Southeast Alaska Mid-Region Access Traffic Projections Technical Memorandum

Prepared for

Federal Highway Administration

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List of Acronyms and Abbreviations

AAA	American Automobile Association
AADT	annual average daily traffic
ACV	air-cushion vehicle
ADT	average daily traffic
AMHS	Alaska Marine Highway System
ANILCA	Alaska National Interest Lands Conservation Act
ATIA	Alaska Travel Industry Association
B.C.	British Columbia
B/C	benefit/cost
BTS	Bureau of Transportation Statistics
CE	cost-effectiveness
DOLWD	Alaska Department of Labor and Workforce Development
DOT&PF	Alaska Department of Transportation & Public Facilities
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
IFA	Inter-Island Ferry Authority
IRS	Internal Revenue Service
MRA	mid-region access
NHTS	National Household Travel Survey
NPV	net present value
O&M	operating and maintenance
OMB	Office of Management and Budget
SATP	Southeast Alaska Transportation Plan
SVE	standard vehicle equivalent
WRG	Wrangell

EXECUTIVE SUMMARY

Purpose of the Memorandum

The Alaska Department of Transportation and Public Facilities (DOT&PF) proposed, in the Southeast Alaska Transportation Plan (SATP), to build a new highway from Ketchikan, Wrangell, and Petersburg in Southeast Alaska to link with the Cassiar Highway in British Columbia (B.C.), Canada. Traveling from these communities to the highway system currently requires a ferry trip either to Prince Rupert, B.C., in the south or to Haines or Skagway, Alaska, in the north. This report evaluates three proposed alternatives for a mid-region access (MRA) highway corridor. The three alternatives for a MRA corridor are the Bradfield Canal, Stikine River, and Aaron Creek Corridors. The general location of each corridor is presented on Figure ES-1.

This memorandum provides future traffic estimates for a Bradfield Canal Corridor, as well as traffic estimates for corridors near the Stikine River and Aaron Creek. The projections are based on current traffic trends, future population estimates, and travel cost and time. The report uses the most current data available and corresponds to data for 2009 unless otherwise noted. All of the proposed corridors would connect to Wrangell, and one corridor would also connect to Petersburg. Short ferry links would be required under certain corridors and the early phases of development for all corridors.

Existing Transportation System

The current passenger travel modes of travel to/from the continental United States and within the project region are air, ferry, and cruise ship. Cargo moves by air, ferry, or barge service. There are major seasonal differences in traffic volumes: summer is the peak season, attracting a large number of visitors to the region, primarily via cruise ship, while winter traffic consists mainly of resident travel.

Future Traffic Projections

The projected traffic on the proposed corridors consists of diverted and induced vehicle travel. Diverted traffic is current traffic by existing modes that would shift to the new corridor. Induced traffic is increased traffic volume that is new travel to or through the area. This latter travel would not occur without the new traffic corridor. Induced traffic could be standard vehicles whose purpose is primarily to transport people and large industrial trucks.

Total diverted and induced passenger vehicle traffic could range from a 2030 annual average daily traffic (AADT)[1] count of approximately 5 to 255 AADT with the Stikine River Corridor and a count of approximately 5 to 189 AADT for the other corridors (Table ES-1). Approximately 4 to 20 AADT of these traffic ranges divert from other modes, principally the Alaska Marine Highway System (AMHS), and approximately 1 to 235 AADT for the Stikine River Corridor are new trips by residents of local communities and the broader region. Induced trips for the other corridors range from approximately 1 to 169 AADT.

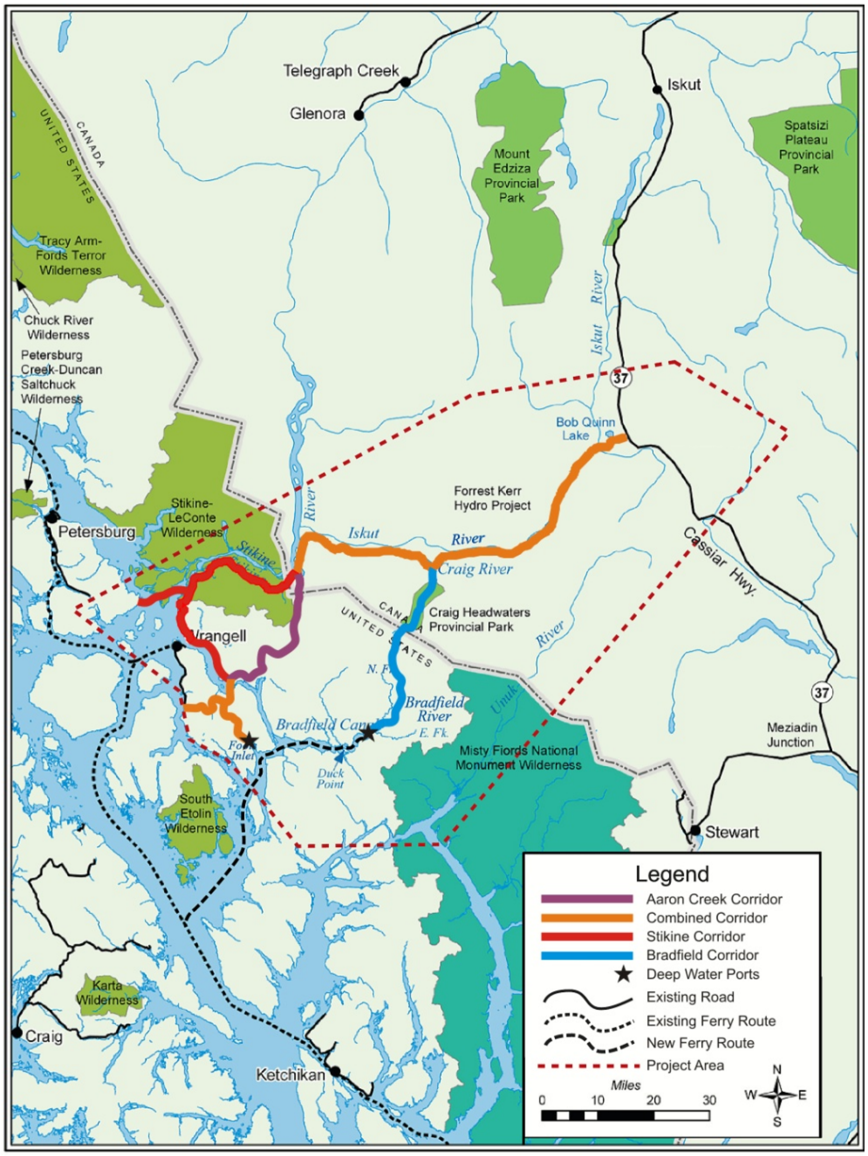

Figure ES-1. Southeast MRA Study Corridors

[1] AADT is a measure used in transportation planning and engineering. It is the total volume of vehicle traffic on a highway or road for a year divided by 365 days.

The number of local induced trips declines with greater distance from a community. The low estimate anticipates that there would be zero local induced trips at a distance of 100 miles. The mid estimate is measured at a distance of 35 miles from Wrangell, and the high estimate is measured at a distance of 10 miles from Wrangell. At approximately 35 miles from Wrangell, which is about where the closest new MRA road segments would begin, Petersburg and Wrangell could generate approximately 110 AADT under the mid estimate with the Stikine River Corridor as depicted in Table ES-1. The community of Iskut could generate approximately 13 trips per day on the MRA segments near the Cassiar Highway, representing approximately 123 AADT for local induced trips for the Stikine River Corridor and approximately 73 AADT under the mid estimate for the other alternatives.

Table ES-1. Comparison of Corridor AADTs and SVEs in 2030

	Corridor Traffic Volumes								
	Bradfield Canal			Stikine River			Aaron Creek		
Trip Type (AADT)	**Low**	**Mid**	**High**	**Low**	**Mid**	**High**	**Low**	**Mid**	**High**
Diverted (from other mode)	4	12	20	4	12	20	4	12	20
Induced (new trips)									
Local[1]	0	73	102	0	123	168	0	73	102
Regional	0	28	55	0	28	55	0	28	55
Other	1	6	12	1	6	12	1	6	12
Subtotal Diverted & Induced	5	119	189	5	169	255	5	119	189
Industrial									
Inbound	10	10	60	10	10	60	10	10	60
Outbound	22	54	300	22	54	300	22	54	300
Subtotal Industrial	32	64	360	32	64	360	32	64	360
Industrial standard vehicle equivalents (SVEs)	144	288	1,620	144	288	1,620	144	288	1,620
Total AADT	37	183	549	37	233	615	37	183	549
Total SVEs	149	407	1,809	149	457	1,875	149	407	1,809

Source: Northern Economics, Inc., estimates.

[1]For local induced traffic, the mid distance for Alaska communities is 35 miles; mid distance for Iskut, B.C., is 67 miles, which is the approximate distance to the intersection of MRA and the Cassiar Highway. The low traffic estimate for local induced trips uses 100 miles, and the high traffic estimate assumes a 10-mile distance from Wrangell.

Note: Data have not been identified to enable estimating AADTs in summertime peaks and winter. The AADTs reported in the table above assume average conditions.

Induced travel between communities in Southeast Alaska and northwest B.C. could add from 0 to 55 AADTs in 2030, depending on assumptions of population growth and the effect of distance on vehicle travel. This is reflected in the table above as regional induced trips.

Approximately 360 additional AADTs could be associated with trucks traveling to and from potential mines in B.C. This truck traffic would be the equivalent of slightly more than 1,600 SVEs in terms of the deck space required on a ferry. None of these mines is presently operating; if the mines do not proceed to development and production, there would be no industrial traffic.

Key Findings and Conclusions

The Bradfield Canal Corridor would have the lowest capital cost. The Stikine River and the Aaron Creek Corridors would provide road access at higher capital costs, with the Stikine River Corridor slightly higher than the Aaron Creek Corridor (Table ES-2).

Seasonal variations in traffic volume on the MRA would likely be similar to current traffic trends on the AMHS and Alaska’s highways. Winter travel, however, might be lower than anticipated due to the remoteness and limited public services available on the proposed corridors and the Cassiar Highway.

The highway could easily accommodate peak summer traffic. However, the Bradfield Canal Corridor and some of the earlier phases of the Stikine River and Aaron Creek Corridors have ferry links. The ferry capacity identified in the SATP for these routes would not be sufficient to accommodate the estimated number of trips if the ferries must transport large numbers of trucks hauling ore concentrates or other resources (Table ES-2). Industrial users should be encouraged to develop terminals at the first major marine access point so that larger ferries are not required. The terminals would also reduce maintenance costs on state highways.

The first stage of the Stikine River and Aaron Creek Corridors envisions air-cushion vehicles (ACVs) that would provide service on the Stikine River until a road was later constructed. It would be difficult to accommodate significant volumes of truck traffic from potential mines in B.C. on the ACVs.

Multiple ACVs would still be needed to serve the estimated AADT for other vehicles during the peak month of July. ACV service would be adversely affected by freezing temperatures and high wind speeds. Issues with reliability of the ACVs would result in low traffic volumes. The ACVs may not be a practical consideration if the project proceeds.

The MRA corridor would offer neither cost nor travel time savings for residents of Ketchikan or Prince of Wales Island for trips to the lower 48 states and most of B.C. As a result, there would be limited MRA traffic using a road to Fools Inlet and a ferry terminal to connect with Ketchikan and Prince of Wales Island.

Table ES-2. Comparison of Corridors

Corridor	Capital Cost (road and ferry system)				Corridor AADT & SVE in 2030 (low, mid, high)	Ferry ADT in 2030 (mid, winter, summer)	Ferry Daily Capacity (standard vehicle units)	Industrial port/traffic	Travel Time	Full Build Capital Cost Ranking
	AK Cost	B.C. Cost	Total	Cumulative Total						
Bradfield Canal	490	345	835	835	AADT: 37/183/549 SVE: 149/407/1809	119/82/171	Winter: 90(=3*30) Summer: 180(=6*30)	Yes to upper reach of Bradfield Canal	Slowest time to all communities	Lowest cost
Stikine River					AADT: 37/233/615 SVE: 149/457/1875	169/116/243	Winter: 90(=3*30) Summer: 270(=9*30)	Yes to Eastern Passage	Most time savings for Petersburg and north if linked to MRA	Highest cost
Stage 1	30	452	482	482						
Stage 2	381	92	473	955						
Stage 3	64	-	64	1,019						
Stage 4	243	-	243	1,262						
Stage 5	89	-	89	1,351						
Aaron Creek					AADT: 37/183/549 SVE: 149/407/1809	119/82/171	Winter: 90(=3*30) Summer: 180(=6*30)	Yes to Eastern Passage or Blake Channel	Fastest time to Wrangell	Slightly lower cost than Stikine River
Stage 1	30	452	482	482						
Stage 2	544	105	649	1,131						
Stage 3	46	-	46	1,178						
Stage 4	60	-	60	1,238						

Notes:

1) Capital costs include road/port (ferry terminal) construction and engineering costs, ferries costs, and the capital costs related to road/ports/ferries operation and maintenance. More detail on capital cost can be found in the Southeast Alaska Mid-Region Access Engineering Technical Memorandum.

2) Ferry ADT in 2030 reflects total ADT for standard vehicles only. Industrial traffic is assumed to use closest tidewater location and not require ferry transport.

3) ADT reflects volumes at full build out; traffic volumes would be lower for early stages.

4) Capital costs are shown in millions of U.S. dollars.

5) The capital costs for the Stages 2 and 4 options include the cost of building the Iskut River roadway portion of Stage 1.

6) For local induced traffic, the mid distance for Alaska communities is 35 miles; mid distance for Iskut, B.C., is 67 miles, which is the approximate distance to the intersection of the MRA and the Cassiar Highway. The low traffic estimate for local induced trips uses 100 miles, and the high traffic estimate assumes a 10-mile distance from Wrangell.

While the road to Fools Inlet and ferry terminal (Stage 3 for the Stikine River and Aaron Creek Corridors) might still provide system-wide benefits, the infrastructure would not provide significant benefits to the MRA. The road to Fools Inlet and the ferry terminal may not be practical until the Cleveland Peninsula or the Revillagigedo Island roads are constructed per SATP recommendations

The last stage (5) of the Stikine River Corridor would save approximately 13 minutes for Wrangell residents for about $89 million in capital cost. This stage would not likely have a positive benefit/cost ratio. If Stage 5 were built in conjunction with the road to Fools Inlet and the road connections to Ketchikan, however, it might be warranted.

The Stikine River Corridor would be located within the Stikine-LeConte Wilderness area. This location would prohibit construction of a surface road corridor unless Canada requested access via the Stikine River Corridor under treaties and provisions in the Alaska National Interest Lands Conservation Act (ANILCA).

Further investigation of the Bradfield Canal Corridor and Stages 2 and 4 of the Stikine River and Aaron Creek Corridors, along with the Iskut River roadway portion of Stage 1, may be warranted. Benefits to Canadian residents and businesses from development of the MRA remain to be determined.

Consistent with the previous conclusions, a further life-cycle cost analysis was performed for the following: the Bradfield Canal Corridor, Stage 2 of the Aaron Creek Corridor, and Stage 2 of the Stikine River Corridor. The roadway alignment along the Iskut River that is a part of Stage 1 was included in the analysis. It was assumed for this analysis that Stage 4 of both the Stikine River and Aaron Creek Corridors would not be built within the study period. The estimated net present values (NPVs) of capital and operating costs less any remaining value for the ferries and roadway between 2012 and 2030 indicate that the Bradfield Canal Corridor has the lowest NPV life-cycle costs ($192 million), followed by the Stikine River Corridor ($204 million) and the Aaron Creek Corridor ($240 million).

This ranking changes when comparing the different corridors over an extended time. The NPV of life-cycle costs net salvage value from 2012 through 2060 for the Stikine River Corridor is the lowest ($609 million), followed by the Bradfield Canal Corridor ($656 million) and the Aaron Creek Corridor ($721 million). The cost-effectiveness estimates for the same period from 2012 through 2060 indicate that, across all scenarios, the Stikine River Corridor has the lowest life-cycle costs per AADT, followed by the Bradfield Canal Corridor and the Aaron Creek Corridor. For the mid-case scenario estimates, in particular, the Stikine River Corridor would have a cost of $239 per trip, followed by the Bradfield Canal Corridor ($328 per trip) and the Aaron Creek Corridor ($360 per trip).

A sensitivity analysis was conducted to determine the effect that a party of four travelers would have on trip generation by mode. Results were compared to the party of two used in this analysis. With a party of four, more trips to Anchorage and Seattle would divert from the AMHS to the MRA due to appreciable cost savings. The sensitivity analysis also assessed whether travelers considering vehicle use expenses applied the full cost of such travel or the variable cost, primarily fuel. It was evident from the analysis that travelers primarily use variable cost accounting, which, in effect, would make the longer vehicle trips less expensive than travel via AMHS.

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1 INTRODUCTION

The Alaska Department of Transportation and Public Facilities (DOT&PF) proposed, in the Southeast Alaska Transportation Plan (SATP), to build a new highway from Ketchikan, Wrangell, and Petersburg in Southeast Alaska to link with the Cassiar Highway in British Columbia (B.C.), Canada. Traveling from these communities to the highway system currently requires a ferry trip either to Prince Rupert, B.C., in the south or to Haines or Skagway, Alaska, in the north.

The proposed corridor lies in the Iskut-Stikine area in Southeast Alaska and Canada. This area is rich in minerals and historically had mining and logging activities, which were limited by the lack of infrastructure.

This report evaluates three proposed alternatives for a mid-region access (MRA) corridor. All three corridors would connect to Wrangell, and one corridor would also connect to Petersburg. The Bradfield Canal Corridor would include a ferry link, and early stages of the other corridors would also have ferry links. Figure 1-1 illustrates the larger study area, showing existing roads and ferry routes, as well as the focused project area considered for an MRA corridor.

1.1 Historical Use of Mid-Region Access Corridors

The Iskut-Stikine area is one of the richest in minerals in B.C. The area has been the subject of mineral exploration and exploitation for many decades. The following subsections discuss the historic use of these corridors, describe the corridors that are evaluated in this report, and discuss the relationship of these corridors to the SATP. Any historic use of Aaron Creek for transportation has not been identified.

1.1.1 Bradfield Canal

Logging activities have occurred along the Bradfield Canal, and old logging roads still exist. At present, the major activity in the area is at the Tyee Hydroelectric Project facility, which is located where Tyee Creek flows into the Bradfield River, approximately 40 miles southeast of Wrangell. The hydroelectric facility uses Tyee Lake as a storage reservoir. Currently, the power plant is connected to Wrangell and Petersburg by 68.2 miles of overhead line and 12.6 miles of submarine cable (The Four Dam Pool Power Agency, 2007).

Currently, the energy generation potential surpasses the demand from Wrangell and Petersburg by almost 100 percent. Studies have been conducted to evaluate the possibilities of exporting the surplus to B.C. through an electric transmission line intertie (Hatch Energy, 2007). The proposed intertie follows the proposed Bradfield Canal Corridor road.

1.1.2 Stikine River

The 379-mile-long Stikine River originates in B.C., with the lowermost 27 miles of the river located in Alaska. In Alaska, the river lies within the Stikine-LeConte Wilderness Area of the Tongass National Forest. The mouth of the river is 2 miles north of the town of Wrangell and 20 miles south of the town of Petersburg (Bureau of Land Management [BLM], 2007).

In 2005, the U.S. Army Corps of Engineers issued a navigability determination for the Stikine River, determining that the river is navigable: "The Stikine River is navigable from approximately May 1 to October 15 for shallow draft boats transporting supplies between Wrangell, Alaska, and Telegraph Creek, B.C., a distance of 130 miles" (BLM, 2007). The Stikine River has been used for transportation of people and goods since before the purchase of Alaska in 1867. During the gold rush of 1874 to 1876 and the Klondike gold rush of 1897 to 1900, a variety of boats transported people to the gold fields (BLM, 2007).

In 1950, the Galore Creek copper and gold deposits were discovered, and exploration began. Barges accessed the area by traveling up the Stikine River. A temporary road enabled travel up the Scud River and Galore Creek valleys to the project site.

During the 1960s and 1970s, the exploration of the Galore Creek area depended largely on the Stikine River for transportation between Wrangell and the mouths of the Anuk and Scud Rivers. Diesel-powered riverboats from Ritchie Transportation in Wrangell would bring barge loads up to 40 tons upstream. After 1964, tugs and barges built specifically for the Galore Creek operations could bring loads up to 200 tons up the river to the mouth of Anuk River. From there, the loads were transported by helicopter.

In the past, the main obstacles to developing the Galore Creek deposits were location and access. Several studies have been conducted to look at options for developing the mine and providing reliable access to the project site (NovaGold Canada, 2006). Construction of the mine was initiated in 2006. In late 2007, however, the owners decided to suspend construction activities at the Galore Creek project due to substantially higher capital costs and a longer construction schedule for the project. The owners are evaluating alternative development strategies (NovaGold Resources Inc., 2007).

1.2 Summary Description of Proposed Mid-Region Access Corridors

Three alternatives for an MRA corridor are proposed, in addition to the Current Trends Alternative. The Current Trends Alternative is based on the SATP; this alternative is based on an assumption that currently planned SATP improvements are constructed except for an MRA corridor. The three alternatives for an MRA corridor are the Bradfield Canal, Stikine River, and Aaron Creek Corridors.

Detailed information on the different stages of these corridors is provided later in the report. Following are summary descriptions of the corridors at the final phase of development. The general location of each corridor is presented on Figure 1-2.

1.2.1 Bradfield Canal Corridor

This alternative assumes that a corridor would be constructed along the Bradfield Canal. The final stage of this corridor would include a road from the Cassiar Highway, down the Iskut River to the vicinity of Bronson Creek, and down the Craig River on the Canadian side of the border. The road would go down the Bradfield River to the Bradfield Canal and along the north side of the Bradfield Canal to a shuttle ferry terminal at Blake Channel where a ferry would transit to Fools Inlet on Wrangell Island. From Fools Inlet, a new or reconstructed roadway would connect to Wrangell.

1.2.2 Stikine River Corridor

The Stikine River Corridor assumes a road connection from the Cassiar Highway down the Iskut River to the Stikine River on the B.C. side of the border. The road would continue down the Stikine River. By Andrew Creek, the road would divide; one route would go towards Petersburg to the north, and the other would go towards Wrangell to the south. Towards Petersburg, there would be a bridge across Dry Strait and a road to the end of Mitkof Highway 7. Towards Wrangell, the road would pass by Crittenden Creek down to The Narrows where a bridge would cross to Wrangell Island. A road connection would be constructed to the end of the Zimovia Highway towards Wrangell.

1.2.3 Aaron Creek Corridor

This alternative describes a corridor going from the Cassiar Highway down the Iskut River to the vicinity of the Stikine River, down the West Fork of the Katete River, over a pass or through a tunnel, and down Aaron Creek to the Eastern Passage. The final phase would include a bridge across The Narrows. From The Narrows, there would be an extension of the Zimovia Highway for a connection to Wrangell.

1.3 Relationship of Proposed Mid-Region Access Corridors to the Southeast Alaska Transportation Plan

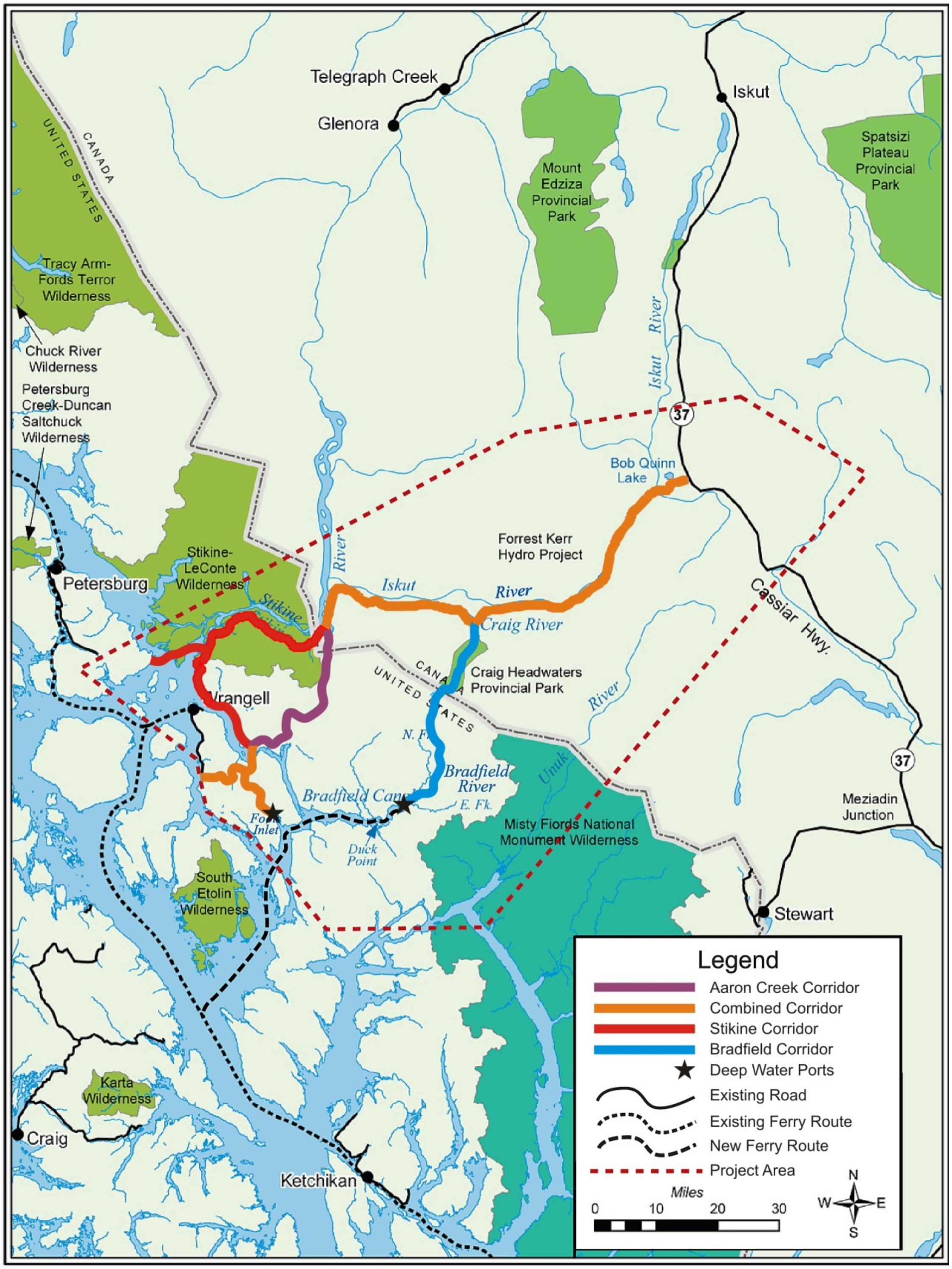
One of the highway corridors proposed in the SATP is a highway corridor to connect Ketchikan, Wrangell, and Petersburg to the Cassiar Highway in Canada. Although the final route has not been selected, the route is proposed from the end of the Bradfield Canal to the Cassiar Highway in Canada. Two different routes are considered, and the choice is between two large river valleys on the Alaska side of the border. The SATP also proposes a Revillagigedo highway from the end of the Bradfield Canal going south to connect with Ketchikan.

Part of the SATP includes plans to extend the Zimovia Highway from Wrangell, construct a ferry terminal on Fools Inlet, and initiate ferry service between Fools Inlet and the Bradfield Canal. The SATP designated 34 corridors as “Essential Transportation and Utility Corridors” to meet future needs. After reviewing the proposed projects, those that would likely go forward before 2030, or that may have a significant effect on the MRA, were identified, and they are presented in Section 4.2. The projects (other than the MRA-related projects) that may move forward or that could significantly influence travel on the MRA corridor are identified below:

- Lynn Canal Road
- Kake–Petersburg Road
- Kake–Totem Bay Road
- Red Bay Cutoff

Source: Parametrix, Inc.

Figure 1-1. SE Alaska MRA Project Study Area Vicinity



Source: Parametrix, Inc.

Figure 1-2. Southeast Alaska MRA Study Corridors

2 SUMMARY OF TRAFFIC ESTIMATES

2.1 Introduction

Vehicle traffic on the proposed MRA corridors would include both diverted and induced traffic. The terms are described below.

Diverted traffic is current traffic on existing modes of travel, such as ferry and air travel that would shift to the new corridor when a connection is provided. The level of diverted traffic would depend on several factors, including travel time and cost of the new corridor compared to travel time and cost for other modes of transportation.

Induced traffic is new traffic to or through the area that would not occur without the proposed improvement in the transportation infrastructure. The presence of a new road would result in additional trips among communities and would make more areas accessible for recreation, sightseeing, and similar activities. The new road might also be a catalyst for mining development and resource extraction in the area and would generate additional traffic from transport of these resources to tidewater.

2.2 Summary of Approach and Data Used for Traffic Projections

Estimates of future diverted traffic were developed using data on current levels of traffic and trends from a number of sources, including the Alaska Marine Highway System (AMHS) annual reports, DOT&PF traffic data, and Federal Aviation Administration (FAA) data. The travel time and cost for each of the corridors were calculated and compared with the travel time and cost for current travel mode options. The travel time and cost were calculated for travel from selected cities in Southeast Alaska, including Wrangell, Petersburg, Ketchikan, Craig, Juneau, and Sitka, to Seattle, Washington, and Anchorage, Alaska, as the final destinations. Section 5 provides additional detail on the approach used to estimate diverted traffic and the results of the analysis.

To estimate induced regional trips on the proposed corridor, a gravity model was developed. The gravity model is based on the theory that the level of interaction between two communities is a function of the size of each community and the distance between each community. Telephone interviews were also conducted with Canadian companies holding mineral claims in the region to estimate new traffic that might be generated by potential mines. Section 6 describes the data used to develop multiple regression equations used to predict traffic counts and the results of the interviews and analysis.

2.3 Current Traffic and Trends

Passenger travel in the project area is primarily by air, with ferry service provided by AMHS and the Inter-Island Ferry Authority (IFA) accounting for the balance. AMHS provides year-round transportation for passengers and vehicles among coastal communities of Alaska, from Dutch Harbor to Metlakatla and extending south to Prince Rupert, B.C., and Bellingham, Washington. IFA mainly provides service between Ketchikan and Prince of Wales Island.

Approximately 60 percent of passengers and vehicles on the ferries in 2009 traveled during the summer season, May through September. The large seasonal variations are important when considering new infrastructure and future traffic projections. When considering alternatives and stages that include ferry links, predicted traffic volume might be limited by ferry capacities, making summer travel lower than projected. In 2006, for example, approximately 63 percent of all ferry passengers were Alaska residents. In the summer, however, non-residents account for the highest percentage of travelers on the routes between Alaska and Prince Rupert.

Most freight destined for Southeast Alaska moves by tug and barge, with more time-sensitive or valuable freight transported by airplane. Some smaller communities have most of their freight transported by ferry from the larger communities. AMHS transports vans among the Alaska communities, Prince Rupert, and Bellingham, while other companies provide tug and barge service between Southeast Alaska and Puget Sound.

2.4 Diverted Traffic Projections

Diverted traffic is current traffic on existing modes of travel that would shift to the new corridor when constructed. The magnitude of diverted traffic would depend on several factors, including travel time and cost. The difference in travel time and cost between the MRA corridors is minimal, so the final stage of development for all corridors has an estimated 12 annual average daily traffic (AADT)[2] count of diverted traffic in 2030. Travel time and cost do not vary enough between the corridors to substantially change the volume of diverted traffic. The greatest share of the diverted traffic would come from AMHS, with limited, if any, diversion from air travel or barge service.

2.5 Induced Traffic Projections

The induced traffic consists of regional travel of residents in communities within and close to the project area. Most of these residents would be traveling for recreational or non-work-related activities.

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[2] AADT is a measure used in transportation planning and engineering. It is the total volume of vehicle traffic on a highway or road for a year divided by 365 days.

Interaction among residents of the region would increase with the reduction in travel time and cost. The region likely affected would include Southeast Alaska and northwest B.C. The presence of an MRA is not anticipated to result in new trips to Alaska or B.C., so there are no induced trips for persons residing outside of the region; however, the MRA would divert some trips made by persons residing outside of the region as noted above. If Wrangell were the only Alaska community connected directly to the MRA, the regional MRA travel induced between communities would range from 130 to 200 AADT in 2030, depending on assumptions used to estimate such trips.

