrows (likely a submarine cable) and a cable line system connecting to new areas of development. As in the case of other new utility lines, development of the telephone lines would likely entail additional clearing of wildlife habitat. Where practicable, the telephone line corridors would likely be co-located with electric transmission lines and likely would follow roadway corridors. In areas where the transmission corridor would not follow a road, the transmission corridor would be maintained in low vegetation coverage, which would provide an alternate habitat type. Placement of the submarine cable could have minor short-term impacts on marine habitat and water quality.

4.27 Cumulative Impacts

Cumulative effects are defined as effects to the environment resulting from the incremental effect of a proposed action when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

A cumulative effects analysis broadens the scope of analysis to include effects beyond those attributable solely to the implementation of the alternatives. The purpose of the cumulative effects analysis, as stated by the CEQ, "is to ensure that federal decisions consider the full range of consequences."[310] The process of analyzing cumulative effects, or impacts, requires consideration of cumulative effects issues in each of the traditional components of the EIS, including scoping, describing the affected environment, and determining environmental consequences. The incorporation of cumulative effects analysis also aids in the development of alternatives and appropriate mitigation measures.

The analysis of cumulative effects is centered on four key elements:

- Critical resources likely to experience cumulative effects
- Geographic (spatial) boundaries of the affected area
- Temporal (time frame) of the analysis
- Relevant past, present, and future actions that could affect the critical resources

The critical resources identified for the cumulative impact analysis are land use, the recreation and subsistence elements of the social environment, local economic conditions, transportation, air quality with respect to GHG emissions, water quality, wetlands, wildlife, historic and archeological resources, and visual resources.

The geographic boundaries for evaluating potential cumulative effects were identified for each critical resource based on the distribution of the resource relative to the area in which substantial cumulative effects could occur and beyond which the resource would not be substantially affected. For water quality, wetlands, wildlife, and historic and archeological resources, the geographic area comprises Gravina and Pennock islands. For water quality, the area also includes Tongass Narrows and East and West channels. For land use, the social environment, economics, transportation, and visual resources, the area is broader, encompassing the Borough and including the cities of Ketchikan and Saxman.

The temporal boundaries for determining cumulative impacts of the project were based on the rise in settlement and development in the area during the past 100 years and a planning horizon extending out to 2033. The gold rush of the early twentieth century spurred the rapid growth and development of Southeast Alaska, including Ketchikan. Growth in the timber industry in the area also contributed to development of Ketchikan. The relatively recent changes in the area due to development of natural resources help establish the temporal boundary of past actions. The future temporal boundary of 2033 is considered as a reasonable horizon for community planning, based upon the opening year of an action alternative in 2018.

Each resource potentially affected by the project was individually examined to identify all past, present, and future activities and factors affecting that resource.

Past Actions. For purposes of this analysis, past actions are:

- Logging
- Mining
- Hunting, fishing, and trapping
- Industrial, commercial, and residential development
- Ketchikan International Airport improvements: extension of the runway safety area
- Development of the Gravina Island Highway

[310] Council on Environmental Quality. 1997. *Considering Cumulative Effects Under the National Environmental Policy Act*. Washington, DC: Council on Environmental Quality. Available online at http://ceq.hss.doe.gov/publications/cumulative_effects.html.

Future Actions. Reasonably foreseeable future projects are:

- Additional parking facilities at the Ketchikan International Airport consistent with the master plan[311]
- Development of the North Gravina Road, a 1.3-mile extension of Seley Road, to serve residential parcels (potentially 30 units) in the North Gravina area
- Development of a 33.3-acre marine park on Gravina Island's West Channel shoreline, approximately 1.5 miles south of the Gravina Island Highway terminus
- Development of a new harbor in the City of Saxman, near the Totem Row Street/South Tongass Highway intersection
- Trail access to Black Sand Beach State Park, southwest of the airport, near Blank Inlet
- Development of a mill to process ore concentrate from Niblack mine located on Prince of Wales Island at the Seley Mill site and an associated Tailings Disposal Facility (TDF) on Gravina Island.
- Development of road improvements between Bostwick and Vallenar Bay.
- Timber sales on Gravina Island: two to three small/mid-size sales (500,000 board feet) and one to two larger sales (2 to 4 million board feet).

The future actions listed above have been identified by the Borough Planning Department and Alaska Department of Natural Resources as actions that are likely to occur, independent of the Gravina Access Project. Although it is possible that, in the case of Alternative F3, a road would be constructed on Pennock Island to provide a connection between the project roadway and homes on the island, the Borough has no plan for infrastructure on Pennock Island independent of the Gravina Access Project. Therefore, new road construction on Pennock Island is not considered a reasonably foreseeable future action in this cumulative impact analysis.

The cumulative impact assessment considered the direct and indirect (secondary) impacts of the Gravina Access Project alternatives, together with the impacts of past, present, and reasonably foreseeable future actions on the critical resources within the appropriate geographic and temporal boundaries.

4.27.1 Land Use Impacts

The Borough Department of Planning and Community Development has been reviewing the existing land uses and planning for future growth and development on Gravina Island. The Borough's goal is to assist the Ketchikan community in making decisions regarding future development of Gravina Island. This planning activity is being conducted in conjunction with the Gravina Access Project, as well as with the other reasonably foreseeable future projects. Including all of these projects in the planning process ensures consistency in land use goals and development trends. Because of this coordinated planning activity, the Gravina Access Project, considered with the reasonable foreseeable actions, would have no adverse cumulative effect on the land use plans, policies, and goals of the Borough.

On Gravina Island, the cumulative effects of past, present, proposed, and reasonably foreseeable future actions on land use would be the gradual change from undeveloped land to developed land along the eastern shorelines of the island, which would occur under the No Action Alternative and all of the action alternatives. With most of the land owned by the USFS and DNR, it is likely that most of the island would be maintained as undeveloped lands. The addition of parking facilities at the airport would be consistent with airport development and

[311] Ketchikan Gateway Borough Department of Planning and Community Development. November 2003. *Gravina Island Plan.*

the *Ketchikan International Airport Master Plan*. Therefore, the changes in overall land use on Gravina Island would be very limited.

On Pennock Island, there is no reasonably foreseeable action that would contribute to land use changes. If Alternative F3 were selected, the direct and indirect impacts of the Pennock Island crossing would not contribute to a greater cumulative effect because there are no other independent actions that would affect land use on the island.

4.27.2 Social Impacts

Two elements comprising the social environment would experience cumulative impacts as a result of the project alternatives: recreation and subsistence on Gravina and Pennock islands. These resources are identified as potentially experiencing cumulative impacts because they have been affected by past actions and would also be affected by reasonably foreseeable future actions. Recreational and subsistence uses of natural resources on Gravina Island currently rely on access to the shoreline by private boat, the airport ferry, or floatplane, and access to interior lands by the Gravina Island Highway and logging roads. Reasonably foreseeable actions that would affect recreation and subsistence use on Gravina Island are development of a marine park, road extensions, and a trail to Black Sand Beach State Park Future development of a marine park would encourage recreational use of the island, as would trail development to state park lands.

Recreational and subsistence uses of natural resources on Pennock Island are limited because access is possible only by private boat or floatplane and, once on the shoreline, access to the interior and most other areas of the island is limited to foot traffic. There are no reasonably foreseeable future actions on Pennock Island that would contribute to a cumulative effect on recreation or subsistence resources there.

4.27.2.1 Bridge Alternative C3-4

The cumulative effect of improved access to Gravina Island on recreation would be the attraction of more tourists and visitors to the area. Recreational drivers would have more convenient access the once-remote interior areas of Gravina Island. Development of a marine park and trails on Gravina Island, combined with bridge access to the island, would increase demand for access to these recreational resources and may spur development of more trails and recreational amenities.

While primitive recreational experiences would still be available on Gravina Island, more travelers to the island and the increase in human activity, combined with more recreational amenities, could deter those seeking a primitive experience.

With greater accessibility to Gravina Island, more residents would be using its subsistence resources, and competition for these resources would increase. Impacts on subsistence could also be compounded by logging roads, some of which have remained open after the timber harvest was complete. Increased use of the logging roads could be expected with improved access from Alternative C3-4, which would create an even greater impact on subsistence practices.

4.27.2.2 Bridge Alternative F3

Alternative F3 would have the same benefits and adverse impacts as those described for Alternative C3-4. Additionally, Alternative F3 could contribute to growth in recreational and subsistence uses of Pennock Island by improving access to the area. However, because there are no reasonably foreseeable future actions on Pennock Island independent of Alternative F3, the cumulative effects on recreation and subsistence resources there would be negligible.

4.27.2.3 Ferry Alternatives G2, G3, and G4

Without hard-link access (such as a bridge) to Gravina Island, the cumulative effect on recreational and subsistence uses of Gravina Island would be limited. With modest increases in visitors associated with improved ferry service, the cumulative effect of any of these alternatives with other actions would be greater use of recreational and subsistence resources compared to the No Action Alternative, but not as great an impact as with a bridge alternative.

4.27.2.4 Ferry Alternative G4v

Implementation of Alternative G4v would not change recreational or subsistence uses on Gravina Island and therefore would not contribute to a cumulative impact on these resources.

