Juneau Access Improvements Project
Draft Supplemental Environmental Impact Statement

Appendix CC
Development of Alternative 1B – Enhanced Service with Existing Alaska Marine Highway System (AMHS) Assets

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Executive Summary

This report documents the development of Alternative 1B, Enhanced Service with Existing Alaska Marine Highway System (AMHS) Assets, for the Juneau Access Improvements (JAI) Project 2014 Draft Supplemental Environmental Impact Statement (SEIS). In keeping with Court orders, the Alaska Department of Transportation & Public Facilities (DOT&PF) and the Federal Highway Administration (FHWA) developed this alternative based on the following objectives:

- Rely on existing ferry assets and terminals, without new construction
- Consider reassigning mainline vessels
- Provide additional capacity as compared to the No Action Alternative
- Reduce travel times as compared to the No Action Alternative
- Adjust schedules and increase frequency as compared to the No Action Alternative
- Consider system enhancements such as increasing the staff at the ferry terminals, increasing the reservation staff, upgrading the reservation website, producing and maintaining a reliable two-year ferry schedule, increasing marketing, reducing fares, and improving management.

DOT&PF and FHWA took the following steps to develop Alternative 1B:

- Examined the decisions from the U.S. District Court and 9th Circuit Court of Appeals as the basis for developing Alternative 1B.
- Coordinated with AMHS staff to evaluate existing assets for their potential to provide additional or dedicated service in Lynn Canal.
- Identified a preliminary proposal for Alternative 1B that relied on existing AMHS assets to increase frequency and capacity in Lynn Canal.
- Shared the preliminary proposal for Alternative 1B with agencies and the public during the scoping period for the Draft SEIS.
- Accepted and considered scoping comments that were received.
- Evaluated enhancements identified by the plaintiffs and the Court for inclusion in Alternative 1B.
- Refined the preliminary proposal based on scoping comments, analysis of potential enhancements, and legal and legislative proceedings that occurred after scoping.
- Refine the alternative to address the change from a programmed 350-foot Alaska Class Ferry (ACF) to a Day Boat ACF.

The resulting alternative includes all components of Alternative 1, No Action, but focuses on enhancing service using existing AMHS assets without major initial capital expenditures. Similar to Alternative 1, Alternative 1B includes the following elements and assumptions:

- Mainline ferry service in Lynn Canal would continue;
- The AMHS would continue to be the NHS route from Juneau to Haines and Skagway;
- No new roads or ferry terminals would be built; and

- In addition to the Day Boat ACFs, programmed improvements would include improved vehicle and passenger staging areas at the Auke Bay and Haines ferry terminals to optimize traffic flow on and off the Day Boat ACFs, as well as expansion of the Haines Ferry Terminal to include a new double bow berth to accommodate the Day Boat ACFs.

Service to other communities would remain the same as the No Action Alternative. Alternative 1B keeps the motor vessel (*M/V) Malaspina* in service after the second Day Boat ACF is brought online to provide additional capacity in Lynn Canal. Enhancements included as part of Alternative 1B are a 20 percent reduction in fares for trips in Lynn Canal; shore-side labor to assist with security screening, staging, baggage, and similar functions; extended hours of operation for the reservation call center; and commitment to a two-year ferry schedule in Lynn Canal.

Mainline service would include two round trips per week in the summer and one per week in the winter with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. During the summer, the *M/V Malaspina* would make one round trip per day, 7 days per week on a Skagway-Auke Bay-Skagway route, while one Day Boat ACF would make one round trip between Auke Bay and Haines 6 days per week, and one would make two round trips per day between Haines and Skagway 6 days per week. The Day Boat ACFs would not sail on the 7th day because the mainliner would be on a similar schedule. In the winter, ferry service in Lynn Canal would be provided primarily by the Day Boat ACFs three times per week.

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List of Acronyms

AADT ....annual average daily traffic
ACF............................Alaska Class Ferry
AMHS........................Alaska Marine Highway System
DOT&PF....................Alaska Department of Transportation and Public Facilities
FEIS ....final environmental impact statement
FHWA........................Federal Highway Administration
FVF ....Fast Vehicle Ferry
FY ....Fiscal Year
JAI..............................Juneau Access Improvements
M/V ....motor vessel
NEPA ....National Environmental Policy Act
O&M..........................operations and maintenance
ROLO.........................roll-on-roll-off
RV ....recreational vehicle
SADT ....summer average daily traffic
SEACC.......................Southeast Alaska Conservation Council
SEIS ....supplemental environmental impact statement
SOLAS.......................Safety of Life at Sea

1. Introduction

1.1 Purpose

The purpose of this technical memorandum is to document the development of Alternative 1B, Enhanced Service with Existing Alaska Marine Highway System (AMHS) Assets, for the Juneau Access Improvements (JAI) Project Supplemental Environmental Impact Statement (SEIS).

1.2 Alternative 1B Development Process

The Alaska Department of Transportation & Public Facilities (DOT&PF) and Federal Highway Administration (FHWA) took the following steps to develop Alternative 1B:

- Examined the decisions from the U.S. District Court and 9th Circuit Court of Appeals as the basis for developing Alternative 1B (see Section 2).
- Coordinated with AMHS staff to evaluate existing and programmed assets for their potential to provide additional or dedicated service in Lynn Canal (see Sections 3.1 and 3.2).
- Identified a preliminary proposal for Alternative 1B that relied on existing AMHS assets to increase frequency and capacity in Lynn Canal (see Section 3.3).
- Shared the preliminary proposal for Alternative 1B with agencies and the public during the scoping period for the SEIS (see Section 3.3).
- Received and considered scoping comments (see Section 3.4).
- Refined Alternative 1B based on changes to the No Action Alternative (see Section 4.0)
- Refined the preliminary proposal based on scoping comments, analysis of potential enhancements, and legal and legislative proceedings that occurred after scoping to refine Alternative 1B for evaluation in the JAI Project Draft SEIS (see Section 5).
- Evaluated enhancements identified by the plaintiffs and the Court for inclusion in Alternative 1B (see Section 5.2).
- Prepared this technical report to document and share the analysis leading to development of Alternative 1B.

2. Court Decision: Basis for Alternative 1B

Development of the current SEIS stemmed from Court proceedings, which found that DOT&PF and FHWA should have considered an alternative that would enhance service using existing ferry assets. DOT&PF and FHWA have developed an alternative that would satisfy the Court's decisions, identified as Alternative 1B. It is instructive to understand the Court's findings as they heavily influence the development of Alternative 1B. This section provides summary information from the legal proceedings, focusing on the alternative requested to be examined by plaintiffs and mandated by the Court for consideration.

A lawsuit was filed by the Southeast Alaska Conservation Council (SEACC) in U.S. District Court for the District of Alaska. In 2009, the U.S. District Court ruled that the Final Environmental Impact Statement (FEIS) was not valid because it did not consider an alternative that would improve surface transportation in Lynn Canal by utilizing existing AMHS assets. According to the U.S. District Court:

> Plaintiffs first argue that FHWA violated NEPA[1] by failing to consider the "obvious alternative" of providing improved ferry service using existing ferries and terminals. Plaintiffs further argue that improving ferry service using existing ferries and terminals is a reasonable alternative because it meets the purpose and need statement for the Project. Namely, improving ferry service with existing boats and terminals could provide capacity to meet transportation demand in Lynn Canal, provide more flexibility and opportunity for travel, reduce travel times between Juneau, Haines, and Skagway, and reduce state and user costs for transportation in the corridor. Plaintiffs also contend that FHWA has not demonstrated "why adjusting schedules, increasing the frequency of ferry service, reducing fares, or other improvements using existing boats and terminals could not meet the purpose and need for the project." Accordingly, plaintiffs seek a declaratory judgment finding that the FEIS for the Project violates NEPA by failing to consider a reasonable alternative for improving transportation in Lynn Canal using existing infrastructure without new construction. (SEACC et al v. State of Alaska et al, 2009)

The U.S. District Court found that:

> … Contrary to federal defendants' assertion, the FEIS did not include a reasonable alternative for improving ferry transportation using existing infrastructure, such as by adjusting ferry schedules, increasing frequency of ferry runs, reducing loading/unloading times, reducing fares, or other improvements. (SEACC et al v. State of Alaska et al, 2009)

[1] National Environmental Policy Act (NEPA).

The DOT&PF appealed the District Court ruling to the U.S. Court of Appeals for the 9th Circuit, and in May 2011, the three-judge panel upheld previous Court decisions (by a 2 to 1 vote) because the FEIS did not include an alternative that would improve transportation using existing assets. In its finding, the 9th Circuit quoted from a Plaintiff comment letter, which indicated:

> Rather than building new ferries, roads, or terminals, ADOT[2] could make more efficient use of the assets it currently owns. Through more efficient management and scheduling, capacity can be increased dramatically, cost to the state and user can be lowered, and flexibility and reliability can be increased without the enormous initial expense of money, tremendous dangers, and ecological and cultural damage that would accompany ADOT's preferred alternative. (SEACC et al v. State of Alaska et al, 2011)

The Court goes on to identify Plaintiff's proposed alternative, indicating:

> To remedy this deficiency, SEACC proposed a "Better Ferry Service Alternative" that included specific changes to improve the current ferry system in Lynn Canal, without resorting to the construction of new ferries or terminals. The suggested changes included modifications to the current ferry schedule, reassigning mainline vessels, increasing the staff at the ferry terminals, increasing the reservation staff, upgrading the reservation website, producing and maintaining a reliable schedule two years in advance, increasing marketing, reducing fares, and improvements in the management structure.

As a result of these legal proceedings, the DOT&PF and FHWA initiated preparation of a SEIS to include an alternative that satisfies the Court order. The new alternative, Alternative 1B - Enhanced Service with Existing AHMS Assets, is a transportation system management alternative that includes improvements that rely on existing ferry assets and explores other system enhancements. In keeping with the Court order, DOT&PF and FHWA developed an alternative based on the following objectives:

- Relies on existing ferry assets and terminals, without new construction
- Considers reassigning mainline vessels
- Provides additional capacity as compared to the No Action Alternative
- Adjusts schedules and increases frequency as compared to the No Action Alternative
- Reduces travel times as compared to the No Action Alternative
- Considers system enhancements such as increasing the staff at the ferry terminals, increasing the reservation staff, upgrading the reservation website, producing and maintaining a reliable schedule two years in advance, increasing marketing, reducing fares, and improvements in the management structure.

[2] The Court abbreviated the Alaska Department of Transportation and Public Facilities as "ADOT." This document uses DOT&PF for the abbreviation.

This technical memorandum describes the process followed to develop Alternative 1B, and examines the enhancements and other considerations identified by the Court that will be incorporated into Alternative 1B for evaluation in the JAI Project SEIS.