The new road would also generate shorter, local trips primarily for recreational and non-work-related activities. These trips would be short jaunts up and down the road and would not necessarily involve travel among communities. The volume of this traffic would decrease with distance from the communities. Locally induced trips for recreation and similar activities could add 90 or more AADT close to Wrangell or Petersburg. The level of induced travel would likely be the same for all three corridors, because such travel consists of opportunities for recreation and other activities rather than travel time. However, the distance from Wrangell to a ferry link for the various corridors and development stages would change the number of trips on the ferry, and the ferries might experience capacity constraints. For example, the Stikine River Corridor ferry terminal would be at Wrangell. It could receive 90 or more AADT from locally induced trips. The Aaron Creek terminal would be more than 20 miles from Wrangell. It could experience approximately 80 AADT from locally induced trips, and the Bradfield Canal ferry might experience 60 AADT.

In addition to induced recreational and other non-work-related travel, the construction of a corridor might improve the economic viability of mineral deposits that are located in the region within Canada. Companies with mining claims in the region were asked about plans and potential use of the proposed corridor if it were constructed. Some companies would consider using the corridor, depending on cost, time, road standards, and a port that could accommodate the large ships needed for transportation of mineral products. Others emphasized that the Port of Stewart is already an attractive alternative as the infrastructure needed for large vessels and ship loading is in place. The latter companies probably would not use the proposed corridor. Three companies indicated that they would use the MRA if a suitable port were available. These three mines could generate approximately 360 AADT of truck traffic on the MRA. In terms of deck space required on a ferry, these trucks would equal approximately 1,600 standard vehicles. Other factors such as the price of minerals influence development decisions, and it is possible that none of these mines will be developed.

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3 CURRENT TRANSPORTATION SYSTEM TRAFFIC PROJECTIONS

3.1 Introduction

This section reviews the current transportation system and projects future growth in travel activity assuming that the existing transportation system remains in place without development of a new MRA corridor connection to the Cassiar Highway. The current passenger transportation system in the project area consists of air, cruise, and ferry travel. Most freight is transported by barge and air, and the remainder is moved on the ferry system. There is no direct connection to the highway system south of Haines and Skagway or north of Hyder, Alaska, and Stewart, B.C.

3.2 Alaska Marine Highway System

AMHS transports passengers and vehicles between coastal communities in Alaska and provides service to Prince Rupert, B.C., and Bellingham, Washington. The scheduled ferry services are provided year-round in Southeast Alaska and are an integral part of the Alaska highway system. AMHS operates 11 vessels, with 7 of these operating in the Southeast Alaska system, from Bellingham north to Yakutat. The remaining vessels operate in Prince William Sound and in the Gulf of Alaska out to Unalaska, on the Aleutian Chain. In addition to transporting passengers and vehicles, the AMHS is also used for year-round shipment of container vans, including time-sensitive cargo such as fresh vegetables, meat, and dairy products, from Bellingham and regional Alaska centers to communities served by the system.

The Southeast system is divided into two subsystems: the mainline routes that typically take more than one day and the shorter routes that are called “day boat” routes. In the summer, the mainline routes carry a high percentage of tourists, while the day boat routes primarily serve local residents in the smaller communities in Southeast Alaska and Prince William Sound.

In addition to the AMHS service in Southeast Alaska, the IFA provides ferry service in the region. The route connects Hollis on Prince of Wales Island with Ketchikan. The IFA previously operated a second route between Coffman Cove, Wrangell, and Petersburg’s South Mitkof Terminal, but that service was curtailed in 2009. A connection from the mid-region of Southeast Alaska to the Cassiar Highway would probably not have an adverse effect on IFA traffic on the Hollis to Ketchikan run since it would be faster and less expensive for Ketchikan and Prince of Wales Island residents to use the Prince Rupert ferry to access the continental highway system.

Analysis indicates that the cost and travel time for Prince of Wales residents using the IFA route from Coffman Cove to Wrangell and the MRA would be about the same as the IFA to Ketchikan and then

AMHS to Prince Rupert route. Traffic on the Coffman Cove route would not likely be sufficient to sustain operations given the small population on Prince of Wales Island and the small number of anticipated trips. In addition, the Coffman Cove route would reduce traffic on the Hollis to Ketchikan route, making it more difficult to justify operating the northern route in the future. Subsequently, potential impacts on the IFA are not evaluated further in this report.

The following subsections provide additional information on trends in passenger and vehicle volumes on the AMHS in the region.

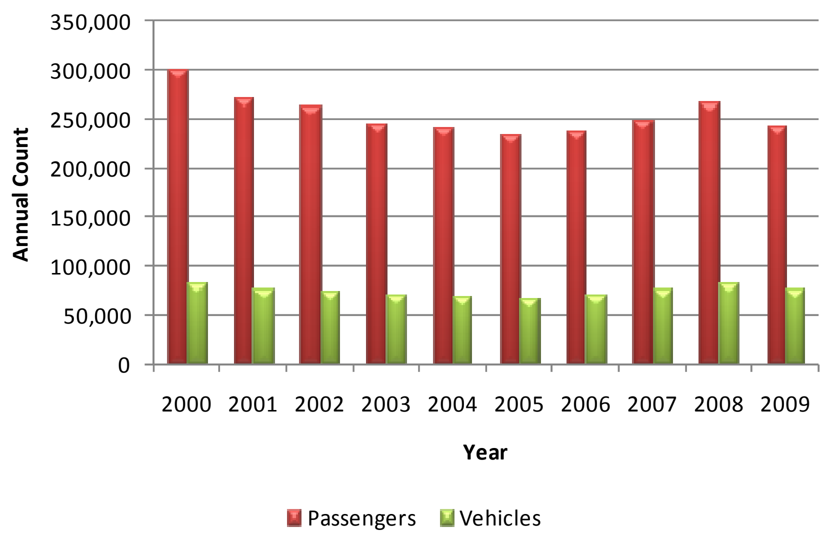
3.2.1 Current Traffic and Trends

In 2008, approximately 60 percent of the passengers and 58 percent of the vehicles that traveled on ferries did so during the 5-month summer season, May through September (AMHS, 2009). The balance traveled during the winter season. From 2000 to 2005, summer travel accounted for 64 to 65 percent of total annual passengers. For 2006, the AMHS adopted a discount pricing strategy to attract more traffic in the winter and then applied that strategy for the entire year in 2007. The discount pricing strategy has been maintained since 2007.

In addition, the AMHS added two fast ferries (catamarans) in 2006 and has been able to provide more frequent service to several communities in Southeast Alaska, which has increased ridership. As demonstrated by the percent change in travel, the pricing strategy and improved service successfully increased ridership. These two factors resulted in the first gain in total passenger counts for the AMHS system over the 2000 to 2009 period; in all previous years during that period, total ridership had declined from the prior year, as shown on Figure 3-1. The 2008-2009 recession resulted in a decline in ridership in 2009 for the first time since the pricing change.

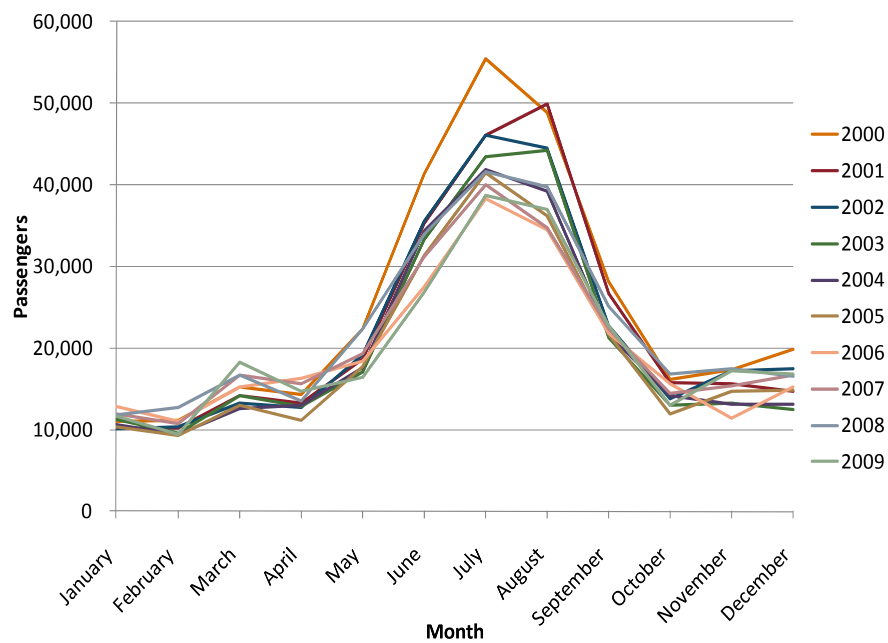
As illustrated on Figure 3-2, the demand for ferry service has a large degree of seasonality with a substantial increase in travel during the 5-month summer season. The figure also shows that the higher ridership that existed early in the decade (Figure 3-1) was primarily attributable to much higher summer traffic volumes. Tourism is a major economic driver in Southeast Alaska. Although most tourists arrive via cruise ship, a large number of tourists travel via the AMHS ferry fleet.

Anecdotal evidence suggests that fewer out-of-state passengers are riding the ferry system now than in the past due to the expansion of the cruise ship fleet calling in Alaska (Section 3.3.1). However, historical data are not available from the AMHS to document these anecdotal statements. AMHS staff estimates that Alaska residents represent approximately 70 percent of total ridership on Southeast routes in the winter and approximately 30 percent in the summer or approximately 45 percent of total passenger counts during the year (AMHS, 2007b). This would mean that non-residents account for 55 percent of total passenger counts.



Source: AMHS 2010

Figure 3-1. Annual Passenger and Vehicle Traffic for Southeast Routes, 2000 to 2009

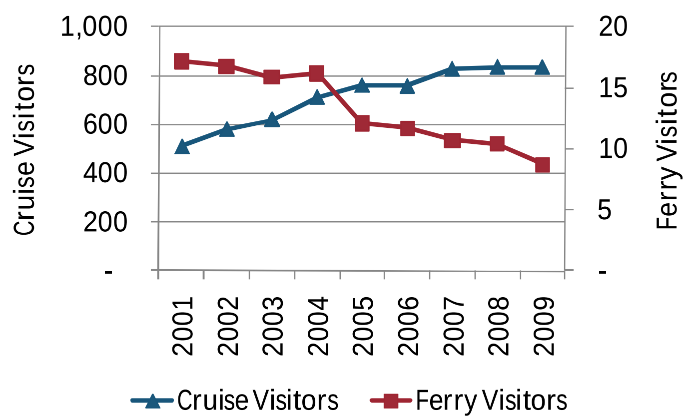


Source: AMHS 2010

Figure 3-2. Monthly Passenger Traffic for Southeast Routes, 2000 to 2009

The experience of traveling on a cruise ship is different from that on a ferry, and the needs of many ferry passengers could not be met by a cruise, but the two modes compete for passengers, and the cruise lines have been successful in attracting travelers. In addition, the total price of a low-cost cruise fare can be very competitive with the price of a ferry ticket to a city plus the cost of return transportation. Figure 3-3 shows the number of cruise ship passenger arrivals and exits from Alaska. Data for 2001 through 2004 were collected through surveys of arriving passengers, and data for 2005 through 2009 were based on surveys of passengers exiting the state. The total number of cruise passengers exceeded 1 million in 2009 since some passengers arrived in the state via cruise ship and departed via air travel.

Data on the number of out-of-state visitors arriving in or departing from Alaska on ferries are also captured in the Alaska Visitor Statistics Program conducted by the Alaska Department of Commerce, Community, and Economic Development; this information provides additional insight into non-resident travel on the Southeast ferry system. Between 2001 and 2009, the number of non-resident visitors arriving or departing on a ferry in the summer declined from 17,200 to 8,700 (McDowell Group, 2010). In addition, the number of arriving highway visitors has declined from 86,700 in 2001 to 55,200 in 2009 (McDowell Group, 2010). Visitors arriving via highway are more likely to use a ferry to arrive via air or cruise ship because they can travel among Southeast communities in their vehicles.



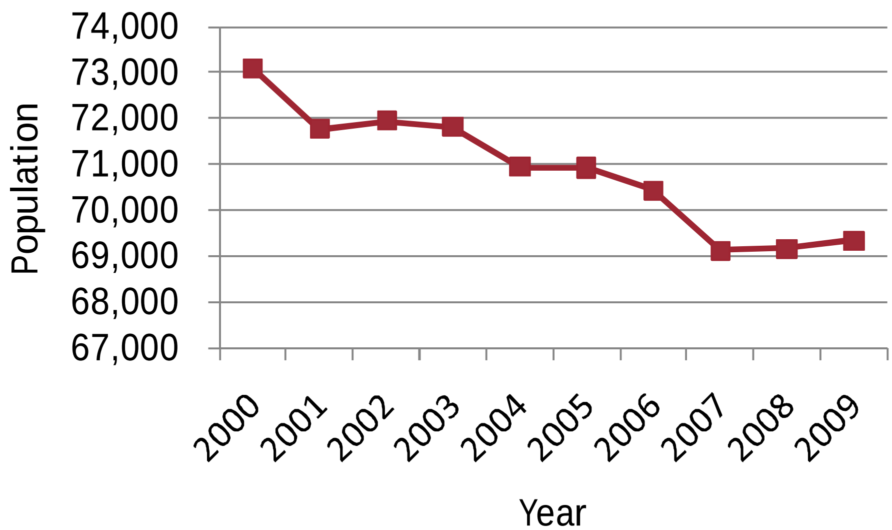
Sources: 2001 to 2004 data are obtained from Alaska Visitor Arrivals studies (conducted by Northern Economics, Inc.); 2005 to 2008 data are based on visitor/resident ratios obtained for AVSP V (conducted by McDowell Group, Inc.; AMHS, 2009).

Note: Cruise data were not collected in 2000 for the Alaska Visitors Statistics Program.

Figure 3-3. Cruise Ship Visitors and Southeast Ferry Visitors (in 000s), 2001 to 2009

Another reason for the difficulty in increasing ferry ridership in Southeast Alaska might be the declining population in the region. Figure 3-4 shows the change in population in Southeast Alaska from 2000 to 2009. In years when the national economy is in recession, the population in Southeast

Alaska increases slightly or remains flat. In years when the national economy is doing well, the population in Southeast Alaska declines as more people leave Southeast Alaska than move into the region. Between 2000 and 2007, the total population of the region declined, but the population increased slightly in 2008 and 2009 as the national economy entered a recession.



Source: Alaska Department of Labor and Workforce Development [DOLWD], 2010.

Figure 3-4. Southeast Region Population, 2000 to 2009

In 2006, the Alaska Department of Labor and Workforce Development (DOLWD) projected population change at the census area level and for Southeast Alaska (Table 3-1). The population forecasts are based on current population and historical trends in birth, death, and migration levels. Migration levels are a reflection of economic activity as people move out of a region when jobs are not available and move into a region when jobs are plentiful. Under the mid-case scenario developed by DOLWD, Juneau would see its population increase while other areas would decline. The regional population (total Southeast Alaska) in 2030 would be 5,200 fewer individuals than the 2010 forecast.

Table 3-1. Mid-Case Population Forecast 2010 to 2030, Southeast Alaska and Selected Census Areas

Census Area/Borough	Year				
	2010	2015	2020	2025	2030
Ketchikan Gateway Borough	12,836	12,507	12,088	11,587	11,095
Prince of Wales-Outer Ketchikan C.A.	5,261	4,996	4,658	4,274	3,894
Sitka Borough	8,964	8,948	8,864	8,740	8,658
Wrangell-Petersburg Census Area	5,960	5,785	5,580	5,340	5,076
Juneau City and Borough	31,691	32,078	32,252	32,227	32,260
Subtotal	**64,712**	**64,314**	**63,442**	**62,168**	**60,983**
Total Southeast Alaska	**70,315**	**69,593**	**68,335**	**66,661**	**65,073**
Percent change for Total		**-1.0**	**-1.8**	**-2.4**	**-2.4**

Source: DOLWD 2007

Table 3-2 presents the population forecasts for Southeast Alaska under the three forecast cases prepared by DOLWD. There is substantial variation in the forecasts, with the low case declining by about 14,000 persons from current levels and the high case increasing slightly to almost 74,000. According to DOLWD's low-case forecasts, all census areas in Southeast Alaska would lose population in the future. In the high-case forecast, Juneau and Sitka are the only two census areas with appreciable population growth. The DOLWD population estimate for Southeast Alaska in 2009 was 69,338 (DOLWD, 2010), which is approximately 1,000 persons under the mid-case forecast for 2010 and 1,300 above the low case forecast for the same year.

Table 3-2. Population Forecasts for Southeast Alaska, 2010 to 2030

Case	Year				
	2010	2015	2020	2025	2030
Low	68,023	65,275	62,269	59,310	56,749
Mid	70,315	69,593	68,335	66,661	65,073
High	72,838	74,228	74,588	74,251	73,786

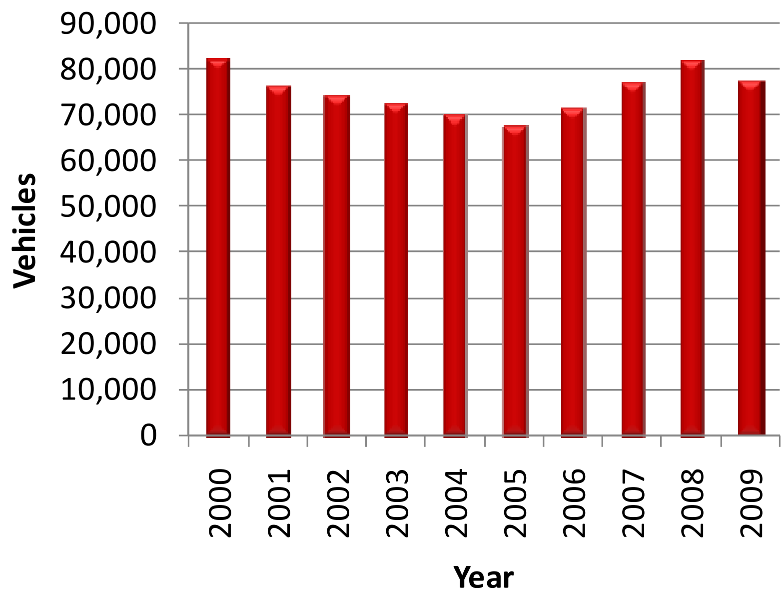
Source: DOLWD 2007

The following subsections provide additional details on vehicle and passenger counts and provide forecasts to 2030 for AMHS.

3.2.2 Vehicle Forecasts

Numerous vehicle analyses were undertaken to project future vehicle traffic on Southeast routes for AMHS. Numerous variables were evaluated, the most significant of which were Southeast Alaska population and a variable that represents a change in the year-round pricing structure (driver of vehicle rides for free) offered by AMHS starting in 2007. This pricing structure is assumed to continue through the study period. These data variables for 2000 through 2009 were inputs to a regression analysis that generated vehicle forecasts.

Figure 3-5 shows that vehicle traffic decreased from 2000 to 2005 and increased from 2006 to 2009 due partly to the pricing change that allows free travel for the driver of a vehicle.



Source: AMHS, 2010.

Figure 3-5. Annual Vehicle Counts, 2000 to 2009

The vehicle forecast was conducted using two variables: Southeast Alaska population and a variable reflecting the presence of the pricing change. While non-residents also ride the AMHS, Alaska residents and out-of-state friends and family of Alaska residents likely account for a substantial portion of the AMHS traffic.

The 10 annual data points for each variable for 2000 through 2009 were inputs to a regression analysis that produced P (probability) values of less than 0.02 (i.e., 98 percent probability that the true mean falls within the 95 percent confidence intervals estimated by the equation) with the equation having an adjusted R2 (coefficient of determination) of 0.71, suggesting that 71 percent of the variation in predicted values is explained by the two variables. The regression equation used for forecasting is as follows:

> Y = -269829 + 4.799908 * Southeast Alaska population + 16552.99 * Pricing variable (which is 1 for the forecast years).

The results of the vehicle forecast in 5-year increments are presented in Table 3-3. As indicated by the regression equation above, the trends in the vehicle forecasts are a direct result of the evolution in population under the low, mid, and high scenarios.

Table 3-3. Vehicle Forecasts for Southeast Alaska, 2010 to 2030

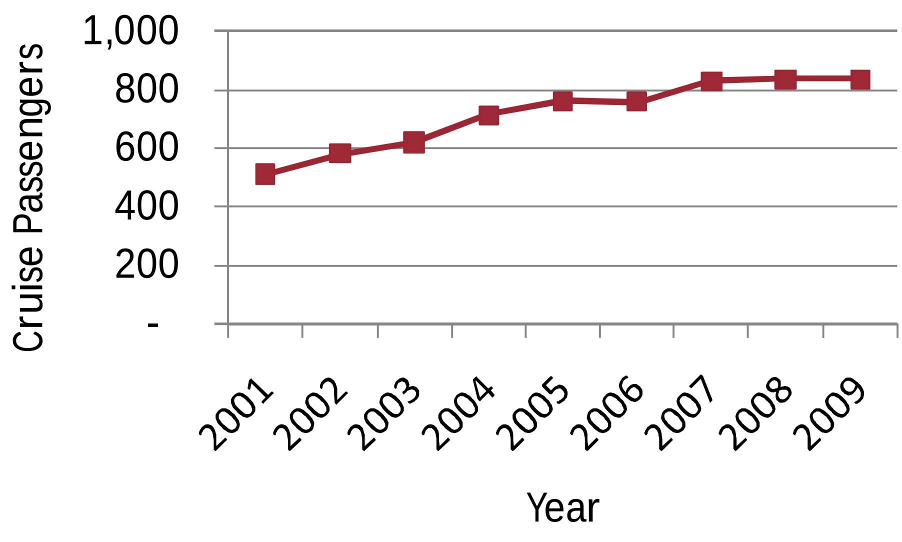
Case	Year				
	2010	2015	2020	2025	2030
Low	73,229	60,038	45,610	31,407	19,114
Mid	84,230	80,764	74,726	66,691	59,069
High	96,340	103,012	104,740	103,122	100,890

Source: Estimates by Northern Economics, 2010.

3.3 Other Marine Industry

3.3.1 Cruise Ships

According to the Alaska Visitor Statistics Program, the number of cruise passengers in Alaska has increased substantially since 2001 (Figure 3-6). In addition to the estimates shown in the figure, additional cruise passengers enter or exit the state via another mode (primarily air). When those passengers are added to the estimates shown on Figure 3-6, the total number of cruise passengers has exceeded 1 million since 2007.



Note: 2001 to 2004 data based on entry mode; 2005 to 2008 data based on exit mode

Sources: 2001 to 2004 data from Alaska Visitor Arrivals studies (conducted by Northern Economics, Inc.); 2005 to 2009 data based on the Alaska Visitor Statistics Program V (conducted by McDowell Group, Inc.)

Figure 3-6. Cruise Passengers (000s), 2000 to 2009

In August 2006, Alaska voters passed an initiative to levy a $50 tax per cruise passenger and implemented a tax on cruise ships' gaming income. The effect of both the tax increases and the recession has resulted in only marginal increases in cruise passengers since 2007. In 2010 and 2011, however, passenger counts are anticipated to decline substantially as the cruise industry is reducing its capacity by 14 percent, partly in response to the increased taxes (McDowell Group, 2010).

Alaska reduced the cruise passenger tax to $34.50 in July 2010. However, the cruise companies have already scheduled their ships for 2011, so any increases in capacity would not take place until 2012 at the earliest. Based on discussions with cruise industry representatives (Bustamante, 2010), it is anticipated that the reduced tax will constrain future growth in cruise ship capacity and passengers in comparison to the 5 percent per year growth in passengers since 1993 and the 7.3 percent per year increase between 2001 and 2007. The number of cruise passengers is assumed to increase at a 3 percent rate from 2012 through the end of the study period, resulting in about 1.7 million cruise passengers in 2030.

New venues and activities would be needed to accommodate this large increase in visitors over the next 20 years. It was thought that the presence of the MRA might result in additional visitors to Wrangell and possibly Petersburg. According to Princess Cruises, however, Wrangell receives only a few cruise ship calls per year from smaller vessels because there are limited venues and activities in and around the community, and other port calls are more attractive to cruise passengers and the industry. Additional calls at Wrangell would result in the ships not calling at another community where the companies may be able to generate more revenue from excursions and other activities than they could at Wrangell (Bustamante, 2010). That situation would not likely be significantly affected regardless of whether an MRA project is developed, so no significant traffic volumes on the MRA are anticipated to result from an expanding cruise industry in Southeast Alaska.

3.3.2 Freight

Most of the freight destined for Southeast Alaska moves by tug and barge, with more time-sensitive or valuable freight (e.g., produce and milk, or electronics) transported by airplane or ferry. Some smaller communities have most of their freight transported by ferry from the larger communities. Wood products, seafood, and other products are shipped by barge to the lower 48 states and Canada, and ore concentrates and wood products move by ship to other countries. The AMHS transports vans among Alaska communities, Prince Rupert, and Bellingham. Seattle serves as the primary port of origin and destination for Northland Services, Alaska Marine Lines, and other tug-and-barge companies that serve Southeast Alaska.

U.S. Army Corps of Engineers data indicate that maritime freight volumes increased from 2001 through 2007 (the latest year for which data are available) in all of the communities shown in Table 3-4 except Hoonah and Kake, where mill closures or harvest reductions resulted in lower freight volumes. Petroleum products are typically the largest commodity by weight. Other important commodities include wood products, fish products, and equipment/vehicles.

Table 3-4. Freight Volumes in Select Communities, 2001 to 2007

Port	2001	2002	2003	2004	2005	2006	2007(*)
	(Thousand short tons, in-bound and outbound combined)						
Hoonah	105	7	16	31	59	41	18
Kake	14	11	9	4	21	66	4
Ketchikan	596	753	680	651	674	632	595
Petersburg	93	171	286	183	185	170	189
Sitka	93	139	133	123	111	117	121
Wrangell	24	21	33	24	34	45	23
Total	925	1,102	1,157	1,016	1,084	1,071	950

Note: (*) The latest available information corresponds to 2007.

Sources: U.S. Army Corps of Engineers, various years; Waterborne Commerce of the United States for Calendar Year 2001; and subsequent years

AMHS carried 4,022 vans in 2001, and this number declined to 3,249 in 2008 (Table 3-5). Vans represent approximately 4 percent of AMHS vehicle traffic in most years and approximately 6 percent in terms of linear feet of car deck space used. Assuming that the average van carries 25,000 pounds of cargo, the AMHS would have carried approximately 41,000 tons of cargo in 2009, a very small portion (less than 0.5 percent) of the total volume of freight transported to and from the communities shown in Table 3-4.

Table 3-5. AMHS Van Counts, 2001 to 2009

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Vans	4,022	3,616	3,254	3,745	3,857	3,489	3,439	3,482	3,249

Source: AMHS, various years. 2001 Annual Traffic Volume Report; and subsequent years.

The Economic Assessment of the Bradfield/Iskut Transportation Corridor (McDowell Group, 2005) indicated that barge service to Seattle was approximately one-third of the cost of trucking via a Bradfield Canal transportation corridor. The authors concluded that trucking would not likely divert a significant amount of barge freight. They did anticipate that diversion of air freight currently used for time-sensitive goods could occur.

The vessels operating in Southeast Alaska on routes that went to Bellingham, Prince Rupert, Haines, or Skagway accounted for approximately two-thirds (2,260) of the vans that were transported by AMHS in 2006. Other van movements were within the region and would not be affected by a potential road corridor. This analysis assumes that the number of vans transported on the routes connecting to ports with road connections would be the only movements to be affected by a road corridor.

The forecast for AMHS vans is based on a regression equation using Southeast Alaska population and a variable that reflects the 2002-2003 recession and the 2009 recession. The regression equation used for forecasting is as follows:

> Y = -6843.83 + 0.149398 * Southeast Alaska population – 394.749 * Recession variable (which is 1 for 2002, 2003, and 2009; 0 for other forecast years).

The P-values were less than 0.03, and the equation had an adjusted R2 of 0.63. The forecast under each population case is shown in Table 3-6.

Table 3-6. Alaska Marine Highway System Vans Forecast, 2010 to 2030

	Year				
Case	**2010**	**2015**	**2020**	**2025**	**2030**
Low	2,924	2,908	2,459	2,017	1,634
Mid	3,266	3,553	3,365	3,115	2,878
High	3,643	4,246	4,299	4,249	4,180

Source: Estimates by Northern Economics, Inc.

3.4 Aviation Industry

Air travel is the mode of choice for most residents and a sizeable number of non-residents traveling to and from Southeast Alaska. Air freight is the mode of choice for valuable and time-sensitive freight moving to or from the region.

3.4.1 Air Passengers

Table 3-7 presents the number of air passengers boarding in selected communities in Southeast Alaska from 2000 to 2009. These airports have scheduled jet service and are the principal airports used by Southeast Alaska residents and non-residents to travel to or from the region. These numbers include all scheduled carriers, but do not include charter or flight-seeing operations. Overall, the number of passengers increased from 2000 through 2007 and was then affected by the national recession and higher fuel prices.

Table 3-7. Air Passengers (in 000s) Boarding in Selected Communities in Southeast Alaska, 2000 to 2009

Community	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Juneau	255	258	273	282	288	294	301	310	292	264
Ketchikan	99	94	98	101	105	108	107	110	107	96
Petersburg	18	17	17	17	18	20	19	20	19	17
Sitka	67	70	70	69	74	73	71	74	68	62
Wrangell	10	10	9	9	10	11	11	11	11	11
Total	449	449	467	478	495	505	509	525	496	450

Source: Bureau of Transportation Statistics (BTS) 2010

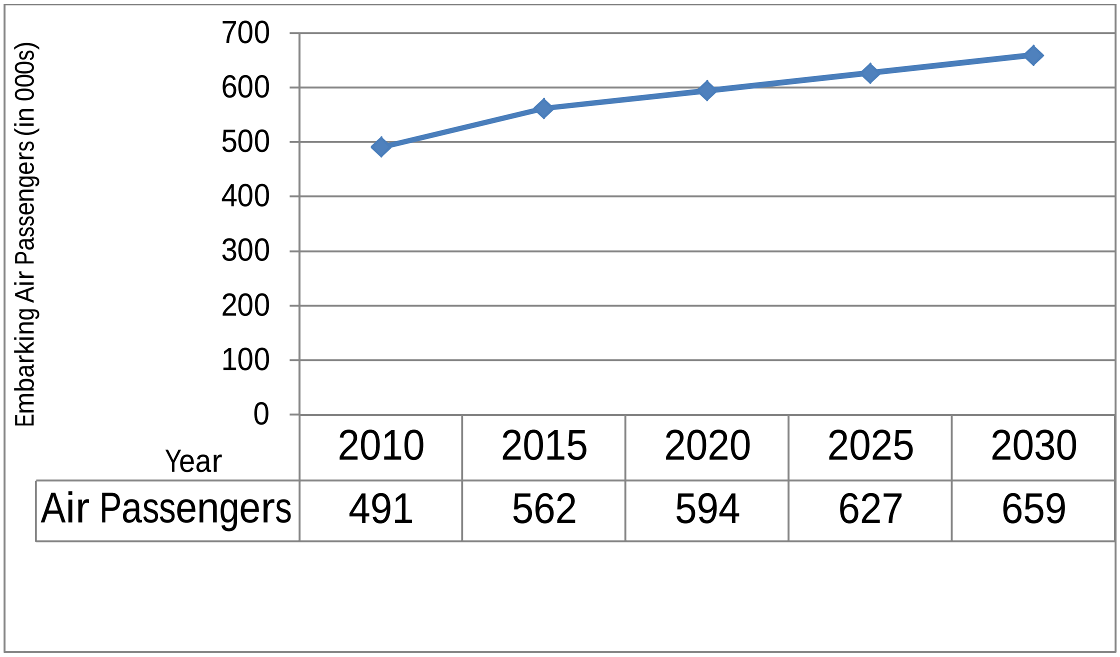
The air passenger forecast is based on a regression equation that uses time and a variable that accounts for the effects of September 11, 2001, and a recession in 2008 and 2009. The P-values are less than 0.03, and the equation has an adjusted R2 of 0.53. The regression equation used for forecasting is as follows:

Y = 458.2739+6.484837 * Time (1 to 10 for 2000 through 2009; 2010 is 11, and 2030 is 31) – 38.5695* Recession variable (which is 1 for 2002, 2003, 2008, 2009, and 2010; 0 for other years).