4.27.3 Economic Impacts

Ketchikan and the surrounding area has grown in population and economic activity since the late nineteenth century as a mining, fishing, timber, and tourist area, and before that, as a fishing area for Alaska Natives. The most pertinent past actions have been development of a timber and pulp industry and fishing industry around which the City of Ketchikan grew to be the fifth-largest city in Alaska in 2000. Tourism has boomed in Southeast Alaska in the past two decades, primarily with steadily expanding cruise ship activity. Growth of the tourism industry and the decline of the forest products industry have accounted for most of the changes in Ketchikan's economy in recent years.

Improvements to the road network on Gravina Island in recent years have not independently spurred growth on the island. The USFS Gravina Island timber sale is indefinitely on hold as a result of the 2001 Roadless Area Conservation Rule (36 CFR Part 294). As a result, the local timber industry is unlikely to change in the foreseeable future, providing a relatively small contribution to cumulative effects on the local economy. Development of an ore processing facility at the Seley Mill site would bring approximately 80 jobs to the community for a 10 to 15-year period, which would contribute to a positive cumulative effect on the economic activity in Ketchikan.[312]

The improved access of the action alternatives, combined with efforts to increase recreational opportunities on Gravina Island, would enhance the tourism economy. This cumulative effect would be greatest with a no-toll bridge alternative because the improved access would be more convenient, offering free access all year, around the clock. The toll associated with the ferry alternatives and the bridge alternatives with a toll would present a partial deterrent to access and recreational use.

4.27.4 Transportation Impacts

4.27.4.1 Aviation

No cumulative impacts on aviation are expected as a result of the Gravina Access Project. No other reasonably foreseeable action would affect aviation.

4.27.4.2 Marine Navigation

Development of a new harbor in Saxman would affect marine navigation by providing a new location for moorage in the East Channel. The harbor may draw more ship traffic to this section of Tongass Narrows. Alternative F3 is the only alternative under investigation in this SEIS that

[312] Memorandum of Understanding between the Ketchikan Gateway Borough and Niblack Project LLC regarding the Gravina Island Industrial Complex, signed August 8, 2012.

would affect marine navigation in the East Channel. The other action alternatives would allow marine navigation conditions in East Channel to persist with no cumulative effects, as under the No Action Alternative. Alternative F3 would reduce the number of large vessels (i.e., air draft greater than 60 feet) transiting East Channel. If the harbor and Alternative F3 were developed, the cumulative effect on marine navigation in East Channel would be smaller than in the No Action Alternative because Alternative F3 would eliminate a large portion of the marine traffic from East Channel, which would reduce potential conflict with boats entering and exiting the new harbor at Saxman.

Development of the ore processing facility at the Seley Mill site would result in more marine freight traffic in Tongass Narrow with shipments of materials to and from the facility. Workers accessing the mill site might choose private marine transportation (e.g., skiff) from Revillagigedo Island or use the new bridge (Alternative C3-4 or F3) or ferry (i.e., the new ferry under Alternative G2, G3, or G4, or existing airport ferry). Additional marine traffic for freight or personnel would contribute to a cumulative effect on marine traffic with the ferry alternatives, but would not create congestion or affect overall safety of marine navigation in Tongass Narrows.

The marine park on Gravina Island would add some marine traffic to West Channel, increasing congestions there. Under Alternative F3, the marine park would contribute to a cumulative effect on marine navigation.

No other reasonably foreseeable future actions would contribute to a cumulative effect on marine navigation.

4.27.4.3 Vehicles

4.27.4.3.1 No Action Alternative

The cumulative impacts associated with the No Action Alternative relate to the inconvenience associated with continued reliance on the airport ferry for access to the airport and other lands on Gravina Island, which would limit the amount of development on Gravina Island. Traffic to Gravina Island generated by the No Action Alternative may not be enough to warrant construction of additional parking facilities at the airport, as identified in the *Ketchikan International Airport Master Plan*.[313]

4.27.4.3.2 All Action Alternatives

None of the reasonably foreseeable future actions would impact vehicle transportation such that the actions would contribute to a cumulative impact on traffic or roadways with any of the actions alternatives. Demand for parking at the airport might increase with a bridge alternative, resulting in development of such facilities sooner than under other alternatives, but no other cumulative impacts on vehicle transportation would be expected. Development of the ore processing facility would result in higher use of the roads on Gravina Island and access provided by either a bridge or ferry. The additional traffic would be within the range of anticipated future traffic levels and is therefore not anticipated to result in an adverse cumulative effect.

4.27.5 Pedestrian and Bicyclist Impacts

There would be no cumulative effects on pedestrians and bicyclists as a result of the No Action Alternative. With a greater network of roads on Gravina Island and improved access to Gravina

[313] Ketchikan Gateway Borough Department of Planning and Community Development. December 2003. *Gravina Island Plan.* Final Public Review Draft.

Island under an action alternative, pedestrians and bicyclists would have more opportunities to walk and ride.

4.27.6 Air Quality Impacts: Climate Change

4.27.6.1 Cumulative Effects from GHG Emissions

Under NEPA, detailed environmental analysis should be focused on issues that are significant and meaningful to decision-making. FHWA has concluded, based on the nature of GHG emissions and the exceedingly small potential GHG impacts of the reasonable alternatives, as discussed below and shown in Table 4-34, that the GHG emissions from the reasonable alternatives would not result in "reasonably foreseeable significant adverse impacts on the human environment" (40 CFR 1502.22(b)). The GHG emissions from the action alternatives would be insignificant, and would not play a meaningful role in a determination of the environmentally preferable alternative or the selection of the preferred alternative. More detailed information on GHG emissions "is not essential to a reasoned choice among reasonable alternatives" (40 CFR 1502.22(a)) or to making a decision in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no alternatives-level GHG analysis has been performed for this project.

The context in which the emissions from the proposed project would occur, together with the expected GHG emissions contribution from the project, illustrate why the project's GHG emissions would not be significant and would not be a substantial factor in the decision-making. The transportation sector is the second largest source of total GHG emissions in the U.S., behind electricity generation. The transportation sector was responsible for approximately 27 percent of all anthropogenic (human caused) GHG emissions in the U.S. in 2010. The majority of transportation GHG emissions are the result of fossil fuel combustion. Carbon dioxide makes up the largest component of these GHG emissions. U.S. carbon dioxide emissions from energy sources accounted for about 18 percent of worldwide energy consumption carbon dioxide emissions in 2010. U.S. transportation carbon dioxide emissions accounted for about 6 percent of worldwide carbon dioxide emissions.

While the contribution of GHGs from transportation in the U.S. as a whole is a large component of U.S. GHG emissions, as the scale of analysis is reduced the GHG contributions become quite small. Using carbon dioxide because of its predominant role in GHG emissions, Table 4-34 below presents the relationship between current and projected Alaska roadway-derived carbon dioxide emissions and total global carbon dioxide emissions, as well as information on the scale of the project relative to statewide travel activity.

Based on emissions estimates from EPA's Motor Vehicle Emissions Simulator (MOVES) model, and global carbon dioxide estimates and projections from the Energy Information Administration, carbon dioxide emissions from motor vehicles in the entire State of Alaska contributed less than one hundredth of one percent of global emissions in 2010 (0.0095 percent). These emissions are projected to contribute an even smaller fraction (0.0072 percent) in 2040. Vehicle miles traveled (VMT) in the project study area represents 2.10 percent of total Alaska travel activity; and the project itself would increase statewide VMT by 0.39 percent. (Note that the project study area includes travel on other roadways in Kethcikan in addition to the proposed project.) As a result, based on the build alternative with the highest VMT, FHWA estimates that the proposed project could result in a potential increase in global carbon dioxide emissions in 2040 of 0.000022 percent (less than one thousandth of one percent), and a corresponding increase in Alaska's share of global emissions in 2040 of 0.3 percent. This very

small change in global emissions is well within the range of uncertainty associated with future emissions estimates.

Table 4-34: Statewide and Project Emissions Potential, Relative to Global Trends

	Global carbon dioxide emissions, MMT[a]	Alaska motor vehicle Carbon dioxide emissions, MMT[b]	Alaska motor vehicle emissions, Percent of global total	Project study area VMT, Percent of statewide VMT	Percent change in statewide VMT due to project
Current Conditions (2010)	29,670	2.81	0.0095%	2.10	(None)
Future Projection (2040)	45,500	3.25	0.0072%	2.49	0.39

MMT = million metric tons. Global emissions estimates are from International Energy Outlook 2010, data for Figure 104, projected to 2040. Alaska emissions and statewide VMT estimates are from MOVES2010b.

[a] These estimates are from the EIA's *International Energy Outlook 2010*, and are considered the best-available projections of emissions from fossil fuel combustion. These totals do not include other sources of emissions, such as cement production, deforestation, or natural sources; however, reliable future projections for these emissions sources are not available.

[b] MOVES projections suggest that Alaska motor vehicle CO_2 emissions may increase by 15.9% between 2010 and 2040; more stringent fuel economy/GHG emissions standards will not be sufficient to offset projected growth in VMT.

4.27.6.2 Mitigation for Global GHG Emissions

To help address the global issue of climate change, the U.S. Department of Transportation (USDOT) is committed to reducing GHG emissions from vehicles traveling on our nation's highways. USDOT and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward lower carbon intensive fuels. The agencies have jointly established new, more stringent fuel economy and first ever GHG emissions standards for model year 2012-2025 cars and light trucks, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on September 15, 2011, the agencies jointly published the first ever fuel economy and GHG emissions standards for heavy-duty trucks and buses. Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce carbon dioxide emissions future years.