3. Development of Alternative 1B

To comply with the Court's ruling, DOT&PF reviewed their existing ferry assets and terminals and considered and evaluated the following three components for Alternative 1B:

- Existing AMHS assets reasonably available and feasible for use in Lynn Canal
- Programmed AMHS assets (i.e., AMHS programmed improvements that will be implemented regardless of the outcome of the JAI Project).
- Enhancements that could be employed as part of Alternative 1B that do not involve substantial initial capital investments

3.1 Evaluation of Existing AMHS Assets - Prior to Draft SEIS 2012 Scoping

The mission of the AMHS is to provide safe, reliable, and efficient transportation of people, goods, and vehicles among Alaska communities, Canada, and the "Lower 48," while providing opportunities to develop and maintain a reasonable standard of living and high quality of life, including social, education, and health needs. The AMHS has been operating year-round since 1963, with regularly scheduled passenger and vehicle service to 33 communities in Alaska, plus Bellingham, Washington, and Prince Rupert, British Columbia. DOT&PF evaluates demand and revenues on an annual basis and attempts to optimize its schedule to satisfy its mission and meet demand based on the capabilities of its vessels and within the budgetary direction of the State Legislature (which provides an annual subsidy). There are currently 11 vessels in the AMHS fleet.

To evaluate its existing ferry assets, DOT&PF considered the vessel's size, the loading configuration relative to the existing terminals in Lynn Canal, the speed and ability to make the Lynn Canal run in a timely fashion, the physical feasibility and limitation of maneuvering in Lynn Canal (and elsewhere in the system), whether there was schedule float available to divert vessels into Lynn Canal, and the implications to other communities of reassigning vessels to Lynn Canal relative to AMHS's overall mission. This section provides a brief overview of each ferry and summarizes its potential for use in Lynn Canal as part of Alternative 1B.

Table 3-1 provides a summary of each vessel in the AMHS fleet, including programmed improvements.

Table 3-1. AMHS Vessel Characteristics (Prior to 2012 Scoping)

Vessel	Year Built	Length (ft)	Pass.	Veh.	Vans	Crew	Staterooms / Berths	Travel Speed (Knots)	Open-Ocean Capable	SOLAS [1] Compliant	Ability to Load/Unload at Auke Bay, Haines, and Skagway [2]
Columbia	1974	418	600	134	16	66	103 /294	17.3	No	No	Yes
Kennicott	1998	382	499	80	20	56	109 /320	16.75	Yes	Yes	Yes
Tustumena	1964	296	174	36	12	37	26 /68	13.8	Yes	Yes	Yes[3]
Lituya	2004	181	149	18	2	4	0/0	11.5	No	No	Yes
Taku	1963	352	370	69	7	42	44 /106	16.5	No	Yes	Yes
Matanuska	1963	408	499	88	12	50	108/247	16.5	No	Yes	Yes
Malaspina	1963	408	499	88	14	50	74/238	15.5	No	No	Yes
Chenega	2005	235	250	36	5	10	0/0	32	No	No	Yes
Fairweather	2004	235	250	36	5	10	0/0	32	No	No	Yes
Aurora	1977	235	300	34	8	24	0/0	14.5	No	No	Yes
LeConte	1974	235	300	34	9	24	0/0	14.5	No	No	Yes

[1]The International Convention for the Safety of Life at Sea (SOLAS) is an international maritime safety treaty. The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment, and operation of ships, compatible with their safety. AMHS must use a ferry that meets SOLAS regulations in order to sail to Prince Rupert, BC.

[2]The Auke Bay Ferry Terminal has one side mooring berth and one stern mooring berth. The Haines Ferry Terminal has one side mooring berth. The Skagway Ferry Terminal has one side mooring berth.

[3] While the *M/V Tustemena* has the ability to load and unload at Auke Bay, Haines and Skagway, it is not efficient. Vehicles must use an elevator to load/unload which increase the time needed to load and unload the ferry.

Table 3-2 provides a summary analysis of each vessel and its suitability to be relocated or diverted for service in Lynn Canal.

Table 3-2. AMHS Vessel Analysis

Vessel	Auke Bay-Haines Round Trip in 12 Hours	Unique Characteristics and Considerations	Possible Substitute Vessel with Adequate Size, Speed, and Operating Parameters	Relocating/ Diverting Vessel to Lynn Canal Jeopardizes AMHS Mission[1]
Columbia	Yes	Largest vessel, fastest for its size. Capacity and speed needed as mainliner to and from Bellingham.	None – other mainliners have less capacity and slower speeds.	Jeopardizes mission
Kennicott	Yes	SOLAS[3]-compliant. Only ocean-going vessel with adequate capacity that can safely cross the gulf for regular service.	Only the *Tustumena*	Jeopardizes mission
Tustumena	No	SOLAS-compliant. Only ocean-going vessel that can serve Ouzinkie, Akutan, Port Lions, Chignik, and False Pass.	None	Jeopardizes mission
Lituya	No	Slowest vessel in the fleet (size, slow speed, and open deck designed for short runs).	None	Jeopardizes mission
Taku	Yes	SOLAS-compliant – Both it and the *Matanuska* needed to meet schedule and demands of Prince Rupert, B.C. run.	Only the *Matanuska*	Jeopardizes mission
Matanuska	Yes	SOLAS-compliant – Both it and the *Matanuska* needed to meet schedule and demands of Prince Rupert, B.C. run.	Only the *Taku*	Jeopardizes mission
Malaspina	Yes	Scheduled to be retired in 2015.	Day Boat ACFs.	Possible availability
Chenega	Yes	Speed needed for 12-hour service in Prince William Sound.	Only the *Fairweather*	Jeopardizes mission
Fairweather	Yes	Speed needed for same-time-of-day Auke Bay-Sitka run[2].	Only the *Chenega*	Jeopardizes mission
Aurora	No	Needed in Prince William Sound during the summer to accommodate the traffic demand.	*LeConte*	Possible availability
LeConte	No	Only vessel in Southeast that can operate on the Pelican, Hoonah, Tenakee, and Gustavus route.	*Aurora*	Possible availability

[1]Because of the unique characteristics of the vessel and the communities it serves, relocating or diverting this vessel to Lynn Canal would jeopardize AMHS's mission.

2 Unable to regularly run on the Auke Bay-Haines-Skagway-Haines-Auke Bay route as a day boat because of limitations with the engines.

[3] SOLAS: Safety of Life at Sea

The following existing ferry assets were considered but rejected for additional or dedicated use in Lynn Canal as part of Alternative 1B:

- The motor vessel (***M/V) Tustumena*** was built in 1964. It carries a crew of 37 and has a maximum capacity of 174 passengers, 36 vehicles, and 12 vans, and has an operating speed of 13.8 knots. This ferry has 26 staterooms (68 berths). The *M/V Tustumena* is one of two ocean-going vessels in the AMHS fleet. It is considered unique in that no other ferry in the state is capable of serving all the communities that it calls on in the Aleutian chain. For example, the *M/V Tustumena* can sail to Ouzinkie, Akutan, Port Lions, Chignik, and False Pass, but *M/V Kennicott* (the other ocean-going ferry*)* is unable to call at these locations because of maneuvering or depth restrictions. Using this ferry to provide service in Lynn Canal would require eliminating ferry service for the Aleutian chain (or at least from several communities there), meaning AMHS would not be able to satisfy its mission. For these reasons, this vessel was **considered not reasonable** by FHWA and DOT&PF for use in Lynn Canal, and therefore the *M/V Tustumena* was not considered further for use in Alternative 1B.

- The ***M/V Lituya*** was built in 2004 and was specifically designed to operate on the short run between Ketchikan and Metlakatla. It has an open deck, a crew capacity of 4, space for 18 vehicles and 149 passengers, and operates at a speed of 11.5 knots (the slowest vessel in the AMHS fleet). Because of speed limitations, the *M/V Lituya* does not have the ability to sail between Auke Bay and Haines within 12 hours, thereby requiring extra crews or overtime. It would not offer substantive travel time benefits for service in Lynn Canal. With its limited capacity and limited speed to function as a day boat in Lynn Canal, the use of the *M/V Lituya* was **considered not reasonable** by FHWA and DOT&PF for use in Alternative 1B in Lynn Canal.

- The ***M/V Kennicott*** was built in 1998 and has a maximum capacity of 499 passengers, 80 cars, and 20 vans. It has 109 staterooms (320 berths). It has an operating speed of 16.75 knots. The *M/V Kennicott* is one of two accredited ocean-going vessels in the AMHS fleet (the other is the *M/V Tustumena*). It is the only ferry in the fleet capable of safely running across the Gulf of Alaska. The run across the gulf requires an ocean-going vessel, with large capacity and berths. Because this ferry is unique in the system, using this ferry in Lynn Canal would mean eliminating the cross-gulf service, meaning AMHS would be unable to satisfy its mission. For these reasons, the *M/V Kennicott* was **not considered reasonable** by FHWA and DOT&PF use in Alternative 1B in Lynn Canal.

- The ***M/V Taku*** was built in 1963, carries 42 crew, has a maximum capacity of 370 passengers, 69 vehicles, and 7 vans, and operates at 16.5 knots. The *M/V Taku* is SOLAS-compliant, making it one of only two AMHS vessels that can sail to Prince Rupert, BC (the other being the *M/V Matanuska*). During the summer, AMHS typically provides four sailings a week to Prince Rupert. Redeploying the *M/V Taku* to Lynn Canal would mean reducing or eliminating service on this route, as both the *M/V Matanuska* and the *M/V Taku* (SOLAS-compliant vessels) are required to meet the planned schedule[4]. Keeping the *M/V Taku* available for use on the run to Prince Rupert was

[4] Using the *M/V Kennicott* or the *M/V Tustemena* is not considered reasonable on the Prince Rupert route because these ferries do not have replacement ferries on their existing routes.

deemed essential for AMHS to satisfy its mission. As a result, the *M/V Taku* was **not considered reasonable** by FHWA and DOT&PF for use in Lynn Canal in Alternative 1B. The *M/V Taku* would, however, continue to provide mainline service as part of Alternative 1B as it does now and in the No Action Alternative.

- The ***M/V Matanuska*** was built in 1963. The *M/V Matanuska* is the sister ship to the *M/V Malaspina*, and they are considered identical except that the *M/V Matanuska* was kept Safety of Life at Sea (SOLAS)[5]-compliant and the *M/V Malaspina* was not. The *M/V Matanuska* carries 50 crew, 499 passengers, 88 vehicles, and 12 vans, and has 108 staterooms (247 berths). Its travel speed is 16.5 knots. During the summer, AMHS typically provides four sailings a week to Prince Rupert using its two SOLAS-compliant vessels. Using the *M/V Matanuska* in Lynn Canal would mean reducing service on the Prince Rupert route, as both it, and the *M/V Taku*, are required to meet the schedule. Keeping the *M/V Matanuska* available for use on the run to Prince Rupert was deemed essential for AMHS to satisfy its mission. As a result, the *M/V Matanuska* was **not considered reasonable** to provide service in Lynn Canal in Alternative 1B. The *M/V Matanuska* would, however, continue to provide mainline service in Alternative 1B in Lynn Canal, as it does now and in the No Action Alternative.