The total number of passengers boarding flights at these airports would reach about 660,000 in 2030 (Figure 3-7). The total number of passengers (embarking and disembarking) would be almost twice this number, or approximately 1,320,000. The effects of the 2008 and 2009 recessions are assumed to affect air travel in 2010, but not in subsequent forecast years.

3.4.2 Air Freight and Air Mail

Air freight and air mail are used extensively in Southeast Alaska to move seafood and other products from the region and for residents and local businesses to purchase goods and supplies that may not be available in their community. As shown in Table 3-8, the volume of mail and freight varies a great deal from 2003 through 2009. Data for earlier years are not shown since the Bureau of Transportation Statistics (BTS) has acknowledged issues with the data in earlier years.



Source: Estimates by Northern Economics, Inc.

Figure 3-7. Air Passengers, 2010 to 2030

Table 3-8. Air Freight and Air Mail to and from Selected Communities in Southeast Alaska (thousands of pounds), 2003 to 2009

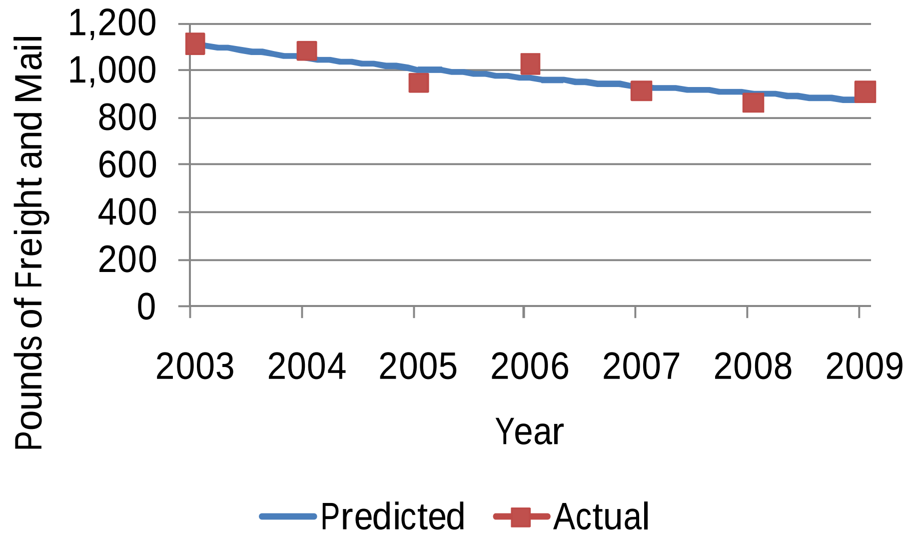
Community	Year						
	2003	2004	2005	2006	2007	2008	2009
Juneau	9,088	10,415	9,703	8,147	9,718	6,964	6,826
Ketchikan	8,185	8,695	7,121	4,637	6,274	4,336	4,156
Petersburg	648	1,100	1,127	1,262	1,403	1,162	1,032
Sitka	11,543	11,924	10,806	6,873	9,333	6,400	6,520
Wrangell	431	884	711	698	676	747	686
Total	29,894	33,018	29,467	21,618	27,404	19,608	19,219

Source: Calculated by Northern Economics, Inc., from BTS, 2010a

A regression analysis was conducted with total annual air freight and air mail volumes regressed against annual population estimates for Southeast Alaska as the independent variable. The P-values were less than 0.03, and the equation has an adjusted R2 of 0.65, but with the low population forecast, results were negative, so this regression analysis was rejected in favor of a curve-fitting program for time and pounds per capita, which resulted in an equation with P-values less than 0.01 and an adjusted R2 of 0.69. The equation is as follows:

$$Y = 1257.0492-145.00717*Time\ (2003=1,\ 2009=7)^{0.5}.$$

The actual pounds per capita and the predicted values using this equation are shown on Figure 3-8.



Source: Estimates by Northern Economics, Inc.

Figure 3-8. Pounds of Mail and Freight per Capita, 2003 to 2009

Projecting the curve into the future and applying the resulting pounds per capita to the DOLWD population estimates provided air freight and air mail volumes (Table 3-9).

Table 3-9. Air Freight and Air Mail Forecast for Southeast Alaska, 2010 to 2030

	Year				
	2010	**2015**	**2020**	**2025**	**2030**
Pounds per capita	847	734	642	562	490
Case	Millions of Pounds				
Low	57.6	47.9	40.0	33.3	27.8
Mid	59.6	51.1	43.9	37.4	31.9
High	61.7	54.5	47.9	41.7	36.1

Source: Estimates by Northern Economics, Inc.

4 CORRIDORS AND STAGES

4.1 Introduction

This section describes the three corridors for the proposed MRA link to the Cassiar Highway, including the different stages of development for each corridor. The corridors and stages are also portrayed in maps.

4.2 Description of Corridors

One of the goals of the SATP is to improve access by shifting from a transportation network based on long-distance ferry service to a more robust network of longer road corridors with shorter ferry links.

Improved access to hinterland highway systems mitigates some disadvantages of living in remote locations and enhances the prospects for economic growth in the region. The purpose of this task is to develop and assess a range of potential multi-modal transportation system improvements designed to achieve this objective by providing a mid-Southeast Alaska surface transportation connection to the continental highway system via the Cassiar Highway (Highway 37) in B.C.

Figure 1-1 illustrates the larger Southeast Alaska study area extending from Juneau to Prince Rupert in B.C. Shown in the figure are major cities and towns, existing roads, and both the AMHS and Inter-Island Ferry system as they currently exist in this area.

Currently, Ketchikan residents can access the continental highway system with a relatively short ferry ride to Prince Rupert. Residents of Juneau in the northern portion of Southeast Alaska can take a relatively short ferry ride to connect to the continental highway system at Haines or Skagway. Other Southeast residents can access the continental highway system by taking the ferry to Haines or Skagway in the north via Juneau, or by taking a ferry south to either Prince Rupert or Bellingham via Ketchikan.

The proposed MRA project could reduce travel time and cost for mid-region residents of Southeast Alaska by providing access to the continental highway system at a location much closer than the currently available connections. The project could reduce the need for long-distance ferry links in Southeast Alaska. It could also increase mobility of area residents by increasing the frequency of service over shorter ferry links at reduced cost to the traveler.

The consultant team has developed 20-year traffic forecasts (2010 through 2030) for the MRA project. These projections are based on scenarios with varying levels of development in the region and on an assessment of different transportation system connections, including reference to the SATP, the geographic location of the corridors, the potential phasing of transportation infrastructure development, and traffic estimates from a previous report (Supplemental Economic Assessment of the Bradfield/lskut Transportation Corridor, McDowell Group, 2004).

In this analysis, several transportation corridor alternatives are compared to a base case that reflects current trends. Figure 1-2 illustrates the corridors that were considered. To facilitate comparison of alternatives, all traffic forecasts assume each corridor and stage considered is completed and in service in 2030.

The Current Trends Alternative described below serves as the base case or "without project" option. Initially, four corridor options were considered for the study. However, the Unuk River Corridor was dropped due to terrain and land use issues. Development of the remaining MRA surface transportation corridors to the Cassiar Highway in Canada are referred to as the Bradfield Canal, Stikine River, and Aaron Creek Corridors. All three corridors use the Iskut River valley to access the Cassiar Highway.

4.2.1 SATP Current Trends Alternative

This alternative is based on the existing infrastructure conditions in Southeast Alaska, plus a set of assumptions regarding projects in the SATP that are likely to go forward and that should be considered in the analysis. The following assumptions are made to facilitate the comparison of mid-region alternative traffic forecasts and do not reflect any anticipated funding program.

The SATP designated 34 corridors as "Essential Transportation and Utility Corridors" to meet future needs. By designation of these corridors and adoption of the transportation plan, the state is requesting that no other actions be taken on a state or federal level that would interfere with the future public use of the mapped corridors (DOT&PF, 2004).

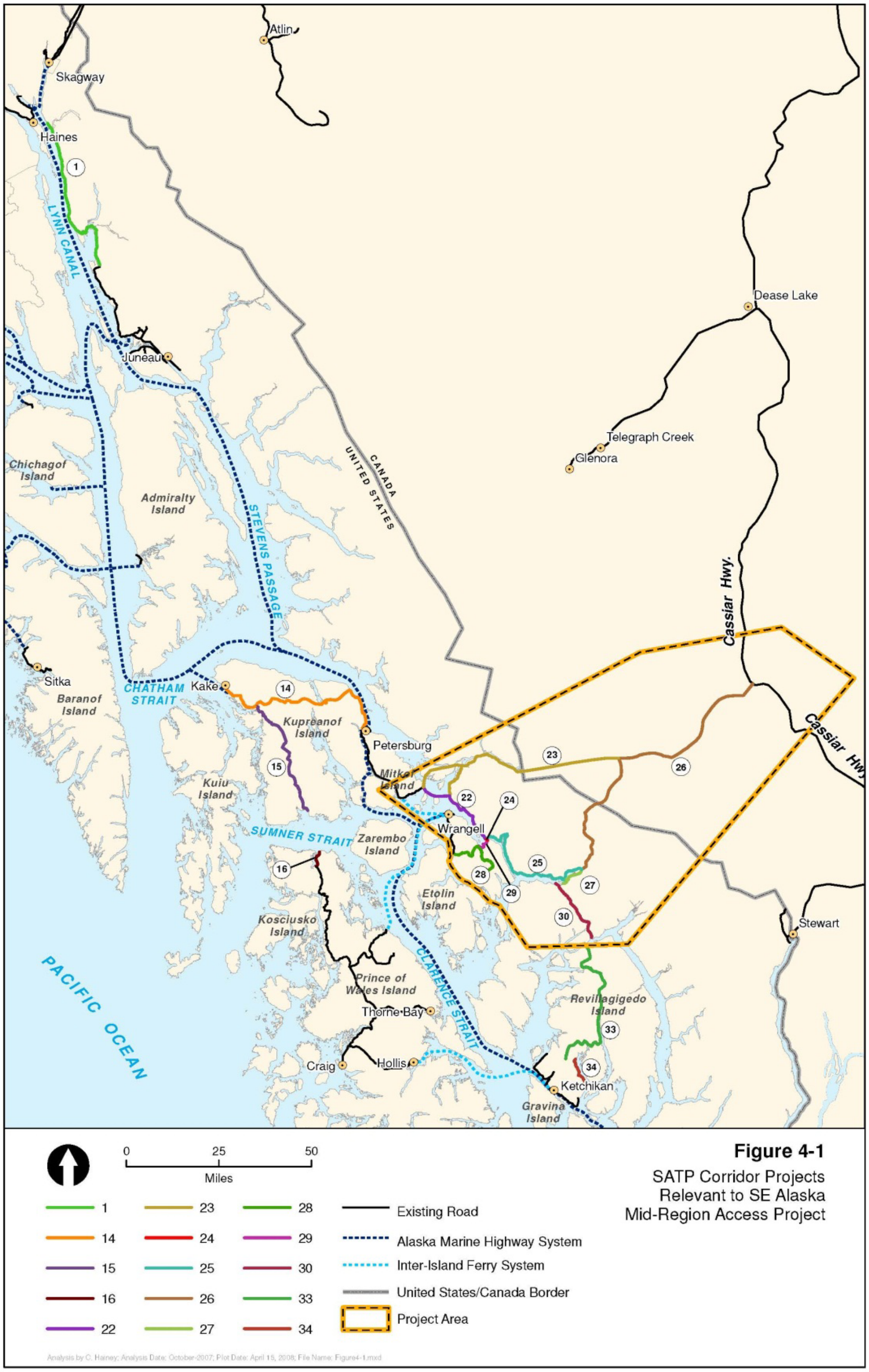
The outcome of reviewing the 34 corridors is provided in the bulleted list below.[3] The projects were divided into three categories: 1) projects that would go forward and that might have an impact on the MRA corridor, 2) projects that in the study team's opinion would not likely go forward during this study period (e.g., before 2030), and 3) projects that would have no effects or limited effects on the corridor analysis.

The projects that would go forward or might have a significant effect on the MRA are presented in the bulleted list and shown on Figure 4-1. The numbering of these projects is consistent with text numbering in Appendix A of the SATP. A corresponding table that relates these numbers to graphics found in the SATP is attached as Appendix A.

[3] The complete list of "Essential Transportation and Utility Corridors" can be found in Appendix A of the Southeast Alaska Transportation Plan, which is available on the Alaska Department of Transportation and Public Facilities Web site.

At present, the IFA is not operating its Northern Route, which transits between Coffman Cove, Wrangell, and South Mitkof Island. The route is, however, shown on the maps presented in this section.

- Lynn Canal Corridors– Juneau to Haines and Skagway
  - Item 1, Lynn Canal Road, would entail road construction from Echo Cove northerly along the shore of Berners Bay and Lynn Canal, with construction of a ferry terminal on the north side of the Katzehin River delta. Assumes project completion at end of 2015.
- Kupreanof Island Corridor
  - Item 14, Kake – Petersburg Road, and Item 15, Kake – Totem Bay Road, would provide access from Kake and northern Southeast communities to Petersburg and the MRA corridor. These roadways would also provide an alternative route between Ketchikan and the northern communities. Assumes project completion for the Kake-Petersburg road by 2015.
- Prince of Wales Island Corridors
  - Item 16 is the Red Bay Cutoff that would provide access from the proposed Sumner Strait ferry to the existing road.
- Mid-Region Access Corridors
  - Items 22 through 27 are related to the MRA corridor and are the subject of the analysis.
- Wrangell lsland Corridors
  - Items 28 and 29 are related to the MRA corridor and the traffic forecasts associated with them.
- Revillagigedo Island Corridors
  - Items 33 and 34 would potentially provide another access route from southern Southeast Alaska to the MRA corridor. Assumes completion beyond the end of the study period.



Source: Parametrix, Inc.

Figure 4-1. SATP Corridor Projects Relevant to SE Alaska MRA Project

4.2.2 Bradfield Canal Corridor

This corridor, to be known as the Bradfield Canal Ultimate Corridor with Deep-water Terminal, assumes that, in addition to the projects included in the base case or Current Trends Alternative, a transportation corridor would be constructed from the Bradfield Canal up the Bradfield River, along the Craig River, and across the Canadian Border to connect with the Cassiar Highway. This corridor is illustrated on Figure 4-2 and would include the following elements:

- Construction or upgrading of a road from the Cassiar Highway to the vicinity of the confluence of Bronson Creek and the Iskut River, south up the Craig River and across the border, with construction of a tunnel to the North Fork of the Bradfield River and down the Bradfield River to a suitable ferry terminal location on the Bradfield Canal.
- Construction of a ferry terminal on the north side of the canal up as far as possible, while still having a deep-water port (e.g., east of the Harding River). This ferry terminal would accommodate IFA and AMHS ferries and would also accommodate deepwater vessels.
- Construction of a conventional ferry terminal on the west side of Fools Inlet at one of several potential locations with sufficiently deep water and with a road connection to Wrangell. This road connection would include approximately 4 miles of new road from the end of an existing logging road and 6 miles of reconstruction of existing unpaved logging roads to the paved end of the Zimovia Highway.
- Provision of a shuttle ferry to run between the Bradfield Canal terminal and the Fools Inlet terminal. The IFA and AMHS mainline ferries would continue to provide conventional ferry service in the vicinity.

4.2.3 Stikine River Corridor

This corridor anticipates that air-cushion vehicle (ACV) service would be provided as an interim measure, with a road connection to be built later along the Stikine River. The corridor would also include ferry service to cross major waterways.

This alternative assumes that full build-out would result in road connections to Wrangell and Petersburg. Development of this corridor could happen in five stages as illustrated on Figures 4-3a to Figure 4-3e. Details and the assumed timing of these stages are as follows:

- Stage 1. This stage assumes reconstruction and extension of the road from the Cassiar Highway to a suitable ACV terminal site on the Iskut River near its confluence with the Stikine River. It also anticipates construction of a suitable ACV ferry terminal at or near

Wrangell Airport and construction of a suitable ACV ferry terminal near the end of Mitkof Highway 7 at the southeastern tip of Mitkof Island. This stage, illustrated on Figure 4-3a, could operate for the duration of the study period through 2030, or it could operate until a road alternative is provided. The use of multiple ACVs is recommended to enhance mobility and reliability and to meet peak seasonal demand. The reliability of ACV service in winter months and during freeze-up and break-up could limit ridership.

- Stage 2. Extension of the road from the vicinity of the Iskut River to a suitable conventional ferry terminal site across from Wrangell Airport near the mouth of Crittenden Creek, construction of opposing conventional ferry terminals near the Wrangell Airport, and implementation of a shuttle ferry to operate across the Eastern Passage (Figure 4-3b). AMHS and IFA ferry service would continue in operation.
- Stage 3. Includes all the elements of Stage 2 plus construction of a conventional ferry terminal at Fools Inlet with a road connection to Wrangell. IFA and AMHS ferries would call at the Fools Inlet terminal and Wrangell. This stage is illustrated on Figure 4-3c.
- Stage 4. Extension of a road connection from the vicinity of Andrew Creek across Dry Strait to the end of Mitkof Highway 7 (Figure 4-3d). Ferry service between Wrangell, Blind Slough, and Petersburg would cease with construction of this stage.
- Stage 5. Extension of the road from the mouth of Crittenden Creek, construction of a bridge across The Narrows, and construction of a road connection to Wrangell and the Fools Inlet ferry terminal. This stage represents the ultimate Stikine River Corridor (Figure 4-3e).

The proposed Stikine River Corridor would transect the Stikine-LeConte Wilderness in which mechanized travel is not permitted. Under this restriction, the road could not be built. The only exception to this prohibition is if Canada would request access via the Stikine River Corridor under treaties and provisions of the Alaska National Interest Lands Conservation Act (ANILCA). This corridor would not be viable unless such a request were made.

4.2.4 Aaron Creek Corridor

This alternative describes a transportation corridor consisting of a road and ferry from the Iskut River to Wrangell as illustrated on Figures 4-4a through 4-4d. This scenario comprises four development stages:

- Stage 1. Stage 1 of this corridor is similar to Stage 1 of the Stikine River Corridor described above, so it is not duplicated here and is not analyzed separately. This stage is illustrated on Figure 4-4a.
- Stage 2. Stage 2 consists of a road constructed up the West Fork of the Katete River, over a pass or through a tunnel, and down Aaron Creek to the Eastern Passage; it includes construction of opposing conventional ferry terminals at Berg Bay and at an existing log transfer facility just west of The Narrows, as well as operation of a conventional shuttle ferry and reconstruction of the existing logging road from the log transfer facility to the end of the Zimovia Highway (Figure 4-4b).
- Stage 3. Stage 3 consists of construction of a shuttle ferry terminal at Fools Inlet and new and upgraded road extensions to this terminal (Figure 4-4c). IFA and AMHS ferries could call at the Fools Inlet terminal and Wrangell.
- Stage 4. Stage 4 consists of construction of a road across The Narrows (Figure 4-4d) connecting Berg Bay to Wrangell Island.

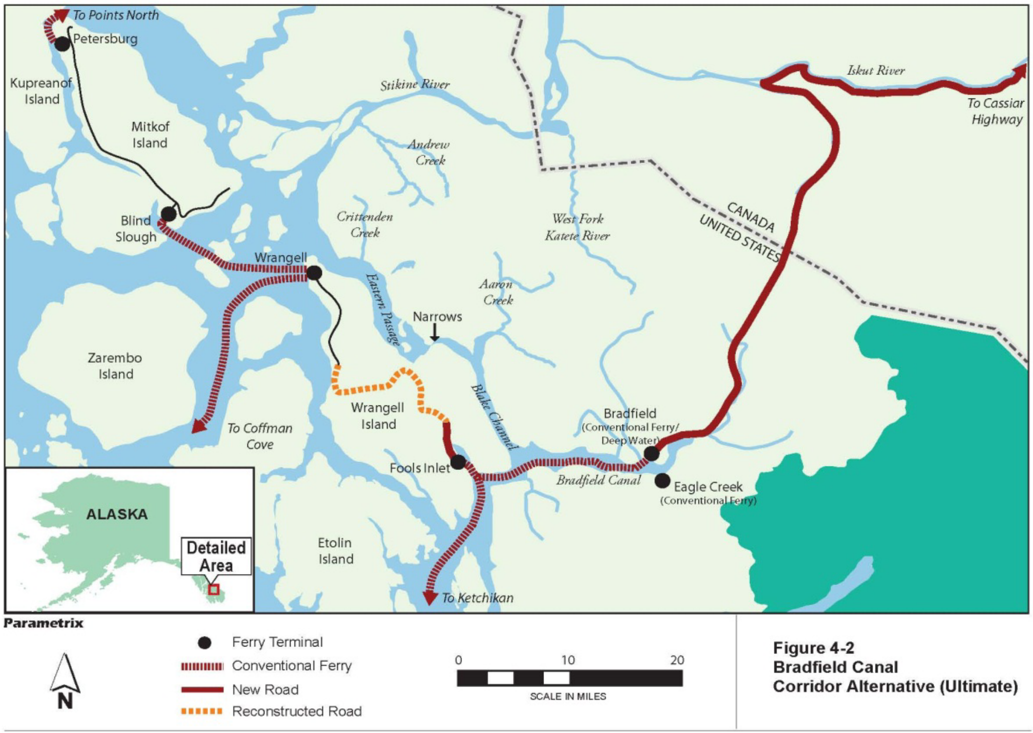


Figure 4-2. Bradfield Canal Corridor (Ultimate)

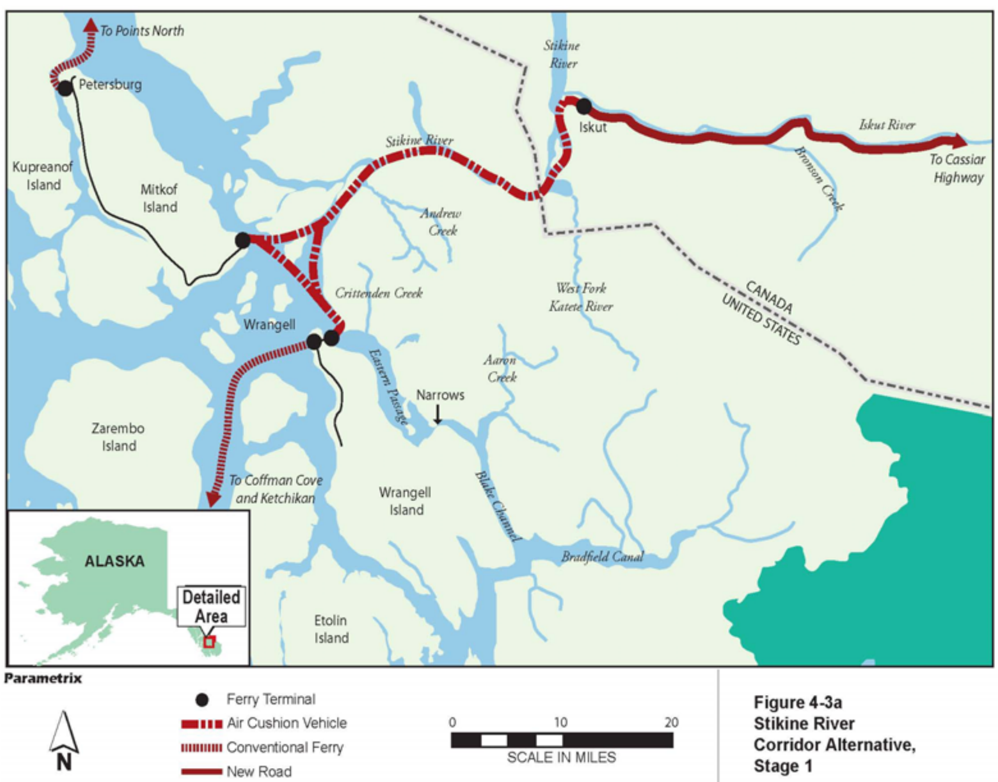


Figure 4-3a. Stikine River Corridor, Stage 1

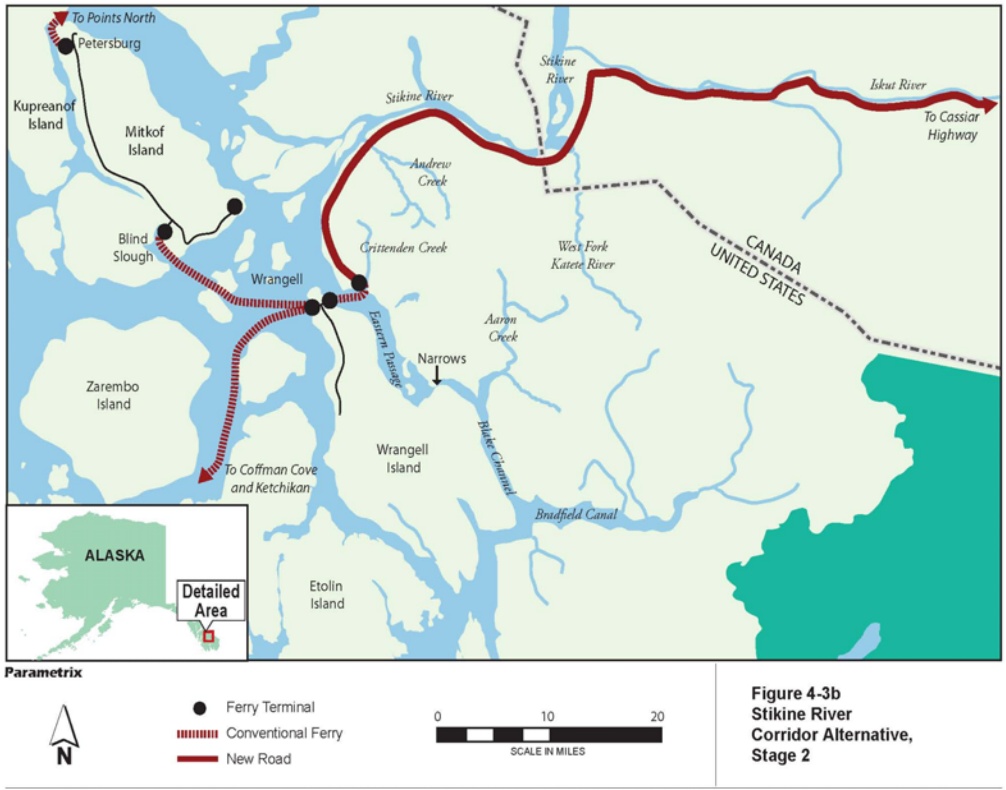


Figure 4-3b. Stikine River Corridor, Stage 2

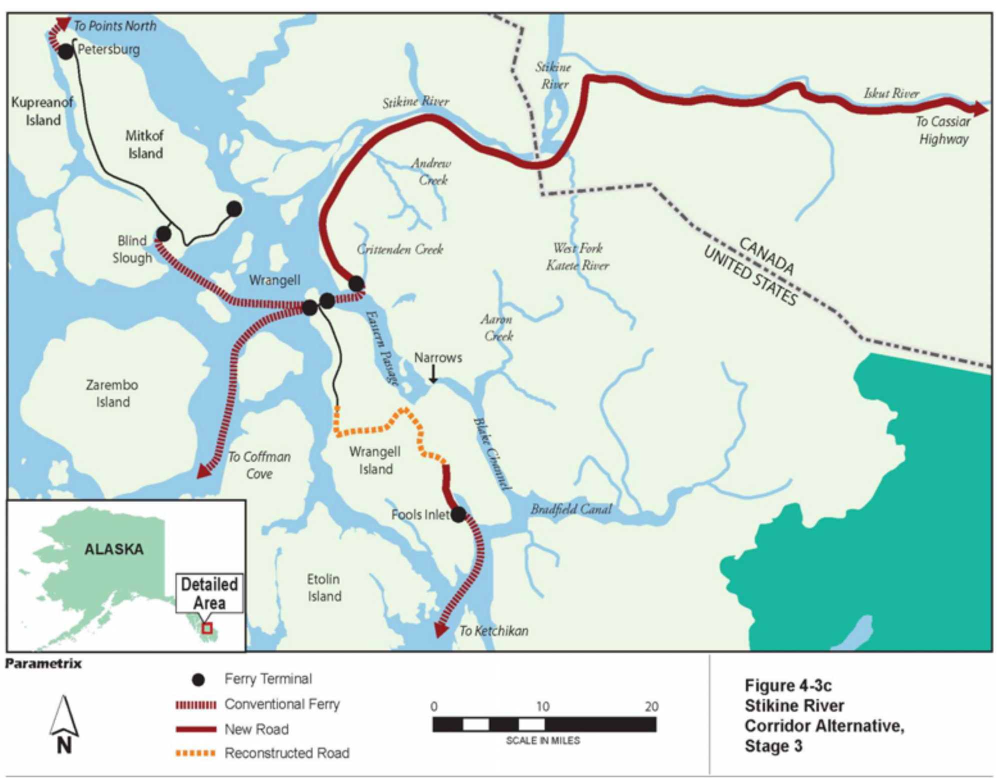


Figure 4-3c. Stikine River Corridor, Stage 3

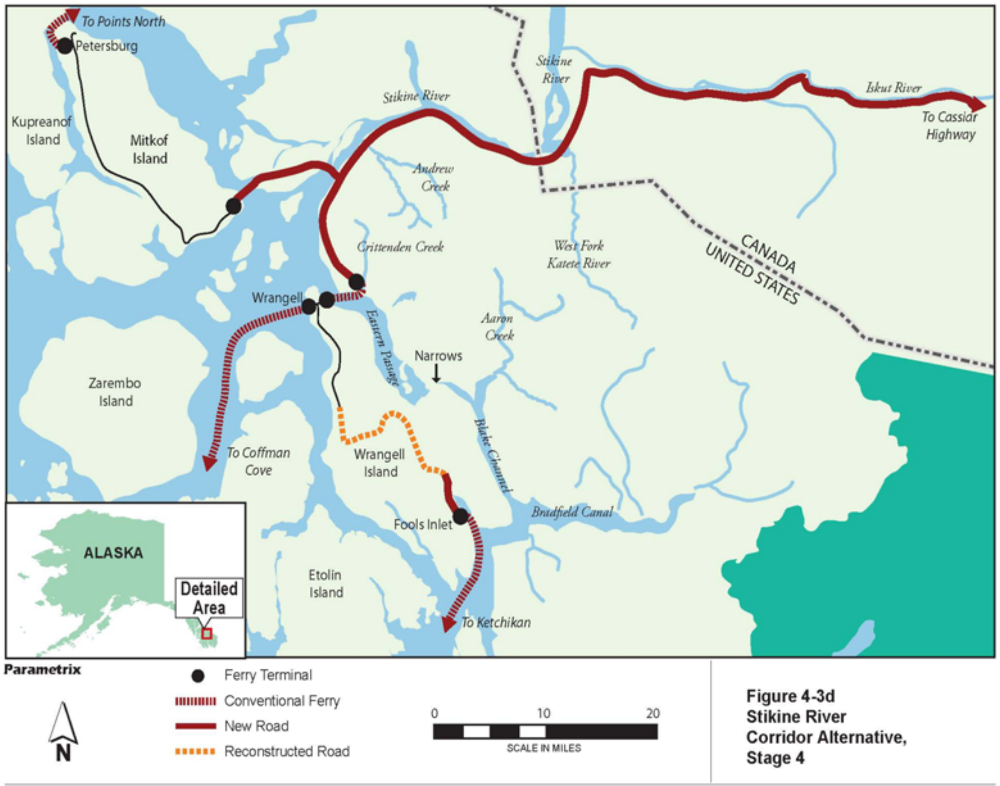


Figure 4-3d. Stikine River Corridor, Stage 4

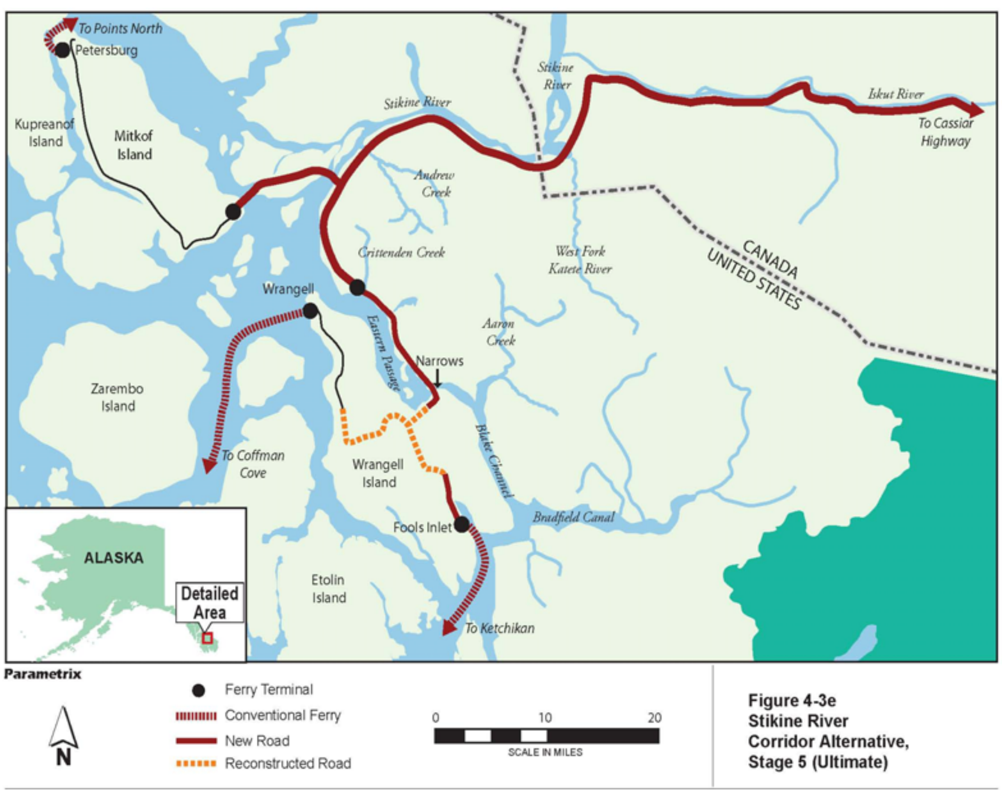


Figure 4-3e. Stikine River Corridor, Stage 5 (Ultimate)