Consistent with its view that broad-scale efforts hold the greatest promise for meaningfully addressing the global climate change problem, FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly carbon dioxide emissions—and to assess the risks to transportation systems and services from climate change. In an effort to assist States and metropolitan planning organizations (MPOs) in performing GHG analyses, FHWA has developed a Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process. The Handbook presents methodologies reflecting good practices for the evaluation of GHG emissions at the transportation program level, and will demonstrate how such evaluation may be integrated into the transportation planning process. FHWA has also developed a tool for use at the statewide level to model a large number of GHG reduction scenarios and alternatives for use in transportation planning, climate action plans, scenario planning exercises, and in meeting state GHG reduction targets and goals. To assist states and MPOs in assessing climate change vulnerabilities to their transportation networks, FHWA has developed a draft vulnerability and risk assessment conceptual model and has piloted it in several locations.

At the State level, project planning activities are key to reducing GHGs from highway projects, and mitigation of GHGs. To this end, the State of Alaska created the Alaska Climate Change

Sub-Cabinet in 2007 under Administrative Order 238. This resulted in the formation of the Climate Change Mitigation Advisory Group. The Mitigation Advisory Group, tasked with analyzing mitigation options to reduce GHG emissions in Alaska, submitted its *Mitigation Advisory Group Final Report* in 2009. Chapter 7 of the report identified measures to mitigate emissions resulting from transportation and land use patterns. Suggested measures included, but were not limited to: reducing idling times for diesel and gasoline vehicles, requiring DOT&PF-approved congestion management plans for all high-traffic-volume construction projects, and promoting the use of alternative-fuel vehicles. Alaska has also initiated activities to prepare infrastructure in the state for current and future impacts of climate change.

Even though project-level mitigation measures will not have a substantial impact on global GHG emissions because of the exceedingly small amount of GHG emissions involved, the following measures taken during construction will have the effect of reducing GHG emissions:

- To reduce impacts associated with construction delays and changes in traffic flow, the constructor would be required to create and execute a Transportation Management Plan (TMP), which would minimize construction-related congestion and would maintain traffic flow throughout the construction site.
- To reduce impacts associated with construction equipment, unnecessary idling of construction vehicles, trucks, and heavy equipment would be prohibited.
- The construction contractor would be required to routinely maintain and service all construction vehicles, trucks, and equipment to ensure they are in proper working condition, and therefore running as efficiently as possible.
- To reduce energy use to retrieve construction materials, construction equipment and material would be located as close to project construction sites as possible to reduce hauling distances and energy consumption.

These activities are part of a program-wide effort by FHWA to adopt practical means to avoid and minimize environmental impacts in accordance with 40 CFR 1505.2(c).

4.27.6.3 Summary of Climate Change Impacts

This document does not incorporate an analysis of the GHG emissions or climate change effects of each of the alternatives because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the GHG impacts, those impacts are not meaningful to a decision on the environmentally preferable alternative or to choosing among alternatives. As outlined above, FHWA is working to develop strategies to reduce transportation's contribution to GHGs—particularly carbon dioxide emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. Finally, the construction best practices described above represent practicable project-level measures that, while not substantially reducing global GHG emissions, may help reduce GHG emissions on an incremental basis and could contribute in the long term to meaningful cumulative reduction when considered across the Federal-aid highway program.

4.27.7 Water Quality Impacts

The project would adversely affect, both directly and indirectly, Tongass Narrows and several streams and water bodies on Gravina Island (Airport Creek, Government Creek, Clam Cove, and Blank Inlet and its tributaries).

The major past and ongoing activities affecting water quality in Tongass Narrows are emissions from boats and ships, discharges from seafood processing plants (permitted under NPDES),

logging and timber processing, and discharge from cruise ships. Although these activities can degrade water quality, the strong tidal currents help flush pollutants out of Tongass Narrows and maintain its overall good water quality. Logging and mining activities, construction of the runway safety area extension, and construction of the Gravina Island Highway may have affected the freshwater streams and marine waters of Gravina Island in the past, but these water bodies have no known water quality problems at present. Future development of an ore processing facility and its associated TDF could result in increased pollutant loading in surface waters. These facilities would need to comply with state and federal water quality regulations and the Niblack Mine LLC would need to obtain permits for all discharges.

Land-clearing and grading for the future improvements to the airport, logging, extension of the road north of the airport, the ore processing facility and TDF, and marine park development could have short-term adverse impacts on water quality during construction (from exposing sediments and debris to erosion), as well as long-term adverse impacts (from runoff and a larger impermeable area). Increased human activity—and the potential for pollutants—near streams and lakes is anticipated from increased recreational opportunities and improved access. A new harbor in Saxman could result in long-term impacts to Tongass Narrows' water quality from boat emissions.

4.27.7.1 No Action Alternative

Indirect impacts to water quality on Gravina Island as a result of the No Action Alternative would contribute to the cumulative adverse effects of past and future actions on water resources. However, with no bridge access to Gravina Island, the incremental impact would be negligible.

4.27.7.2 All Action Alternatives

The action alternatives of the Gravina Access Project would contribute a slight incremental adverse impact on the water quality of Tongass Narrows and streams throughout Gravina Island when considered with all past, present, and reasonably foreseeable actions that have affected or could affect water quality. Pollutant sources associated with foreseeable development include untreated runoff from bridges, ferry emissions, roadway runoff, runoff and pollutant spills associated with industrial and commercial development, permitted discharges from industrial sites, runoff and pollutants produced by residential development, erosion resulting from land clearing and altered stream hydrology, and increased human activity on currently inaccessible lands.

4.27.8 Wetland Impacts

Wetlands on Gravina Island were lost during development of the Ketchikan International Airport, extension of the runway safety area, and in the development of the Gravina Island Highway. Approximately 42 acres of wetlands were converted to uplands with the extension of the runway safety area in 2007. Approximately 69 acres were filled with the development of the Gravina Island Highway and associated improvements to Lewis Reef and Airport Access roads. Table 4-35 provides the permitted and actual wetland fill areas associated with Gravina Island Highway development.

Table 4-35: Section 404 Permits Associated with Gravina Island Highway Development

Section 404 Permit No.	Acres of Fill Permitted	Permitted Action	Description	Actual Fill Area
POA-2000-0307-N and -O Date: 8-17-05	14.66	Airport Access Road and Lewis Reef Road Realignment	An existing permit was modified for the new 24-foot Lewis Reef Road alignment and its crossing of Airport Creek.	14.66 acres
POA-2000-152-2 Date: 6-23-06	77.2	Gravina Access Project/Alternative F1: Gravina Island Highway (35.9 acres); Lewis Reef and Airport Access roads (13.4 acres); Pennock Island (8.5 acres); Revillagigedo Island (16.5 acres); bridge piers (2.9 acres)	Permit for the construction of the 40-foot Gravina Island Highway and additional acreage to widen Lewis Reef Road and Airport Access Road to 40-feet; and construct access across Pennock and Revillagigedo islands.	49.3 acres
POA-2000-152-2 Date: 6-23-06	5.0	Minor modifications to Gravina Island Highway	Under Special Condition 22d, the minor project modifications did not require additional mitigation.	5 acres

Most other development on Gravina Island has been small in scale, having relatively little effect on wetlands; however, some wetlands were no doubt filled to construct the timber processing plant north of the airport. Continued growth in the region under any of the Gravina Access Project alternatives would require the filling of wetlands.

4.27.8.1 No Action Alternative

Indirect impacts on wetlands on Gravina Island as a result of the No Action Alternative would contribute to the cumulative effects of past and future actions on wetland resources. However, with no bridge access to Gravina Island, the incremental impact would be negligible.

4.27.8.2 All Action Alternatives

The roadway development associated with the action alternatives of the Gravina Access Project, when considered with all past, present, and reasonably foreseeable actions, would have a cumulative effect on wetlands. Continued loss of wetland resources to induced development would reduce the function provided by these resources, including provision of wildlife habitat and moderation of surface runoff. The loss of wetland functions would be minor within the context of the Gravina Island and Pennock Island ecosystems and their extensive wetland resources.

4.27.9 Water Body Modification and Wildlife Impacts

4.27.9.1 Water Body Modification

With the exception of development associated with the airport and the Gravina Island Highway, there has likely been little modification of water bodies to date on Gravina and Pennock islands. Airport development led to alteration of the Gravina Island shoreline by fill and rock-armoring. Extension of the airport's runway safety area in 2007 required diversion of Government Creek to the south. Two smaller creeks now flow into the diverted Government Creek, creating a larger

river and estuary, which provides more salmon habitat than was previously available at the mouth of Government Creek.

4.27.9.1.1 No Action Alternative

The No Action Alternative would not contribute to cumulative impacts on water bodies.

4.27.9.1.2 All Action Alternatives

The Gravina Access Project action alternatives, when considered with past, present, and other future actions, would contribute to the trend of modifying the Gravina Island waterfront along the airport and would induce development that could have a measurable cumulative effect on streams and estuaries. Roadways, and clearing and filling for residential, commercial, and other development would result in directing small streams into culverts, channelization of flows, and increased runoff intensity that could alter natural stream hydrology.

4.27.9.2 Wildlife Impacts

Fish and wildlife resources on Gravina and Pennock islands have been affected by historic development of the shoreline, past logging activities, airport development, and hunting. These human activities have reduced habitat availability and quality, and affected the populations of some species.

4.27.9.2.1 No Action Alternative

The No Action Alternative would contribute to cumulative impacts on wildlife only by continuing these types of impacts for a small amount of additional development and additional access via new roads for hunting.