- The ***M/V Columbia*** was built in 1974 and can transport 134 vehicles and 600 passengers and operates at 17.3 knots. With 100 large staterooms, it is best suited for longer, multi-day runs such as the Bellingham, WA to Skagway, AK route. The *M/V Columbia* is not SOLAS-compliant so it cannot sail to Prince Rupert, BC and therefore has less flexibility in the system – making it best suited to making the runs to Bellingham. Being the only ferry large enough to accommodate the demand on the Bellingham to Skagway route, using the *M/V Columbia* in Lynn Canal was **not considered reasonable** for additional or dedicated use as part of Alternative 1B in Lynn Canal. The *M/V Columbia* would, however, continue to provide mainline service in Alternative 1B as it does now and in the No Action Alternative.

- The ***M/V Chenega*** is a fast vehicle ferry (FVF) built in 2005. It carries 10 crew, 250 passengers, 36 vehicles, and 5 vans, and operates at 32 knots. The *M/V Chenega* was specifically developed for providing fast ferry service in Prince William Sound. In other words, its capacity and speed were designed to meet the demands and travel distances found in Prince William Sound. The *M/V Chenega* is not ocean-going and therefore cannot routinely cross the Gulf of Alaska (it only traverses the Gulf for required maintenance and is not rated to carry passengers or vehicles in open ocean conditions). It therefore is not easily deployed for short-term stints in Lynn Canal. Moving the *M/V Chenega* out of Prince William Sound would leave the communities there without the same-time-of-day service for which the *M/V Chenega* was intended. AMHS would be unable to satisfy its mission if this vessel were relocated (the only vessel with the same capabilities is the *M/V Fairweather*). Because the *M/V Fairweather* has the same

[5] The International Convention for the Safety of Life at Sea (SOLAS) is an international maritime safety treaty. The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment, and operation of ships, compatible with their safety. AMHS must use a ferry that meets SOLAS regulations in order to sail to Prince Rupert, BC.

capacity, speed, and loading/unloading characteristics, and is already in service in SE Alaska, that vessel was identified as a candidate for providing service in Lynn Canal instead of the *M/V Chenega*. Moreover, the Auke Bay ferry terminal cannot accommodate both the *M/V Fairweather* and the *M/V Chegena* at the same time without capital modifications. For these reasons, the *M/V Chenega* was **not considered reasonable** for use as part of Alternative 1B in Lynn Canal.

The following existing assets were evaluated and deemed to be candidate vessels to provide additional or dedicated service in Lynn Canal in Alternative 1B.

- The ***M/V Aurora*** was built in 1977, carries 24 crew, and has a maximum capacity of 300 passengers, 34 vehicles, and 8 vans. It has a travel speed of 14.5 knots. The *M/V Aurora* currently provides service in Prince William Sound but has previously operated in Lynn Canal. As a result, the *M/V Aurora* was **deemed reasonable for further consideration** for use in Alternative 1B. However, the M/V Aurora is needed in Prince William Sound in addition to the M/V Chenega to accommodate the traffic demand. The M/V Aurora is also needed in Prince William Sound during the winter because the rough weather prevents the M/V Chenega from operating.
- The ***M/V LeConte*** was built in 1974. It has a crew capacity of 24 and a maximum capacity of 300 passengers, 34 cars, and 9 vans, and operates at 14.5 knots. It does not have staterooms, and U.S. Coast Guard regulations no longer permit the *M/V LeConte* to operate 24 hours per day, meaning it is not well-suited for longer multi-day sailings. The *M/V LeConte* is one of two stern loading ferries that are small enough to provide service to Pelican, Hoonah, and Tenekee Springs, so it does have commitments elsewhere in the system. Because it does not have staterooms (which are not needed on runs between Auke Bay-Haines/Skagway), and as there is a second ferry that can provide service to these smaller communities (the *M/V Aurora*), the *M/V LeConte* was **deemed reasonable for further consideration** for providing additional or dedicated service in Lynn Canal in Alternative 1B.
- The ***M/V Fairweather*** is an FVF that was built in 2004. It carries a crew of 10, and has a maximum capacity of 250 passengers, 36 vehicles, and 5 vans, and operates at 32 knots. The *M/V Fairweather* was designed and sized to provide daily same-time-of-day service between Auke Bay and Sitka. Scheduling same-time-of-day service on this route with a conventional monohull ferry is not possible because sailing times must be adjusted based on peak tidal currents in Sturgis Narrows, meaning only the *M/V Fairweather* or the *M/V Chenega* (its sister ship) could provide this same-time-of-day service. The *M/V Fairweather* is also one of three AMHS ferries (the others being the *M/V Chenega* and the *M/V LeConte*) that are small enough to enter Killisnoo Harbor to provide service to Angoon. Providing direct access between Sitka and Angoon is important because Sitka is the nearest Tribal Health Consortium hospital to Angoon. However, as other AMHS ferries are capable of sailing between Auke Bay and Sitka (although not capable of providing same-time-of-day service), and Angoon service is provided only 2 days a week, the *M/V Fairweather* was **deemed reasonable for further consideration** for use in Alternative 1B.

- The ***M/V Malaspina*** was built in 1963. It carries 60 crew, 499 passengers, 88 vehicles, and 14 vans, and operates at 15.5 knots. It has 73 staterooms (238 berths). It is identical to the *M/V Matanuska* except it is not SOLAS-compliant and cannot sail to Prince Rupert. The *M/V Malaspina* has crew quarters and is able to serve routes longer than 12 hours. The *M/V Malaspina* is scheduled to be retired in 2015. Therefore, because it is an existing asset that does not have an essential planned function for meeting AMHS's mission elsewhere in the system, keeping the *M/V Malaspina* in service was **deemed reasonable for further consideration** for providing additional or dedicated use in Lynn Canal in Alternative 1B.

3.2 Programmed Assets

As part of its routine operational planning, AMHS identified and requested funding for a replacement vessel with new vessel design, designated as an Alaska Class Ferry (ACF). A new vessel class was needed to replace ferries that are nearing the end of their economic and technological life. As of December 2011, State funds for design and construction of one ACF had been approved by the Legislature. This ferry would have a capacity of 300 passengers and 53 vehicles, carry 7 crew, and travel at 15.5 knots. It would be approximately the same size as the *M/V Taku*, and would have overnight accommodations only for its crew. Construction was estimated to take between 3 and 5 years and it was scheduled to replace the *M/V Malaspina* starting in 2015. This programmed asset was considered during 2012 Draft SEIS scoping to be available as an "existing asset" for use in Alternative 1B because the funds had already been committed and programmed[6], regardless of the outcome of the JAI Project.

3.3 1B Alternative – Version Developed for JAI Project Draft SEIS 2012 Scoping

Based on the information above and the Court orders, DOT&PF and FHWA developed an alternative, called "Alternative 1B - Enhanced Service with Existing AMHS Assets." The alternative relied on existing ferry assets from the short list of possible candidate vessels that were identified in Section 3.1 (*M/V Aurora*, *M/V LeConte, M/V Fairweather, and M/V Malaspina)*. In addition, DOT&PF and FHWA considered the programmed (at that time) 350-foot ACF as an asset that could be used in Lynn Canal under Alternative 1B. In creating the alternative, DOT&PF and FHWA had a goal of developing an alternative to improve ferry service in the Lynn Canal corridor without eliminating existing ferry routes or jeopardizing AMHS's mission. Because of the availability of the newly programmed 350-foot ACF, DOT&PF and FHWA determined they could keep the *M/V Malaspina* in service to add capacity in Lynn Canal, allowing the *M/V Aurora* to remain in Prince William Sound, thereby avoiding a reduction in service there. They also decided that because of its more appropriate size, the *M/V LeConte* would be better suited to provide continued service to smaller communities in SE Alaska such as Gustavus, Hoonah, Angoon, Tenakee, and Pelican. The remaining candidate ferries (the *M/V Malaspina*, *M/V Fairweather*, and the programmed 350-Boat ACF) would be

[6] It should be noted that at the time Alternative 1B was first developed, only one larger (350-foot with overnight quarters for crew) ACF was programmed. After scoping, the 350-foot ACF program was changed from one larger ferry to two smaller day boat ferries, which caused DOT&PF and FHWA to modify Alternative 1B. Modifications to Alternative 1B that resulted after scoping are described in Section 4.

used to provide additional or dedicated service in Lynn Canal, thereby increasing frequency and capacity. The resulting alternative, which was presented to agencies and the general public during the scoping period for the JAI Project Draft SEIS, is described below.

Summer service
M/V Malaspina would be based in Skagway and make daily trip to Auke Bay via Haines. The *M/V Fairweather* would be based in Juneau. Five days a week, the *M/V Fairweather* would make one round trip between Auke Bay and Haines and one round-trip between Auke Bay and Skagway as it is the only vessel able to sail this route within a 12-hour operating day. On the remaining two days, the *M/V Fairweather* would provide service between Auke Bay, Angoon, and Sitka as the *M/V Fairweather* is the only vessel able to provide a direct connection between Angoon and Sitka[7]. The 350-foot ACF would provide one round trip between Auke Bay and Sitka six days a week while on the seventh day, it would provide one round-trip between Auke Bay and Petersburg. The mainliner service would continue to operate in Lynn Canal a minimum of two days per week.

Winter service
During the winter, the *M/V LeConte*, *M/V Fairweather*, or the 350-foot ACF would provide service between Auke Bay and Skagway (via Haines) a minimum of three days per week. Mainline service would continue to operate a minimum of one day per week.

In addition to the schedule and redeployment of existing assets, described above for Alternative 1B, DOT&PF and FHWA indicated they would include evaluation of reservation staff for longer call-in service hours, and fare reductions to reduce traveler cost and promote greater ridership. The evaluation of enhancements is presented in Section 5.2.

3.4 Scoping Comments on Alternative 1B

FHWA and DOT&PF conducted scoping for the JAI Project Draft SEIS during January and February 2012 to obtain input from agencies and the public on the new Alternative 1B, updated FEIS reasonable alternatives, and new information about the project area. A total of 185 pieces of correspondence were received from state, federal, and local agencies and the public. Within these comments, a total of 1,283 distinct issues were identified; 1,171 were from the public, and 112 from agencies.