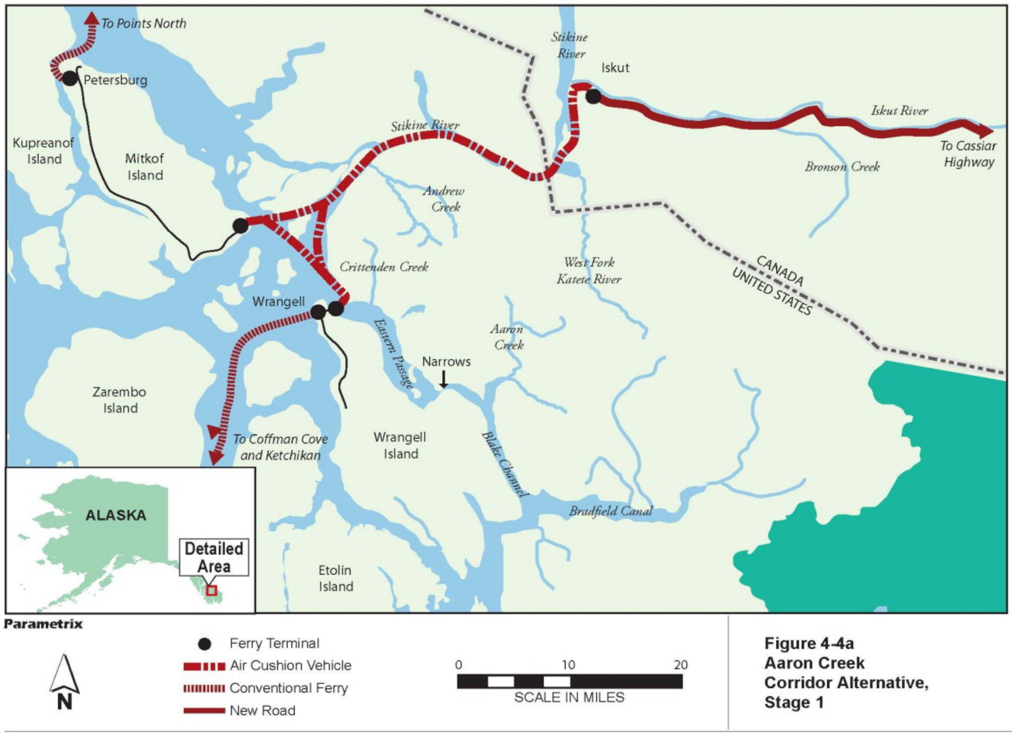


Figure 4-4a. Aaron Creek Corridor, Stage 1

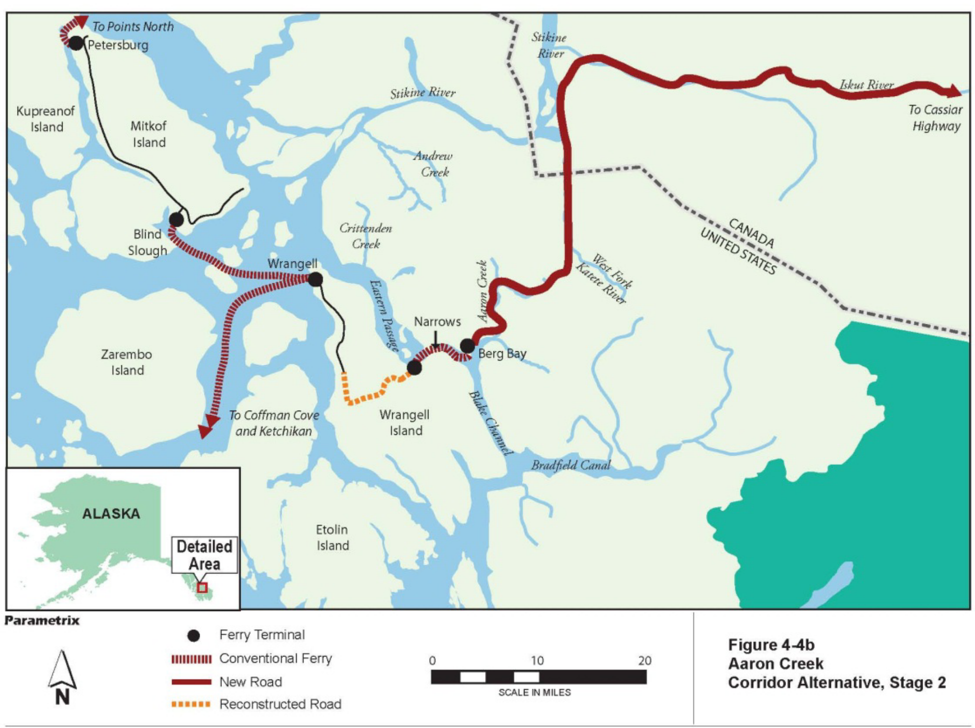


Figure 4-4b. Aaron Creek Corridor, Stage 2

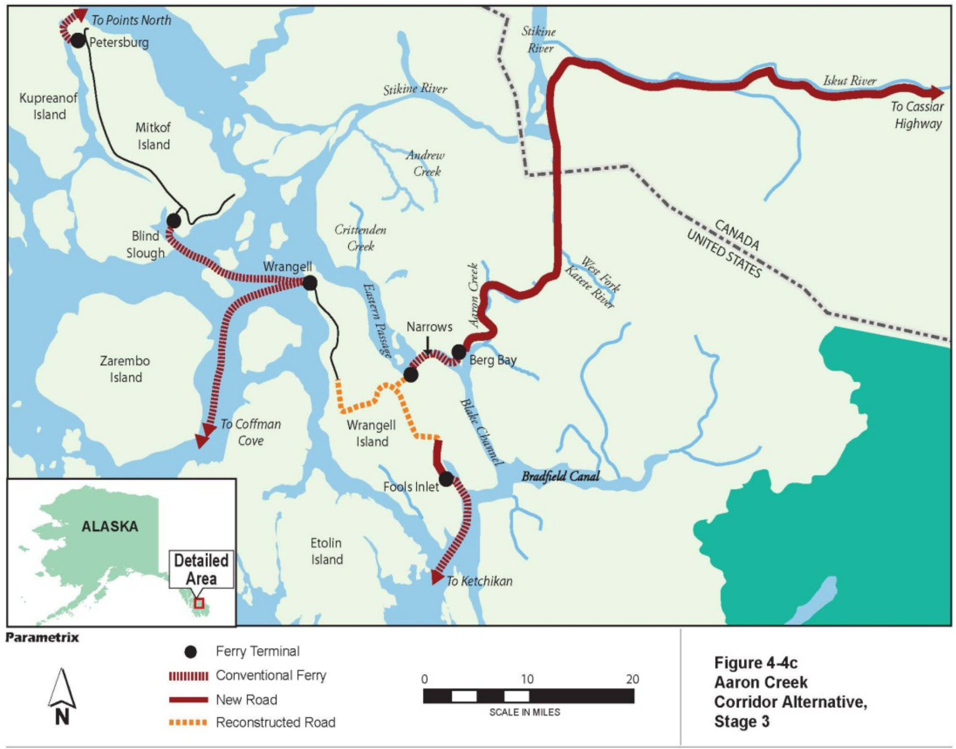


Figure 4-4c. Aaron Creek Corridor, Stage 3

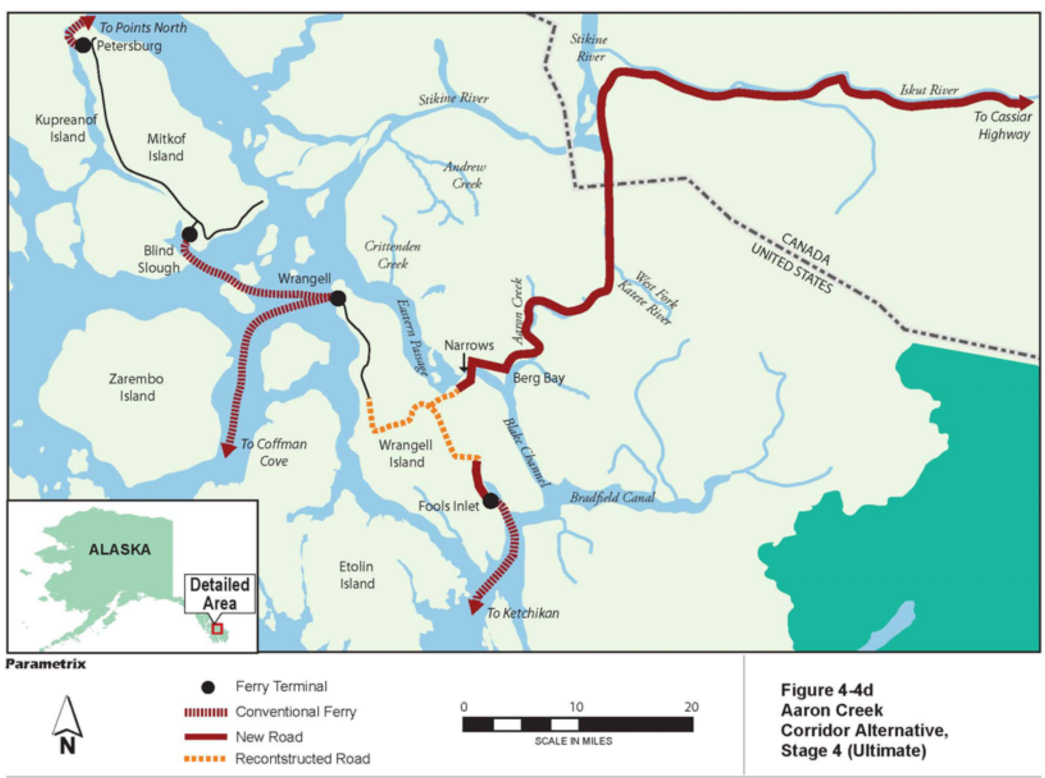


Figure 4-4d. Aaron Creek Corridor, Stage 4 (Ultimate)

5 DIVERTED TRAFFIC

5.1 Introduction

Vehicle traffic on the proposed MRA corridor would consist mainly of diverted and induced traffic. This section contains information on diverted traffic.

Diverted traffic is current traffic on existing modes of travel, such as ferry and air travel, that would shift to the new corridor when a connection is provided. The percentage of diverted traffic would depend on several factors, including travel time and cost on the new corridor compared to travel time and cost for other modes of transportation.

As will be explained in detail later, freight will not likely be diverted from the existing tug and barge operations due to their much lower cost structure, nor is it likely that significant numbers of travelers will be diverted from air travel given aviation's generally lower cost structure and time savings. Most of the traffic diversion is expected from the AMHS system.

As shown in Table 5-1, about 4,000 vehicles annually are expected to divert from AMHS to the MRA corridors in 2030 for selected communities, with the Stikine River Corridor having slightly higher traffic levels. The estimated diversion of traffic is also shown on Figure 5-1. Based on these estimates, about 11 AADT (4,000/365=11) would be diverted from AMHS to MRA. The communities shown in the table account for approximately 88 percent of the total Southeast Alaska population. Increasing the 11 AADT estimate by roughly 14 percent (1/.88) increases the total AADT to about 12 AADT. Adjusting the middle case estimate of 12 AADT to reflect the range of future population changes (Table 3-2) suggests that the AADT in 2030 could range from approximately 4 AADT in the low population case to 20 AADT under the high case. Truck or van traffic diverted from the AMHS could add 0.25 to 0.5 AADT to the estimates shown below for Wrangell and Petersburg. No truck or van traffic is anticipated to be diverted from other communities.

The MRA provides cost savings to residents of Sitka, Wrangell, and Petersburg compared to the AMHS when traveling to Seattle (Appendix C). When traveling to Anchorage, residents of Wrangell would experience cost savings under all corridor alternatives, and residents of Petersburg would save money if the Stikine River Corridor were built. The total annual savings for residents of these communities would slightly exceed $150,000 per year and approximately $200,000 for all residents of Southeast Alaska, assuming the mid population forecast provided by DOLWD.

Table 5-1. Annual Diverted Vehicle Traffic in 2030

To/From Community	MRA Corridor		
	Bradfield Canal	**Stikine River**	**Aaron Creek**
Passenger Cars:			
Sitka	182	182	182
Ketchikan	51	51	51
Wrangell	369	369	369
Petersburg	402	483	402
Juneau	2,852	2,852	2,852
Skagway	54	54	54
Haines	76	76	76
Total	**3,987**	**4,067**	**3,987**
Trucks and Vans:			
Wrangell & Petersburg	80	80	80

5.2 Description of Approach, Data, and Assumptions Used for Traffic Diversion Estimates

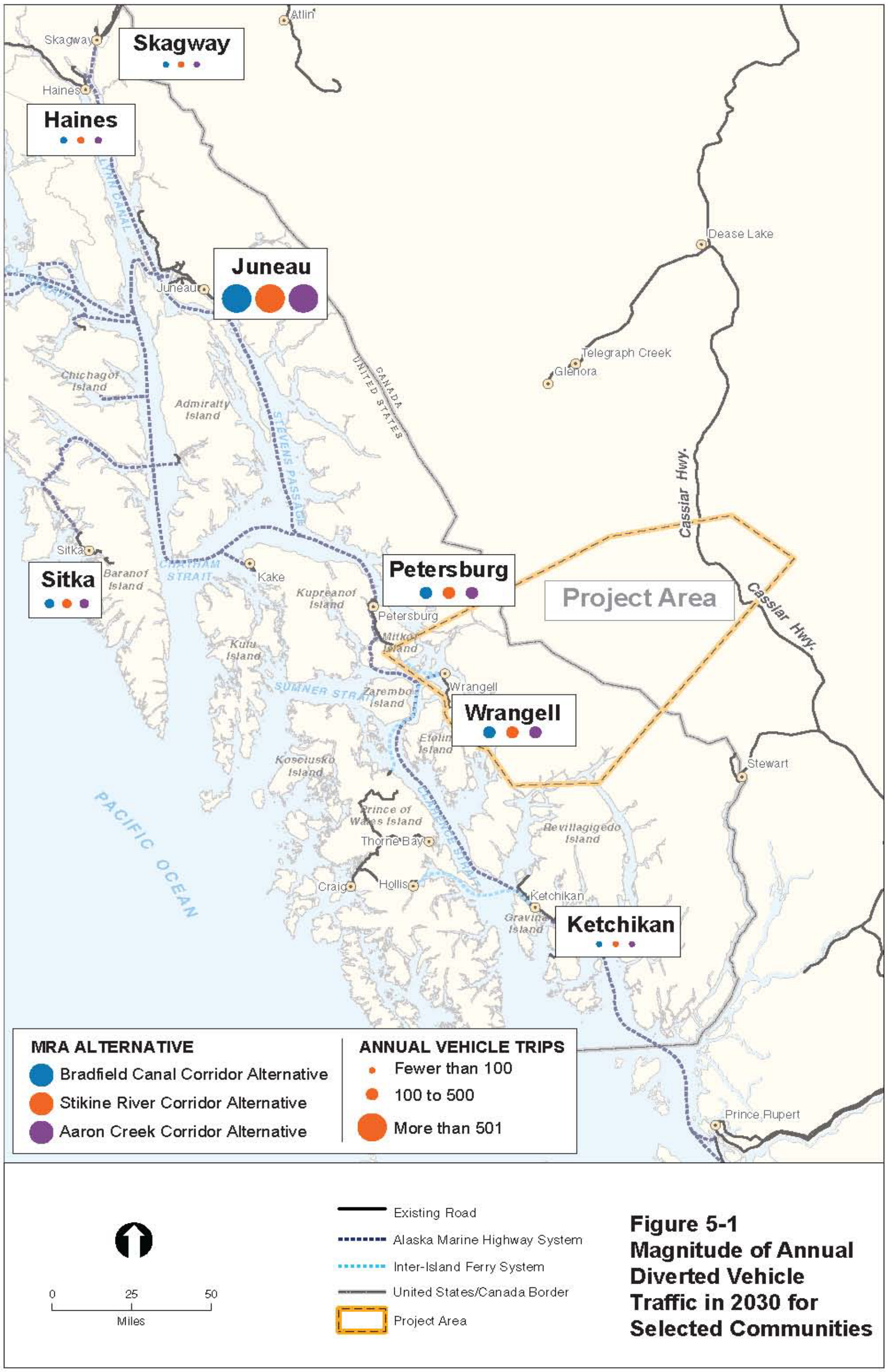
Personal decisions about travel mode depend on several factors, with travel time and cost being among the more important considerations. Travel time and cost for each proposed corridor were compared to the travel cost and time of the current travel mode options with SATP improvements.

Travel times and cost via ferry, vehicle, and air were calculated from the selected cities of Wrangell, Petersburg, Ketchikan, Craig, Juneau, and Sitka, to Seattle, Washington, and Anchorage, Alaska. For ferry travel, the cost of a ferry to Prince Rupert and vehicle to Seattle and a ferry to Bellingham with vehicle to Seattle were calculated, as well as a ferry to Haines for northbound travel to Anchorage.

5.2.1 Air Travel

BTS air passenger data for the fourth quarter of 2008 through the third quarter of 2009 (latest data available) indicated that slightly more than half (52 percent) of the air travelers to or from Southeast Alaska communities travel to or from the Seattle airport with slightly less than half (48 percent) bound for or from Anchorage (BTS, 2010b). This trip share is assumed representative of directional travel by other modes used by Southeast Alaska residents, and the number of trips to Seattle or Anchorage is assumed equal.

Air travel assumes one-way tickets for two passengers. Bargain air costs assume purchase one month prior to travel. Fares were selected for travel in the months of May and July, then averaged between the two months, making the fares consistent with the AMHS summer fares, which run from May through September.



Source: Parametrix, Inc.

Figure 5-1. Annual Diverted Vehicle Traffic in 2030, Selected Communities

For travelers from Craig, a one-way ticket from Craig to Ketchikan with ProMech Air is included. All other airplane tickets are one-way tickets with Alaska Airlines. Total trip time includes 15 minutes to drive to the airport, arrival at the airport one hour before plane departure, 30 minutes to collect luggage, and then 15 minutes to drive to the final destination.

5.2.2 Vehicle Travel

A review of traffic counts on the Cassiar Highway, including the spur to Stewart, which has been improved over the past two decades with paving and seal coat, has not resulted in any traffic increases according to available data (Table 5-2). Counts are generally flat to down since 2001. The count sites noted in the table are south and north of the potential junction with the MRA corridor. This study does not anticipate a change in traffic volume if the corridor is paved.[4]

Table 5-2. Annual Average Daily Traffic on Cassiar Highway, 2001, 2005, and 2008

Counter Location	Year		
	2001	2005	2008
Cassiar Junction	188	180	182
Meziadin Lake Junction	253	236	224
Stewart	N.R.	295	248

Source: B.C. Ministry of Transportation, 2010.

N.R.: Not Reported.

Note: The B.C. Ministry of Transportation and Infrastructure adopted a 3-year reporting period for temporary (short count) sites after 2002. These temporary count sites are operated for two periods during the year, generally March or April and August or September; the number presented here is an average of the AADT calculated from those two counts.

There are limited data on vehicle occupancy rates in Southeast Alaska. According to Hughes (2010), the Southeast Region of DOT&PF uses 1.6 persons per vehicle for all travel in the region based on vehicle occupancy data from the 2001 National Household Travel Survey. DOT&PF attempted to update the occupancy rate a few years ago, and the data obtained tended to support this estimate. More detailed vehicle occupancy information for Southeast Alaska is not available.

This analysis uses a higher occupancy rate of two persons per vehicle, excluding heavy trucks. Conclusions are based on the 2009 National Household Travel Survey (NHTS) data that show higher vehicle occupancy rates for social and recreational purposes (2.2 persons) (FHWA, 2010) and indicate that weekend trips also have a higher occupancy rate (2.0 persons) (BTS, 2010c).

[4] A 2002 Northern Economics study, "Socioeconomic and Environmental Impacts of Paving Gravel Roads," prepared for DOT&PF, examined several roads in the Central Region of Alaska to look for changes in traffic volumes after paving unpaved roads. The study indicated that, in general, there was no evidence that paving roads resulted in increased traffic. Paving roads likely leads to increased vehicle speeds, even if the road design is not changed.

The distances between Wrangell and any of the communities in B.C. are well beyond any reasonable distance for a round trip in one day. Most travelers would be on multiple-day trips to distant destinations for social and recreational purposes, suggesting an occupancy rate higher than 1.6 would be more appropriate, so 2.0 is used in this analysis. An occupancy rate of 1.2 persons per heavy truck used in this analysis is also from the 2009 NHTS data. For travel via other modes, a party of two persons is assumed, although sensitivity analyses are presented with a party of four.

Travel on the existing highway system (e.g., Cassiar Highway, Klondike Highway, Haines Highway) is assumed to be at an average speed of 50 miles per hour with the average vehicle on the road for 10 hours per day. An average speed of 35 miles per hour is used for the MRA corridors. These speeds would account for road design speeds, stops during the drive for meals, rest periods, sightseeing, border crossings, and congestion. The costs for lodging and meals were added for the travel between Southeast Alaska and Seattle or Anchorage at a cost of $120 per night, and meals are prorated for less than a full day of travel.

The Internal Revenue Service (IRS) estimates the full cost of driving a vehicle in 2010 at 50 cents per mile for ownership and operation (IRS, 2010). It also suggests rates of 16.5 cents per mile for medical or moving purposes and 14 cents for miles driven in service of charitable organizations. These latter rates approximate the variable costs of driving an automobile. This study evaluates travel using 50 cents per mile to compare costs of driving a vehicle with the other modes and also provides a case using a variable rate of 15 cents, which is approximately midway between 16.5 and 14 cents. As explained later in this analysis, it is evident that travelers base travel decisions on the variable cost of approximately 15 cents per mile.

The Southeast Region Traffic & Safety Report (DOT&PF, 2009) presents information on the percentages of motorcycles, cars, pickups, and trucks in traffic counts from 1998 to 2007. To minimize the effect of local traffic on vehicle counts for a specific highway, the most distant road segment from a community was used. These data indicate that trucks account for 8.5 percent of vehicles on the Haines Highway, 25.3 percent on the Klondike Highway (Skagway), and 25.2 percent on the Salmon River road (Hyder). Each of these roads was selected because they are similar to the proposed MRA corridor in that they all provide connectivity to the continental road system and are thought to provide similar functions. The average percentage of trucks on these three roads was 19.7 percent, and the figure is rounded to 20 percent to avoid indicating a higher degree of accuracy than is likely.

5.2.3 Vessel Travel

For shuttle ferries, the vessel(s) would likely be similar to the Lituya, which operates between Ketchikan and Metlakatla, and would have a similar fare structure. The Lituya fares were adjusted to account for differences in distances between terminals.

The AMHS travel costs are based on one-way 2010 summer prices from the AMHS web site. Prices have not yet been set for the winter season. For ferry travel, the price of a cabin was included unless the trip was less than 16 hours. A two-person, inside cabin, which is the least expensive cabin, was used in the analysis. Two people and a 19-foot car are assumed for ferry travel, with the driver riding free under the discount program started in 2006. Travel time includes a short drive to or from the ferry terminal, the voyage time, and boarding times for AMHS and IFA ferries, as well as for the new ferry links proposed in the MRA corridors.

Additional detail on the calculation of travel time and travel costs for the various modes is presented in Appendix C.

5.2.4 Travel Time and Cost

As shown in Table 5-3, air travel between Seattle or Anchorage and the selected Southeast Alaska communities requires less time than the other modes. Since the AMHS ferries operate 24 hours per day, with port calls according to the route, the shortest travel time with an automobile would generally be via the AMHS directly to Bellingham or Haines, rather than via the MRA corridors.

Wrangell and Petersburg would be the primary beneficiaries of the MRA in terms of vehicle travel time to Seattle or Anchorage. Communities that are farther from the MRA terminus would have other options. For example, communities in the northern part of Southeast Alaska, such as Juneau and Sitka, would find travel through Skagway to be faster than using the MRA. Similarly, travel on the AMHS via Prince Rupert would be faster for Ketchikan and Craig and other communities on Prince of Wales Island seeking to travel to Seattle.

The Bradfield Canal Corridor would have the slowest travel time of the three MRA corridors, generally due to the need for a ferry link from Fools Inlet to a ferry terminal up the Bradfield Canal. Travel via Aaron Creek would be slightly faster than the Stikine River route for most communities. At this preliminary design phase, however, the minor difference is likely within the range of error of the estimates.

Table 5-3. Travel Time in Hours to Seattle and Anchorage from Selected Southeast Alaska Communities by Mode

	MRA			AMHS				Air
				Seattle via				
	Bradfield Canal	Stikine River	Aaron Creek	Prince Rupert	Bellingham	Skagway	Anchorage via Haines	Air
To Seattle								
Sitka	101.0	95.1	84.7	71.8	68.5	83.0		4.6
Ketchikan	83.0	77.1	76.7	49.8	42.8	94.8		4.3
Wrangell	63.5	57.6	57.2	56.3	53.0	87.0		5.5
Petersburg	79.5	63.1	63.2	60.8	57.3	83.8		6.5
Craig	96.5	80.5	80.1	53.2	46.2	98.2		4.6
Juneau	98.0	82.1	81.7	71.0	81.3	73.3		4.5
To Anchorage								
Sitka	102.8	96.9	96.5				41.0	5.5
Ketchikan	84.8	78.9	78.5				53.3	7.0
Wrangell	75.8	59.9	59.5				45.8	6.5
Petersburg	81.3	75.4	65.0				42.3	5.3
Craig	97.8	81.9	81.5				56.7	7.5
Juneau	99.8	83.9	83.5				32.3	4.0

Source: Estimated by Northern Economics, Inc.

Table 5-4 shows the estimated travel costs from the Southeast Alaska communities to Seattle and Anchorage. All costs are expressed in U.S. dollars as of 2009. Air travel is the least expensive option for two persons traveling to Seattle or Anchorage. For travel to Seattle with a vehicle, using AMHS via Prince Rupert would be the lowest-cost alternative except for Wrangell, where the MRA would be slightly less expensive. Travel costs to Anchorage with a vehicle would be lower using AMHS via Haines for all communities. This table uses the full vehicle operating cost as estimated by the IRS to estimate travel costs with a vehicle.

The travel time and travel cost estimates are based on full build out of the corridor alternatives. The various phases of each corridor would have longer travel times and potentially higher costs.

5.2.5 Sensitivity Analysis

The cost of travel can vary from the amounts estimated above due to several factors such as party size and whether the persons traveling by vehicle view the cost of operating the vehicle as only the variable costs, primarily fuel, or as the full cost of operating the vehicle as presented in Table 5-4. These factors are important to understanding the behavior of travelers and the potential number of trips that might be made on the MRA corridors. Key factors are noted in the following sections.

Table 5-4. Travel Cost per Trip to Seattle and Anchorage from Selected Southeast Alaska Communities by Mode

	MRA			AMHS				Air
				Seattle via				
	Bradfield Canal	Stikine River	Aaron Creek	Prince Rupert	Bellingham	Skagway	Anchorage via Haines	Air
To Seattle								
Sitka	1,817	1,496	1,557	1,297	1,414	1,584		525
Ketchikan	1,533	1,280	1,273	922	1,026	1,908		558
Wrangell	1,261	1,009	1,002	1,016	1,117	1,781		558
Petersburg	1,372	1,239	1,232	1,168	1,185	1,697		558
Craig	1,735	1,602	1,476	1,101	1,195	2,077		818
Juneau	1,722	1,522	1,583	1,417	1,418	1,382		572
To Anchorage								
Sitka	1,862	1,541	1,602				743	485
Ketchikan	1,578	1,325	1,318				1,146	527
Wrangell	1,306	1,054	1,047				1,015	519
Petersburg	1,537	1,284	1,277				850	519
Craig	1,780	1,647	1,641				1,325	787
Juneau	1,767	1,567	1,628				631	425

Note: Costs are expressed in 2009 U.S. dollars.

Source: Estimated by Northern Economics, Inc.

5.2.6 Party Size

Table 5-5 shows the travel cost for a party of four traveling between Southeast Alaska communities and Seattle or Anchorage. A party of four would pay for additional ferry fares for two passengers and additional meals for these two passengers while on the ferry and when traveling via vehicle. A slightly higher lodging cost of $100 per night is assumed for a party of four as compared $80 per night for a party of two. Similar to the analysis presented for a party of two, air would be the lowest-cost option for travel to the two cities. Travel on AMHS via Prince Rupert to Seattle would be the lowest-cost vehicle option for Ketchikan and Craig, with the MRA providing the lowest-cost option for the other communities to Seattle. For travel to Anchorage, the AMHS via Haines would be the lowest-cost option for the northern communities of Juneau and Sitka, with the MRA providing the lowest-cost option for the other Southeast Alaska communities.

Table 5-5. Travel Cost per Trip to Seattle and Anchorage for Four Persons from Selected Southeast Alaska Communities by Mode and Alternative

	MRA			AMHS				Air
				Seattle via				
	Bradfield Canal	Stikine River	Aaron Creek	Prince Rupert	Bellingham	Skagway	Anchorage via Haines	
To Seattle								
Sitka	2,213	1,697	1,849	1,919	2,564	2,206		965
Ketchikan	1,632	1,530	1,528	1,320	1,841	2,708		1,031
Wrangell	1,077	975	973	1,482	2,039	2,521		1,031
Petersburg	1,553	1,191	1,189	1,701	2,203	2,388		1,031
Craig	2,232	1,869	1,867	1,647	2,178	3,035		1,551
Juneau	2,072	1,713	1,868	2,067	2,703	1,987		1,059
To Anchorage								
Sitka	2,226	1,710	2,122				1,144	885
Ketchikan	1,646	1,543	1,541				1,650	969
Wrangell	1,350	988	986				1,445	953
Petersburg	1,567	1,464	1,202				1,320	953
Craig	2,245	1,883	1,881				1,977	1,489
Juneau	2,245	1,726	1,881				930	765

Note: Costs are expressed in 2009 U.S. dollars.

Source: Estimated by Northern Economics, Inc.

Table 5-6 presents the information from Table 5-5 in a different format. The lowest-cost options for the MRA and the AMHS have been selected from the various corridor and port alternatives, and the lowest-cost option for travel from each community is also presented in terms of the cost per person for a traveling party of four. Air would remain as the lowest-cost option on a per-person basis for travel to Anchorage and Seattle. Ketchikan and Craig have lower travel costs using the AMHS to Seattle as compared to MRA, while the remaining Southeast Alaska communities would have lower costs using MRA. On a per-person basis, travel to Anchorage is less expensive for the northern communities (Juneau and Sitka) using the AMHS. The mid and southern Southeast Alaska communities would have lower travel costs using the MRA corridor.