4.27.9.2.2 All Action Alternatives

The Gravina Access Project action alternatives, when considered with past, present, and future actions, would add to existing cumulative effects on fish and wildlife species. Existing development, coupled with future actions (improvements to the airport, logging, development of an ore processing facility and TDF, roadway and park development, and widely dispersed residential and commercial development) would further impact fish and wildlife species and habitat on Gravina and Pennock islands as a result of direct disturbance during construction and long-term use of the lands. Loss of habitat, particularly higher value habitats such as estuaries, would lead to reduced populations of game and nongame species, and long-term wildlife loss resulting from reduced carrying capacity.

Particularly important would be the improved access to and increased human activity in the interior of Gravina Island. The combination of improved access from the Gravina Access Project and new recreational opportunities, and residential and commercial development, would result in increased human activity in the interior of Gravina Island. This could affect EFH associated with tributaries to Vallenar Bay and Bostwick Inlet, deer winter habitat around Bostwick Inlet and Lewis Cove, important upland habitats in the valley of Vallenar and Bostwick Creeks, and important marine habitat at Vallenar Bay and Bostwick Inlet. The Alexander Archipelago wolf is particularly sensitive to human presence and could experience population declines as a result of increased human activity in these areas of Gravina Island. Roads may increase both legal harvest and illegal poaching of wolves, and increased human presence along the project corridor would also increase the frequency of bear-human interactions, some resulting in "defense of life and property" kills.

Hunters in Southeast Alaska actively pursue wolf and deer. With improved access to their habitat, it is likely that human harvest of these species would increase. Because deer are the primary food source for wolves, an increase in deer harvest would reduce deer numbers,

potentially to levels inadequate to support the wolf population, adding to its decline. The Alexander Archipelago wolves are dependent on long-term deer habitat viability. The loss of long-term carrying capacity for deer due to increased hunting and habitat degradation would be detrimental to wolf population. Regardless of alternative, increased hunting pressure and reduction of habitat viability could lead to a reduction in population viability of both wolves and deer on Gravina Island. The Alaska Board of Game may choose to implement more restrictive hunting regulations to reduce the potential for overall declines in game species populations.

4.27.10 Historic and Archaeological Resources

Historically, the use and development of Gravina and Pennock islands have occurred primarily along their shorelines, and have contributed to their cultural richness. Some development within the past 50 years, including the development of Ketchikan International Airport, could have resulted in the removal and/or destruction of cultural properties, but documentation of such losses is limited.

Continued growth along the shorelines would be anticipated under all of the alternatives evaluated for the Gravina Access Project, and this growth could have indirect impacts on cultural resources, as described in Section 4.26.14. Future development of airport parking facilities would occur mostly in areas that have been previously disturbed, and so would likely have little potential to affect cultural resources. The proposed road north of the airport is expected to have no effect on cultural resources.

When considering past actions that could have resulted in adverse impacts on cultural resources with the project's indirect impacts and the impacts on cultural resources expected from reasonably foreseeable actions, cumulative impacts on cultural resources are not expected.

4.27.11 Visual Impacts

Historically, the incremental changes to the visual environment of the Ketchikan area have been primarily related to human development along the western shoreline of Revillagigedo Island, the eastern shoreline of Gravina Island, and the northern shoreline of Pennock Island. The most substantial adverse effects on the visual environment occurred through the development of commercial and industrial facilities along the shoreline of Revillagigedo Island and the development of the airport and related facilities on Gravina Island. All of these facilities introduced large-scale, manmade features into a predominantly natural viewshed. Logging activities on Gravina Island have historically been limited in scale, resulting in minor adverse impacts on visual resources. Similarly, mining activities have been limited and generally have occurred in areas outside of the viewshed of most populated areas.

4.27.11.1 No Action Alternative

The No Action Alternative would have no adverse cumulative effect on the visual environment.

4.27.11.2 Bridge Alternative C3-4

The proposed development of the bridge near the airport would contribute substantially to the influence of manmade structures on the viewshed in that area. With future development planned for the airport area, the elements contributing to the adverse cumulative impact on the visual environment would be concentrated in this section of the Borough. No other reasonably foreseeable actions would contribute substantially to the visual impacts near the airport. North of the airport, the ore processing facility and TDF would expand the current industrial development at the Seley Mill site, contributing to a cumulative visual impact on the Gravina Island shoreline

in that broader context. The bridge would dominate views from marine vessels and aircraft in the area, particularly for vessels and aircraft transiting under or over the bridge.

4.27.11.3 Bridge Alternative F3

The Alternative F3 bridges would be visible from downtown Ketchikan, but because they would be 1.5 miles distant from major viewpoints in Ketchikan, the visual intrusion of the structures would be limited. Reasonably foreseeable future development associated with the airport would affect the visual environment in that area, but would not be perceived as a cumulative visual impact given its distance from the Alternative F3 bridges. The adverse cumulative effect on visual resources would be the incremental increase in manmade structures in predominantly natural viewsheds.

4.27.11.4 Ferry Alternatives G2, G3, G4, and G4v

The ferry alternatives would have a low profile within any of the viewsheds to which they contribute. When considered with past or reasonably foreseeable future actions in the area, the adverse cumulative impacts of these alternatives on the visual environment would be negligible.

4.28 Short-Term Uses and Long-Term Productivity

This section discusses in general terms the relationship of local, short-term impacts and use of resources, and the maintenance and enhancement of long-term productivity for the project alternatives. In the assessment of environmental impacts under NEPA, the natural productivity of land is viewed as a long-term, renewable resource, whereas a developed use of the land is considered a short-term use with a relatively short economic life.

4.28.1 No Action Alternative

Under the No Action Alternative, some productive land would be developed to some extent for transportation. These short-term uses of the environment likely would be consistent with local land use and comprehensive planning documents. Within the project area and the region there is an abundant supply of naturally productive land. The No Action Alternative would have no adverse effect on the long-term productivity of resources that dominate the area. For more information, see the land use discussion in Section 4.1.

4.28.2 All Action Alternatives

For the action alternatives, the long-term productivity that would be lost is the current productivity of wetlands and habitat within the proposed right-of-way of the action alternatives. The amount of natural productivity lost through road widening and the construction of new facilities would vary by alternative; more information can be found in wetlands and vegetation discussion in Section 4.14. This natural productivity would be replaced by the use of the land for transportation for the life of the proposed project. These losses are similar to, but of greater magnitude than, those that would occur under the No Action Alternative. All of the projected impacts or effects of implementation of the action alternatives have been analyzed. These impacts are fully described in other sections of this Draft SEIS. The potentially beneficial and adverse impacts would include those to the social, natural, physical, and cultural environments, as well as the projected economic impacts of implementation of the proposed alternatives.

Short-term uses of the environment by implementation of the action alternatives would be consistent with local land use plans. Comprehensive planning for the region recognizes the long-term benefit of improvements, and improving surface transportation between Revillagigedo Island and Gravina Island would be consistent with these plans. The long-term productivity of

the Borough would be enhanced by construction and operation of the alternatives as described in the Purpose and Need Statement (see Section 1.3).

Considering the overall abundance of naturally productive land in the project area, the project's consistency with local land use plans, and the benefits of the project's short-term use of the land, the project would not be detrimental to maintaining and enhancing the long-term productivity of the resources in the project area.

4.29 Irreversible and Irretrievable Commitments of Resources

4.29.1 No Action Alternative

The No Action Alternative would require a commitment of resources the same as that required of the existing ferry service. The No Action Alternative would primarily require an irreversible and irretrievable commitment of fiscal resources involving the expenditures of labor and a commitment of fossil fuels for operations of the existing ferry service. This alternative would involve no construction and would have no effect on other available natural resources (i.e., conversion of wetlands) or undeveloped land.

4.29.2 All Action Alternatives

Implementation of any of the action alternatives would irreversibly and irretrievably commit a broad range of natural, physical, human, and financial resources. Land converted to transportation use during the construction and operation of the proposed facility is considered an irreversible commitment. The quality and amount of the converted land in terms of habitat and wetlands varies by alternative and is described in detail in Section 4.14. Although mitigation measures would be implemented during project construction, re-creation or restoration of some of these areas would not be possible.

Modest to substantial amounts of cement, aggregate, and fill materials would be expended, depending on the alternative. Table 4-36 provides an estimate of the amount of materials and financial resources required by action alternative. Human labor and physical resources would be used to fabricate and prepare construction materials. These materials are generally not retrievable; however, these resources are not in short supply, and their use would not have an adverse effect upon their continued availability, and construction is not predicted to exhaust known sources of these materials.

Table 4-36: Estimated Materials Required by Action Alternative

Resources/Materials	Alternative					
	Bridge Alternatives		Ferry Alternatives			
	C3-4	F3	G2	G3	G4	G4v
Embankment select material, cubic yards	213,697	396,201	241,885	62,870	35,745	35,745
Select material type A, cubic yards	43,853	48,314	89,378	22,873	21,708	21,708
6-inch Aggregate base course grading D-1, cubic yards	8,196	24,991	12,382	3,207	2,448	2,448
Asphalt concrete pavement, type II class A, tons	5,000	50,000	29,232	7,464	2,000	2,000
Financial resources, $Hundreds	223,265	275,966	81,004	70,046	62,339	22,792

Construction of any action alternative will also require a substantial one-time expenditure of state and federal funds which are not retrievable. The ferry alternatives would require less commitment of financial resources for construction as compared to the bridge alternatives (see Table 4-36). Life cycle costs for the ferry alternatives range from approximately $168 million (Alternative G4v) to $245 million (Alternative G2) and the bridge alternatives from approximately $222 million (Alternative C3-4) to $286 million (Alternative F3).[314] Refer to Chapter 2.0 for additional information on the costs and funding of the project.