DOT&PF and FHWA used scoping comments to refine Alternative 1B. The following comments were received that related to Alternative 1B. A full accounting of scoping comments, including the original correspondence can be found in the *Scoping Summary Report* (DOT&PF, 2012b).

Alternative 1B / Support *(for stated reasons)*

- It makes sense to economize on public transportation costs by improving the marine highway instead of building a new road.
- This alternative seems okay, but it needs a daily run in the winter, and the Taku should not turn around in Juneau.

[7] The M/V LeConte is the only other vessel able to sail to Angoon, but it is not able to complete the Auke Bay/Sitka/Angoon route within its 12-hour operating day.

- I [support Alternative 1B, but I] need the cost/benefit information for 1B, 4A, and 4C before I make a final decision.
- This alternative would work if passenger and vehicle traffic warrants it, but my observations of current demand indicate that there might be a lot of empty space on days with two ferries.
- This alternative makes the best use of an existing system that has been successful for years.
- If improved access is such a pressing issue, then the solution that improves it in the shortest amount of time for the least cost is the most sensible.
- I also support the fare reduction included in this alternative as a means to increase use, but am not certain the additional service is necessary at this point in time.
- Ferry travel is safe, reliable, and—with improved service—convenient.
- This alternative might benefit by including some elements from alternatives 4A and/or 4C.
- I support this alternative with one caveat: it cannot include scheduling FVFs during winter months.
- We might support Alternative 1B or 4C with more study given to fuel efficiency and impacts to wildlife.

Alternative 1B / Against *(for stated reasons)*

- It is a temporary, short-term solution that is the result of poor legal decisions.
- This is not a viable alternative because it is just a redeployment of portable assets that can be redirected by the administration or elected bodies at will.
- It adds service to Lynn Canal at the expense of the other ferry routes in Southeast Alaska.
- Ferry service as the sole method of public surface transportation cannot meet project purpose and need or the long-term transportation needs of the Lynn Canal corridor.
- FVFs cannot handle the weather in Lynn Canal and have too many maintenance issues.
- The severe limitations in capacity and scheduling, plus rising fuel and O&M costs, will always cause the ferries to be less desirable than road links.
- Moving the FVF to Lynn Canal would seriously reduce the level of service between Sitka and Juneau; ridership on slower vessels will be reduced due to increased travel time.

Alternative 1B / AMHS System Analysis

- This alternative needs to meet the needs of Lynn Canal travelers without negatively impacting other Southeast Alaska ferry services.
- Existing legacy boats could be utilized during peak travel times to keep an FVF from being taken out of service on the Sitka route.
- Other vessel deployment options should be explored, and a comprehensive vessel operation matrix should be created.

Alternative 1B / Evaluation

- We applaud DOT's willingness to explore improving current ferry service using existing infrastructure and consider increasing the efficiency of service routes through innovations.
- It is possible we would support this alternative if more study is given in the Draft SEIS to fuel efficiency and impacts to wildlife.
- The project should analyze the efficiencies of existing vessels regarding passenger and vehicle capacity, crew costs, fuel efficiency, and maintenance requirements in the context of actual demand to find the optimum vessels for this alternative.

Alternative 1B / Ferry Design

- I request that the state find the optimum vessel configuration to meet transportation needs in the Lynn Canal.

Alternative 1B / Schedule

- Provide strategic and efficient scheduling options.

Alternative 1B / Service

- This alternative provides the service we have been asking for.
- This alternative allows freedom of movement in both directions and will increase ridership.
- I do not understand how the new service frequency would differ from existing service, what an "existing" asset is, or how you will keep from reducing service to some areas.
- Given its periodic scheduled maintenance service gaps, how will the Malaspina make increased sailings?

Additional related comments:

- Re-number the new alternative as Alternative 2, and the road alternative as Alternative 3;
- Make sure that the Draft SEIS reflects a comprehensive and integrated analysis of regular, predictable, and safe transportation in Lynn Canal;
- If the above Lynn Canal marine alternative would significantly diminish service to other Southeast Alaska communities, consider a third action alternative that would build two or more 350-foot Alaska Class Ferries in order to meet capacity demand in Lynn Canal and provide adequate system-wide service.

4. Post-Scoping Changes to Alternative 1B

Subsequent to the JAI Project Draft SEIS 2012 scoping period, Alternative 1B has been modified to reflect the following events:

- In December 2012, the Governor announced that the AMHS would pursue plans to build two smaller, less-costly state-funded ACFs instead of one large 350-foot ACF. The smaller ACFs are referred to as Day Boat ACFs. Both ferries will have a capacity of approximately 300 passengers and 53 vehicles, and travel at 15.5 knots. The change in direction in the ACF program was made to develop vessels that better meet AMHS needs in Southeast Alaska and was a State decision independent from the JAI Project. This meant two new programmed ferries would be available for use in the JAI project, including Alternative 1B instead of just one[8].
- In March 2013, litigation regarding recurrent problems with the engines of the *M/V Fairweather* and *M/V Chenega* was resolved[9]. Essentially the engines were not designed to run at the speeds needed to make the two runs between Juneau and Haines/Skagway in a 12-hour window as needed for day boat service in Lynn Canal. The settlement of the litigation involves replacing the engines on both ferries. However, the replacement engines also will not provide sufficient sustained speed to make two round trips in Lynn Canal (one between Auke Bay and Haines and the other between Auke Bay and Skagway) within 12 hours. Having an FVF make only one round trip per day (which it could easily do) was considered unreasonable since there are other vessels that can also make one trip per day and there are other routes that need the speed of the FVF. Extending the operating day beyond 12 hours is not possible without crew quarters[10]. Based on this development, DOT&PF and FHWA determined that their earlier decision to use the *M/V Fairweather* as part of Alternative 1B needed to be revised.
- During scoping, many commenters expressed concern over the loss of fast ferry service to Sitka and Petersburg that would result from using the *M/V Fairweather* in Lynn Canal. Many believed that the use of the *M/V Fairweather* would improve service in Lynn Canal at the expense of other routes in Southeast Alaska. This, in combination with the engine problems identified in bullet two above, contributed to removing the *M/V Fairweather* from Alternative 1B.

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[8] This decision also required Alternative 1, No Action, to be modified to reflect the availability of two new ferries instead of one. Other changes that occur in Alternative 1 as a result of this decision include improved vehicle and passenger staging areas at the Auke Bay and Haines Ferry Terminals to optimize traffic flow on and off the Day Boat ACFs, and the expansion of the Haines Ferry Terminal to include a new double bow berth.

[9] In 2010, the State sued the engine manufacturer and the contractor responsible for the design and construction of the two FVFs based on recurrent problems with the ferries' diesel engines.

[10] According to U.S. Coast Guard rest requirements, crew quarters would be needed to provide crews adequate rest. The FVFs do not have crew accommodations that would permit this, so crews would have to change while the ferry is docked. In addition, maintenance, fueling, emptying holding tanks, fresh water restocking etc would require the FVF's to return to home port (or would require capital improvements to port/docking facilities).

5. Alternative 1B – JAI Project Draft SEIS

5.1 Routing

Based on the information described in Section 4, Alternative 1B was revised in July 2013 to reflect the newly programmed Day Boat ACF ferry availability and the engine feasibility problem of trying to use the *M/V Fairweather* as a day boat in Lynn Canal, and in response to JAI Project Draft SEIS scoping comments. Figure 5-1 shows the resulting Alternative 1B.

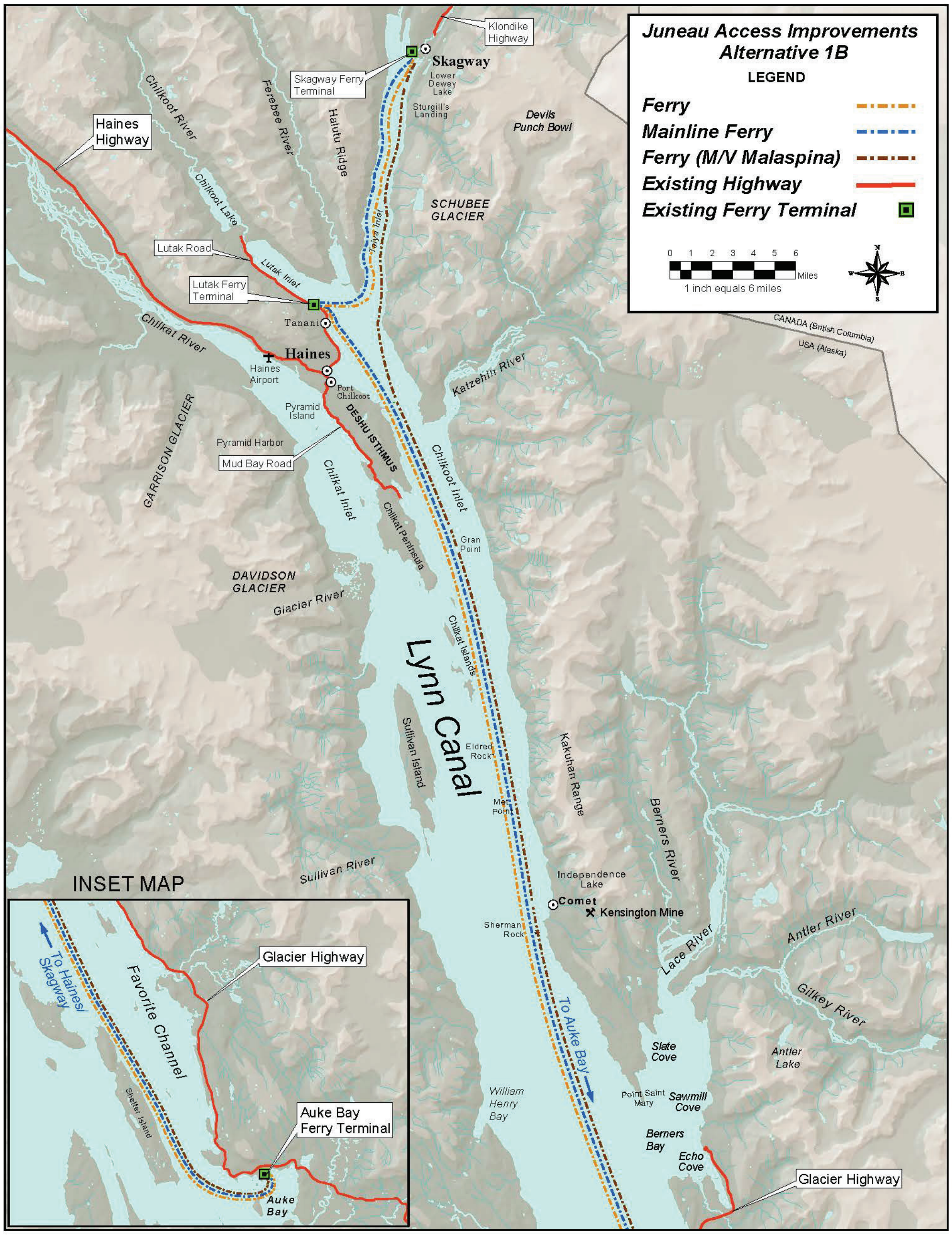

Figure 5-1. Alternative 1B – Enhanced Service with Existing AMHS Assets

The revised Alternative 1B summer and winter service to be used in the JAI Project 2014 Draft SEIS is described below:

Summer

- Day Boat ACF-1 would homeport in Auke Bay. It would make one round-trip per day between Auke Bay and Haines six days per week[11]. Travelers wanting to go between Auke Bay and Skagway would take the *M/V Malaspina*, transfer ferries in Haines, or take a mainliner on the days one is operating in Lynn Canal.
- The *M/V Malaspina* would homeport in Skagway and would make one round-trip to Auke Bay per day; 7 days per week. Routing would be Skagway-Auke Bay-Skagway.
- Day Boat ACF-2 would homeport in Haines. As in the No Action Alternative, it would make two round-trips per day between Haines and Skagway six days a week[12] (as a Haines-Skagway shuttle). The schedules for the two Day Boat ACFs would be coordinated to keep total travel time between Auke Bay and Skagway less than the similar trip on the mainliner.
- Mainline ferry service would continue with a minimum of two trips per week. Routing in Lynn Canal would be Auke Bay-Haines-Skagway-Haines-Auke Bay.

Winter

- Dedicated Lynn Canal ferry service (between Auke Bay and Haines) would be three round-trips per week provided primarily by the Day Boat ACFs. On the same three days the ferry operates from Auke Bay to Haines, the Haines Skagway shuttle would make 2 round trips. On the other four days, the Day Boat ACFs would not operate. When each of the Day Boat ACFs is in an annual overhaul, service will be provided by a combination of the *M/V LeConte* and the remaining Day Boat ACF. When both Day Boat ACFs are operating, the routing would be the same as the summer months (one Day Boat ACF operating between Auke Bay and Haines and the other Day Boat ACF operating between Haines and Skagway). When the *M/V LeConte* is operating in Lynn Canal, the routing would be either Auke Bay-Haines-Skagway-Haines-Auke Bay or a combination of routing such that service on all routes is provided.
- Mainline ferry service would continue with a minimum of one trip per week. Routing in Lynn Canal would be Auke Bay-Haines-Skagway-Haines-Auke Bay.

5.2 Enhancements

As part of the lawsuit, the plaintiffs asserted that the AMHS should consider other enhancements to improve the ability of an alternative using existing assets to meet the purpose and need for the project. The Court relied primarily on the letter provided by the plaintiffs commenting on the FEIS, wherein the plaintiffs described a "Better Ferry Service" alternative (SEACC, ATPP and Auk Kwaan 2006). The plaintiffs' "Better Ferry Service" alternative requested consideration of the following management changes:

[11] On the seventh day, the Day Boat ACF-1 would be on a similar schedule as a mainliner. To avoid a duplication of service, typically only the mainliner will sail on that day.

[12] On the seventh day, typically the Day Boat ACF-2 would make only one round-trip because a mainliner would be on a similar schedule to the second sailing.

- Increasing staff at the ferry terminals to ease delay;
- Expanding the hours of operation to make reserving space on the ferry system easier;
- Upgrading the reservation website and schedule to make both more user-friendly;
- Producing and maintaining a reliable schedule two years in advance and providing adequate notice if minor changes must be made;
- Reducing fares in Lynn Canal to lower user costs; and
- Increasing marketing in order to increase ridership and, thus, revenue.

This section provides an evaluation of each of these potential enhancements for inclusion in Alternative 1B.

5.2.1 Use Additional Staff at Terminals

The suggestion of adding additional staff at terminals was to try to increase the efficiency of loading and unloading times for the ferries, thereby reducing the overall trip time. DOT&PF examined the staffing needs at Haines, Skagway, and Auke Bay and determined that additional staff would have very little benefit to overall travel time in the corridor beyond the measures identified below. DOT&PF did, however, identify two measures that would result in a substantial reduction in travel time: (1) the use of straight drive-through ferries[13] and (2) a more simplified loading process afforded by point-to-point service.

First, straight drive-through ferries reduce loading and unloading time by minimizing the amount of maneuvering on the vessel during the loading and unloading process. Vehicles simply drive on at one end in one port, and drive through and off the ferry at the other end when they reach their destination. The Day Boat ACFs are being designed as straight drive through ferries, which improves loading and unloading time and makes additional staffing less effective and less of a need.

Second, point-to-point service means that there are not multiple stops on a given route. This greatly simplifies the loading of a vessel, because vehicles need not be sorted as part of the loading and unloading process; all the cars getting on are getting off at the same place. This not only reduces the loading and unloading time, it reduces staffing needs and makes adding additional staff less effective. In Alternative 1B, one of the Day Boat ACFs provides point-to-point service to Haines, and the *M/V Malaspina* provides point-to-point service to Skagway. As a result, the check-in time needed will be reduced from 2 hours (required today) to 1 hour under Alternative 1B. This same benefit will be realized in the No Action Alternative, but only for Auke Bay-Haines route as there is not Auke Bay-Skagway point-to-point service proposed in the No Action Alternative.

As a result of these evaluations, DOT&PF determined that the use of additional staff at the terminals would not result in a further substantive reduction in wait or check-in time.

[13]Straight drive through refers to the ability to drive a vehicle straight on and off a ferry without having to turn or back up.

5.2.2 Reservation Enhancements

DOT&PF examined the AMHS reservation system and determined that additional staffing and longer hours would have little benefit in improving ridership but would improve customer service. As a result of the analysis, DOT&PF will include reservation system improvements as part of Alternative 1B. This section presents an overview of the evaluation.

The AMHS reservation call center is open Monday through Friday from 7 a.m. to 5 p.m. In fiscal year 2009, the call center had 24 full-time positions: 22 were in Juneau, and 2 were in Ketchikan. In 2012, the call center had 21 positions.

Figure 5-2 depicts the number of itineraries initiated through the call center, the website, and other venues (e.g., walk-ons). An "itinerary" is a trip reservation or booking. Each itinerary has an average of 2.5 people. AMHS staff indicated that travelers with vehicles typically book reservations in advance either online or by telephone to ensure a vehicle space is reserved. They also indicated that "complex" bookings are typically made through the AMHS call center, where the passenger can get assistance with schedule, transfers, and logistical issues (Leary, personal communication 2012b).

Current trends indicate that the reservation call center and other venues have been decreasing in importance, as compared to website bookings. The AMHS reservation website was put in service in 2002. That year, only 2 of the 132,899 itineraries were booked online. As shown on Figure 5-2, however, the number of bookings made online continues to increase. In fact, reservations booked using the AMHS website overtook the number booked through the call center in 2008[14]. The graph, however, also shows that the call center and other outlets remain important ways to book reservations. For example, in 2012 AMHS booked 128,006 itineraries; of these, 25 percent were made through the call center, 32 percent through the website, and 43 percent through the other purchase points. Because website bookings have been steadily increasing while call center and other bookings have declined, the benefits of increasing staff and hours will likely decrease marginally over time if trends continue.

[14] Because of the growing importance of online reservations, AMHS is in the process of improving its reservation website to make it more user-friendly. This enhancement is occurring regardless of the outcome of the JAI Project, and it is assumed the enhancements will be in place for all the ferry alternatives that will require reservations.

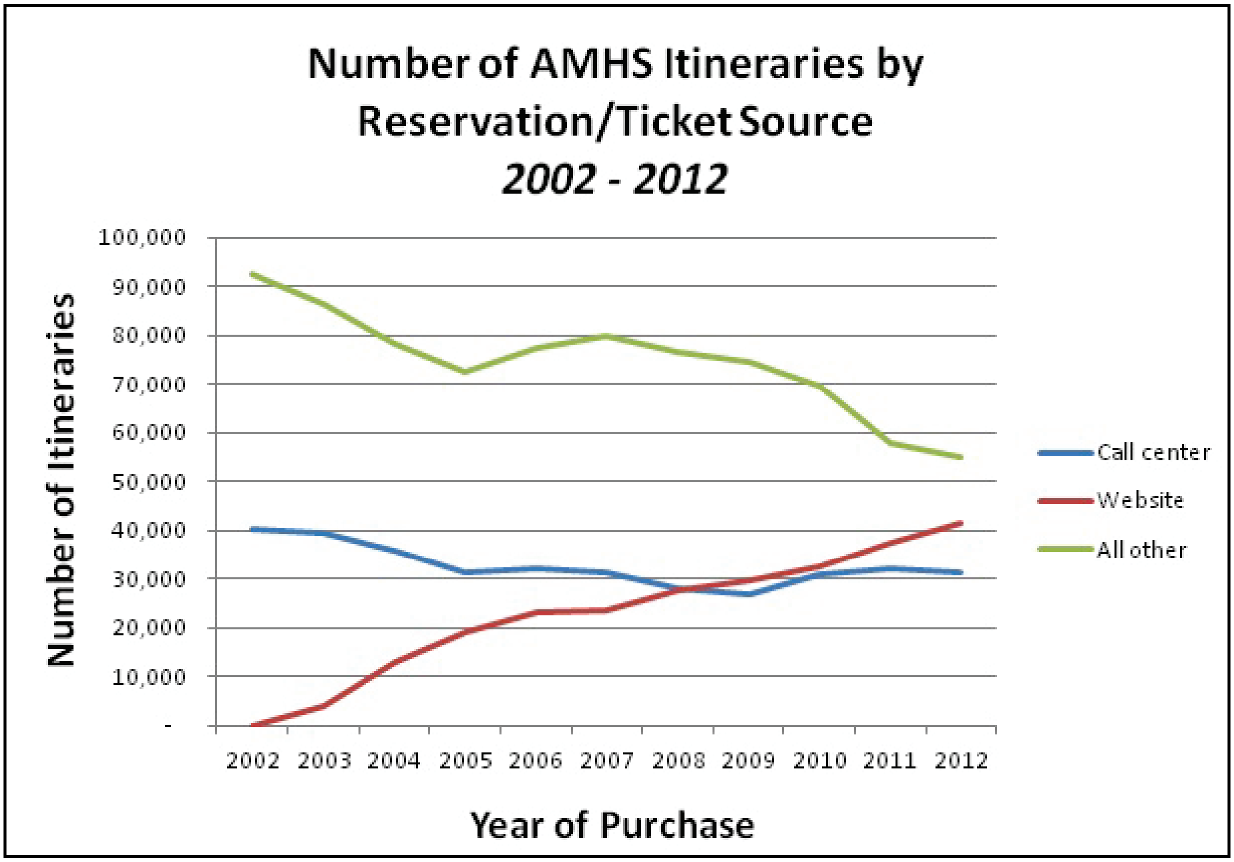

Figure 5-2. Number of AMHS Itineraries by Reservation/Ticket Source 2002–2012

Source: AMHS 2012 (Leary, personal communication 2012a)

Table 5-1 presents information about the number of telephone calls coming into the AMHS Call Center in Juneau for fiscal years 2011 and 2012. As can be seen from the table, 9,193 calls were abandoned in 2011 and 7,205 were abandoned in 2012 (approximately 8 percent to 9 percent). While it is anticipated that many of these callers called back or made reservations another way, additional staffing and longer hours would help capture some of the customers who may have abandoned a trip altogether.