Table 5-6. Lowest-Cost Travel Option, per Trip, by Mode to Seattle and Anchorage for Four Persons from Selected Southeast Alaska Communities

	MRA		AMHS Seattle		AMHS Anchorage		Air	
	4 Persons	Per Person	4 Persons	Per Person	4 Persons	Per Person	4 Persons	Per Person
To Seattle								
Sitka	1,697	424	1,919	480			965	241
Ketchikan	1,528	382	1,320	330			1,031	258
Wrangell	973	243	2,039	510			1,031	258
Petersburg	1,189	297	2,203	551			1,031	258
Craig	1,867	467	1,647	412			1,551	388
Juneau	1,713	428	1,987	497			1,059	265
To Anchorage								
Sitka	1,710	428			1,144	286	885	221
Ketchikan	1,541	385			1,650	412	969	242
Wrangell	986	247			1,445	361	953	238
Petersburg	1,202	301			1,320	330	953	238
Craig	1,881	470			1,977	494	1,489	372
Juneau	1,726	432			930	232	765	191

Note: Costs are expressed in 2009 U.S. dollars.

Source: Estimated by Northern Economics, Inc.

5.2.7 Variable Vehicle Costs

As noted above, persons traveling in their vehicle may consider the fixed costs of vehicle ownership as "sunk" costs, or irrelevant to the distance traveled since the fixed costs would be incurred even if the vehicle did not move. Table 5-7 shows the travel cost from the selected Southeast Alaska communities to Seattle and Anchorage for a party of two using a variable cost of $0.15 per mile, which represents mostly fuel, compared to the $0.50 per mile cost used in previous tables.

With this variable cost input, air travel would still be less expensive compared to the vehicle modes. For the AMHS mode, however, Prince Rupert would become a significantly less expensive port alternative than Bellingham with the variable operating cost compared to the total operating cost shown in Table 5-4. A similar statement can be made for the MRA corridors; the travel costs would be lower than those shown in Table 5-4; since the cost per mile would lower, the difference between the Stikine River and Aaron Creek Corridors would be smaller.

Table 5-7. Travel Cost per Trip to Seattle and Anchorage Using Variable Vehicle Costs from Selected Southeast Alaska Communities by Mode and Alternative

	MRA			AMHS				Air
				Seattle via				
	Bradfield Canal	Stikine River	Aaron Creek	Prince Rupert	Bellingham	Skagway	Anchorage via Haines	
To Seattle								
Sitka	1,466	1,109	1,201	1,076	1,382	1,734		525
Ketchikan	1,112	1,009	1,007	661	994	2,068		558
Wrangell	777	675	673	775	1,085	1,931		558
Petersburg	1,061	798	796	927	1,153	1,847		558
Craig	1,507	1,245	1,243	840	1,163	2,247		818
Juneau	1,478	1,124	1,214	1,186	1,386	1,512		572
To Anchorage								
Sitka	1,452	1,122	1,375				548	485
Ketchikan	1,125	1,023	1,021				971	527
Wrangell	950	688	686				820	519
Petersburg	1,074	972	810				645	519
Craig	1,521	1,258	1,256				1,150	787
Juneau	1,491	1,138	1,227				416	425

Note: Costs are expressed in 2009 U.S. dollars.
Source: Estimated by Northern Economics, Inc.

Table 5-8 shows the lowest-cost options for the MRA and the AMHS among the various corridor and port alternatives and air travel on a two-person party and a per-person basis using the variable vehicle operating cost input. Air travel would still be the lowest-cost option on a per-person basis for travel to Seattle and Anchorage. Wrangell and Petersburg would have lower travel costs using the MRA to Seattle as compared to the AMHS, while the remaining Southeast Alaska communities would have lower costs using the AMHS. Travel from Wrangell to Anchorage would be less expensive using the MRA, and the AMHS would be less costly for the other communities.

5.2.8 Findings of Sensitivity Analysis

The factors of party size (number of persons traveling together) and full vehicle cost per mile or variable vehicle cost per mile considerations by those traveling were evaluated to determine their potential effect on mode and route choice. Air travel to Anchorage or Seattle would remain as the lowest-cost option in all cases.

For travel with a vehicle to those cities, however, party size would change mode selection for travelers in certain Southeast Alaska communities, as would the use of variable costs for the vehicle. As noted in the prior section, a party of two persons from all communities in Southeast Alaska would find it less expensive to use AMHS through Haines rather than the MRA to access Anchorage, and everyone except residents of Wrangell would have the lowest cost by using the AMHS through Prince Rupert to travel to Seattle. Wrangell would have a lower cost by using the MRA. In comparison, a party of four persons traveling from Craig or Ketchikan to Seattle would use the AMHS via Prince Rupert to achieve the lowest travel cost, while all other communities would find it less expensive to use the MRA. For travel to Anchorage, a party of four from Juneau and Sitka would find it less expensive to use AMHS via Haines, while other Southeast communities would find the lowest-cost choice to be the MRA.

Table 5-8. Lowest-Cost Travel Option Using Variable Vehicle Costs from Selected Southeast Alaska Communities by Mode and Alternative

			AMHS					
	MRA		Seattle		Anchorage		Air	
	2 Persons	Per Person	2 Persons	Per Person	2 Persons	Per Person	2 Persons	Per Person
To Seattle								
Sitka	1,109	554	1,076	538			525	263
Ketchikan	1,007	504	661	330			558	279
Wrangell	673	336	775	387			558	279
Petersburg	796	398	927	463			558	279
Craig	1,243	621	840	420			818	409
Juneau	1,124	562	1,186	593			572	286
To Anchorage								
Sitka	1,122	561			548	274	485	243
Ketchikan	1,021	510			971	486	527	264
Wrangell	686	343			820	410	519	260
Petersburg	810	405			645	323	519	260
Craig	1,256	628			1,150	575	787	394
Juneau	1,138	569			416	208	425	213

Note: Costs are expressed in 2009 U.S. dollars.

Source: Estimated by Northern Economics, Inc.

Even with a vehicle cost of $0.15 per mile, air travel would remain the lowest-cost option. Compared to travel costs using $0.50 per vehicle mile, Wrangell and Petersburg would use the MRA to reach Seattle with variable costs of $0.15 per mile, while only Wrangell would use the MRA with full vehicle costs. All other Southeast communities would use the AMHS through Prince Rupert. For travel to Anchorage and a full cost of $0.50 per mile, residents of all Southeast communities would use AMHS via Haines. With variable costing, Wrangell residents would find it less expensive to use the MRA; all other Southeast residents would use the AMHS via Haines.

5.3 Diverted Traffic Estimates

As stated earlier in this report, diverted traffic is current traffic on existing modes of travel that would shift to the new corridor when the road is constructed. The magnitude of diverted traffic would depend on several factors, including travel time, cost, and frequency of ferry service. Resources are not available to survey the population in the region to determine potential use of the MRA, so potential use of the MRA is inferred using other measures.

People respond to price differences. Thus, multiple regression models were developed to estimate travel between the Southeast Alaska communities and Seattle and Anchorage by using AMHS (AMHS, 2010) and BTS (BTS, 2010b) data on the number of trips between community pairs (e.g., Seattle and Ketchikan) and the cost of such travel for ferry (AMHS) and air (BTS). For example, the equation used to forecast air travel between the Southeast Alaska communities and Anchorage was as follows:

> Y = -391631 + 34570.88*Government Seat (Juneau = 1; other communities = 0) – 377.073* Air Fare (between Anchorage and each Southeast Alaska community) + 1.263756 * Total Population (Anchorage population + each Southeast Alaska community population).

The data used to develop the trip estimates are shown in Table 5-9.

Table 5-9. Data Used to Estimate Air Travel Regression Equation between Anchorage and Southeast Alaska Communities

Community	Government	One-way Air Fare	Total Population
Sitka	0	200	383,529
Ketchikan	0	221	393,278
Wrangell	0	217	376,794
Petersburg	0	217	377,875
Juneau	1	170	405,563

Source: Estimated by Northern Economics, Inc.

The equation had P-values less than 0.09 and an adjusted R2 of 0.99. Table 5-10 shows the estimated trips from the equation and compares those trips with the total reported trips between Anchorage and the Southeast Alaska communities. The equation estimates are close to the trips reported by BTS.

Table 5-10. Comparison of Reported Air Travel Trips and Estimated Air Travel Trips between Anchorage and Southeast Alaska Communities

Community	Total Trips	Estimated Trips
Sitka	17,650	17,641
Ketchikan	22,080	22,043
Wrangell	3,290	2,720
Petersburg	3,470	4,086
Juneau	91,370	91,370

Source: Estimated by Northern Economics, Inc.

Table 5-11 shows the effect of a price variation of approximately 5 dollars on the total number of trips between Anchorage and selected Southeast Alaska communities. The calculations use the average total population from Table 5-9 and one-way air fares that range from the lowest amount ($170) shown in Table 5-9 to the highest amount ($221).

Table 5-11. Estimated Trips between Anchorage and Selected Southeast Alaska Communities with Different Air Fares

Row	Population	Government	One-Way Air Fare ($)	Trips
1	387,408	1	170	68,426
2	387,408	1	175	66,503
3	387,408	1	180	64,580
4	387,408	1	185	62,657
5	387,408	1	190	60,734
6	387,408	1	196	58,811
7	387,408	1	201	56,888
8	387,408	1	206	54,965
9	387,408	1	211	53,042
10	387,408	1	216	51,119
11	387,408	1	221	49,196

Note: Costs are expressed in 2009 U.S. dollars.
Source: Estimated by Northern Economics, Inc.

The data shown above permit estimating the arc elasticity of demand for air travel, and similar data for AMHS enable estimating the arc elasticity of demand for ferry travel. The arc elasticity represents the relative stability (or reaction) of one variable with respect to a change in another variable. It is calculated as the percentage change of one variable divided by the percentage change in another variable between two given data points. In this case, the objective is calculating the percentage change in trips in response to a percentage change in fares between the two extreme data points (the minimum [$170] air fare and the maximum [$221] air fare shown above).

The arc elasticity of demand for the data presented in Table 5-10 is estimated with the following equation:

((Max Trips - Min Trips)/((Min Trips+Max Trips)/2))/((Max Air Fare-Min Air Fare)/((Min Air Fare+Max Air Fare)/2)).

The results of this equation for trips to Anchorage and Seattle by mode and for different gateway ports are presented in Table 5-12.

Table 5-12. Arc Price Elasticity of Demand to Anchorage and Seattle by Mode

	Mode	
City	**AMHS**	**Air**
Anchorage		
Via Haines	3.40	
Air With Juneau		1.25
Air Without Juneau		2.61
Seattle		
Via Prince Rupert	1.72	
Via Bellingham	3.55	
Air		0.82

Source: Estimated by Northern Economics, Inc.

5.3.1 Air Passengers

As shown in Table 5-12, air travel to or from Seattle is relatively inelastic (less than 1.0); a 1 percent change in price will result in a 0.82 percent change in the number of annual trips. Air travel to or from Anchorage is elastic with travel substantially affected by trips between Juneau and Anchorage. If Juneau were excluded from the list of Southeast Alaska communities, then the resulting elasticity estimate would be 2.61 compared to a 1.25 estimate when Juneau was included.

Juneau is the state capital, and Anchorage is the largest city in the state with more state employees than Juneau. It is likely that state government travel is relatively unaffected by air fares and, thus, has a lower elasticity than for persons traveling on other trip purposes.

Given this set of elasticities, the inference is that people traveling to or from Seattle by air would be unlikely to divert to the MRA, even if travel costs via the MRA were lower than air travel, while persons traveling to or from Anchorage by air might switch if travel costs for the MRA were lower than air expenses. In all cases, air fares would be lower than MRA or AMHS travel to Anchorage. Subsequently, the MRA would not likely divert any significant air traffic in the future.

5.3.2 Air Freight and Air Mail

An evaluation of BTS (2010a) origin and destination data for air freight and air mail to and from Wrangell and Petersburg suggests that potential diversion of this material to truck would have a limited impact on traffic volumes on the MRA. Compared to Juneau or Ketchikan, Wrangell and

Petersburg have less frequent air and ferry service to other Southeast Alaska communities. Therefore, these two MRA gateway communities would likely not be hubs for air transport of freight and mail brought into the region via the MRA. As a result, the volume of air freight and air mail that might be diverted would primarily be destined for Wrangell and Petersburg.

Most of the air freight and air mail to or from Wrangell and Petersburg is transported to or from other Southeast Alaska communities without road access. The balance of about 37 to 38 percent is transported to or from the road-connected cities of Anchorage and Seattle (Table 5-13).

Since few other Southeast Alaska communities have a road connection, it is unlikely that air freight and air mail would be affected by the MRA. Air freight and air mail between the MRA communities and Anchorage and Seattle could be affected, but even if 50 percent of this volume were diverted to the MRA, it would account for only about 311,000 pounds per year, or less than 1,000 pounds per day. This volume would not be sufficient to make a trucking operation between Wrangell and Petersburg and Anchorage or Seattle economically viable. As noted in Section 3.4.2, air freight and air mail volumes will likely decline in the future, making it even more difficult to sustain such service. For these reasons, the analysis does not assume diversion of air freight or air mail cargoes to the MRA.

Table 5-13. Volume and Percent of Air Freight and Air Mail To and From Wrangell and Petersburg, 2009

To/From	Wrangell		Petersburg	
	Pounds	Percent	Pounds	Percent
Seattle	92195	12%	106812	12%
Anchorage	187013	25%	236447	26%
Total	749082	100%	912273	100%

Source: Estimates by Northern Economics, Inc., from BTS 2010a data

5.3.3 Ferry

As shown in Table 5-12, AMHS travel is elastic (estimate is greater than 1.0); travelers respond to changes in price, and a 1 percent change in price will result in more than a 1 percent change in the number of annual trips made on the AMHS system in Southeast Alaska to or from Haines, Prince Rupert, and Bellingham.

Table 5-14 indicates that AMHS travelers consider the variable cost of vehicle operation when making their travel decisions. The elasticity to Prince Rupert is much lower than the elasticity estimated for Haines or Bellingham. The ferry component of the travel through Prince Rupert is a smaller percentage of the total trip cost because most of the trip involves travel by vehicle; thus, changes in the ferry fare through Prince Rupert have less effect than changes in fares to Haines or

Bellingham. If the full vehicle operating cost were considered by travelers, then the cost of ferry travel to Anchorage via Haines would be a lower percentage of the total trip cost, and the elasticity of demand would be significantly lower than the elasticity estimate for travel to Seattle via Bellingham.

AMHS traffic is sensitive to price changes, and it is likely that the lowest cost surface mode (ferry or road) will capture a large portion of the vehicle travel to or from Seattle and Anchorage, but not all of the trips will divert to the less expensive option. A review of AMHS data (AMHS, 2010) indicates that ferry travel may already reflect a pattern of multiple modes and routes, some of which are at higher prices.

The percent of passengers going through Prince Rupert is higher for communities in the southern portion of Southeast Alaska and diminishes as community distances increase from Prince Rupert. In all cases, however, travel via more expensive or time-consuming options still occurs.

Travelers likely have other considerations besides travel time and cost that they factor into their decision making process. For example, Northern Economics (1997) found that approximately 30 percent of non-Alaskans would pay to travel on a toll causeway across Turnagain Arm just for the experience of taking a different route on their travels. A similar pattern could exist for travel in Southeast Alaska where travelers take one route part of the time and use another route on other occasions.

Table 5-14. AMHS Vehicle Counts from Selected Southeast Alaska Communities to Gateway Ports

	Gateway Port				
Community	**Bellingham**	**Prince Rupert**	**Skagway**	**Haines**	**Total**
Vehicle Counts					
Sitka	290	277	152	161	880
Ketchikan	2,658	3,432	78	504	6,672
Wrangell	266	400	14	121	801
Petersburg	387	415	57	189	1,048
Juneau	2,661	2,078	6,772	13,242	24,753
Skagway	495	369		6,165	7,029
Haines	2,973	715	6,165		9,853
Total	9,730	7,686	13,238	20,382	51,036
Percent of Community Total					
Sitka	33	31	17	18	100
Ketchikan	40	51	1	8	100
Wrangell	33	50	2	15	100
Petersburg	37	40	5	18	100
Juneau	11	8	27	53	100
Skagway	7	5	0	88	100
Haines	30	7	63	0	100

Source: Percent estimates by Northern Economics, Inc.; vehicle data from AMHS 2010

The selected communities account for almost all of the vehicle traffic through the gateway ports and in the Southeast Alaska AMHS system. The smaller communities in Southeast Alaska account for very little vehicle traffic.

5.3.4 Diversion to MRA

The information presented in Table 5-14 is used in this section to allocate the percent of vehicle traffic to and from selected communities to the MRA or other gateway ports. These percentages should be considered best estimates given available data; they rely upon professional judgment. If the project moves forward, a survey of residents in the region should be undertaken to more accurately estimate diverted traffic.

Seattle Traffic

For travel to Seattle, it is unlikely that Ketchikan or Prince of Wales residents would use the MRA to any large degree since travel costs and time would be greater than their present alternatives. However, as noted above by the traffic between Ketchikan, Wrangell, and Skagway, some small percent of travelers from Ketchikan and Prince of Wales would likely use the MRA. For this analysis, the assumption is that about 1 percent of all trips to or from these two communities (Ketchikan and Craig) would use the MRA for travel to or from Seattle.

Wrangell residents would be the most likely users of the MRA among residents of Southeast Alaska. Even with the MRA access, however, some percentage of Wrangell travelers would probably use Prince Rupert and Bellingham as gateway ports to access the continental highway system. Traffic to and from Wrangell would likely use the MRA about 60 percent of the time with approximately 23 percent using Prince Rupert, 15 percent using Bellingham, and 2 percent using Skagway. The percentage estimates for Prince Rupert and Bellingham are about the same proportion (5:3) as shown in Table 5-14.

Petersburg is the closest community to Wrangell, and access to the MRA at Wrangell would provide a less expensive option, compared to other gateway ports, for people destined to or departing from Petersburg. If the Stikine River MRA Corridor were built with a road extension to Petersburg, then Petersburg would become a second gateway port for the MRA. This analysis assumes that Petersburg travelers would use the MRA for about 60 percent of their Seattle-oriented trips under the Stikine River Corridor and approximately 50 percent under the Bradfield Canal or Aaron Creek Corridors. Under the Stikine River Corridor, approximately 35 percent of traffic would move via Prince Rupert (20 percent) and Bellingham (15 percent). The balance of 5 percent would be destined to or from Skagway.

For the other two MRA corridors, approximately 25 percent of Seattle-bound traffic would likely move through Prince Rupert, and 20 percent would travel direct to Bellingham. Skagway would remain at 5 percent for the Bradfield Canal and Aaron Creek Corridors.

The MRA provides approximately the same cost to Seattle as Prince Rupert for Sitka-related travelers (Appendix C), but would be less costly than the Bellingham or Skagway gateway ports. However, the frequency of service between Skagway and Sitka is higher than for the other gateway ports, which may account for the approximately 21 percent of traffic moving between the two communities. Skagway likely retains 20 percent of the traffic to or from Sitka with the balance split equally (about 27 percent each) among the other three gateway ports.

Skagway is the lowest-cost option for Juneau by a significant amount. It also has the highest frequency of service. For these reasons, Skagway would likely retain about 60 percent of the traffic to and from Juneau, with 15 percent each going to the MRA and Bellingham and 10 percent to Prince Rupert.

Anchorage Traffic

It is unlikely that the MRA would divert any significant traffic from Sitka or Juneau that is destined to or from Anchorage due to the higher cost and longer travel time if residents of those communities used the MRA. However, Table 5-14 indicates that there would be some level of traffic volumes to all gateway ports. One percent of traffic from these northern Southeast communities would likely use Wrangell or Petersburg to access the MRA.

Wrangell traffic would have lower costs to Anchorage with the MRA. Approximately 60 percent of the trips would likely be made on the MRA, with about 40 percent using the AMHS through Haines. The costs for Ketchikan travelers are slightly lower to Anchorage via Haines. Therefore, the assumption is that about 55 percent would travel via Haines and 45 percent via the MRA.

If the Stikine River Corridor with the road extension were built to Petersburg, Petersburg traffic would have about the same costs to Anchorage as Wrangell and about the same percentage split. However, if the other MRA corridors were selected, then the costs would be higher for the MRA, and the split would reverse with approximately 60 percent accessing Anchorage via Haines and about 40 percent using the MRA.

Truck or Van Traffic

Approximately 2,878 AMHS vans would likely travel on the Southeast Alaska AMHS system in 2030 (Table 3-6). Given the expected level of AMHS service between the MRA gateway ports and other communities in Southeast Alaska, neither Wrangell nor Petersburg would likely become a substantial intermodal hub in the region. Rather, most of the truck freight using the MRA would be destined for those two communities.

AMHS does not report the number of vans moving to or from a community, but the number of vehicles, of which vans are a small percentage, is reported. Assuming that the percent of total Southeast Alaska AMHS system vehicles destined to or from Wrangell and Petersburg (5.5 percent) is representative of the percent of vans to those two communities, approximately 160 vans are likely destined to or from Wrangell or Petersburg on an annual basis.

The cost to transport vans to Wrangell and Petersburg via the MRA is unknown since the cost would be a function of volume, route, frequency of service, equipment, fuel cost, and other variables, so it is difficult to compare the cost of transport via the MRA or AMHS. It is unlikely that all 160 vans would be diverted, but assuming that half of the vans would divert to the MRA, this would result in 80 vans per year, or about 0.25 AADT. If all vans were diverted, the result would be approximately 0.5 AADT.

5.4 Seasonal Traffic

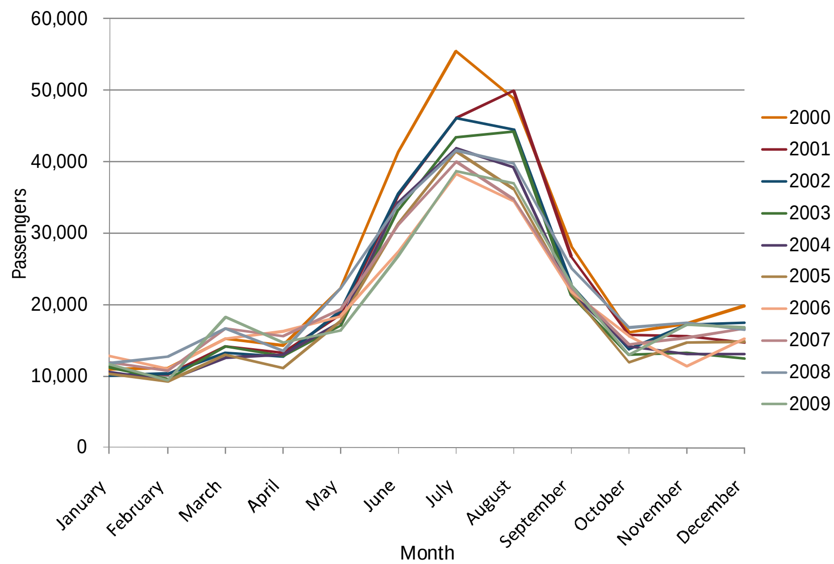
Current traffic in the project area has significant seasonal swings, with summer months having a large amount of both tourist and resident travel. Figure 5-1 shows AMHS travel by month from 2000 to 2009 for Southeast Alaska. In the past, roughly 60 percent of the passengers and vehicles traveling on ferries did so during the summer, May through September (AMHS, 2006). The balance traveled during the winter season. From 2000 to 2005, summer travel accounted for 64 to 65 percent of total annual passengers. For 2006, however, the AMHS adopted a different pricing strategy to attract more traffic in the winter.

As demonstrated by the percent change in travel, the pricing strategy was successful. The pricing strategy resulted in the first gain in total passenger counts for the AMHS system over the 2000 to 2006 period; in all previous years during that period, total ridership had declined from the prior year, as shown on Figure 5-1. Section 3 provides additional details on passenger and vehicle counts and 2030 forecasts for AMHS.

The seasonal peak and low periods are important to consider when making projections for future travel. Depending on the capacity of ferries or ACVs on the different links, traffic in the peak season might be limited by the ferry or ACV capacities and be lower than projected.

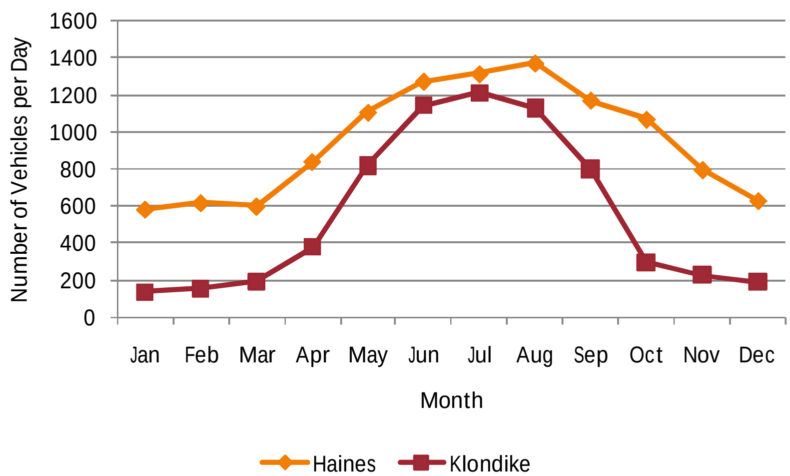
July is generally the peak month on the AMHS system. In 2008, 16 percent of the annual passenger travel in the Southeast AMHS routes occurred in July. June, July, and August are the peak months on the Haines and Klondike Highways (Figure 5-3). In 2007, July traffic counts on the Klondike Highway were approximately 18 percent (or 2.16 times the average month) of total annual traffic, and July and August counts on the Haines Highway were approximately 12 percent (or 1.44 times the average month).

These numbers suggest that peak AADT for diverted traffic in summer months on the MRA corridors could range from approximately 18 to 26 AADT, compared to 12 AADT under the mid-case, with higher numbers on weekends. In developing these traffic projections, the study team assumed that ACVs or conventional ferries could accommodate the seasonal peaks.



Source: AMHS, various years; 2001 Annual Traffic Volume Report, and subsequent years

Figure 5-2. Monthly AMHS Passenger Traffic, Southeast Alaska



Source: DOT&PF, 2009; Southeast Region 2007 Traffic and Safety Report

Figure 5-3. Monthly Average Daily Traffic, Haines and Klondike Highways, 2007

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6 INDUCED TRAFFIC

6.1 Introduction

Induced traffic is increased traffic volume that is new travel in the area. This traffic would not occur without the improvement in the transportation infrastructure. Induced trips are not included in the diverted traffic estimates (Section 5), which include trips that are shifted in time, route, destination, or mode.

Household surveys for Sitka and Juneau related to proposed new road links show that new transportation infrastructure that reduces travel cost and time would likely result in people traveling more frequently, which would result in induced traffic (McDowell Group Inc., 2004).

Discussions with mining companies exploring close to the road alignment in B.C. indicate that their mines might not be developed in the foreseeable future unless a road to tidewater in Alaska were available. The mining potential in the area is large, but it is limited by the cost of development and operation. Construction of the proposed corridor could provide better transportation opportunities for some companies and would make development profitable. This industrial traffic would also be considered induced traffic.

6.2 Summary of Induced Trips

Table 6-1 summarizes the local, regional, and industrial traffic that might be induced by construction of the MRA. The potential number of trips would range from 33 at the low end to almost 600 AADT, depending on the assumptions made regarding distance from the community, the model used to estimate travel between communities, and the likelihood of mine development. The mid-level estimates would be around 170 to 220 AADT, depending on the alternative.

Excluding industrial traffic, the induced trips could range from 1 to 235 with the mid-range alternating from 107 for the Aaron Creek and Bradfield Canal Corridors to 157 for the Stikine River Corridor. With the high level of industrial truck traffic and other traffic, the deck space required on the AMHS ferries could be as high as 1,855 standard vehicle equivalents (SVEs). The high industrial truck traffic estimate assumes that all three mines would be developed. The mid industrial truck traffic estimate assumes that the Schaft Creek project, the project with the middle estimate of truck traffic, would move forward. The low estimate assumes that the Red Chris project would be the only mine to be developed. As noted above, none of these proposed mines is presently in production, and Stewart, B.C., is an existing port with loading facilities that would compete with the MRA port, so it is possible that no industrial trips would occur in the future.

Table 6-1. Summary of Estimated Induced Traffic, AADT and Standard Vehicle Equivalent (SVE)

	Corridor								
	Bradfield Canal			Stikine River			Aaron Creek		
Trip Type (AADT)	**Low**	**Mid**	**High**	**Low**	**Mid**	**High**	**Low**	**Mid**	**High**
Induced									
Local (100, 35, & 10 miles)	0	73	102	0	123	168	0	73	102
Regional	0	28	55	0	28	55	0	28	55
Other	1	6	12	1	6	12	1	6	12
Subtotal	1	107	169	1	157	235	1	107	169
Industrial									
Inbound	10	10	60	10	10	60	10	10	60
Outbound	22	54	300	22	54	300	22	54	300
Subtotal	32	64	360	32	64	360	32	64	360
Industrial SVE	144	288	1,620	144	288	1,620	144	288	1,620
Total AADT	33	171	529	33	221	595	33	171	529
Total SVE	145	395	1,789	145	445	1,855	145	395	1,789

Source: Northern Economics, Inc., estimates

Note: For local induced traffic, the mid distance for Alaska communities is 35 miles; mid distance for Iskut, B.C., is 67 miles, which is the approximate distance to the intersection of the MRA and the Cassiar Highway. The low traffic estimate for local induced trips uses 100 miles, and the high traffic estimate assumes a 10-mile distance from Wrangell.

6.3 Types of Induced Traffic

The nature and scenery in the area of the proposed corridors offers opportunities for various activities as well as driving for pleasure. These activities might include hiking, fishing, hunting, camping, and other recreation. As the distance from each community increases, the number of trips (AADT) recorded at greater distances would be expected to decline.

These types of trips are defined as local induced travel for this report, and they are not necessarily between communities. As described later in this section, local induced travel for Wrangell is estimated to range from approximately 60 trips per day (AADT) at a distance of 35 miles from Wrangell to near zero at 90 miles away. Slightly fewer trips (50) at the 35-mile distance from Wrangell would be generated by Petersburg residents if that community were connected to the road system via the Stikine River Corridor. The community of Iskut in B.C. could generate approximately 13 AADT on those segments of the MRA near the Cassiar Highway. Total local induced traffic at distances of 35 miles or so from Wrangell and approximately 70 miles from Iskut would be approximately 125 AADT under the Stikine River Corridor and about 75 under the other corridors. The Bradfield Canal and Aaron Creek Corridors would not provide a direct connection to Petersburg, so the local induced trips are only for Wrangell and Iskut.

Interaction among residents of the region would increase with reduction in travel time and cost. The region likely affected would include Southeast Alaska and northwest B.C. New trips among communities in the region are defined as regional induced trips in this analysis. As noted previously, the presence of an MRA corridor would not likely induce new trips to Alaska or B.C. from persons residing outside of the region, although it would divert trips from other modes and routes.

If Wrangell were the only Alaska community connected by road, the regional travel induced by the MRA corridor could range from 0 to 55 AADT in 2030 (Section 6.1.4). If Petersburg were also connected via the Stikine River Corridor, the regional travel would be approximately one or two trips more per day in that same year.

The presence of the MRA and a suitable port at tidewater could improve the economic feasibility of potential mines in B.C. Based on interviews with companies with mineral claims in the area, the consultant team identified three potential mines that would be interested in using the MRA if a suitable port were available. These three mines might generate 149 truck round trips per day of production and have approximately 30 truck round trips per day on average of inbound freight (Section 6.1.6). This truck traffic would be approximately 360 AADT. The trucks are much larger than regular vehicles and would be the equivalent of more than 1,600 standard vehicles per day in terms of size and demand for ferry deck space.

6.4 Description of Approach and Data used for Induced Regional Traffic Estimates

To estimate induced regional trips on the proposed corridors, gravity models were developed using fiscal year 2007 AMHS data and 2004 survey results for vehicle trips by Whitehorse residents (McDowell Group, Inc., 2004). The gravity model is based on the theory that the level of interaction between two communities is a function of the size of each community and a factor that accounts for the distance and cost of travel between each community. The model can be estimated using distance, travel time, travel cost, or similar factors, and it is often used for estimating travel volume between different areas (Werner, 1985).

The AMHS data included the zip code of the ticket purchaser, as well as the origin and destination points for the trip. With this information, it was possible to calculate the number of trips residents made between each community. This information was then combined with travel time between each community and community population data to estimate the influence of each of the latter variables on trips taken.