A commitment of resources is inherent and unavoidable when constructing large-scale transportation improvements. The information outlined in the project Purpose and Need (see Chapter 1.0) validates that residents in the region will benefit from the improved quality of the transportation system. The benefit provided by the project—improved access to Gravina Island—is anticipated to outweigh the impacts of these commitments of resources.

4.30 Mitigation Compilation

This section compiles all the individual mitigation sections from Sections 4.1 through 4.29, above, into one section for easy reference. The text is the same as in the sections above.

4.30.1 Mitigation of Direct Impacts

4.30.1.1 Mitigation of Transportation Impacts

4.30.1.1.1 Aviation: Mitigation for Bridge Alternative C3-4

The FAA would require the bridge to be lighted and marked in accordance with FAA regulations and advisory circulars to facilitate existing aviation operations in proximity to Alternatives C3-4 and F3. The FAA also would require DOT&PF to complete and return FAA Form 7460-2, Notice of Actual Construction or Alteration, within five days after the construction reached its greatest height (7460-2, Part II).

4.30.1.1.2 Marine Transportation: Mitigation for Bridge Alternatives C3-4 and F3

The piers would be design to withstand ship impact using AASHTO design standards and would be equipped with a fendering system to help protect the ships.

4.30.1.2 Mitigation of Air Quality Impacts

4.30.1.2.1 Mitigation for All Action Alternatives

To reduce vehicle emissions during operation, the proposed project under all action alternatives would incorporate designs that are expected to reduce the use of single-occupancy vehicles and improve fuel efficiency compared to the No Action Alternative. In addition, the alternative designs would include improvements to bicycle and pedestrian infrastructure.

All alternatives are designed using materials with the longest available life. This includes using bridges rather than highway fill at several of the stream crossings. These choices would result in new facilities that have a longer life before needing to be replaced than those built without such considerations, which in turn would reduce overall emissions for reconstruction and replacing materials.

[314] Alaska Department of Transportation and Public Facilities, August 2012. *Gravina Access Project Supplemental EIS Cost Estimate Report*. Prepared by HDR Alaska, Inc.

4.30.1.3 Mitigation of Water Quality Impacts

4.30.1.3.1 Mitigation for Bridge Alternatives C3-4 and F3

All new and improved roads would be designed to maintain existing surface water courses (e.g., by using ditches) and stormwater drainage. Final roadway design would include culverts or bridges along existing drainages and across streams on Revillagigedo and Gravina islands. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet requirements of the Clean Water Act. The roadway and bridge designs would incorporate a stormwater treatment system to minimize the effects of runoff. The stormwater treatment system would need to be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. Impacts to water quality would be minimized through the use of BMPs, most of which would be part of the SWPPP. The plan will follow DOT&PF's SWPPP Guide. BMPs that would be employed to protect water quality include:

- Increasing, where practicable, the angle of fill slopes to reduce encroachment into adjacent wetlands
- Designing and constructing the roadway with a low-profile embankment to minimize the fill footprint
- Using rock to stabilize toes of slopes to limit the erosion of fine-grained material into adjacent waters and wetlands
- Using plant species indigenous to the area for vegetating road slopes wherever possible to protect the integrity of the natural plant communities
- Using non-native, non-invasive annual grasses (such as annual rye) to provide rapid, initial soil cover to prevent runoff of fine-grained material into adjacent wetlands
- Applying topsoil to the surface of road slopes to aid in the reseeding process
- Designing roadside swales to keep surface water within the natural drainage basins to allow sediment-laden water to clear before its discharge to adjacent wetlands and waters
- Recontouring stream banks at all stream crossings (both culverts and bridge crossings), to approximate original conditions
- Reseeding recontoured stream banks with native seed and annual rye to minimize erosion, as recommended in the DNR *Coastal Revegetation and Erosion Control Guide*[315]

Section 4.25.10 describes construction-related BMPs to protect water quality. All necessary permits and agency approvals would be obtained prior to construction, and any permit stipulations would be incorporated into the construction contract specifications.

4.30.1.3.2 Mitigation for Ferry Alternatives G2, G3 and G4

New roads for Alternatives G2 and G3 would be designed to maintain existing surface water courses and stormwater drainage. Final roadway design would include culverts or bridges along existing drainages and across streams on Gravina Island. The construction contractor would be responsible for developing erosion and sediment control and SWPPP to meet requirements of the Clean Water Act. The roadway and ferry terminal designs would incorporate a stormwater treatment system to minimize the effects of runoff. The stormwater treatment system would be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. BMPs would further reduce adverse effects on water quality (see Sections 4.12.2 and 4.25.10).

[315] Wright, Stoney J., and Philip K. Czapla. 2011. *Alaska Coastal Revegetation and Erosion Control Guide*. Palmer, Alaska: Alaska Department of Natural Resources, Division of Agriculture, Plant Materials Center.

4.30.1.3.3 Mitigation for Ferry Alternative G4v

Final roadway design would include culverts or bridges along existing drainages and across streams on Gravina Island. The construction contractor would be responsible for developing erosion and sediment control and SWPPP to meet requirements of the Clean Water Act. The roadway design would incorporate a stormwater treatment system to minimize the effects of runoff. The stormwater treatment system would be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. BMPs would further reduce adverse effects on water quality (see Sections 4.12.2 and 4.25.10).

4.30.1.4 Mitigation of Wetlands and Vegetation Impacts

4.30.1.4.1 Wetlands: Mitigation for All Action Alternatives

Wetlands were avoided in preliminary design of the action alternatives as a first step in mitigating impacts. For example, through consultation with USACE, DOT&PF and FHWA revised the design of Alternative C3-4 to eliminate the need for fill in Tongass Narrows. Final mitigation for wetland impacts would be based on discussions among DNR, FHWA, USACE, and other resource management agencies. Detailed mitigation measures would be developed and implemented as a condition of federal permits for the project. In addition to the BMPs listed in Section 4.12.2, culverts would be installed through fill slopes in appropriate locations to maintain natural flow patterns for surface water courses and to ensure that the existing timing and amounts of inflow to adjacent wetlands and waters were retained.

DOT&PF proposes to compensate for unavoidable adverse impacts to wetlands by paying a fee in lieu of onsite wetland restoration, enhancement, or preservation. This compensatory mitigation would be calculated and applied to the preferred alternative identified in the Final SEIS. This fee would be provided to a land trust acceptable to the USACE. The proposed fee would be directed toward activities relating to wetland creation, restoration, enhancement, and preservation or land acquisition in the region.

4.30.1.4.2 Vegetation: Mitigation for All Action Alternatives

Final project design would avoid and minimize direct impacts to vegetation by reducing clearing limits and using previously disturbed areas for staging wherever feasible. Temporary disturbed areas would also be planted with native woody vegetation that would provide forage value for wildlife and a net gain in stormwater quality.

4.30.1.5 Water Body Modification and Wildlife Impacts

4.30.1.5.1 Water Bodies: Mitigation for Bridge Alternatives C3-4 and F3

The project design would maintain natural water flow conditions under the Airport Creek bridge for Alternative C3-4. Potential adverse impacts of the crossing at Airport Creek would be avoided by using a clear-span bridge at the crossing. Changes to the hydrology of smaller creeks would be minimized by designing culverts that are appropriately sized and placed, would allow fish passage, would accommodate stormwater flow, and would not cause scour.

All construction in and around anadromous fish streams would occur when stream disturbances would have the least impact to anadromous fish species (see Section 4.25.12.3, subsection on EFH, for related detail regarding mitigation of construction impact). In accordance with the memorandum of agreement between DOT&PF and ADF&G,[316] the culvert crossing would use a

[316] Alaska Department of Fish and Game and Alaska Department of Transportation and Public Facilities. August 3, 2001. *Memorandum of Agreement Between the ADF&G and DOT&PF for the Design, Permitting, and Construction of Culverts for Fish Passage*. Juneau, Alaska.

Tier 1 stream simulation design, which means that it would maintain natural stream conditions such as flow, substrate, and existing fish passage efficiency for the fish in the stream. In-water work areas would be limited to the stream crossing areas and isolated from flowing waters in all anadromous fish streams. Additionally, gravels and streambed material would be used in the bottoms of culverts to simulate the natural streambed.

Roadway and bridge designs would incorporate a stormwater treatment system that would collect, convey, treat, and detain runoff to minimize the effects of runoff. The stormwater treatment system would be submitted to ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC, EPA, and USACE requirements of the Clean Water Act.

4.30.1.5.2 Water Bodies: Mitigation for Ferry Alternatives G2, G3, G4, and G4v

The design of the ferry alternatives would maintain natural water flow conditions, and bridge or culvert design would accommodate stormwater flow, not result in scour, and allow fish passage. All construction in and around anadromous fish streams would occur when stream disturbances would have the least impact to anadromous fish species. (See Section 4.25.12.3, subsection on EFH, for related detail regarding mitigation of construction impact.) In-water work areas, except for stream crossings by construction equipment, would be isolated from flowing waters in all anadromous fish streams. In addition, gravels and streambed material would be used in the bottoms of culverts. Potential adverse impacts of the reconstructed Airport Creek crossing would be avoided by using a clear-span bridge. The roadway and ferry terminal designs would incorporate a stormwater treatment system to minimize the effects of runoff. The stormwater treatment system would be approved by ADEC under its plan review for a non-domestic wastewater treatment system and issuance of a non-domestic wastewater disposal permit. (See Section 4.25.12.3 and its subsection on EFH for related detail on mitigation of construction impact.)