Table 5-1. Fiscal Year (FY) 2001 and 2012 Juneau Call Center Log

Month	Calls Presented		Calls Answered		Average Hold Time in Seconds		Calls Abandoned	
	2011	2012	2011	2012	2011	2012	2011	2012
July	12,904	12,168	12,032	10,723	64	119	872	1,445
August	11,043	12,263	10,397	10,614	52	122	646	1,649
September	8,889	8,686	8,617	7,962	25	76	272	724
October	6,782	6,089	6,640	5,946	18	24	142	143
November	6,270	5,329	6,187	5,223	13	17	83	106
December	5,838	4,645	5,685	4,550	15	19	153	95
January	8,120	6,118	7,463	5,960	71	30	657	158
February	8,301	6,888	7,060	6,499	140	62	1,239	389
March	10,275	7,694	9,458	7,459	81	36	817	235
April	10,129	8,637	9,337	8,220	71	50	792	417
May	12,459	10,316	10,372	9,447	164	93	2,087	869
June	13,111	10,634	11,678	9,659	108	98	1,433	975
Totals	**114,121**	**99,467**	**104,926**	**92,262**	**76**	**71**	**9,193**	**7,205**

Source: AMHS 2012 (Leary, personal communication 2012a)

A review of the call center logs also indicates there could be benefits to staying open longer, but previous experiments with longer hours have come with only marginal increases in bookings. Based on previous operational experiments, AMHS managers believe that the benefits of additional staff and longer operating hours will be marginal. In 2005 and 2006, AMHS did an informal study using phone reports and incoming call times. During this experiment, the AMHS call center was open 7 days a week from May through August. Based on a review of the incoming call times, AMHS found that being open 7 days a week from 6:00 a.m. until 6:00 p.m. did not provide enough benefit to continue the longer hours. They found that it was also difficult to keep the non-permanent positions filled, and training of part-time and non-permanent staff was very time-consuming for management. As a result, the call center hours were changed to its current schedule. AMHS staff also indicated that the call center had previously been open during the evening but that the call center activity was very light during that time, which led the call center to change their hours of operation (Leary and Mason, personal communication 2012). Currently calls to the 800 reservations number after call center hours are routed to an open ferry terminal where a terminal agent can make reservations and answer questions.

In summary, AMHS believes that adding additional reservation staff has the potential to reduce the amount of time customers are on hold, as well as reduce the number abandoned calls, which now amount to 8–9 percent of all calls (Table 5-1). Additional staff would allow for more concentrated labor during existing hours and permit extended hours. These improvements would make a positive impact on customer service, especially in local markets. As result of the analysis, DOT&PF decided to integrate additional staffing and longer call-center hours into Alternative 1B, adding 4 additional hours per day (closing at 9:00 p.m. instead of the current 5:00 p.m.).

AMHS estimates that the call center would need four to five agents to cover the additional 4 hours each day, and would operate on a three- or four-shift work day to stagger start times. The additional cost of adding 4 hours to the call center day would be approximately $125,000 annually (Leary and Mason, personal communication 2012). Additionally, AMHS is already actively pursuing a project to upgrade the reservation system, including enhancing their reservation website, to make it easier to use. The benefits of that upgrade would apply to the No Action Alternative and all ferry alternatives that will accept reservations.

5.2.3 Schedule

Plaintiffs and others have indicated that having a set schedule would improve reliability and have a positive affect on ridership. Plaintiffs suggested that setting a 2-year schedule should be considered. AMHS has been striving to maintain a stable summer schedule in Lynn Canal and other service areas. With the exception of minor vessel changes, the 2012 and 2013 summer schedule have been essentially the same, and the planned 2014 summer is the same as 2013. Nevertheless, the schedule each year is subject to the availability of vessels used in the Southeast part of the system, three of which are over 50 years old. Also, summer schedules are set in the fall of the preceding year based on anticipated funding levels which are not finalized until the following spring. Subject to both of these constraints, Alternative 1B, as well as the No Action Alternative, incorporate a commitment to operate on two year schedules. Adequate notice of minor schedule changes would be provided (as in all alternatives that require reservations, including the No Action Alternative) through the AMHS website (http://www.dot.state.ak.us/amhs/schedule_changes.shtml).

5.2.4 Fare Reductions

Plaintiffs suggested reducing prices would have a beneficial affect on ridership and should be considered as a means of enhancing Alternative 1B. To determine the effect that price changes would have on ridership, DOT&PF considered the price elasticity of fares on the Lynn Canal run. This section presents a summary of the findings.

Price elasticity is a measure used in economics to show the responsiveness of the quantity demanded of a good or service to a change in its price. Price elasticities are almost always negative because almost all goods and services fit the basic economic principles of supply and demand wherein the quantity purchased will increase when the price decreases. Economists classify price elasticity into three main groups as follows:

1. Goods and services that are **elastic** have elasticities that range from –1.0 to –∞ (negative infinity). If ferry fares are elastic, then a 10 percent reduction in fares will increase ridership by more than 10 percent.
2. Goods and services that are **inelastic** have elasticities that range from 0 to –1.0. If ferry fares are inelastic, then a 10 percent reduction in fares will increase ridership by an amount that is less than 10 percent.
3. Goods and services that have elasticities that are equal to –1.0 have **unitary elasticity**. If ferry fares have unitary elasticity, then a 10 percent reduction in fares will increase ridership by 10 percent.

For example, a 1993 report (Erickson and Associates) cited in Northern Economics' *Break-Even Demand on Alternative Ferry Systems in Lynn Canal* (1999) estimated the price elasticity on AMHS ferries as -0.69 for vehicles. This means that a 10 percent reduction in vehicle fares would result in approximately a 7 percent increase in demand for vehicles.

For this current Draft SEIS effort, DOT&PF commissioned a new analysis of fare elasticity in Lynn Canal (Appendix A). Northern Economics examined 11 years worth of AMHS data (2000-2011) on price changes and demand to calculate fair elasticities for passengers, vehicles, RVs, and container vans. The calculated elasticities are reported in Table 5-2.

Table 5-2. Estimated Price Elasticity Estimates for Internal Lynn Canal Travel by Fare Type and Port Group

Port Pairs	Passengers	Cars	RVs	Vans
Juneau and Haines	-0.520	-1.284	-1.051	-2.997
Juneau and Skagway	-0.492	-1.336	-0.978	-2.997

Source: Estimated by Northern Economics (Appendix A).

In general, passenger travel on AMHS ferries appears to be relatively inelastic, with magnitudes between 0 and -1.0. This implies that if there were a 10 percent decrease in prices, the increase in passengers is predicted in most cases to be less than 10 percent. Similarly, travel volumes between Haines and Skagway appear to be less responsive to price changes than travel volumes between Juneau and Haines, and Juneau and Skagway. While passenger travel was estimated to be fairly inelastic, the price responsiveness for car and RV bookings for ferry travel in Lynn Canal was generally closer to unitary elasticity (i.e., elasticity estimates around -1.0). With unitary elasticity, a given percentage decrease in price is expected to generate a similar percentage increase in traffic. Container van traffic within Lynn Canal was fairly elastic, meaning that a price decrease is expected to generate a much greater percentage increase in traffic.

Study results on the elasticities for passenger vehicles for both the Juneau-Haines and Juneau-Skagway runs identify elasticities that are in the -1.2 to -1.3 range. These elasticity coefficients imply that if fares for passenger vehicles are lowered by a marginal amount, the number of cars using the ferry will increase by percentages that are greater than the percentage decrease in prices. Such a change would also have the effect of increasing revenue to AMHS. The magnitude of the price decreases over which these findings will hold is not known. It is believed that with a 10 percent price change, both the number of passenger vehicles and total revenue would increase. It is also plausible (but not certain) that even with a 20 percent price reduction, both the number of vehicles and total revenue from passenger vehicles will increase. It should be noted that the same not does generally hold for passengers or for recreational vehicles (RVs); dropping the price would improve ridership, but it is expected that revenue from passengers and RVs would also drop.

Based on these elasticities, Northern Economics also estimated how much additional ridership would have been anticipated to be generated in 2011 if 10-percent and 20-percent reductions in price had been in effect in Lynn Canal Ferry Service. In 2011 there were 66,315 passenger trips on the Juneau-Haines and Juneau-Skagway runs. If a 10-percent price reduction had been enacted that year, an additional 3,381 (9.4 per day) passenger trips would have been predicted to have been made. With a 20-percent reduction, an additional 6,762(18.5 per day) passenger trips would have been made. Similarly, 2,401 additional car trips (6.7 per day) and 4,803 additional car trips (13.3 per day) would have been made with 10-percent and 20-percent price reductions, respectively. For RV trips the increase would have been 61 RVs per year (.17 per day) for a 10% price reduction and 122 RVs per year (.33 per day) for a 20% price reduction. For contain van trips the increase would have been 61 RVs per year (.17 per day) for a 10% price reduction and 122 RVs per year (.33 per day) for a 20% price reduction.

In the travel forecasting completed for the project, Fehr and Peers developed a travel forecasting model (2013) that includes price sensitivity. To examine the potential effect that changes in fare would have on future travel volumes, Fehr and Peers ran sensitivity tests of varying price reductions to examine anticipated future change in demand for Alternative 1B. The fare reduction percentage was varied to test the sensitivity of the ridership demand in the forecasting model to changes in fare. Table 5-3 shows the 2050 annual average daily traffic (AADT) and summer average daily traffic (SADT) forecasts for four different pricing scenarios for Alternative 1B. The model was first run with fares equivalent to Alternative 1-No Action fares, followed by reductions of 10, 20, and 30 percent, respectively. The table shows the forecasted daily traffic for each scenario relative to the "No Reduction" scenario for the AADT and the SADT. The final column estimates the fare elasticity.[15] The forecasting model does not use elasticities directly, but does include price as one of a number of factors used to forecast travel demand. However, a basic elasticity can be estimated from the forecasted results. Note that the volumes reported in the table have been rounded to the nearest five trips; however, the percent change and elasticity were calculated using unrounded volumes and rounded to two significant figures.