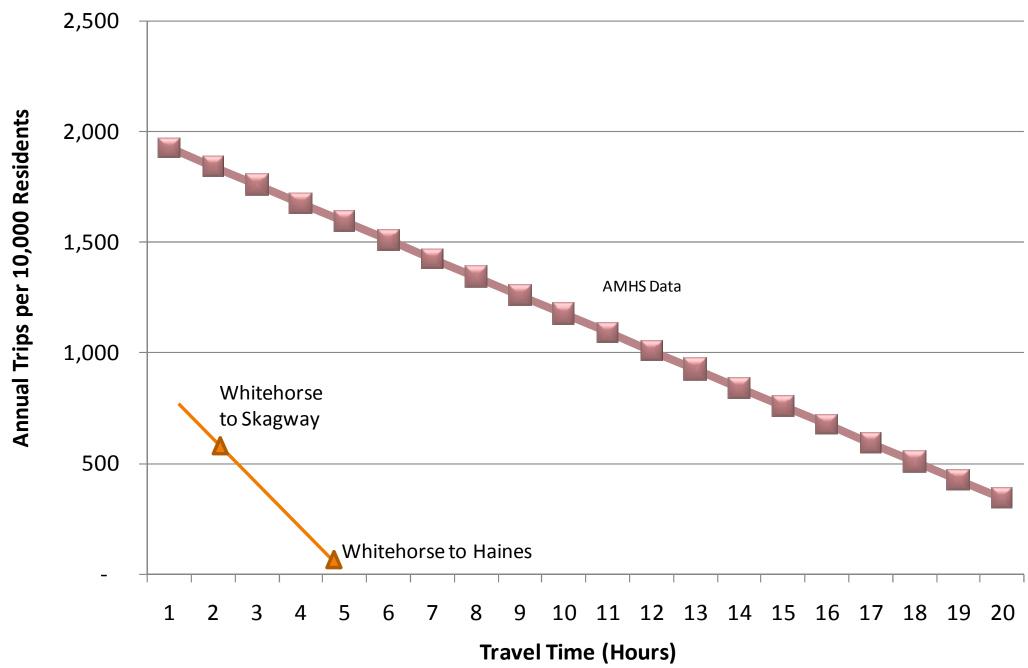
The analysis resulted in a multiple regression equation or gravity model used to estimate the number of trips. The equation developed from the AMHS data for estimating induced trips within the region is as follows:

$$N = 1330.09 + 0.067934 * P - 83.3162 * T.$$

Where N = the number of annual passenger trips; P = the combined population of the community pairs; and T = total travel time between each community in hours.

The equation has an adjusted R squared of 0.906973 and the P – values were less than 0.001.

In 2004, 100 Whitehorse residents were surveyed to determine the number of trips they made to Skagway and Haines over the previous 12 months (McDowell Group, 2004). Extrapolating the results of the survey to the Whitehorse population indicated that approximately 1,500 Whitehorse residents (total population of approximately 26,000 persons) traveled to Skagway (approximately 850 residents and 110 miles distance) and approximately 900 Whitehorse residents traveled to Haines (approximately 2,240 residents and about 250 miles). Adjusting the Whitehorse and AMHS estimates to reflect a hypothetical community-pair population of 10,000 provides insight into the effect of distance on trip demand for vehicle and ferry modes (Figure 6-1).



Source: Estimated by Northern Economics, Inc.

Figure 6-1. Induced Regional Travel Trips per 10,000 Residents by Mode

The slope of the line between the two Whitehorse data points suggests that trips by vehicle are more sensitive to travel time than those trips made by ferry. The increased travel time of ferries may be offset by the ability to relax onboard the vessel and not have to be at the wheel of a vehicle.

The AMHS data reflect passenger-only and passenger-with-vehicle travel among communities. While these data might not reflect the same travel patterns that would occur with vehicle travel on the MRA corridor, the AMHS data are useful since many of the MRA trips would incorporate a ferry trip as part of the overall travel plan. The AMHS data likely reflect the upper bound of potential trip generation.

The Whitehorse data, while only two data points, are the only data found that are similar to the MRA, which would have one terminus at a small Alaska community with road connections to other communities in B.C. The Whitehorse data may be indicative of the lower boundary of trip generation.

Regression equations were developed for the AMHS and the Whitehorse data using the mid-case population estimate of the Southeast Alaska communities in 2030 and by 2009 population of the following communities in northwest B.C.:

Community (2009 population):

- Dease Lake (450)
- Telegraph Creek (400)
- Iskut (283)
- Stewart (444)
- Kitwanga (481)
- Hazelton (304)
- Terrace (11,675)
- Prince Rupert (12,846)

No attempt was made to forecast the 2030 population for B.C. communities; populations have been declining in recent years for most of the B.C. communities in the region.

6.5 Induced Regional Vehicle Trips

Table 6-2 shows the estimated induced regional vehicle traffic in 2030 for the MRA using the two equations, distance between the communities, and the combined population for each community pair.

The regression equations are based on passenger counts, and the estimates were divided by two persons per vehicle to arrive at the number of vehicles. The equation developed using AMHS data results in approximately 16,700 vehicle trips per year, or about 46 AADT between all communities (Figure 6-2). The Whitehorse equation, which represents the low estimate, is that the distances between communities are too great to generate induced regional trips.

Table 6-2. Estimates of Annual Induced Regional Vehicle Traffic in 2030

Community	Sitka	Ketchikan	Wrangell	Petersburg	Juneau
AMHS Ferry Equation (High)					
Dease Lake	0	448	462	254	834
Telegraph Creek	0	388	402	194	774
Iskut	6	486	500	291	872
Stewart	0	0	454	246	827
Hyder	0	0	441	232	813
Kitwanga	0	0	408	200	780
Hazelton	0	0	381	173	754
Terrace	245	0	739	531	1,111
Prince Rupert	209	0	703	495	1,075
Whitehorse Vehicle Equation (Low)					
Dease Lake	0	0	0	0	0
Telegraph Creek	0	0	0	0	0
Iskut	0	0	0	0	0
Stewart	0	0	0	0	0
Hyder	0	0	0	0	0
Kitwanga	0	0	0	0	0
Hazelton	0	0	0	0	0
Terrace	0	0	0	0	0
Prince Rupert	0	0	0	0	0

Source: Estimate by Northern Economics, Inc.

Note: AMHS ferry equation: 84,85331+-1.11281 * Distance + 0.007857 * Population. Adjusted R2 of .39 with very large P values (>.25) and t-statistics of less than 2 so the equation is not statistically significant. Whitehorse vehicle equation: 567.4779 – 221.54 * Time + 0.052127 * Population. The equation is not statistically significant since there are only two data point s and two variables, and the number of data point must exceed the number of variables by at least one.

Figure 6-2 reflects information from the above table for selected community pairs. Thicker lines in the figure represent higher numbers of estimated induced regional vehicle traffic in 2030.

The five Alaska communities shown in the table account for approximately 83 percent of the Southeast Alaska population, so increasing the total vehicle trips by 20 percent (1/.83) results in approximately 20,100 vehicle trips for induced regional travel, or 55 AADT using the AMHS equation. The travel time estimates for the MRA are based on the Aaron Creek Corridor, which would have the shortest travel time to Wrangell. If another corridor were selected, the AADT counts could decline by one or two vehicles per day. As noted earlier, the Prince Rupert ferry would offer travel cost and travel time savings over the MRA for persons traveling to or from Ketchikan and Prince of Wales Island and points south of the MRA intersection with the Cassiar Highway. Therefore, no induced travel is estimated between those communities.

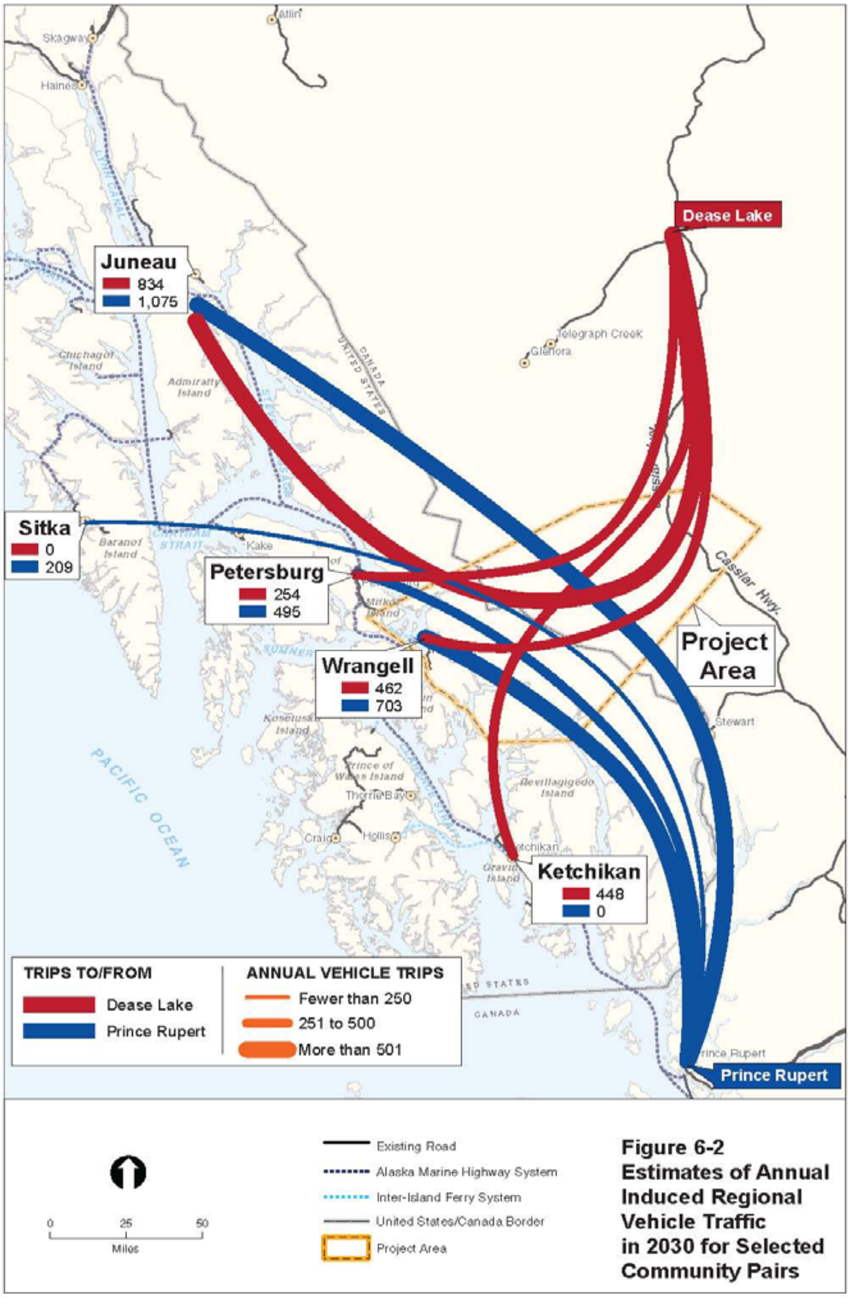


Figure 6-2. Annual Induced Regional Vehicle Traffic in 2030 for Selected Community Pairs

Source: Parametrix, Inc.

The Whitehorse vehicle equation is not statistically significant since there are only two data points for two variables, but using the original data points and the two data points for a 10,000-vehicle combined population enabled development of coefficients for estimating vehicle trips. The results suggest that no induced vehicle trips would be made between communities in the region. As noted in the McDowell Group report (2004), travel time on the Cassiar Highway to either Terrace or Prince Rupert, the only communities of any size in this region of B.C., is 5 or 6 hours of driving time beyond where the MRA alignment would intersect the Cassiar Highway, which is more than 4 hours from Wrangell. This distance would constrain the number of trips between the communities. For communities in southern Southeast Alaska, the current ferry service to Prince Rupert would offer a faster trip than using the MRA corridor. The actual AADT number is likely to fall within the range (0 to 55 AADT) of the vehicle and ferry vehicle equation estimates. If the Southeast Alaska population in 2030 changed by 5,000 persons from the 95,079 population estimate used in this report, the MRA AADT for induced regional trips using the AMHS equation would change by approximately five vehicles per day.

6.6 Induced Local Vehicle Traffic

The presence of a new road would result in additional trips as the new road would make more areas accessible for recreation, sightseeing, and other activities. To estimate the potential number of induced local trips, DOT&PF traffic maps for communities in Alaska that are not connected to the road system were reviewed to identify route segments that were some distance from a community, that did not have industrial or commercial activity, or that lacked major residential development. Such route segments were thought to represent potential recreation-oriented trips and trips “to the end of the road” that might be undertaken on a new road connection.

Table 6-3 shows the routes, the AADT on the particular route segment as determined from the relevant traffic map, the estimated distance from the city center, and the population of the community. The distance information was estimated from the most recent Traffic Volume Data File for each route.

Table 6-3. Selected Routes and Data used to Estimate Induced Local Trips

Community	Route Number.	AADT	Distance in Miles	Population
Ketchikan	291500	217	16.2	13,160
Sitka	295500	173	6.3	8,833
Ketchikan	291400	147	15.5	13,160
Kodiak	067400	101	25.7	6,626
Yakutat	297050	18	9.9	608
Petersburg	294000	17	31.5	3,129
Wrangell	293376	10	26	1,911
Nome	167500	230	9	3,468
Nome	167500	75	53	3.468
Nome	167500	25	85	3,468

Source: Estimate by Northern Economics, Inc., using DOT&PF data

These data were then used in a multiple regression analysis to determine an equation that could be used to estimate the potential number of annual trips for recreation and other local activity that might be generated by a new road. The equation developed from these data is as follows:

$$\text{Annual Number of Trips} = 84.853 + 0.00786 * \text{Population} - 1.113 * \text{Distance}.$$

The results of the equation are not statistically significant, so caution should be used in employing the results. However, the consultant team considers this estimate of locally induced trips to be reasonable, and there are no other known means of developing such estimates.

Table 6-4 shows the estimated induced local traffic that might be generated at different distances from Petersburg and Wrangell, the only two Alaska communities that might have direct road connections to the MRA. At distances of approximately 90 miles from Wrangell, the equation indicates that the number of trips would be at or near zero for both communities. At distances of approximately 35 miles from Wrangell, which is the approximate distance to the closest MRA road segments that would be built, AADT for locally induced traffic would be approximately 60 for Wrangell and approximately 50 for Petersburg, or 110 AADT with the Stikine River Corridor route.

Figure 6-3 reflects the same information provided in Table 6-4, using the Aaron Creek Corridor as an example. The different colors in the figure represent various distances from Wrangell and different induced local traffic estimates.

The community of Iskut in B.C. is located approximately 67 miles from the potential intersection of the MRA and the Cassiar Highway. Applying the equation developed for Alaska communities to this B.C. community results in approximately 13 AADT for the MRA segments close to the Cassiar Highway.

Table 6-4. Estimated Induced Local Traffic

Distance (Miles) from Wrangell	Annual Average Daily Traffic	
	Wrangell	**Petersburg**
10	89	79
20	78	68
30	66	57
40	55	46
50	44	35
60	33	24
70	22	13
80	11	1
90	0	0
100	0	0

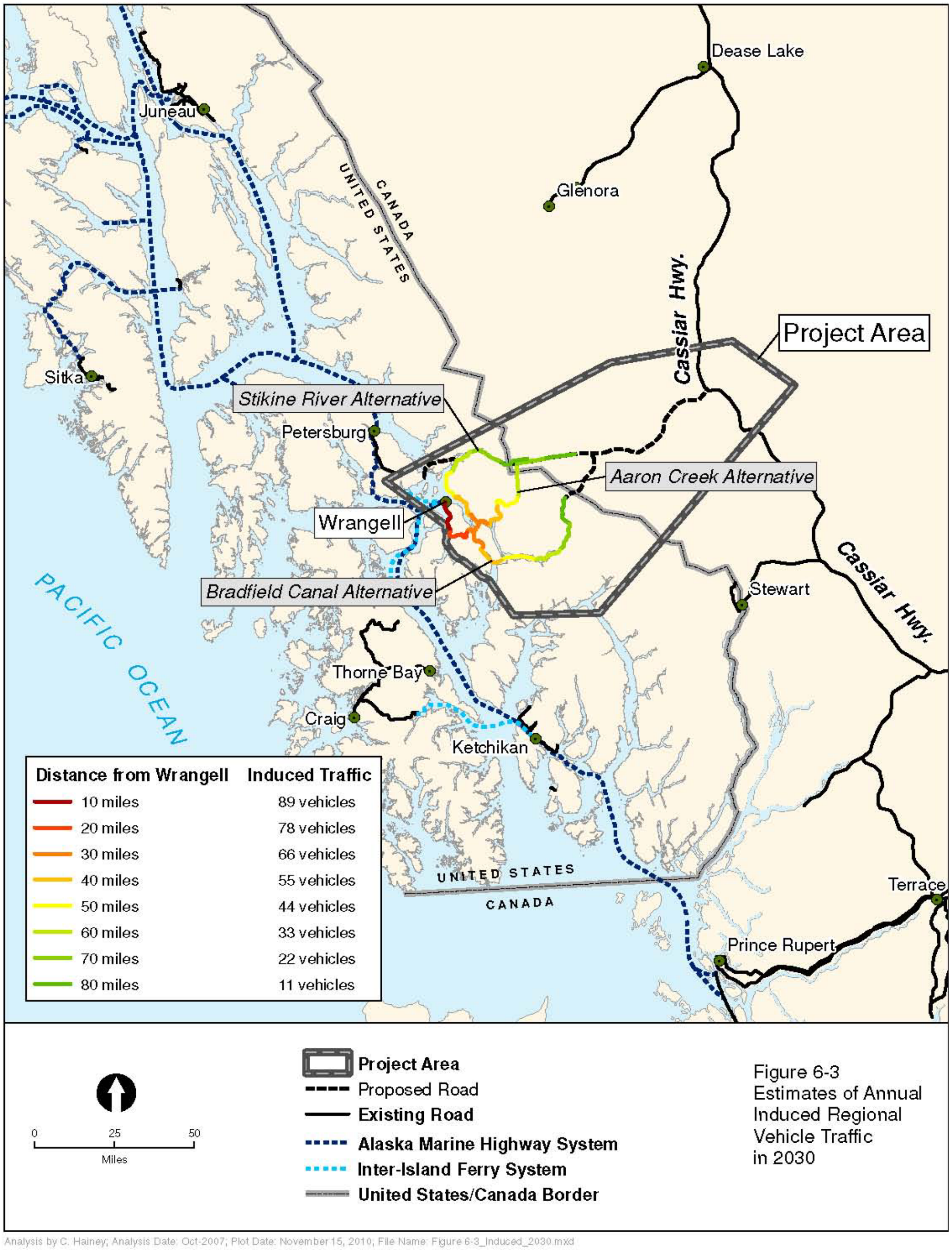
Source: Estimates by Northern Economics, Inc.

The Aaron Creek Corridor would provide road access to Wrangell, and the Stikine River Corridor would provide road access to Wrangell and Petersburg. The Bradfield Canal Corridor would also provide road access to Wrangell, and the ferry terminal is about 43 miles from Wrangell. At that distance, local induced trips would be approximately 50 AADT (Figure 6-3). Data have not been identified to estimate the number of local induced trips with ferry service.

6.7 Induced Industrial Trips

Industrial activity in the Alaska portion of the MRA corridor study area is primarily limited to seafood processing, logging, and forest products manufacturing. As described in Appendix B, the Iskut-Stikine area is one of the richest mineralized areas in B.C., and the area has been the subject of mineral exploration and exploitation for many decades. There are currently several mining operations and exploration activities underway in the region.

Fresh seafood products from Southeast Alaska move primarily by air, and lower value frozen and canned seafood products move by barge. Lumber products move by barge, and raw log exports move by barge or ship depending on the destination. Construction of the MRA could improve the economics of the seafood processors and the forest products industry, but it is not anticipated to induce new trips. Some fresh seafood that moves via AMHS could be diverted to the MRA, as noted earlier, but the volumes of seafood product would not likely change since harvests are constrained by management of the resource. Therefore, there would be no induced trips for seafood products. Forest products would likely continue to move by barge or ship, which is more cost effective than trucking to major markets.



Source: Parametrix, Inc.

Figure 6-3. Estimated Induced Local Traffic

Currently, most of the mining activities near the proposed MRA corridor are still in the pre-application or exploration phase. Access to this area of B.C. has been a major obstacle for mine development. A road through the area could advance future mine development, particularly if it provided a lower cost alternative for transporting materials and supplies during production. The proposed corridor could only be used for mining operations if it connected the mines to a port that could accommodate the big ships needed to move large volumes of mining materials.

As described in Appendix B, telephone interviews with a number of mining and exploration companies identified several firms that would be interested in moving production via an MRA corridor if there were a deep-water dock that could be used by the companies and if the MRA corridor were suitable for large truck traffic. The potential industrial truck traffic on the MRA corridor is shown in Table 6-5.

Table 6-5. Estimated Induced Industrial Traffic

	Truck capacity (tons)	Round trips per day	Mine life in years	Year project operations begin
Red Chris Copper-Gold Mine[1]	40	11	25	2012 or 2014[a]
Schaft Creek Copper-Gold-Molybdenum-Silver Project [2]	30	27	23	2014[b]
Mount Klappan Coal Project [3]	44	111	20	NA

Sources: 1) Robertson, S., 2009; 2) Rescan Tahltan Environmental Consultants, 2008 and Salazar, G., 2009; 3) Kemp, J., 2008

Notes: [a] Depending on the outcome of the Canadian Supreme Court case, mine operations are expected to begin in either 2012 or be delayed to 2014 (if the mine must go through another permitting process).

[b] The year 2014 for the Schaft Creek start is one year past the start year given in the project description based on information provided by Guillermo Salazar, President of Fox Creek Metals.

The estimated total truck traffic per day from these three potential mines is estimated at 149 round trips, or approximately 300 AADT for export (outbound) of these metals or minerals. These trucks are large (Figure 6-4) and require more space that a typical passenger vehicle on a ferry. Parametrix (Sylvester, 2010) estimated that these trucks are equivalent to approximately 4.5 standard vehicles, so 300 of these truck trips would be equivalent to approximately 1,350 vehicles per day.

The mines are located hundreds of miles from any communities that would have labor forces large enough to supply the hundreds of jobs that would be created. As a result, mine workers would likely be housed in camps at the mine site and would be flown in and out of the mine on a rotation schedule. Thus, no trips would be associated with the mine work force.

A deep-water dock for export of mine production would likely be located as far east as practical at the closest suitable tidewater location to avoid building large bridge structures to accommodate the heavy trucks and to avoid having to transport these large trucks on ferries. Unless multiple ferries were available, the industrial truck traffic could exceed the capacity of the SATP planned ferries. For that reason, the Bradfield Canal Corridor likely would not be preferred unless the port were built at or east of the ferry terminal.

Such a port likely would not be used by Wrangell or other communities, but it could be used by the mines to import fuel, supplies, and equipment. The volume of such inbound traffic is uncertain, but would likely be approximately 30 trucks per day (10 trucks for each mine) on average or about 270 standard vehicle equivalents AADT. There would be approximately 180 round trips by trucks per day, or 360 AADT, or 1,620 AADT of standard vehicle equivalents. U.S. Department of Transportation regulations also prohibit the transportation of explosives through tunnels, so the Aaron Creek Corridor, which would include a tunnel, would restrict the transport of explosives used at the mine. Thus, the Stikine River Corridor would be a preferred route for the Canadian mining industry.

As noted above, none of these proposed mines is presently in production. Stewart, B.C. is an existing port with loading facilities that would compete with the MRA port, so it is possible that no industrial trips would occur in the future.

Source: Courtesy of Capstone Mining Corporation

Figure 6-4. Minto Concentrate Truck

6.8 Other Induced Trips

In addition to the trips discussed above, there would be some induced trips associated with U.S. and Canadian personnel manning border stations. At this point, it is uncertain whether the border crossings would be open 24 hours per day or only for designated hours. It is also unknown whether personnel would be provided with housing close to the crossing, would commute from and to local communities, or would rotate to work a week on/week off shift schedule or another similar arrangement. The AADT for these stations could range from less than 1 to as many as 12.

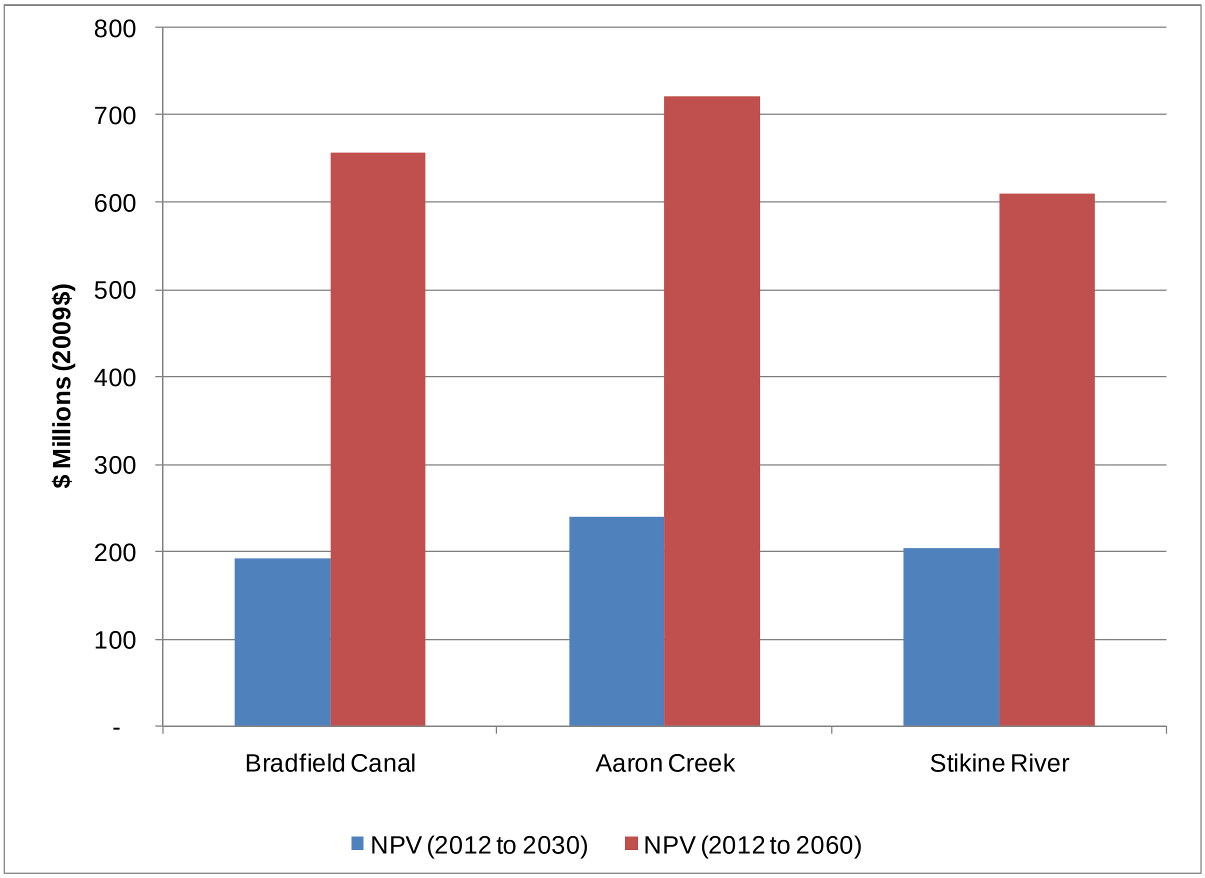
7 LIFE-CYCLE COSTS

7.1 Summary

This section calculates the net present value (NPV) of the life-cycle costs net of salvage value for each of the three proposed MRA corridors. The life-cycle costs include the capital and operating costs for each corridor over the 2012 to 2030 study period, as well as over an extended period from 2012 to 2060. This extended period is added in the analysis to capture the differences among the corridors should the road and ferry become operational.

For the three corridors analyzed in this technical memorandum, the preliminary design and permitting activities (including an EIS and supporting engineering) were assumed to begin in 2012 and last through 2016. Design, engineering, and administration activities were assumed to begin in 2017, with construction activities starting in 2019 and lasting through 2028. Capital investments for operation and maintenance of the road and ferries were assumed to take place in 2028, and the annual operating and maintenance (O&M) costs would occur during the remaining years of the study period. The analysis for the extended period until 2060 included the cost of rehabilitating the road, which was assumed to take place over five years beginning in 2048. The analysis also included the benefits that would occur from the ferries' salvage value in 2060 and the remaining value of the road in 2060.

The results for the NPV of life-cycle costs net of salvage value from 2012 to 2030 indicate that the Bradfield Canal Corridor would have the lowest net costs ($192 million), followed by the Stikine River Corridor ($204 million) and the Aaron Creek Corridor ($240 million). This ranking changes when comparing the different corridors over an extended time. The NPV of life-cycle costs net of salvage value from 2012 to 2060 for the Stikine River Corridor are the lowest ($609 million), followed by the Bradfield Canal Corridor ($656 million) and the Aaron Creek Corridor ($721 million) (Figure 7-1). The cost-effectiveness estimates from 2012 to 2060 indicate that, across all scenarios, the Stikine River Corridor would have the lowest net costs per AADT, followed by the Bradfield Canal and Aaron Creek Corridors (Figure 7-4).



Source: Estimates by Northern Economics, Inc.

Figure 7-1. Summary of Net Present Value (NPV) of Life-cycle Costs by MRA Corridor

7.2 Net Present Value of Costs

The primary sources for the cost data used in this section are the life-cycle cost estimates prepared by Robert Peccia and Associates (2011) and DOT&PF (2011) (Figure 7-2). The NPV of these costs is calculated for the relevant stages for each of the three corridors for the proposed MRA corridor. Previous sections of the report indicate that Stage 1 (ACVs) and Stage 3 (road to Fools Inlet and ferry terminal) of both the Stikine River and the Aaron Creek Corridors may not be practical. Similarly, Stage 5 of the Stikine River Corridor likely does not have a positive benefit/cost (B/C) ratio. Consistent with these conclusions, the cost analysis in this section only includes the Bradfield Canal Corridor, Stage 2 of the Stikine River Corridor, and Stage 2 of the Aaron Creek Corridor.[5, 6] The roadway alignment along the Iskut River that is a part of Stage 1 was included in the analysis. It was

[5] The cost analysis for the Stikine River Corridor assumes a road connection from the Cassiar Highway down the Iskut River to the Stikine River, continuing down the Stikine River to Crittenden Creek where a ferry terminal would be located. A shuttle ferry would operate between Crittenden Creek and a terminal on Wrangell Island near the city.

[6] The cost analysis for the Aaron Creek Corridor assumes a corridor going from the Cassiar Highway down the Iskut River to the vicinity of the Stikine River. This corridor would follow the Katete River and Aaron Creek down to Berg Bay where a conventional ferry terminal would be located. A shuttle ferry would operate between Berg Bay and a ferry terminal at the Log Transfer Station on Wrangell Island, and a short road would connect the latter to the road system.

assumed that Stage 4 of both the Stikine River and Aaron Creek Corridors would not be built within the study period.

7.2.1 Assumptions

For the purposes of calculations in this memorandum, the preliminary design and permitting activities (including the EIS with the supporting engineering) would likely take place from 2012 to 2016. These activities would cost an amount equivalent to 5 percent of the total construction costs. The final design engineering and administration activities were assumed to begin in 2017 and last through 2028. The estimated cost would be approximately 8 percent of the total construction costs.

The construction engineering services (7 percent of total construction costs) and the actual construction of the road/port/ferry were assumed to occur from 2019 to 2028. In the remaining years, the costs would include the annual O&M costs, as well as the capital costs of the main investments needed for the operation and maintenance of the road, port (vehicles and buildings), and ferries. The analysis includes a cost of $1 million per mile for road rehabilitation, which was assumed to take place from 2048 to 2052. If an activity lasted for several years, the costs would be allocated equally among those years.