4.30.1.5.3 Marine Habitat: Mitigation for All Action Alternatives

Marine habitat mitigation is included in the description of mitigation for EFH at the end of Section 4.15.4.4. Further mitigation for adversely affected marine habitat may be determined at the time of project permitting with input from DNR, NMFS, USACE, and USFWS.

4.30.1.5.4 Wildlife—Aquatic Species—Anadromous Fish: Mitigation for All Action Alternatives

All anadromous stream crossings would be designed to minimize impacts to proper stream function and, at fish streams, to provide passage to both anadromous and resident fish. At all stream crossings (both culverts and bridge crossings), stream banks would be recontoured to approximate original conditions and reseeded with native vegetation to minimize erosion. All road structures crossing other fish habitat would be designed to provide passage for resident fish. To mitigate the effects of placing bridge piers in nearshore areas, structures would be located in a manner that would leave a nearshore migration corridor (down to at least -5 feet MLLW) clear of obstruction to the extent practicable.

4.30.1.5.5 Wildlife—Aquatic Species—EFH: Mitigation for All Action Alternatives

Construction of this project would require a DNR Title 41 Fish Habitat Permit and a USACE Permit for fill in waters of the United States. As a result of the coordination with NMFS during development of the 2004 FEIS, the following conservation measures would be incorporated to avoid, minimize, and mitigate impacts to EFH:

- Recontour stream banks at all stream crossings (both culverts and bridge crossings) to approximate original conditions
- Reseed streambanks at all stream crossings (both culverts and bridge crossings) with native seed and annual rye to minimize erosion as recommended in the DNR Coastal Revegetation and Erosion Control Guide[317]
- Employ BMPs consistent with the Alaska Pollutant Discharge and Elimination System Permit to minimize the introduction of sediment and siltation of ponds and streams during adjacent fill placement and during culvert placement; related BMPs are listed in Sections 4.12; 4.14.1; 4.15.1 through 4.15.4; 4.25.10; and 4.25.11
- Design all anadromous fish stream crossings to provide passage for the salmon present in any given stream, per DOT&PF's memorandum of agreement with the ADF&G

These are general measures that would be modified during design to address specific details of the preferred alternative through further coordination with the agencies.

4.30.1.5.6 Wildlife—Bald Eagle: Mitigation for All Action Alternatives

If the selected alternative would come within 330 feet of a bald eagle nest, DOT&PF would work with USFWS to develop mitigation measures. Alternative G2 is constrained by topography, and it may not be practical to shift the alignments to more than 330 feet away to create a buffer between the road and nest. In addition, improvements at the intersection of the Airport Access Road, Lewis Reef Road, and Gravina Island Highway cannot be moved to create an adequate buffer between the road and nest. Biologists would be required to monitor construction activities around eagle nests, or adjacent construction activities (defined as work within 100 meters or blasting within one-half mile) would not be permitted during the nesting season for all the alternatives.

4.30.2 Mitigation of Construction Impacts

4.30.2.1 Land Use—Construction Impacts

4.30.2.1.1 Mitigation for Bridge Alternative C3-4

DOT&PF would work with the businesses and local residents to maintain property access throughout the construction phase using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be acquired and would be selected in a fashion that minimizes disturbance. Properties and land uses would be returned to preconstruction conditions to the maximum extent practicable. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.30.2.1.2 Mitigation for Bridge Alternative F3

DOT&PF would work with the property owners to maintain property access throughout construction using signs, temporary entrances, and traffic controls, as appropriate. Construction staging and movement would be constrained within construction easements. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.30.2.1.3 Mitigation for Ferry Alternative G2

DOT&PF would work with the commercial properties near Peninsula Point to maintain property access throughout construction using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be acquired and selected in a fashion that would

[317] Wright, Stoney J., and Philip K. Czapla. 2011. *Alaska Coastal Revegetation and Erosion Control Guide*. Palmer, Alaska: Alaska Department of Natural Resources, Division of Agriculture, Plant Materials Center.

minimize disturbance, and properties, and land uses would be returned to preconstruction conditions to the maximum extent practicable. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.30.2.1.4 Mitigation for Ferry Alternative G3

DOT&PF would work with the commercial and residential properties near the Revillagigedo Island terminal to maintain property access throughout construction using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be selected in a fashion that would minimize disturbance. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.30.2.1.5 Mitigation for Ferry Alternatives G4 and G4v

Construction easements would be selected in a fashion that would minimize disturbance. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.30.2.2 Social Environment—Construction Impacts

4.30.2.2.1 Community and Public Safety Facilities: Mitigation for All Action Alternatives

Vehicle access to all community and public safety facilities would be maintained throughout construction.

4.30.2.2.2 Accessibility: Mitigation for All Action Alternatives

DOT&PF contractors would be required to work with the businesses and local residents to maintain property access throughout the construction phase, using signs, temporary entrances, and traffic controls, as appropriate. Construction easements would be acquired and selected in a fashion that would minimize disturbance, and properties, and land uses would be returned to preconstruction conditions to the maximum extent practicable. Construction limits would be staked and clearly demarcated to prevent encroachment into adjacent areas.

4.30.2.3 Transportation—Construction Impacts

4.30.2.3.1 Aviation: Mitigation for Bridge Alternative C3-4

DOT&PF would work with helicopter and seaplane operators to minimize disruption of service to the maximum extent practicable during the construction period. Airport access would be maintained to the terminal during construction. The ramps and floats at the airport seaplane base would need to be relocated during construction, and may need to be permanently relocated. Throughout construction, DOT&PF would provide continued access to seaplane service for seaplane customers at the airport. The need to temporarily or permanently relocate the airport seaplane facilities would be determined during final design of Alternative C3-4, if it were selected. A possible future location would be the small cove at the end of the airport perimeter road.

4.30.2.3.2 Aviation: Mitigation for Bridge Alternative F3 and Ferry Alternatives G2, G3, G4, and G4v

DOT&PF would work with helicopter and seaplane operators to minimize disruption of service to the maximum extent practicable during the construction period.

4.30.2.3.3 Marine Navigation: Mitigation for Bridge Alternative C3-4

Impacts to ships transiting Tongass Narrows would be minimized by scheduling bridge construction activity, to the extent practicable, during times of the year when the marine traffic in Tongass Narrows is low (i.e., outside of the tourist and cruise ship season). DOT&PF would work with cruise ship and other marine vessel operators to facilitate marine navigation during

construction. When bridge segment placement requires limiting vessel traffic, DOT&PF would issue notification of such closures to reduce conflicts with marine navigation activities.

4.30.2.3.4 Marine Navigation: Mitigation for Bridge Alternative F3

For this alternative, impacts to navigation could be minimized by constructing each bridge in a separate phase so that one of the two channels would always be unaffected by construction activities, including channel dredging in Alternative F3. DOT&PF would work with cruise ship and marine vessel operators to facilitate marine navigation during construction. During bridge segment placement DOT&PF would issue notification to residents and vessel operators of such closures to reduce conflicts with marine navigation.

4.30.2.3.5 Vehicle Traffic: Mitigation for All Action Alternatives

Under any action alternative, the construction contractor would develop a traffic maintenance and parking plan to minimize impacts to vehicle travel on Ketchikan roadways and at the airport. Construction that might cause lane closures would be timed for low-traffic periods. Temporary roads and driveways would be employed where necessary to ensure continued mobility during construction. Construction of temporary roadways might be required to maintain access to the airport facilities. For Alternative F3, construction to elevate a portion of South Tongass Highway, which would include road closure and restricting traffic to one lane, would be done during off-peak hours to the extent possible to minimize the impacts on vehicle traffic. Access to the USCG Station and other affected property would be accommodated during construction through temporary driveways.

4.30.2.4 Pedestrians and Bicyclists—Construction Impacts

4.30.2.4.1 Mitigation for All Action Alternatives

The traffic maintenance and parking plan would include provisions for maintaining pedestrian and bicycle traffic and safety through construction areas. The project would avoid obstructing or affecting roads, sidewalks, and bike paths whenever possible to maintain access. If obstructing access was unavoidable, the project would establish temporary detour routes.

4.30.2.5 Geological Resources—Construction Impacts

4.30.2.5.1 Mitigation for All Action Alternatives

Impacts to wetland soils would be minimized by placing geotextile mats or equivalent on top of wetland soils in areas that would be temporarily disturbed by construction equipment (see Section 4.25.11).

The construction contractor would be responsible for developing an erosion and sediment control plan associated with upland and wetland areas to meet ADEC and EPA requirements of the Clean Water Act. A registered engineer would prepare the erosion and sediment control plan, and the construction contractor would implement it to minimize soil disturbance during construction. The erosion and sediment control plan would provide guidance to construction contractors to reduce construction impacts, particularly those that would result in the destabilization of adjacent slopes. Disturbed areas within the construction easement would be restored to preconstruction conditions to the extent possible.