Table 5-3. Fare Sensitivity Results – Alternative 1B

Scenario[1]	2050 AADT	Change	Percent Change[2]	Elasticity[2]	2050 SADT	Change	Percent Change[2]	Elasticity[2]
Same Fare as Alternative 1	100	-	-	-	155	-	-	-
10% Fare Reduction from Alternative 1	110	10	10%	-1.0	175	20	10%	-1.0
20% Fare Reduction from Alternative 1	115	15	20%	-1.0	185	30	19%	-1.0
30% Fare Reduction from Alternative 1	125	25	31%	-1.0	205	50	31%	-1.0

[1] Fare reduction scenarios as compared to Alternative 1 fares but using the Alternative 1B schedule/vessels.

[2] Calculated using unrounded forecast volumes.

Calculated by Fehr & Peers, 2013.

[15] Elasticity is calculated as the percent change in forecast ridership divided by the percent change in fare.

The results from the ridership forecasting model show that each 10-percent reduction in fares will result in approximately 15 additional vehicles during an average summer day in 2050 (the JAI Project Draft SEIS design year). Calculating elasticities compared to the no reduction scenario shows that the forecast demand, on average, has an elasticity of approximately -1.0.

Readers should be cautioned against concluding that the predicted fare elasticities using these two methodologies will guarantee a commensurate return in ridership and revenue. Fare elasticities are predictive at the margin, for modest changes in price (estimated by project economists as being up to 20% for this project). Beyond marginal changes in prices, the uncertainty in the results increases. Real world results have borne this out. For instance, AMHS has experimented with various pricing programs, including promotions where drivers rode for free during summer and another where winter prices were reduced by 30%. In both cases, the increase in ridership did not offset the loss in revenues, and consequently both programs were recently discontinued.

The information presented in this section indicates that a reduction in fares could potentially increase ridership, but the increases are not substantial and a fare reduction would be subject to the risk of lost revenue if not realized. For these reasons, DOT&PF determined that a 20-percent reduction in fares in Lynn Canal[16] would be reasonable to include as a component of Alternative 1B given the potential effect on ridership and revenue.

5.2.5 Increase Marketing/Advertising

As a public institution, the AMHS mission is to provide safe, reliable, and efficient transportation of people, goods, and vehicles among Alaska communities, Canada, and the "Lower 48," while providing opportunities to develop and maintain a reasonable standard of living and high quality of life, including social, education, and health needs. While providing the public with useful information about the system is part of that mission, actively competing with private sector transportation providers, such as tour operators or cruise ships, is not. The limited level of marketing AMHS engages in is focused on the system as a whole and on making potential riders from outside the overall AMHS service area aware of the travel opportunities it provides. The purpose and need statement for the JAI project specifically states that the project aims to provide capacity to meet the transportation demand in the corridor. There is nothing to indicate that corridor residents and visitors are unaware of the travel opportunities provided by AMHS. An increased marketing effort to create additional demand from outside the corridor would not address the need to provide for existing unmet demand, and therefore increased marketing of the Lynn Canal route is not included as a component of the enhanced service using existing assets alternative. For these reasons, increasing marketing on the Lynn Canal Route as part of Alternative 1B to entice people to use it was **not considered reasonable**.

5.3 Frequency, Capacity, and Travel Time

DOT&PF and FHWA developed an alternative that increases vessel frequency and capacity, and reduces travel time using existing AMHS assets. During the summer, when demand is highest,

[16] Fares for mainline service were unchanged.

Alternative 1B would maintain the same number of sailings between Auke Bay and Haines as provided by the No Action Alternative. With the retention of the *M/V Malaspina*, Alternative 1B would provide an additional seven round-trips between Auke Bay and Skagway per week as compared to the No Action Alternative. In the winter, when demand is low, no additional sailings are proposed.

During the summer, Alternative 1B would provide capacity for an additional 1,232 vehicles between Auke Bay and Skagway than the No Action Alternative. The capacity between Auke Bay and Haines is the same in both alternatives; however, the addition of direct sailings between Auke Bay and Skagway would result in more available capacity for Juneau/Haines travelers.

Table 5-4 presents the anticipated travel times for Alternatives 1 and 1B. Direct travel to and from Auke Bay to Haines is provided by the mainline vessels or the new Day Boat ACF in both Alternatives 1 and 1B, and thus the travel times are the same. The shortest travel time for the No Action Alternative between Auke Bay and Skagway is 7.6 hours and would be made using both Day Boat ACF vessels and transferring in Haines. That same trip, using the Day Boat ACFs with a transfer in Haines, can be made in Alternative 1B; however, because the *M/V Malaspina* will make a direct run between Auke Bay and Skagway, the shortest Auke Bay-Skagway travel time is 6.8 hours (0.8 hours faster than in the No Action Alternative).

Table 5-4. Travel Times (hours)

Route	Alternative 1	Alternative 1B
Auke Bay-Haines	5.9	5.9
Auke Bay-Skagway	7.6	6.8

Both alternative have the same mainliner travel time; between Auke Bay to Haines is 7:12 and 9:06 to Skagway.

Based on Alternative 1B as described, 2050 travel demand was forecast. The additional travel frequency, capacity, and travel time improvements, along with the other proposed enhancements are forecast to result in additional ridership. The results for Alternatives 1 and 1B are presented in Table 5-5. On an average day, the addition of the *M/V Malaspina* and the system management changes in Alternative 1B are anticipated to result in an additional 25 more trips than the No Action Alternative. On an average summer day, 50 additional trips would be generated and during the peak week (also during summer), an additional 115 additional trips would be expected as compared to the No Action Alternative. During the winter, Alternatives 1 and 1B would have the same schedule, and thus have the same anticipated demand.

Table 5-5. Traffic Forecast for 2050, Alternatives 1 and 1B

Alternative	Annual Average Daily Traffic	Summer Average Daily Traffic	Winter Average Daily Traffic	Peak Weak Average Daily Traffic
1	90	140	50	325
1B	115	190	50	440
Difference	+25	+50	-	+115

Calculated by Fehr & Peers, 2013.

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Appendix A

Part 1

Estimated Ferry Travel on Internal Lynn Canal Links with Price Reductions

Northern Economics, Inc., September 30, 2013

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Memorandum

Date: September 30, 2013

To: John McPherson

From: Alejandra Palma-Riedel and Marcus Hartley

Re: Estimated Ferry Travel on Internal Lynn Canal Links with Price Reductions

The Alaska Department of Transportation and Public Facilities (ADOT&PF) contracted with HDR and Northern Economics to assist in the Supplemental Environmental Impact Statement of the Juneau Access Improvement (JAI) Project. As part of the JAI, ADOT&PF is developing a new alternative (1B) that includes a reduction in fares on ferries in Lynn Canal. This summary of findings is based on the results of an econometric analysis by Northern Economics (2013), the results of which are attached. The objective of that study was to estimate the fare elasticity of ferry ridership in Lynn Canal and to demonstrate the magnitude of increased ferry ridership that would likely occur with reductions in ferry tariffs.

Fare elasticity (also called price elasticity) is a measure used in economics to show the responsiveness, of the quantity demanded of a good or service to a change in its price. Mathematically, price elasticity is calculated as: ***Percentage Change in Quantity ÷ Percentage Change in Price***. Price elasticities are almost always negative because almost all goods and services fit the basic economic principles of supply and demand wherein the quantity purchased will increase when the price decreases.[1]

Economists classify price elasticity into three main groups as follows:

1) Goods and services that are **elastic** have elasticities that range from –1.0 to –∞ (negative infinity). If ferry fares are elastic, then a 10 percent reduction in fares will increase ridership by more than 10 percent.
2) Goods and services that are **inelastic** have elasticities that range from 0 to –1.0. If ferry fares are inelastic, then a 10 percent reduction in fares will increase ridership by an amount that is less than 10 percent.
3) Goods and services that have elasticities that are equal to –1.0 have **unitary elasticity**. If ferry fares have unitary elasticity, then a 10 percent reduction in fares will increase ridership by 10 percent.

The remainder of this overview summarizes the results of the fare elasticity study. A more detail explanation of the model is included in the attachment. The estimates assume that no other changes are made to the ferry system including the number of sailings, the capacity of the vessels, or the speed of the vessels. Table 1 provides a summary of the estimated fare elasticity by traffic type and port group. Ferry ridership was separated into four modes: passengers, passenger vehicles (cars), recreational vehicles (RV), and freight container vans (vans).

[1] Some analysts and studies ignore the negative sign for price elasticity, even though this can lead to ambiguity. In this study the negative sign in kept in place, so that calculations of ferry ridership can be more easily tracked.

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In general, passenger travel on AMHS ferries appears to be relatively inelastic, with magnitudes between 0 and -1.0. This implies that if there were a 10 percent decrease in prices, the increase in passengers is predicted in most cases to be less than 10 percent.

As an example, the first row of Table 1 shows the price elasticity estimates for ferry ridership between Juneau and Haines. If the fare to ride the ferry between Juneau and Haines were to fall by 1 percent, then the model predicts that the number of passengers will increase by 0.520 percent. Note that the negative sign means that direction of the change in quantity is the opposite of the direction of the change in prices.

While passenger travel was estimated to be fairly inelastic, the price responsiveness of cars and RVs moving by ferry through Lynn Canal was generally closer to unitary elasticity (i.e. elasticity estimates around -1.0). With unitary elasticity, a given percentage decrease in price is expected to generate a similar percentage increase in traffic. Container van traffic within Lynn Canal was fairly elastic, meaning that a price decrease is expected to generate a much greater percentage increase in traffic.

Table 1. Estimated Price Elasticity Estimates for Internal Lynn Canal Travel by Fare Type and Port Group

Port Pairs	Passengers	Cars	RVs	Vans
Juneau and Haines	-0.520	-1.284	-1.051	-2.997
Juneau and Skagway	-0.492	-1.336	-0.978	-2.997

Source: Estimated by Northern Economics using the econometrics model shown in the attachment.

Table 2 shows actual passengers in 2011 on AMHS ferry trips that both start and end within Lynn Canal (i.e. internal Lynn Canal ferry trips). The table also shows the estimated passenger fare elasticity from the econometric model, and the predicted number of passengers that are estimated if there were fare decreases of 10 and 20 percent. Because the fare elasticity estimates indicate that demand is relatively inelastic, predicted increases in traffic are proportionally less than decreases in prices. The point estimate for the increase in passengers with a 20 percent fare decrease is exactly double the estimated increase with a 10 percent fare decrease. It should be noted however, that the relative size of the margin of error around estimates is likely to be proportionally larger with a 20 percent change in fares than with a 10 percent change.