For each corridor, the number of ferries and the number of round trips required to meet the demand were estimated based on the expected demand (AADTs), the capacity of the ferry, and the time required to complete a round trip. The analysis assumed the need for at least one operating ferry and one backup ferry to maintain service in the event that a vessel becomes disabled. The Bradfield Canal Corridor would require two operating ferries, making a total of six round trips per day in the summer peak season, and one operating ferry (plus one backup ferry) making the equivalent of three daily round trips in winter. For the Stikine River and Aaron Creek Corridors, one operating ferry (and one back up ferry) would cover the demand both in winter and in summer. The Aaron Creek Corridor would require six round trips per day in summer and the equivalent of three daily round trips in winter. The Stikine River Corridor would require nine round trips per day in summer and the equivalent of four daily round trips in winter to cover the expected demand.[7]

[7] The number of ferry round trips per day needed in the summer peak season was calculated by multiplying the non-industrial AADTs expected in 2030 (Table ES-1 and Table 8-1) by a factor of 1.44 (=0.6/(5/12)). This adjustment factor took into account that 60 percent of the annual average traffic would occur during five months of the summer peak season. Similarly, the adjustment factor for AADTs in winter is 0.69 (=0.4/(7/12)). The resulting AADTs were divided by the ferry capacity (30 vehicles) to obtain the number of ferry round trips. The number of ferry runs calculated based on AADTs for 2030 were considered valid for 2060 because the population was assumed to remain approximately constant from 2030 to 2060, with a slight decrease from 2030 to 2035 according to the available population forecasts for the region (DOLWD 2011).

A linear depreciation method was used to calculate the salvage values of assets that are built or acquired by the project. In particular, the salvage value of the ferry in 2060 was calculated based on the assumptions of 35 years of operational life and a scrap value equivalent to 5 percent of the initial cost of the ferry. The road would remain in place after the study period, and the remaining value of the roadway was estimated based on the time remaining to the next rehabilitation period, which would increase the value of the road to its original cost in real dollars (excluding inflation).

Only direct monetary quantifiable economic costs, not environmental and social costs, were considered. Financing costs were not included; it was assumed that there would be enough funds from state and federal sources. All the costs are reported in real terms and expressed in constant dollars of 2009. Costs were discounted to their present values by using a 2.7 percent annual discount rate based on the real discount rate for projects that last 20 years or more as recommended by the Office of Management and Budget (OMB), Circular A-94.

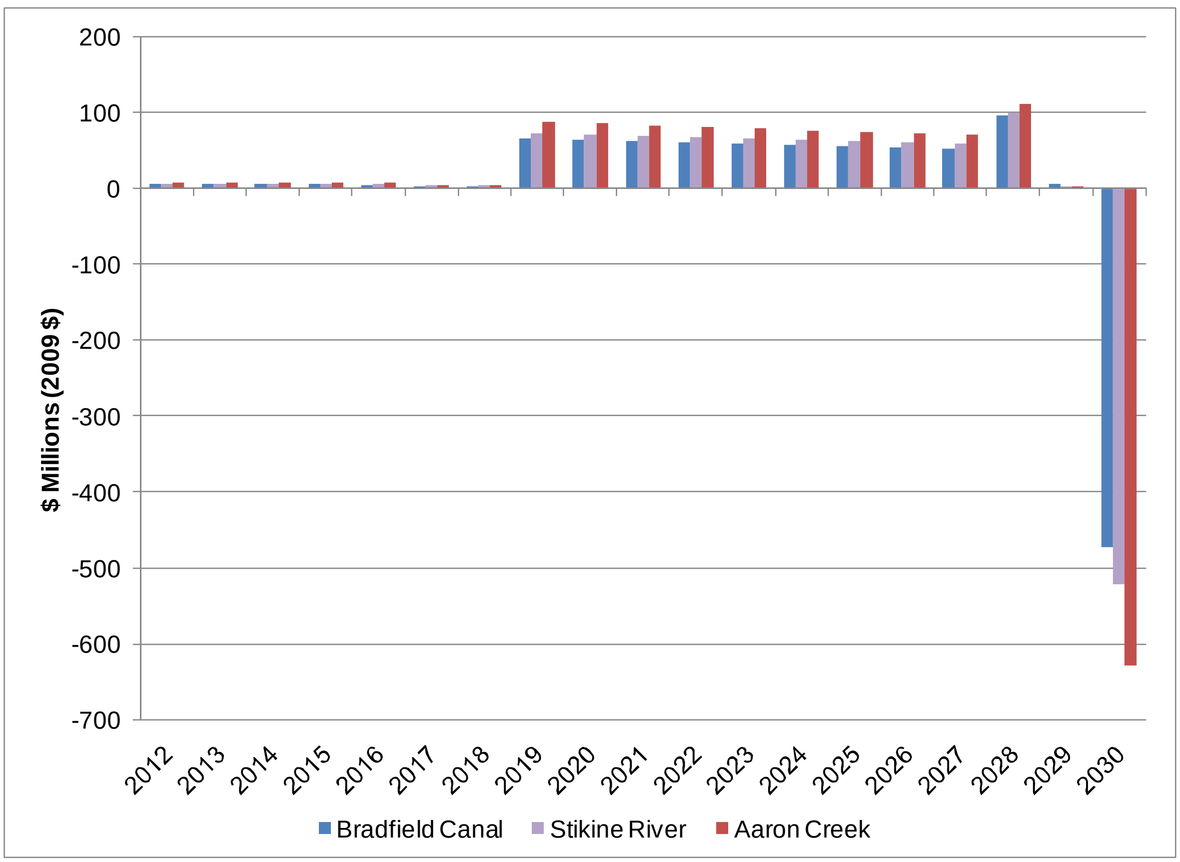
7.2.2 Results

Table 7-1 and Figures 7-2 and 7-3 summarize the life-cycle costs for each corridor, as well as the salvage value of the ferry and roadways under the two alternative study ending periods, 2030 or 2060. The NPV of the life-cycle costs net of salvage value occurring from 2012 to 2030 would be lowest for the Bradfield Canal Corridor ($192 million), followed by the Stikine River Corridor ($204 million) and the Aaron Creek Corridor ($240 million). The NPV from 2012 to 2060 suggests that the Stikine River Corridor would have the lowest life-cycle costs net of salvage value ($609 million), followed by the Bradfield Canal Corridor ($656 million) and the Aaron Creek Corridor ($721 million) (Figure 7.1).

Table 7-1. Life-cycle Costs by MRA Corridor, 2012 to 2060

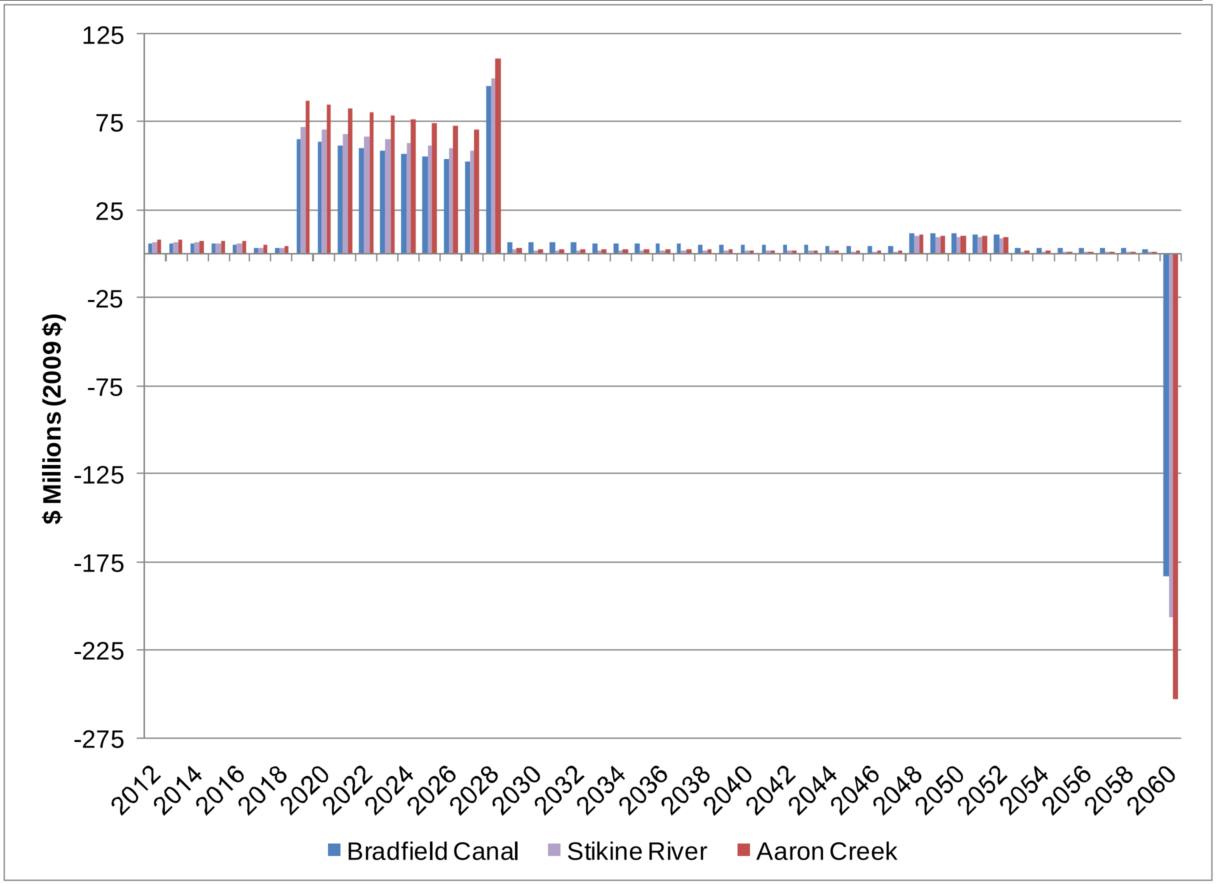
Years	Annual Life-Cycle Costs (Millions of 2009 $)		
	Bradfield Canal	**Stikine River**	**Aaron Creek**
2012 -2016	6.35	7.12	8.59
2017-2018	4.23	4.75	5.73
2019-2027	84.88	94.23	113.81
2028	158.26	165.10	184.81
2029-2047	11.48	4.11	5.37
2048-2052	33.96	28.18	30.44
2053-2059	11.48	4.11	5.37
Alternative Ending Year	**Salvage Values (Millions of 2009 $)**		
2030	(826.67)	(914.21)	(1,099.75)
2060	(711.00)	(802.73)	(985.02)
Alternative Ending Year	**NPV of Life-cycle Costs less Salvage Values (Millions of 2009 $)**		
NPV (2012 - 2030)	192	204	240
NPV (2012 - 2060)	656	609	721

Note: Costs are expressed in 2009 U.S. dollars.
Source: Estimated by Northern Economics, Inc., based on Robert Peccia & Associates (2010) and DOT&PF (2011).



Source: Estimates by Northern Economics, Inc.

Figure 7-2. Discounted Costs and Salvage Values by MRA Corridors, 2012 to 2030



Source: Estimates by Northern Economics, Inc.

Figure 7-3. Discounted Costs and Salvage Values by MRA Corridors, 2012 to 2060

7.3 Cost Effectiveness

To inform decision makers, a rigorous comparison between mutually exclusive projects should not only consider the costs but also the benefits of those projects. Estimating the benefits of the proposed MRA corridors is beyond the scope of this present study. The cost-effectiveness (CE) of a project combines both a measure of its costs and an indirect measure of non-monetary benefits to establish effectiveness. For this study, it was assumed that the MRA would provide surface access to the region, and the number of vehicle trips generated by each corridor would be an indirect measure of the benefits of providing this access.

Table 7-2 shows the estimated NPV of life-cycle costs (net of salvage value), effectiveness measured by the cumulative AADTs, and CE estimates for each of the three alternatives for the proposed MRA corridor from 2012 to 2060.[8] The cost-effectiveness estimates from 2012 to 2060 indicate that, across all scenarios, the Stikine River Corridor would have the lowest cost per AADT, followed by the Bradfield Canal Corridor and the Aaron Creek Corridor. For the mid-case scenario, in particular, the Stikine River Corridor would have the lowest cost per AADT ($239 per trip), followed by the Bradfield Canal Corridor ($328 per trip) and the Aaron Creek Corridor ($360 per trip) (Figure 7-4).

[8] The 2030 AADT estimate for each alternative was held constant to 2060 for this analysis. AADTs for 2030 are considered valid for 2060 because the population is assumed to remain approximately constant between 2030 and 2060, with a slight decrease between 2030 and 2035 according to the available population forecasts for the region (DOLWD 2011).

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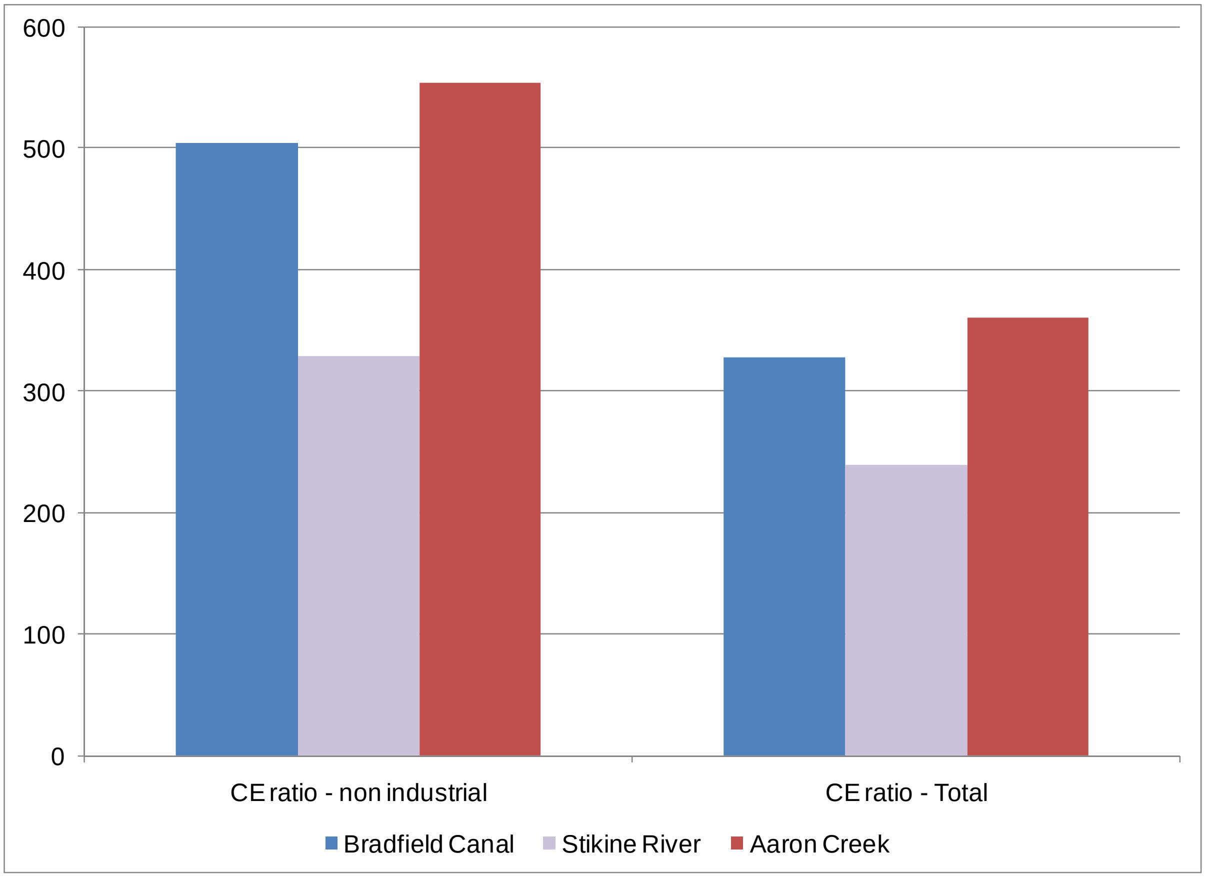
Table 7-2. Cost Effectiveness by MRA Corridor, 2060

	Corridor								
	Bradfield Canal			Stikine River			Aaron Creek		
	Low	**Mid**	**High**	**Low**	**Mid**	**High**	**Low**	**Mid**	**High**
Costs (thousands of dollars)									
Cost less salvage value (NPV)	656,359	656,359	656,359	609,440	609,440	609,440	721,477	721,477	721,477
Effectiveness (thousand trips)									
Non industrial traffic	55	1,303	2,070	55	1,851	2,792	55	1,303	2,070
Industrial traffic	350	701	3,942	350	701	3,942	350	701	3,942
Industrial SVE traffic	1,577	3,154	17,739	1,577	3,154	17,739	1,577	3,154	17,739
Total traffic	405	2,004	6,012	405	2,551	6,734	405	2,004	6,012
Total SVE traffic	1,632	4,457	19,809	1,632	5,004	20,531	1,632	4,457	19,809
Cost effectiveness (dollars per trip)									
CE - non industrial	11,988	504	317	11,131	329	218	13,178	554	349
CE - industrial	1,873	937	167	1,739	870	155	2,059	1,030	183
CE - industrial SVE	416	208	37	387	193	34	458	229	41
CE - total	1,620	328	109	1,504	239	90	1,781	360	120
CE - total SVE	402	147	33	374	122	30	442	162	36

Note: Costs are expressed in 2009 U.S. dollars.

Source: Estimated by Northern Economics, Inc., based on Robert Peccia & Associates (2010) and DOT&PF (2011).



Source: Estimates by Northern Economics, Inc.

Figure 7-4. Cost Effectiveness Estimates by MRA Corridors, 2060

8 FINDINGS AND CONCLUSIONS

8.1 Findings

8.1.1 Findings of Sensitivity Analysis

The factors of party size (number of persons traveling together), and full vehicle cost per mile or variable vehicle cost per mile considerations by those traveling were evaluated to determine their potential effect on mode and route choice. Air travel to Anchorage or Seattle remained the lowest-cost option in all cases.

For travel with a vehicle to those cities, party size would change mode selection for travelers in certain Southeast Alaska communities, as would the use of variable costs for the vehicle. As noted earlier, from every community in Southeast Alaska, a party of two persons would find it less expensive to use AMHS through Haines than the MRA to access Anchorage, and everyone except residents of Wrangell would have the lowest cost using the AMHS through Prince Rupert to travel to Seattle. Wrangell would have a lower cost by using the MRA.

In comparison, a party of four persons traveling from Craig or Ketchikan to Seattle would use the AMHS via Prince Rupert to achieve the lowest travel cost, while all other communities would find it less expensive to use the MRA. For travel to Anchorage, a party of four from Juneau and Sitka would find it less expensive to use AMHS via Haines, while other Southeast communities would find the lowest-cost choice to be the MRA.

Even with a vehicle cost per mile of $0.15, air travel would remain the lowest-cost option for a party of two. Wrangell and Petersburg residents would use the MRA to Seattle, since variable costs of $0.15 per mile would be the lowest-cost option with a vehicle. Only Wrangell would use the MRA with full vehicle costs of $0.50 per vehicle mile. All other Southeast communities would use the AMHS through Prince Rupert. For travel to Anchorage and full costs of $0.50 per mile, residents of all Southeast communities would use the AMHS via Haines. With variable costing, Wrangell residents would find it less expensive to use the MRA; all other Southeast residents would achieve the lowest-cost travel by using the AMHS via Haines.

It is apparent from the studies presented in this report that residents of the region, when planning a trip with a vehicle, use the variable cost of $0.15 per mile. It is also likely that most parties of four or more would use the MRA rather than the AMHS since the cost savings could be appreciable.

8.1.2 Traffic Estimates

Total diverted traffic could range from approximately 4 AADT in 2030 to about 20 AADT, with a mid-point estimate of approximately 12, depending on which DOLWD population forecast case was used. Most of this traffic would be diverted from the AMHS.

Locally induced trips for recreation and similar activities would vary, depending on the distance from a community. At approximately 35 miles from Wrangell, residents of Petersburg and Wrangell could generate about 110 AADT for the Stikine River Corridor and approximately 60 AADT for the other corridors. The community of Iskut, B.C., could generate approximately 13 trips per day on the MRA segments close to the Cassiar Highway.

The distance from Wrangell to a ferry link for the various corridors and stages could change the number of ferry trips, and the ferries might experience capacity constraints. For example, the Stikine River Corridor ferry terminal would be at Wrangell and could receive 170 or so AADT from Wrangell and Petersburg residents, more than shown in Table 8-1 for the high estimate, a count based on a 10-mile distance. The Aaron Creek Corridor terminal would be more than 20 miles from Wrangell; there could be approximately 80 AADT from locally induced trips at the terminal compared to the 73 trips estimated at 35 miles distance in Table 8-1. Induced travel between communities in Alaska and northwest B.C. (regional induced trips) could range from 0 to approximately 55 AADT in 2030, depending on the assumptions used to estimate future demand.

Up to 360 AADT could be associated with trucks traveling to and from potential mines in B.C. This truck traffic would be the equivalent of more than 1,600 standard vehicles in terms of the deck space required on a ferry. None of these mines is presently operating; if they would not move to production, there would be no industrial traffic.

Total AADT on the corridors could range from a low of approximately 37 AADT to approximately 615 AADT under the Stikine River Corridor and 549 AADT for the Bradfield Canal and Aaron Creek Corridors. Total SVE could range from about 149 to 1,875 for the Stikine River Corridor and 1,809 for the other corridors.

Table 8-1. Comparison of Corridor AADTs and SVEs in 2030

Trip Type (AADT)	Corridor Traffic Volumes								
	Aaron Creek			Stikine River			Bradfield		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
Diverted (from other mode)	4	12	20	4	12	20	4	12	20
Induced (new trips)									
Local[1]	0	73	102	0	123	168	0	73	102
Regional	0	28	55	0	28	55	0	28	55
Other	1	6	12	1	6	12	1	6	12
Subtotal Diverted & Induced	5	119	189	5	169	255	5	119	189
Industrial									
Inbound	10	10	60	10	10	60	10	10	60
Outbound	22	54	300	22	54	300	22	54	300
Subtotal Industrial	32	64	360	32	64	360	32	64	360
Industrial SVE[2]	144	288	1,620	144	288	1,620	144	288	1,620
Total AADT	37	183	549	37	233	615	37	183	549
Total SVE	149	407	1,809	149	457	1,875	149	407	1,809

Source: Northern Economics, Inc., estimates

Notes: [1]For local induced traffic, the mid distance for Alaska communities would be 35 miles; mid distance for Iskut, B.C. would be 67 miles, the approximate distance to the intersection of MRA and the Cassiar Highway. The low traffic estimate for local induced trips uses 100 miles, and the high traffic estimate assumes a 10-mile distance from Wrangell.

[2] SVE: Standard vehicle equivalent.

Data have not been identified to allow estimating AADTs in summertime peaks and winter. The AADTs reported in the table above assume average conditions.

8.2 Conclusions

Table 8-2 compares the various corridors that are evaluated in this report. It also summarizes some of the findings.

The Bradfield Canal Corridor would have the lowest capital cost. The Stikine River and the Aaron Creek Corridors would provide road access at higher capital costs, with the Stikine River Corridor slightly higher than the Aaron Creek Corridor.

The first stage of the Stikine River and Aaron Creek Corridors envision ACVs that would provide service on the Stikine River until a road was later constructed. It would be difficult to accommodate significant volumes of truck traffic from potential mines in B.C. on the ACVs.

Multiple ACVs would still be needed to serve the estimated AADT for other vehicles during the peak month of July. ACV service would be adversely affected by freezing temperatures and high wind speeds. Issues with reliability of the ACVs would result in low traffic volumes.

Seasonal variations in traffic volumes on the MRA would likely be consistent with current traffic trends on the AMHS and Alaska’s highways. Winter travel, however, might be lower than anticipated due to the remoteness and limited public services available on the proposed corridors and the Cassiar Highway.

The highway could easily accommodate peak summer traffic. However, the Bradfield Canal Corridor and some of the earlier phases of the Stikine River and Aaron Creek Corridors would have ferry links, and ferry capacity identified in the SATP for these routes could not accommodate the estimated number of trips if the ferries had to transport large numbers of trucks hauling ore concentrates or other resources.

The MRA corridor would not offer cost or travel time savings for residents of Ketchikan or Prince of Wales Island for trips to the lower 48 states and most of B.C. As a result, there would be limited MRA traffic using a road to Fools Inlet and a ferry terminal to connect with Ketchikan and Prince of Wales Island.

While the road to Fools Inlet and ferry terminal (Stage 3 for Stikine River and Aaron Creek Corridors) might still provide system-wide benefits for AMHS, the infrastructure would not provide significant benefits to the MRA. Construction of the road to Fools Inlet and the ferry terminal (Stage 3 for Stikine River and Aaron Creek Corridors) may not be practical until the Cleveland Peninsula or the Revillagigedo Island roads are constructed per SATP recommendations.

The last stage (5) of the Stikine River Corridor would provide a time savings of approximately 13 minutes for Wrangell residents for approximately $89 million in capital cost. This stage would not likely have a positive benefit/cost ratio. If Stage 5 were built in conjunction with the road to Fools Inlet and the road connections to Ketchikan, however, it might be warranted.

Consistent with the previous recommendations, a further cost study was performed for the following: the Bradfield Canal Corridor, Stage 2 of the Stikine River Corridor, and Stage 2 of the Aaron Creek Corridor. The roadway alignment along the Iskut River that is a part of Stage 1 was included in the study. For this study, it was assumed that Stage 4 of both the Stikine River and Aaron Creek Corridors would not be built within the study period. The estimated net present values of capital and operating costs between 2012 and 2030 indicate that the Bradfield Canal Corridor would have the lowest NPV costs ($192 million), followed by the Stikine River Corridor ($204 million) and the Aaron Creek Corridor ($240 million). This ranking changes when comparing the different corridors during an extended period of time. The NPV of life-cycle costs net of salvage value from 2012 to 2060 for the Stikine River Corridor would be the lowest ($609 million), followed by the Bradfield Canal Corridor ($656 million) and the Aaron Creek Corridor ($721 million) (Figure 7.1). The cost-effectiveness estimates from 2012 to 2060 indicate that, across all scenarios, the Stikine River Corridor would have the lowest cost per AADT, followed by the Bradfield Canal Corridor and the Aaron Creek Corridor.

Table 8-2. Comparison of Corridors

Corridor	Capital Cost (road and ferry system) AK Cost	B.C. Cost	Total	Cumulative Total	Corridor AADT & SVE in 2030 (low, mid, high)	Ferry ADT in 2030 (mid, winter, summer)	Ferry Daily Capacity (standard vehicle units)	Industrial port/traffic	Travel Time	Full Build Capital Cost Ranking
Bradfield Canal	490	345	835	835	AADT: 37/183/549 SVE: 149/407/1809	119/82/171	Winter: 90(=3*30) Summer: 180(=6*30)	Yes to upper reach of Bradfield Canal	Slowest time to all communities	Lowest cost
Stikine River					AADT: 37/233/615 SVE: 149/457/1875	169/116/243	Winter: 90(=3*30) Summer: 270(=9*30)	Yes to Eastern Passage	Most time savings for Petersburg and north if linked to MRA	Highest cost
Stage 1	30	452	482	482						
Stage 2	381	92	473	955						
Stage 3	64	-	64	1,019						
Stage 4	243	-	243	1,262						
Stage 5	89	-	89	1,351						
Aaron Creek					AADT: 37/183/549 SVE: 149/407/1809	119/82/171	Winter: 90(=3*30) Summer: 180(=6*30)	Yes to Eastern Passage or Blake Channel	Fastest time to Wrangell	Slightly lower cost than Stikine River
Stage 1	30	452	482	482						
Stage 2	544	105	649	1,131						
Stage 3	46	-	46	1,178						
Stage 4	60	-	60	1,238						

Notes: 1) Capital costs would include road/port (ferry terminal) construction and engineering costs, ferry costs, and the capital costs related to road/ports/ferries operation and maintenance. More detail on capital costs can be found in the Southeast Alaska Mid-Region Access Engineering Technical Memorandum.

2) Ferry ADT in 2030 reflects total ADT for standard vehicles only. Industrial traffic would likely use the closest tidewater location and would not require ferry transport.

3) ADT reflects volumes at full build out; traffic volumes would be lower for early stages.

4) Capital costs are shown in millions of U.S. dollars.

5) The capital costs for the Stages 2 and 4 only option would include the cost of building the Iskut River roadway portion of Stage 1.

6) For local induced traffic, the mid distance for Alaska communities would be 35 miles; mid distance for Iskut, B.C. would be 67 miles, which is the approximate distance to the intersection of the MRA and the Cassiar Highway. The low traffic estimate for local induced trips uses 100 miles, and the high traffic estimate assumes a10-mile distance from Wrangell.

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9 FUTURE ANALYSES FOR CONSIDERATION

The statement of work for the economic component of the MRA project focused on developing traffic estimates for the proposed corridors. If a decision were made to proceed further with evaluating the project, the following are the consultant team's recommendations for future analysis:

- An economic analysis of the project on Alaska and B.C., including an evaluation of the potential impact of the MRA on Stewart, B.C. While the MRA could have an adverse effect on Stewart, the presence of a second port in a region could result in improved utilization for both ports as industrial planners would favor locations with multiple transportation options because they would offer capacity redundancy, as well as competition with regard to services and rates. The economic analysis should start with a macro view of world economic conditions, including forecasts for resources that would affect Alaska and B.C., such as timber, metals and minerals, fishing, recreation, and tourism. These forecasts might be projected at 5-year intervals through 2030 or the design year for the project. A map of potential mines near the corridor would be useful to evaluate the potential effect of MRA on these projects. The analysis should also develop projections of fiscal effects for Alaska and B.C. with construction and operation of the MRA under assumptions of public, private, and public/private ownership and operation of the facilities. A survey of Southeast Alaska and B.C. residents should be conducted to provide more accurate estimates of trip generation with the proposed corridors.

- A benefit/cost (B/C) analysis should be done, concurrent with or following the economic analysis. Perhaps most important, it is critical to allocate the benefits that are derived from the road accurately when compared to other infrastructure and future improvements to the infrastructure that would contribute to the economic viability of potential mines. The potential scale of these projects and the associated benefits would likely dwarf benefits to other users of the road. If the B/C analysis only extended to 2030 or the design year for the road, it would also be important to conduct a reliable estimate of the salvage value for long-lived assets such as bridges. The B/C analysis should be designed to meet the requirements of the Alaska and B.C. governments to the extent practicable.

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APPENDIX A

Correspondence Table for SATP Project Corridor Numbering

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Appendix A Correspondence Table for SATP Project Corridor Numbering

	Corridor name	Segment number	Segment name
Lynn Canal Corridors - Juneau to Haines and Skagway			
1	From Echo Cove northerly along the shore of Berners Bay and Lynn Canal to Skagway with a ferry terminal near the mouth of the Katzhin River	4	Katzehin Ferry Terminal
		5	Lynn Canal Road (Echo Cove to Skagway)
Kupreanof Island Corridors			
14	From Kake to a suitable ferry terminal site in Kupreanof for crossing the The Narrows	46	Kake - Petersburg Road
15	From Kake to a suitable ferry terminal site in Totem Bay for crossing Sumner Strait to Red Bay on Prince of Wales Island	50	Kake - Totem Bay Road
Prince of Wales Corridors			
16	North Prince of Wales Island Road from the intersection with Coffman Cove Road to a suitable ferry terminal site in the vicinity of Red Bay on Sumner Strait	56	Red Bay Terminal
		57	Red Bay Cutoff
Mid-Region Access Corridors			
22	Stikine Delta Causeway to South Mitkof Island to Rynda Island to Kadin Island to mainland, near Green Point, then along the eastern side of Eastern Passage to a bridge crossing point at "the Narrows"	78	Stikine Highway: Eastern Passage Highway to Narrows Bridge
		79	Stikine Causeway
		80	Eastern Passage Highway to Narrows Bridge
23	Stikine River Corridor (according to the Alaska National Interest Lands Conservation Act [ANILCA], Section 1113)		
24	A bridge crossing Eastern Passage at the Narrows between Wrangell Island and the mainland	81	Narrows Bridge
25	East side of Eastern Passage from the Narrows south to Bradfield Canal, then east along the north side of Bradfield Canal to the Bradfield River at the head of the Bradfield Canal	86	Eastern Passage Hwy: Narrows Bridge to Bradfield Road Junction
26	Bradfield Road from the head of the Bradfield Canal along the North 'Fork of the Bradfield River to the Canada border at the Craig River	87	Bradfield Road: Bradfield Road Junction to Canada Border
27	From the head of Bradfield Canal along the south side of the Bradfield Canal west to Duck Point (or other suitable ferry terminal site on the Bradfield Canal)	85	Bradfield Ferry: Fools Inlet to Bradfield Canal Duck Point Terminal
Wrangell Island Corridors			
28	From Zimovia Highway easterly along McCormack Creek, to Eastern Passage, then southerly to a suitable ferry terminal site on Fools Inlet	83	Fools Inlet Road: Zimovia Highway to Fools Inlet
		84	Fools Inlet Ferry Terminal
29	From Zimovia Highway easterly along McCormack Creek to Eastern Passage, then to the Narrows bridge crossing site		

	Corridor name	Segment number	Segment name
Revillagigedo Island Corridors			
33	From a suitable ferry terminal site at or near Claude Point, then southwesterly via Benrer and Klam creeks to Shrimp Bay, then easterly to Cedar Lake and Orchard Creek, then southeasterly along Orchard Creek to a south branch extending toward Carroll Creek, then south to Carroll Inlet, then south along the west shore of Carroll Inlet to Shelter Cove, then westerly to the head of George Inlet to Ward Lake Road	94	Claude Point Ferry Terminal
		95	Revillagigedo Highway: Behm Canal to George Inlet
		96a	Harriet Hunt Lake Road: George Inlet to Harriet Hunt Lake
		96b	Harriet Hunt Lake/Ward Lake Road Upgrade
34	From the head of George Inlet south along the west shore of George Inlet to the end of South Tongass Highway	97a	George Inlet Road: Head of George Inlet to South Tongass Highway
		97b	South Tongass Highway Reconstruction & Paving

APPENDIX B

Summary of Interviews with Canadian Mining Companies

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As the Southeast Alaska Mid-Region Access Traffic Projections Technical Memorandum indicates, the Iskut-Stikine area is one of the richest mineralized areas in the province of British Columbia (B.C.). The area has been the subject of mineral exploration and exploitation for many decades. There are currently several mining operations and exploration activities underway in the region. To facilitate a better understanding of the effect of a potential mid-region access (MRA) highway corridor on mining activities in the region, several mining companies were contacted.