4.30.2.6 Air Quality—Construction Impacts

4.30.2.6.1 Mitigation for All Action Alternatives

The project would implement measures to control dust (PM_{10}) at construction sites. Measures, as needed, would include use of a water truck within construction areas, covering of soil and

material stockpiles, and adhering to a designated construction speed limit to reduce generation of dust. The construction contractor would implement measures to minimize emissions from construction equipment and minimize construction-related traffic delays to reduce GHG emissions:

- To reduce impacts associated with construction delays and changes in traffic flow, the constructor would be required to create and execute a Transportation Management Plan (TMP), which would minimize construction-related congestion and would maintain traffic flow throughout the construction site.
- To reduce impacts associated with construction equipment, unnecessary idling of construction vehicles, trucks, and heavy equipment would be prohibited.
- The construction contractor would be required to routinely maintain and service all construction vehicles, trucks, and equipment to ensure they are in proper working condition, and therefore running as efficiently as possible.
- To reduce energy use to retrieve construction materials, construction equipment and material would be located as close to project construction sites as possible to reduce hauling distances and energy consumption.

4.30.2.7 Noise and Vibration—Construction Impacts

4.30.2.7.1 Noise: Mitigation for Bridge Alternatives C3-4 and F3, and Ferry Alternative G3

In accordance with City of Ketchikan noise regulations, construction activities would be prohibited between the hours of 11:00 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.

4.30.2.7.2 Vibration: Mitigation for All Action Alternatives

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.

4.30.2.8 Water Quality—Construction Impacts

4.30.2.8.1 Mitigation for All Action Alternatives

Construction of all water body and wetland crossings would adhere to applicable state and federal permit conditions. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC and EPA requirements of the Clean Water Act. BMPs would be used to control runoff from the construction area to minimize erosion and transport of sediment, to prevent any accidental leaks of oil or fuel from equipment from contaminating creeks or Tongass Narrows, and to contain any such leaks**.** The SWPPP, which would incorporate BMPs, would be prepared by a registered engineer per the DOT&PF *Alaska Construction Manual*, and implemented during project construction to minimize impacts to water quality.

Construction-related BMPs would include:

- Staking the planned outside limits of disturbance prior to construction to ensure that impacts are limited to that area
- Limiting clearing and grubbing outside of the fill footprint to the extent practicable to control physical disturbance of wetlands and habitats
- Installing silt fences adjacent to waterways just beyond the estimated toe of fill to capture fine-grained material contained in runoff
- Installing ditch checks to reduce bank erosion
- Employing sedimentation basins, as necessary (based on the potential volume of stormwater runoff), to limit sedimentation of adjacent wetlands and other waters and habitats
- Locating all staging, fueling, and equipment-servicing operations at least 100 feet away from all streams and wetlands
- Having spill response equipment readily available and ensuring that construction personnel are trained in spill response to contain accidental leaks of oil or fuel from construction equipment

Sections 4.12, 4.14.1, 4.15.1 through 4.15.4, 4.25.11, and 4.25.12 contain additional BMP-related discussion. DOT&PF would hold meetings at the beginning of construction with the construction contractor and agencies to ensure implementation of BMPs and other mitigation commitments.

4.30.2.9 Wetlands —Construction Impacts

4.30.2.9.1 Mitigation for All Action Alternatives

Use of wetlands for construction activities would be minimized to the extent practicable. DOT&PF requirements to operate construction equipment on geotextile mats would allow complete removal of the mat without further soil disturbance upon completion of construction, which would protect wetland soils in the construction easement (including staging areas for Alternative F3, construction access roads, and temporary access areas). After construction activities, shrubs and herbs likely would recover naturally, but the disturbed areas would be reseeded after construction to minimize erosion. Seeding of the disturbed areas would conform to Section 618 of the DOT&PF Standard Specifications for Seeding. Materials used for seeding would conform to DOT&PF Standard Specification Section 724 (Seed), Section 725 (Fertilizer), and Subsection 712-2.01 (Water).[318]

DOT&PF also would require the construction contractor to place temporary fill on geotextile mats or other suitable materials of sufficient thickness to facilitate the removal of the fill and the materials to the maximum extent practicable when they are no longer needed for construction. No natural earthen material would be removed from under the geotextile mat (or equivalent materials) when the temporary fill was removed. Wetlands would be stabilized against erosion once construction equipment and protective mats were removed. DOT&PF would restore wetlands that had been temporarily filled by reseeding and revegetating the disturbed areas.

Detailed mitigation measures would be developed and followed as conditions of the required federal permits.

[318] Alaska Department of Transportation and Public Facilities. 2004. *Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction*. <http://www.dot.state.ak.us/stwddes/dcsspecs/assets/pdf/hwyspecs> Accessed December 29, 2011.

4.30.2.10 Water Body Modification and Wildlife —Construction Impacts

4.30.2.10.1 Water Bodies: Mitigation for All Action Alternatives

Construction activity in any water body would adhere to applicable state and federal permit conditions. Temporary diversions would be designed so that the flow of the water body was not impeded. Any creek banks or beds affected by diversion structure placement would be restored to preconstruction conditions to the maximum extent practicable.

4.30.2.10.2 Marine Habitat: Mitigation for All Action Alternatives

The construction contractor would be required to adhere to all applicable state and federal permit conditions throughout the construction phase of any action alternative. To minimize these potential adverse impacts, the DOT&PF would ensure that construction BMPs, an erosion and sedimentation control plan, and a spill prevention plan were all implemented during project construction. The construction contractor would be responsible for developing erosion and sediment control and stormwater pollution prevention plans to meet ADEC and EPA requirements of the Clean Water Act.

4.30.2.10.3 Wildlife—Marine Mammals, Anadromous Fish, Marine Fish, and Essential Fish Habitat: Mitigation for All Action Alternatives

Construction of this project would require a Title 41 Fish Habitat Permit and a USACE Permit for fill in waters of the United States. Coordination with NMFS has been ongoing during the planning of this project. The following conservation measures would be incorporated to avoid, minimize, and mitigate impacts to marine species and EFH:

- Recontour stream banks at all stream crossings (both culverts and bridge crossings) to approximate original conditions, using native seed and annual rye as recommended in the DNR *Alaska Coastal Revegetation and Erosion Control Guide*[319] to minimize erosion
- Employ BMPs to minimize the introduction of sediment to ponds and streams during adjacent fill placement and during culvert placement
- Design all stream crossings to provide passage for anadromous fish species present in any given stream, per DOT&PF's memorandum of agreement with ADF&G
- Restrict in-water work in Tongass Narrows as follows:
    - General use of boats and barges could occur year round for general survey and work on bridge structures above water
    - Except for blasting, dredging, and pile driving, other work in marine waters could occur between July 1 and February 28
    - As further described below, blasting, dredging, and pile driving could occur only November 1 through February 28, with the possible exception of mid-channel locations, based on further consultation with the DNR, NMFS, USACE, and USFWS
- When pile driving in Tongass Narrows, use a vibratory hammer to drive steel pilings instead of an impact hammer, and drive pilings during low tide when in intertidal and subtidal areas
- Conduct all construction in and around anadromous fish streams when stream disturbances would have the least impact on anadromous fish species:
    - In-stream construction work in the Ketchikan area is June 15 through August 7
    - Isolate in-water work areas, except for stream crossings by construction equipment, from flowing waters of all anadromous fish streams

[319] Wright, Stoney J., and Philip K. Czapla. 2011. *Alaska Coastal Revegetation and Erosion Control Guide*. Palmer, Alaska: Alaska Department of Natural Resources, Division of Agriculture, Plant Materials Center.

- Require the contractor to prepare a blasting plan prior to any blasting activities, to include:
    - Submit the blasting plan to be reviewed by NMFS for both EFH and marine mammal impacts
    - Implement a fish and invertebrate monitoring program for any proposed blasting activities
    - Conduct any blasting during typical daylight hours (i.e. generally 7:00 a.m. to 7:00 p.m.)
    - Conduct a pre-blasting survey to ensure that no fish schools are in the vicinity of the blasting area; if fish schools are detected, delay blasting until they leave
    - Employ a biologist to record any kills within 100 feet up-current and 300 feet down-current of the blast area after blasting is completed
    - Consider monitoring the dredge materials as a method for documenting organisms injured or killed in the blasting
    - Consider measures such as covering the rock to be blasted with sand to dampen blast impact
    - Conduct in-water blasting between November 1 and February 28 to avoid juvenile and adult salmon
- Except for Alternative F3, place dredged debris onto a barge where it would enter a settling basin and be disposed of on land. Alternative F3, which could require substantial removal of sediment and rock, would require ocean disposal. Ocean disposal would require permitting by USACE under Section 404 of the Clean Water Act and may require a USACE permit under Section 102 and 103 of the Marine Protection, Research, and Sanctuaries Act (see Section 4.13).
- Conduct fueling and servicing operations at least 100 feet away from all streams and water bodies, and store fuel at least 100 feet away from all wetlands and water bodies
- Obtain all necessary permits and agency approvals prior to construction
- Incorporate any permit stipulations into the construction contract specifications
- Require that the perimeter of the disturbance area be staked prior to construction to ensure that there is no additional impact from construction activities
- Use sediment control barriers adjacent to EFH stream channels, just beyond the estimated toe of fill
- Use gravels and streambed material in the bottoms of fish passage culverts to emulate natural streambed conditions
- Provide stream bank stabilization as necessary to maintain stream bank integrity, and include the use of bioengineering techniques to improve habitat value of the riprap, by incorporation of willow stakes or other locally available vegetation

These are general measures that would be refined to specifically address details of the selected alternative through further coordination with the agencies during design.