The Environmental Assessment Office of British Columbia coordinates the evaluation of proposed major projects in B.C., as required under the Environmental Assessment Act. The Environmental Assessment Office lists all mining projects that are in a pre-application phase, under environmental assessment review, or certified under the review process, as well as completed projects (Environmental Assessment Office, 2008).

Currently, most of the mining activities near the proposed MRA road corridor are still in the pre-application or exploration phase. The Eskay Creek Mine, located 50 miles northwest of Stewart, B.C., was a large gold and silver mining project that recently closed. When it was still operating, the mine was the fifth largest silver producer in the world, producing 320,784 ounces of gold and 15.5 million ounces of silver on average each year (Minerals Education Program of British Columbia, 2008).

According to the B.C. Ministry of Energy, Mines and Petroleum Resources, based on past mineral mining exploration activities, it is likely that future mining exploration activity will be high (Grant, B., 2008). The Cassiar Iskut-Stikine Land and Resource Management Plan is the sub-regional land use plan covering approximately 5.2 million hectares of northwestern B.C., including the potential MRA corridors. The plan describes the large study area as an area endowed with rich mineralization and energy sources such as coal, oil, gas, and geothermal energy (B.C., 2000). Also, the plan encourages responsible exploration and development of minerals and energy, including development of road access within the Cassiar Iskut-Stikine planning area, outside of protected areas (B.C., 2000).

Access to this remote area of B.C. has been a major obstacle for mine development. A road through the area could advance future mine development, particularly if it provided a lower cost alternative for transporting materials and supplies during production. The proposed corridor could only be used for mining operations if it connected the mines to a port that could accommodate the large ships needed to move large volumes of mining materials.

Several mining companies mentioned that the port would have to accommodate a Panamax vessel (55,000 tons). Another mining company noted that at a minimum, the port would have to accommodate a 20,000-ton ship (Kemp, J., 2008; Robertson, S. 2008). The larger ships would be required for coal and lower value resources while ore concentrates could be shipped in smaller vessels.

Furthermore, the proposed corridor would also have to meet certain road standards, particularly with respect to curvature of the road and road grade, to allow large trucks to use the road for hauling materials (Robertson, S., 2008). Truck capacity standards are different in Canada than in the U.S.; in B.C., a maximum capacity of 40 tons per truckload is common (Grant, B. 2008); in Alaska, the standard maximum weight capacity is 33 tons on the two fixed drive axles.

In addition to the road corridor, some of the mining companies contacted asked if the corridor would lead to extension of electricity along the corridor. As one contact noted, access to electricity could change the landscape of the local area (Edmonds, C., 2008). Also, most of the mining companies contacted indicated that the Port of Stewart in Stewart, B.C., is attractive because it already has the infrastructure needed for large vessels and ship-loading.

Future mining projects that could potentially use the proposed MRA corridor are listed in Table B-1. These projects are located such that it could be less costly (for the mining companies) to transport their materials and supplies through the proposed corridor, assuming that the associated infrastructure needs are met (port and road). The potential mine production levels and associated mine-related trips per day (Table B-2) should be viewed as a starting point, since access to the area has been a large obstacle for exploration activities. If road access were developed, potential mining activities could increase in future years, including development of additional mines near the proposed corridor.

Table B-1. Potential Mine Production Levels

	Tons of concentrate per year	Tons per month	Tons per day	Mine life in years
Red Chris Copper-Gold Mine [1]	150,000	12,500	441	25
Schaft Creek Copper-Gold-Molybdenum-Silver Project [2]	293,000	24,416	803	23
Mount Klappan Coal Project [3]	1,750,000	145,833	4,861	20

Sources: 1) Robertson, S., 2009; 2) Rescan Tahltan Environmental Consultants, 2008; and 3) Kemp, J., 2008.

Notes: The Galore Creek Project has evaluated the option of traveling along the Stikine River towards Wrangell, Alaska, and it has determined that traveling Highway 37 to connect to Stewart, Alaska, is a better option for its operation (Coeklen, P. 2009)

Table B-2. Potential Mine-Related Truck Trips per Day

	Truck capacity (tons)	Trips per day	Mine life in years	Year project operations begin
Red Chris Copper-Gold Mine [1]	40	11	25	2012 or 2014 [b]
Schaft Creek Copper-Gold-Molybdenum-Silver Project [2]	30	27	23	2014 [a]
Mount Klappan Coal Project [3]	44	111	20	NA

Sources: [1]Robertson, S., 2009

[2]Rescan Tahltan Environmental Consultants, 2008 and Salazar, G., 2009

[3]Kemp, J., 2008

Notes: [a]) The year 2014 for the Schaft Creek start is one year past the start year given in the project description based on information provided by Guermo Salazar, President of Fox Creek Metals.

[b]) Depending on the outcome of the Canadian Supreme Court case, mine operations are expected to begin in either 2012 or be delayed to 2014 (if the mine must go through another permitting process).

The following paragraphs provide a description of the proposed mining projects, including a discussion of issues related to the viability of these projects and transportation infrastructure.

Red Chris Copper Gold Mine

The Red Chris Mine is located northeast of the proposed MRA corridor near Highway 37. It is a proposed open pit copper and gold mine. The Red Chris Mine Development Company had received development certification for the project, but this certification is the focus of a Canadian Supreme Court case brought about by opponents of the mine who believe that there was not enough public outreach during the environmental permitting process (Robertson, S., 2009).

The Canadian Supreme Court will hear the case in November 2009. If there is a negative ruling, that is a ruling that the permitting process did not include enough public outreach, then Red Chris Company will go through the permitting process again, delaying mine construction by two years (Robertson, S., 2009). If the ruling is that the permitting process was followed, then construction of the mine will begin in 2010, and mine operations are expected to begin in early 2012 (Robertson, S., 2009).

Lower copper prices are not expected to affect Red Chris Mine project plans because the mine is a copper and gold mine. While copper prices have fallen over the past year, gold prices have remained strong. Therefore, even with the lower copper prices, the project is still economically feasible (Robertson, S., 2009).

Based on current transportation options, Red Chris Mine has been planning to transport mine concentrate to the Port of Stewart via Highways 37 and 37a. If a road corridor were constructed along the Stikine and Iskut Rivers, the company would consider changing its transportation plans because this would likely be a shorter transport distance. The port infrastructure associated with transportation options would be very important to its decision-making process.

The Port of Stewart is an attractive option because the port already has ship-loading facilities available. If the Port of Wrangell were used, and the company had to construct ship-loading facilities, this cost could offset the cost-savings from transporting concentrate a shorter distance. If the MRA corridor included hovercraft transportation along the Iskut River, Red Chris Mine would still consider the MRA corridor, but it would have to closely weigh the cost difference between the MRA corridor and transporting concentrate to the Port of Stewart (Robertson, S., 2009).

Schaft Creek Copper-Gold Molybdenum-Silver Deposit Project

The Schaft Creek Project is a copper-gold-molybdenum deposit situated 45 kilometers west (almost 28 miles) of the Stewart-Cassiar Highway in northwestern B.C. The project area covers 20,932 hectares within a world-class mineral district hosting several porphyry copper-gold deposits (Copper Fox Metals, 2009).

Recent drilling programs by Copper Fox Metals have expanded and upgraded measured and indicated resources to 1.4 billion tonnes containing 4.76 billion pounds of copper, 4.5 million troy ounces of gold, 32.5 million troy ounces of silver, and 255.2 million pounds of molybdenum (Copper Fox Metals, 2009). The mine site also has additional inferred resources, so the actual amount will likely expand in the future.

Copper Fox Metals, Inc., estimates that approximately 293,000 tons of concentrates would be produced each year over an estimated mine life of 23 years (2009). The current transportation plan calls for constructing an access road to the mine site that would connect to the existing Galore Creek Access Road. The Schaft Road would cover a distance of 24 miles from the Galore Road to the Schaft mine site.

If the MRA corridor were developed, Copper Fox would consider transporting its mineral concentrate using this route, if it were a lower-cost option. The company would still consider the corridor if the option included transporting via hovercraft on the Iskut River, assuming it were still a lower-cost option. If the costs were more expensive than other transportation options, the company would transport its concentrate using a different route.

According to the B.C. Environmental Assessment Office, the Schaft Creek Project is in the pre-application phase (2009).

Mount Klappan Coal Project

The Mount Klappan Coal Project is sponsored by Fortune Minerals Limited, Inc., and is located in northwest B.C., 160 kilometers (99 miles) northeast of Stewart (B.C., 2009).

Fortune Minerals Limited, Inc., describes the project as one of the world's largest undeveloped sources of high rank anthracite coal (2009).The project area includes four large deposits that collectively contain 107.9 million tons of measured coal, 123 million tons of indicated coal, and 2.572 billion tons of inferred and speculative coal (Fortune Minerals Limited, 2009).

The company is currently in the process of trying to permit and develop the project (Kemp, J., 2008). Infrastructure is a key issue for the project; Fortune Minerals Limited, Inc., would like its project to be directly connected to rail due to the potentially immense production volumes associated with the mine.

The company participated in a study that involved a rail line passing by the project site and directly connecting its mine to the lower 48 states (Kemp, J., 2008). If the rail line were not developed, the company might be interested in using the proposed MRA corridor, although it could only use the MRA corridor if it allowed access to a port with the capacity to handle moving the coal to a large ship or barge (minimum 50,000 tons) (Kemp, J., 2008).

Galore Creek Copper-Gold-Silver Project

The Galore Creek Mining project is located within Tahlton Traditional Territory near the communities of Dease Lake, Iskut, and Telegraph Creek. The project received Environmental Assessment Office certification, but construction activities were suspended after an engineering review of the project indicated substantially higher capital costs than anticipated.

Galore Creek is estimated to hold 1,250 million tons of silver and gold mineral resources (Kosich, D., 2008). According to project plans, mine production was expected to start in 2012. Now with higher than expected construction costs, the project is on hold, and the economic feasibility of the project will be reevaluated in 2011 (Kosich, D., 2008). Current project operation plans call for construction of a concentrate slurry pipeline to be built from the mine to an access road near Highway 37. From there, the concentrate would be trucked to the Port of Stewart (Nova Gold Resources, 2008).

After the Galore Creek Mining Company was initially contacted regarding the proposed MRA option, it analyzed the option of transporting its mineral concentrate along the proposed route to the Port of Wrangell (Coeklen, P., 2009). The company found that this corridor option would not work for its project and that it would work better to transport its concentrate to Stewart (Coeklen, P., 2009).

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APPENDIX C

Tables

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The following tables provide additional information regarding the development of travel cost and travel time for the various modes and corridors. Cost tables are presented for air, AMHS, and MRA, followed by travel time tables.

The one-way fares shown below were obtained from Alaska Airlines' website on April 19, 2010. The fares represent the lowest prices available with the departure date more than one month in the future. Two fares were obtained for each set of community pairs, one for the month of May and one for July. The latter month fares are the peak season of travel, and the average of the two months would be similar to the summer fares for AMHS, which run from May through September. A cost would be incurred for travel to the airport. Taxi fare of $10 is likely representative of that cost. The table includes a one-day cost for a car rental to reach the city center of Seattle or Anchorage from the airport.

Table C-1. Cost for Travel by Air to Seattle and Anchorage from Selected Communities in Southeast Alaska (in $)

	May		July		Average for 2 persons	Taxi	Car Rental	Total
To SEA	**Lowest fare**	**2 persons**	**Lowest fare**	**2 persons**				
Sitka	212	424	228	456	440	10	75	525
Ketchikan	206	412	267	534	473	10	75	558
Wrangell	206	412	267	534	473	10	75	558
Petersburg	206	412	267	534	473	10	75	558
Craig	336	672	397	794	733	10	75	818
Juneau	220	440	267	534	487	10	75	572
To ANC								
Sitka	189	378	211	422	400	10	75	485
Ketchikan	221	442	221	442	442	10	75	527
Wrangell	217	434	217	434	434	10	75	519
Petersburg	217	434	217	434	434	10	75	519
Craig	351	702	351	702	702	10	75	787
Juneau	170	340	170	340	340	10	75	425

Source: Estimated by Northern Economics, Inc. from data provided by Alaska Airlines, Inc. 2010.

The cost for travel via AMHS to Seattle or Anchorage requires the use of a vehicle. This analysis assumes that two people and a vehicle up to 19 feet long travel on an AMHS ferry and connect to the continental road system at Bellingham, Prince Rupert, Skagway, or Haines. Haines is the connection to Anchorage, and the other three ports are potential gateways to Seattle.

A review of costs to access Anchorage through Prince Rupert or Skagway indicate that they are higher than access through Haines for all communities, so those links are not presented in this analysis. While travel to Seattle via Bellingham is more expensive than the other possible connections, this is an established route, and information on that route is provided to aid in evaluating the potential for travelers to pay more than the minimum cost to reach a destination.

Table C-2 presents the cost estimates for travel via AMHS and the road network. If the ferry trip lasted more than 16 hours, then the cost for a berth was obtained from the AMHS website. Lodging and meal costs are assumed at $120 per day for lodging and meals on the road system and $40 per day for meals, or part thereof, while on the ferry system. Vehicle cost is based on $0.50 per mile for the distance shown in the table. The Internal Revenue Service estimates that the full operating cost of a vehicle is about $0.50 per mile, and the variable cost is about $0.15 per mile, depending on the situation for which the vehicle is being used.

Table C-3 compares the full vehicle operating cost and the resulting total trip cost from Table C-2 with the variable operating cost and resulting total trip cost. There are significant differences in the total trip costs, and travelers could reach very different conclusions regarding their preferred travel mode based on the vehicle cost structure that they believe is most appropriate.

Travel cost to Seattle and Anchorage via the several MRA corridors is presented in Table C-4. The cost for travel to Wrangell (WRG) via the AMHS is estimated from the AMHS website for the Bradfield Canal and Aaron Creek Corridors plus meals as noted for the AMHS mode.

For the Stikine River Corridor, costs for communities north of Petersburg are estimated to Petersburg since it is assumed that travelers would disembark in Petersburg and drive from that point rather than taking the ferry to Wrangell at a higher cost and longer time. Similarly, communities located south of Wrangell are anticipated to travel to Wrangell and not to Petersburg for travel on the MRA.

The MRA road cost is based on the various road lengths for each alternative, and the MRA ferry cost is only estimated for the Stikine River Corridor. The MRA corridors would terminate near Bob Quinn Lake on the Cassiar Highway, and distances are calculated from that point. Vehicle travel costs are estimated using $0.50 per mile in this table. Lodging and meal costs are calculated in the same manner as noted for the AMHS mode.

Table C-2. Cost for Travel by AMHS to Seattle and Anchorage from Selected Communities in Southeast Alaska (in $)

Via Bellingham	Up to 19' Vehicle	2 persons	Cabin 2 berth inside	Mileage to SEA/ ANC	Lodging/ meal cost	Vehicle cost	Total
Sitka	780	602	288		110	44.5	1,715
Ketchikan	515	478	227		60	44.5	1,265
Wrangell	558	520	254		80	44.5	1,377
Petersburg	601	558	260		90	44.5	1,464
Craig	610	552	227		70	44.5	1,434
Juneau	739	652	308		130	44.5	1,744
				SEA			
Via Prince Rupert				1004			
Sitka	282	230	108		290	502	1,412
Ketchikan	116	108	0		250	502	976
Wrangell	176	156	0		260	502	1,094
Petersburg	217	178	90		270	502	1,257
Craig	211	182	0		260	502	1,155
Juneau	360	282	124		290	502	1,558
				ANC			
Via Haines				755			
Sitka	159	132	0		140	377.5	809
Ketchikan	350	268	124		160	377.5	1,280
Wrangell	280	214	100		150	377.5	1,122
Petersburg	233	178	0		150	377.5	939
Craig	445	342	124		170	377.5	1,459
Juneau	86	74	0		130	377.5	668
				SEA			
Via Skagway				1701			
Sitka	188	152	79		390	850.5	1,660
Ketchikan	376	294	124		410	850.5	2,055
Wrangell	308	244	100		400	850.5	1,903
Petersburg	262	202	93		390	850.5	1,798
Craig	471	368	124		410	850.5	2,224
Juneau	111	100	0		370	850.5	1,432

Source: Estimates by Northern Economics, Inc.

Table C-3. Comparison of Travel Cost by AMHS to Seattle and Anchorage from Southeast Alaska Communities with Full and Variable Vehicle Operating Cost (in $)

11	Full operating cost		Variable operating cost	
SEA Via Bellingham	**Vehicle Cost**	**Total**	**Vehicle Cost**	**Total**
Sitka	45	1,414	13	1,382
Ketchikan	45	1,026	13	994
Wrangell	45	1,117	13	1,085
Petersburg	45	1,185	13	1,153
Craig	45	1,195	13	1,163
Juneau	45	1,418	13	1,386
SEA Via Prince Rupert				
Sitka	502	1,587	151	1,236
Ketchikan	502	1,172	151	821
Wrangell	502	1,286	151	935
Petersburg	502	1,438	151	1,087
Craig	502	1,351	151	1,000
Juneau	502	1,697	151	1,346
ANC Via Haines				
Sitka	378	973	113	708
Ketchikan	378	1,236	113	971
Wrangell	378	1,085	113	820
Petersburg	378	910	113	645
Craig	378	1,415	113	1,150
Juneau	378	681	113	416
SEA Via Skagway				
Sitka	851	1,734	255	1,138
Ketchikan	851	2,068	255	1,472
Wrangell	851	1,931	255	1,335
Petersburg	851	1,847	255	1,251
Craig	851	2,247	255	1,651
Juneau	850.5	1,512	255	916

Source: Estimates by Northern Economics, Inc.

Table C-4. Cost for Travel by MRA to Seattle and Anchorage from Selected Communities in Southeast Alaska (in $)

Via Bradfield 174.9 miles	AMHS cost to WRG	MRA Road Cost	MRA Ferry Cost	From Bob Quinn to destination	Lodging/ meals	Total Travel Cost
To SEA			(19.2 miles)	(1138 miles)		
Sitka	369	87	100	569	800	1,925
Ketchikan	175	87	100	569	640	1,571
Wrangell	0	87	100	569	480	1,236
Petersburg	124	87	100	569	640	1,520
Craig	410	87	100	569	800	1,967
Juneau	381	87	100	569	800	1,937
To ANC	(1228 miles)					
Sitka	342	87	100	614	800	1,943
Ketchikan	175	87	100	614	640	1,616
Wrangell	0	87	100	614	640	1,441
Petersburg	124	87	100	614	640	1,565
Craig	410	87	100	614	800	2,012
Juneau	381	87	100	614	800	1,982
Via Stikine	159.4	miles				
To SEA	(1138 miles)					
Sitka	274	80	0	569	640	1,563
Ketchikan	175	80	0	569	640	1,463
Wrangell	0	80	0	569	480	1,129
Petersburg	124	80	0	569	480	1,252
Craig	410	80	0	569	640	1,699
Juneau	290	80	0	569	640	1,578
To ANC				(1228 miles)		
Sitka	274	80	0	614	640	1,608
Ketchikan	175	80	0	614	640	1,508
Wrangell	0	80	0	614	480	1,174
Petersburg	124	80	0	614	640	1,457
Craig	410	80	0	614	640	1,744
Juneau	290	80	0	614	640	1,623
Via Aaron Creek	145.8	miles				
To SEA				(1138 miles)		
Sitka	369	73	0	569	640	1,651
Ketchikan	175	73	0	569	640	1,457
Wrangell	0	73	0	569	480	1,122
Petersburg	124	73	0	569	480	1,246
Craig	410	73	0	569	640	1,692
Juneau	381	73	0	569	640	1,663
To ANC				(1228 miles)		
Sitka	369	73	0	614	800	1,856
Ketchikan	175	73	0	614	640	1,502
Wrangell	0	73	0	614	480	1,167
Petersburg	124	73	0	614	480	1,291
Craig	410	73	0	614	640	1,737
Juneau	381	73	0	614	640	1,708

Source: Estimates by Northern Economics, Inc.

Table C-5 compares the travel cost by MRA to Seattle and Anchorage from the Southeast Alaska communities with full and variable vehicle operating costs.

Table C-6 shows the estimated travel time by air from selected Southeast Alaska communities. Flight times are from the Alaska Airlines website and are the shortest available flight times. The Craig flight time includes a flight to Ketchikan.

Table C-7 shows the estimated travel time in hours using AMHS via the several gateway ports to reach Seattle and Anchorage. The voyage duration is from the AMHS website using the shortest voyage time listed for each Southeast Alaska community. Required arrival times before departure are also from the AMHS website. The destination time is based on 50 miles per hour for a 10-hour day, plus time for meals, and lodging time is based on 10 hours per night. In some instances, travelers' arrival times at the gateway ports results in them having to overnight before starting the road portion of the trip.

Table C-8 provides the estimated travel time in hours to Seattle and Anchorage via the MRA. For those communities that would require a ferry trip to Wrangell or Petersburg, the time is included in the estimate. The Bradfield Canal Corridor would also have a shuttle ferry trip. Travel time on the MRA road corridor is based on 35 miles per hour, and from Bob Quinn Lake to the final destination is 50 miles per hour. Other assumptions are same as noted for the AMHS mode.

Table C-5. Comparison of Travel Cost by MRA to Seattle and Anchorage from Selected Communities in Southeast Alaska with Full and Variable Vehicle Operating Cost (in $)

Corridor/Destination	Vehicle Operating Cost	
Bradfield	**Full**	**Variable**
To SEA		
Sitka	1,925	1,466
Ketchikan	1,571	1,112
Wrangell	1,236	777
Petersburg	1,520	1,061
Craig	1,967	1,507
Juneau	1,937	1,478
To ANC		
Sitka	1,943	1,452
Ketchikan	1,616	1,125
Wrangell	1,441	950
Petersburg	1,565	1,074
Craig	2,012	1,521
Juneau	1,982	1,491
Stikine		
To SEA		
Sitka	1,563	1,109
Ketchikan	1,463	1,009
Wrangell	1,129	675
Petersburg	1,252	798
Craig	1,699	1,245
Juneau	1,578	1,124
To ANC		
Sitka	1,608	1,122
Ketchikan	1,508	1,023
Wrangell	1,174	688
Petersburg	1,457	972
Craig	1,744	1,258
Juneau	1,623	1,138
Aaron Creek		
To SEA		
Sitka	1,651	1,201
Ketchikan	1,457	1,007
Wrangell	1,122	673
Petersburg	1,246	796
Craig	1,692	1,243
Juneau	1,663	1,214
To ANC		
Sitka	1,856	1,375
Ketchikan	1,502	1,021
Wrangell	1,167	686
Petersburg	1,291	810
Craig	1,737	1,256
Juneau	1,708	1,227

Source: Estimates by Northern Economics, Inc.

Table C-6. Total Travel Time by Air to Seattle and Anchorage from Southeast Alaska

To SEA	Flight Time	Travel to Airport	1 Hour Early Arrival	Collect Luggage	Travel from Airport to Final Destination	Total Travel Time (hours)
Sitka	2.3	0.3	1.0	0.5	0.5	4.6
Ketchikan	2.0	0.3	1.0	0.5	0.5	4.3
Wrangell	3.3	0.3	1.0	0.5	0.5	5.5
Petersburg	4.3	0.3	1.0	0.5	0.5	6.5
Craig	2.3	0.3	1.0	0.5	0.5	4.6
Juneau	2.3	0.3	1.0	0.5	0.5	4.5
To ANC						
Sitka	3.3	0.3	1.0	0.5	0.5	5.5
Ketchikan	4.8	0.3	1.0	0.5	0.5	7.0
Wrangell	4.3	0.3	1.0	0.5	0.5	6.5
Petersburg	3.0	0.3	1.0	0.5	0.5	5.3
Craig	5.3	0.3	1.0	0.5	0.5	7.5
Juneau	1.8	0.3	1.0	0.5	0.5	4.0

Source: Estimates by Northern Economics, Inc.

Table C-7. Total Travel Time by AMHS to Seattle and Anchorage from Southeast Alaska

12	Total Duration of Voyage	Travel to Departure Point	Required Arrival before Departure	Offload time	To Destination	Lodging	Total Travel Time
Via Bellingham					SEA		
Sitka	64.75	0.25	1	0.5	2	0	68.50
Ketchikan	38	0.25	2	0.5	2	0	42.75
Wrangell	49.25	0.25	1	0.5	2	0	53.00
Petersburg	53	0.25	1.5	0.5	2	0	57.25
Craig	41	0.69	2	0.5	2	0	46.19
Juneau	76.5	0.25	2	0.5	2	0	81.25
Via Prince Rupert					SEA (1004 miles)		
Sitka	30	0.25	1	0.5	30	30	91.75
Ketchikan	7	0.25	2	0.5	30	30	69.75
Wrangell	14.5	0.25	1	0.5	30	30	76.25
Petersburg	18.5	0.25	1.5	0.5	30	30	80.75
Craig	10	0.69	2	0.5	30	30	73.19
Juneau	28.25	0.25	2	0.5	30	30	91.00
Via Haines					ANC (755 miles)		
Sitka	14.25	0.25	1	0.5	15	20	51.00
Ketchikan	25.5	0.25	2	0.5	15	10	53.25
Wrangell	19	0.25	1	0.5	15	10	45.75
Petersburg	15	0.25	1.5	0.5	15	10	42.25
Craig	28.5	0.69	2	0.5	15	10	56.69
Juneau	4.5	0.25	2	0.5	15	10	32.25
Via Skagway					SEA (1700 miles)		
Sitka	17.25	0.25	1	0.5	34	30	83.00
Ketchikan	28	0.25	2	0.5	34	30	94.75
Wrangell	21.25	0.25	1	0.5	34	30	87.00
Petersburg	17.5	0.25	1.5	0.5	34	30	83.75
Craig	31	0.69	2	0.5	34	30	98.19
Juneau	6.5	0.25	2	0.5	34	30	73.25

Source: Estimates by Northern Economics, Inc.

Table C-8. Total Time by MRA to Seattle and Anchorage from Southeast Alaska

Bradfield	**Travel to Departure Point**	**Required Arrival before Departure**	**Duration of AMHS trip to WRG/PSG**	**Vessel Offload time**	**MRA road time**	**MRA Ferry time & queue & load/ unload time**	**From Bob Quinn to destination**	**Travel Time (Hours)**	**Lodging nights**	**Lodging Time**	**Total Travel Time (Hours)**
To SEA	174.9	miles of road; 19.2 miles of ferry travel					SEA (1138 miles)				
Sitka	0.25	1	16	0.5	5.0	5.5	22.8	51.0	5	50.0	101.0
Ketchikan	0.25	2	7	0.5	5.0	5.5	22.8	43.0	4	40.0	83.0
Wrangell	0.25	0	0	0	5.0	5.5	22.8	33.5	3	30.0	63.5
Petersburg	0.25	1.5	4	0.5	5.0	5.5	22.8	39.5	4	40.0	79.5
Craig	0.69	2	10	0.5	5.0	5.5	22.8	46.5	5	50.0	96.5
Juneau	0.25	2	12	0.5	5.0	5.5	22.8	48.0	5	50.0	98.0
To ANC							ANC (1228 miles)				
Sitka	0.25	1	16	0.5	5.0	5.5	24.6	52.8	5	50.0	102.8
Ketchikan	0.25	2	7	0.5	5.0	5.5	24.6	44.8	4	40.0	84.8
Wrangell	0.25	0	0	0.5	5.0	5.5	24.6	35.8	4	40.0	75.8
Petersburg	0.25	1.5	4	0.5	5.0	5.5	24.6	41.3	4	40.0	81.3
Craig	0.69	2	10	0.5	5.0	5.5	24.6	48.3	5	50.0	98.3
Juneau	0.25	2	12	0.5	5.0	5.5	24.6	49.8	5	50.0	99.8
Stikine	159.4	Miles									
To SEA							SEA (1138 miles)				
Sitka	0.25	1	12	0.5	4.6		22.8	41.1	4	40.0	81.1
Ketchikan	0.25	2	7	0.5	4.6		22.8	37.1	4	40.0	77.1
Wrangell	0.25	0	0	0	4.6		22.8	27.6	3	30.0	57.6
Petersburg	0.25	1.5	4	0	4.6		22.8	33.1	3	30.0	63.1
Craig	0.69	2	10	0.5	4.6		22.8	40.5	4	40.0	80.5
Juneau	0.25	2	8.5	0.5	4.6		22.8	38.6	4	40.0	78.6
To ANC							ANC (1228 miles)				
Sitka	0.25	1	12	0.5	4.6		24.6	42.9	4	40.0	82.9
Ketchikan	0.25	2	7	0.5	4.6		24.6	38.9	4	40.0	78.9

Table C-9. Total Time by MRA to Seattle and Anchorage from Southeast Alaska (continued)

Bradfield	**Travel to Departure Point**	**Required Arrival before Departure**	**Duration of AMHS trip to WRG/PSG**	**Vessel Offload time**	**MRA road time**	**MRA Ferry time & queue & load/ unload time**	**From Bob Quinn to destination**	**Travel Time (Hours)**	**Lodging nights**	**Lodging Time**	**Total Travel Time (Hours)**
Wrangell	0.25	0	0	0.5	4.6		24.6	29.9	3	30.0	59.9
Petersburg	0.25	1.5	4	0.5	4.6		24.6	35.4	4	40.0	75.4
Craig	0.69	2	10	0.5	4.6		24.6	42.3	4	40.0	82.3
Juneau	0.25	2	8.5	0.5	4.6		24.6	40.4	4	40.0	80.4
Aaron Creek	145.8	Miles									
To SEA							SEA (1138 miles)				
Sitka	0.25	1	16	0.5	4.2		22.8	44.7	4	40.0	84.7
Ketchikan	0.25	2	7	0.5	4.2		22.8	36.7	4	40.0	76.7
Wrangell	0.25	0	0	0	4.2		22.8	27.2	3	30.0	57.2
Petersburg	0.25	1.5	4	0.5	4.2		22.8	33.2	3	30.0	63.2
Craig	0.69	2	10	0.5	4.2		22.8	40.1	4	40.0	80.1
Juneau	0.25	2	12	0.5	4.2		22.8	41.7	4	40.0	81.7
To ANC							ANC (1228 miles)				
Sitka	0.25	1	16	0.5	4.2		24.6	46.5	5	50.0	96.5
Ketchikan	0.25	2	7	0.5	4.2		24.6	38.5	4	40.0	78.5
Wrangell	0.25	0	0	0.5	4.2		24.6	29.5	3	30.0	59.5
Petersburg	0.25	1.5	4	0.5	4.2		24.6	35.0	3	30.0	65.0
Craig	0.69	2	10	0.5	4.2		24.6	41.9	4	40.0	81.9
Juneau	0.25	2	12	0.5	4.2		24.6	43.5	4	40.0	83.5

Source: Estimates by Northern Economics, Inc.

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