4.30.2.10.4 Wildlife—Amphibians, Birds, and Land Mammals: Mitigation for All Action Alternatives

To mitigate for construction impacts to wildlife, temporary areas of vegetation removal would be minimized to the extent practical. Prior to construction, specific trees and vegetation to be preserved would be identified. Throughout construction, BMPs would be used to minimize sedimentation, erosion, or other impacts to wildlife. Clearing of nests for species protected under the Migratory Bird Treat Act will be conducted prior to construction and outside of the nesting season (typically March through July).

4.30.2.10.5 Wildlife—Bald Eagle: Mitigation for All Action Alternatives

If the selected alternative were to come within 660feet of a bald eagle nest, DOT&PF would be required to obtain a Bald Eagle Take Permit. This permit would require development of mitigation measures with USFWS. Mitigation measures may require biologists to monitor construction activities around the area that would potentially affect eagle nests, and would limit certain construction activities, such as blasting, during the nesting season (typically February through August).Topography would constrain Alternative G2, and it may not be practical to shift the alignments to more than 660 feet away to create a buffer between the road and nest. In addition, improvements at the intersection of the Airport Access Road, Lewis Reef Road, and Gravina Island Highway could not be moved to create an adequate buffer between the road and nest.

4.30.2.11 Threatened and Endangered Species—Construction Impacts

4.30.2.11.1 Mitigation for All Action Alternatives

To ensure no injury to or harassment of Steller sea lions, humpback whales, or other marine mammals, DOT&PF and FHWA are committed to the measures listed below:

- Conducting dredging and in-water blasting only in the period from November 1 to February 28, unless pre-approved by NMFS, to avoid runs of salmon and herring, on which humpback whales and Steller sea lions feed, and so that dredging and blasting occurred after most humpback whales had left Southeast Alaska for wintering grounds near Hawaii
- Requiring, via the construction contract, a blasting plan for Alternative F3, approved by NMFS (if blasting amounts are minor, and if agreed by the agencies, monitoring may not be required)
- Obtaining NMFS approval for a dredging plan for Alternatives F3, G2, G3, and G4 and ensuring that, during blasting and dredging, the project would use trained and NMFS-approved observers to indicate when marine mammals were within a 164-foot (50-meter) zone around pier work or other in-water work, and delaying or ceasing work until the animals moved out of the area
- Issuing an in-water warning sound prior to blasting to allow any marine mammals to voluntarily move to a comfortable distance
- Acquiring all necessary permits and agency approvals prior to construction, and incorporating stipulations into contract specifications
- Obtaining any necessary incidental harassment authorization from NMFS
- Finalizing mitigation measures during the permitting process with input from DNR, NMFS, USACE, and USFWS

These mitigations are designed to be compatible with EFH mitigation measures for the project (see Section 4.25.12.3). All project-related activities would conform to the pertinent provisions of the Marine Mammal Protection Act and the Endangered Species Act.

4.30.2.12 Historic and Archeological Preservation—Construction Impacts

4.30.2.12.1 Mitigation for All Action Alternatives

Once an alternative is selected, historic and archaeological sties in the vicinity of construction areas will be identified for the construction contractor to avoid.

In general, under all alternatives, FHWA and DOT&PF would continue coordination with the SHPO through design. Once the alignment was staked during design and prior to construction, a qualified archaeologist would be sent into the field to ensure that no cultural sites were

present that might have been missed in previous field surveys. If cultural resources were discovered during construction, construction at that location would halt for site evaluation. DOT&PF would consult with the SHPO about the appropriate course of action. Protocol and contact information for construction contractors in the event of an inadvertent cultural resource or human remains discovery will be developed by DOT&PF in coordination with FHWA and the Alaska SHPO and NHPA Section 106 consulting parties prior to commencement of construction.

4.30.2.13 Hazardous Waste Sites—Construction Impacts

4.30.2.13.1 Mitigation for All Action Alternatives

Construction contractors would be required to meet all federal, state, and local regulatory requirements regarding the discovery and use of hazardous materials. These regulatory requirements include worker right-to-know and safety training for the discovery and use of hazardous materials. Construction contractors on site must be trained to meet federal, state, and local regulatory requirements in recognizing and reporting discovery of unknown contamination, and proper use and handling of hazardous materials during construction. If unknown hazardous materials were encountered during construction, the contractor would be expected to isolate the area and prevent migration of any contaminants.

A spill prevention and response plan would be developed for the selected alternative. Cleanup would occur in accordance with state and federal regulation and in consultation with ADEC. Hazardous materials used during project construction would be stored and handled according to state and federal regulations. Material Safety Data Sheets would be available for all hazardous materials on the site. Construction vehicles will contain spill prevention kits in case of minor hazardous materials or chemical spills during construction.

4.30.2.14 Visual Environment—Construction Impacts

4.30.2.14.1 Mitigation for All Action Alternatives

All construction equipment and debris would be removed after construction was completed. Reseeding would repair bare soil areas. These efforts would repair the visual impacts of construction after the construction process was finished but would not affect

4.30.2.15 Utilities—Construction Impacts

4.30.2.15.1 Mitigation for All Action Alternatives

Affected customers would be given advance notice of any service interruptions. For longer outages, temporary facilities would be provided to ensure maintenance of service to affected customers.

4.31 Summary of Impacts

This section summarizes and compares the key beneficial and adverse impacts of the No Action and action alternatives for the Gravina Access Project.

4.31.1 No Action Alternative

The No Action Alternative would not affect airport property, existing airport or floatplane facilities, or Federal Aviation Administration (FAA) Part 77 airspace[320] in the vicinity of Ketchikan International Airport (14 CFR 77.1). Existing problems associated with access, convenience,

[320] Part 77 airspace refers to the protected airspace for aeronautical navigation. Objects that affect navigable airspace are identified by the FAA in accordance with Part 77.

and reliability for passengers, airport tenants, emergency personnel, equipment, and freight shipment would continue (see Section 4.7.1.1). Also, the No Action Alternative would have no change in the impact of current infrastructure and operation on cruise ship operations, the Ketchikan docking and berthing areas and facilities used by the cruise ships, or on facilities used by the AMHS ferries. There would be no traffic improvements that would change vehicular access to Ketchikan International Airport. The Gravina Island Highway and Lewis Reef Road would continue to provide access to other Borough and developable lands on Gravina Island. No wetlands or EFH would be lost to the construction of new facilities. Development would likely continue at the existing rate, with approximately 16 acres developed on Gravina Island by 2030.

4.31.2 Bridge Alternatives

4.31.2.1 Alternative C3-4

Alternative C3-4 is estimated to have a $233 million construction and project development cost, a $222 million lifecycle cost ($214 million with a toll), and a total life cost of $391 million ($335 million with a toll). The bridge associated with this alternative would intrude into the Part 77 airspace for Ketchikan International Airport, obstruct flight under normal VFR and could greatly reduce the effectiveness of SVFR for seaplane operators (see Section 4.7.1.2). Cruise ship passage would continue unhindered (see Section 4.7.2.2). Wetland habitat loss is estimated as 13 acres (Table 4-13); 1.4 acres of EFH are expected to be lost (Table 4-15). Development on Gravina Island is projected to be about 336 acres by 2030 (see Section 4.26.1). Adding a $5 toll to the bridge would reduce the amount of development by approximately 13 percent.

4.31.2.2 Alternative F3

Alternative F3 is estimated to have a $276 million construction and project development cost, a $286 million lifecycle cost ($280 million with a toll), and a total life cost of $576 million ($531 million with a toll). The Alternative F3 bridges would not intrude into the Part 77 airspace, but would affect seaplane operations because seaplanes would need to fly over or taxi under them (primarily the East Channel bridge). The bridges associated with this alternative would alter cruise ship navigation patterns by requiring large vessels to use the West Channel around Pennock Island (see Section 4.7.2.3). Wetland habitat loss is estimated as 33 acres (Table 4-13); 15.3 acres of EFH are expected to be lost (Table 4-15). Development on Gravina Island is projected to be about 336 acres by 2030 (see Section 4.26.1). Adding a $5 toll to the bridge would reduce the amount of development by approximately 14 percent.

4.31.3 Ferry Alternatives

Alternatives G2, G3, G4, and G4v would have lower construction and project development costs ($23 million to $81 million) and lower lifecycle costs ($182 million to $331 million) than the bridge alternatives, but would have higher total life costs ($1,050 to $1,330 million without toll or $712 to $879 million with toll) than the No Action and the bridge alternatives. The ferry alternatives would have no impacts to aviation. Alternatives G2, G3, and G4 would have a slight effect on marine navigation by increasing the amount of cross-channel traffic. These alternatives would not provide the convenience and reliability of access to the airport and other lands on Gravina Island as well as a bridge alternative would. Wetland habitat loss with Alternatives G2, G3, G4, and G4v is estimated as 24, 18, 13, and 13 acres, respectively (Table 4-13); approximately 1.0, 4.0, 0.7, and 0.1 acres of EFH, respectively, are expected to be lost (Table 4-15). Projected development on Gravina Island under Alternatives G2, G3, and G4, at approximately 43 acres by 2030, is approximately three times the amount of development projected under the No Action Alternative and Alternative G4v, but about one-tenth of what any of the bridge alternatives would provide.