Table 2. Actual Passengers in 2011 and Predicted Passengers with Fare Reductions

Port Pairs	Passengers in 2011	Fare Elasticity Estimate	With 10% Fare Decrease		With 20% Fare Decrease	
			Predicted Passengers	Net Increase	Predicted Passengers	Net Increase
Juneau and Haines	42,173	-0.520	44,366	2,193	46,559	4,386
Juneau and Skagway	24,142	-0.492	25,330	1,188	26,518	2,376
Total Traffic and average elasticity	**66,315**	**-0.510**	**69,696**	**3,381**	**73,077**	**6,762**

Source: Estimated by Northern Economics using the econometrics model shown in the attachment.

Table 3 shows actual car volumes in 2011 on internal Lynn Canal ferry trips. The table also shows the estimated car fare elasticity from the econometric model, and the predicted volume of cars that are estimated if there were fare decreases of 10 and 20 percent. Because the fare elasticity estimates indicate that demand is somewhat elastic, predicted increases in traffic are proportionally greater than the decrease in prices. The point estimate for the net increase in car volume with a 20 percent fare decrease is exactly double the estimated net increase with a 10 percent fare decrease. It should be noted however, that the relative size of the margin of error around the estimates is likely to be proportionally larger with a 20 percent change in fares than with a 10 percent change.

Table 3. Actual Car Volumes in 2011 and Predicted Car Volumes with Fare Reductions

Port Pairs	Car Volume in 2011	Fare Elasticity Estimate	With 10% Fare Decrease		With 20% Fare Decrease	
			Predicted Car Volume	Net Increase	Predicted Car Volume	Net Increase
Juneau and Haines	12,933	-1.284	14,594	1,661	16,254	3,321
Juneau and Skagway	5,545	-1.336	6,286	741	7,027	1,482
Total Traffic and average elasticity	**18,478**	**-1.300**	**20,879**	**2,401**	**23,281**	**4,803**

Source: Estimated by Northern Economics using the econometrics model shown in the attachment.

Table 4 shows actual Recreational Vehicle (RV) volumes in 2011 on internal Lynn Canal ferry trips. The table also shows the estimated RV fare elasticity from the econometric model, and the predicted volume of RVs that are estimated if there were fare decreases of 10 and 20 percent. RV fare elasticity estimates for the links involving Juneau are closer to unitary indicating that predicted increases in traffic will be proportional to decreases in prices. As with cars and passengers, the net increase in volumes with a 20 percent fare decrease is exactly double the net increase predicted with a 10 percent fare decrease, but the margin of error is expected to be proportionally larger with the larger decrease in prices.

Table 4. Actual RV Volumes in 2011 and Predicted RV Volumes with Fare Reductions

Port Pairs	RV Volume in 2011	Fare Elasticity Estimate	With 10% Fare Decrease		With 20% Fare Decrease	
			Predicted RV's	Net Increase	Predicted RV's	Net Increase
Juneau and Haines	367	-1.051	406	39	444	77
Juneau and Skagway	227	-0.978	249	22	271	44
Total Traffic and average elasticity	**594**	**-1.023**	**655**	**61**	**716**	**122**

Source: Estimated by Northern Economics based on the econometrics model in the attachment.

Table 5 shows actual container van volumes in 2011 on AMHS ferries trips that both start and end within Lynn Canal. The table also shows the estimated fare elasticity for container vans from the econometric model, and the predicted number vans that are estimated if there were fare decreases of 10 and 20 percent. Because of the small number of data points involving individual port pairs data for vans, these estimates were aggregated and a single elasticity estimate was developed. As shown in Table 5, the demand is relatively elastic, and therefore predicted increases in container van volumes are proportionally higher than the decrease in prices. As with other fare types, the increase in volume with a 20 percent decrease is two times the increase with a 10 percent change, but the relative size of the margin of error around the predicted volume is expected to increase.

Table 5. Actual Container Vans in 2011 and Predicted Container Vans with Fare Reductions

Port Pairs	Container Vans in 2011	Fare Elasticity Estimate	With 10% Fare Decrease		With 20% Fare Decrease	
			Predicted Containers	Net Increase	Predicted Containers	Net Increase
Juneau and Haines	426	-2.997	554	128	681	255
Juneau and Skagway	61	-2.997	79	18	98	37
Total Traffic and average elasticity	**487**	**-2.997**	**633**	**146**	**779**	**292**

Source: Estimated by Northern Economics based on the econometrics model in the attachment.

As a general caveat, the econometric analysis of AMHS demand elasticity can be used to estimate increases in passengers and vehicles that are likely to result from marginal decreases in fares, assuming there are no other changes in the service provided by AMHS ferries within Lynn Canal. It should be noted that the reliability of the estimates is reduced with larger and larger price changes (i.e. extramarginal changes). With a marginal price decrease, the actual change in traffic is likely to fall within the 95 percent confidence interval of the estimates that are shown in the attachment. A 10 percent price decrease is probably the upper bound of a "marginal" price decrease. With even larger decreases, (e.g. a 20 percent price decrease or even a 30 percent decrease), the point estimates of volume increases would be proportional to those seen in the tables, but we would expect that the relative size of the margin of error to increase.

Attachment: Econometric Model for Lynn Canal Fare Elasticity

1 Overview

The Alaska Department of Transportation and Public Facilities (ADOT&PF) contracted with HDR and Northern Economics to assist in the Supplemental Environmental Impact Statement (SEIS) of the Juneau Access Improvement (JAI) Project. As part of the JAI, ADOT&PF is developing a new alternative (1B) that includes a reduction in fares. The objective of this study is to estimate the fare elasticity of ferry ridership in Lynn Canal.

Ridership was separated into four modes: passengers, passenger vehicles (cars), recreational vehicles (RV), and freight container vans (vans). Ridership was further classified into groups of port-pairs to account for the different types of travel and therefore different responses to fare changes across groups. These groups represent: i) travel strictly within Lynn Canal, ii) travel to/from a hub with some portion of the trip inside Lynn Canal, and iii) travel to/from a small community in Southeast Alaska that involves some portion of the trip inside Lynn Canal (see Table 6).

Table 6. Ferry Ridership between HNS or SGY and other Ports, 2000–2011

Port-Pair Group	Passenger	Car	RV	Van
Between HNS/SGY and JNU (Internal Lynn Canal)	79.6%	76.3%	82.3%	88.2%
Between HNS/SGY and SE Alaska Hubs (SIT, PSG, WRG, or KTN)	5.8%	5.8%	3.0%	10.6%
Between HNS/SGY and Non Alaska Hubs (YPR, or BEL)	14.5%	17.8%	14.6%	1.1%
Between HNS/SGY and Villages (ANG, HNH, HOL, KAE, MET, PEL, or TKE)	0.2%	0.2%	0.0%	0.1%

Source: Northern Economics utilizing data from AMHS (2012).

The Alaska Marine Highway System (AMHS) provided historic data on ferry ridership and fares from July 1999 to August 2011. The data included supply side control variables such as vessel capacity, travel distance and duration, and date and time of each sailing during that period. Northern Economics combined this information with demographic and economic control variables (such as population, gasoline prices, inflation, and recession variables). Separate reduced-form panel-data regression models were estimated for passengers, cars, RVs, and vans in Lynn Canal. Table 7 shows the resulting fare elasticity estimates by port-pair group for these four models.

Table 7. Fare Elasticity Results, for Selected Port-Pairs

Port-pairs	Passenger Elasticity		Car Elasticity		RV Elasticity		Van Elasticity	
Juneau and Haines	-0.520	***	-1.284	**	-1.051	**	-2.997	***
Juneau and Skagway	-0.492	***	-1.336	*	-0.978	**	-2.997	***

Source: Estimated by Northern Economics.

Note: *** significant at 1 percent, ** significant at 5 percent, * significant at 10 percent.

2 Passenger Fare Elasticity

Fare elasticity is a measure of the change in ridership that is induced by a change in the fare, assuming that no other change in the ferry service has been made. However, the observed changes in ridership as seen in the AMHS data are the result of a combination of changes in fares, level of service (routes frequency, ferry speed and capacity, etc.) and other economic and demographic factors. In the next section we present the econometric model used to generate fare elasticity estimates that takes into consideration for those other factors that have the potential to influence ridership.

2.1 Methodology and Data

Northern Economics estimated the following reduced-form, panel data model of ferry ridership in Lynn Canal:

$lnpaxcount_{ijk} = \alpha_{ij}(x\_lnrtpax_{ijk}) + \beta_{ij}(B_{ij}) + \gamma_t(C_t) + \sum_{k \in K} \delta_{ijk}(D_{ijk}) + \_const$; where…

- α_{ij} represents the passenger fare elasticity by port-pair (ij).
- B_{ij} represents the effects of characteristics that vary by port-pair (ij) but are constant across time, such as the distance between the origin and destination (cpmiles).
- C_t represents the effects of time-varying characteristics such as price of gasoline (realgasolineprice), and calendar year month (cym).
- D_{ijt} represents the effects of service characteristics that vary with origin-destination pair (ij), and time (t), such as the size of the port-pair's population (popcitypair), travel time (elapseddays), and service frequency (trips))

The regression model is estimated using monthly observations between July 1999 and 2011. The original daily data provided by the AMHS Reservations Management System (AMHS-RMS) for each individual sailing were collapsed into monthly observations for each port-pair. The model is estimated in logarithms (indicated by the "ln" in front of the variable) and therefore the coefficients of the continuous variables correspond to elasticities.

The variables used in the regression are as follows:

- $lnpaxcount_{ijk}$: natural logarithm of the sum of monthly total passengers travelling between an origin-destination port-pair for a given time period (k). This is the dependent variable in the model, obtained from data provided by AMHS-RMS.
- $lnrealtariff\_passage_{ijk}$: natural logarithm of the real tariff for a one way passenger trip between a given origin-destination (ij) for a given time period (k). The variable corresponds to the one-way adult nominal fare published for each season by AMHS, adjusted by the U.S. consumer price index CPI-U from the Bureau of Labor Statistics (BLS, 2012) to create real fares expressed in dollars of June, 2011.
- We explicitly differentiate between fare elasticities across port-pair groups by estimating the coefficients of various interaction terms. The interaction terms are computed by multiplying $lnrealtariff\_passage_{ijk}$ times a dummy variable for each of the port-pair groups.
  - The coefficient of the variables "x_jnuhns_lnrtpax" and "x_jnusgy_lnrtpax" provide the passenger fare elasticity for JNU-HNS and JNU-SGY, respectively. The focus of the analysis is in these port-pairs that were emphasized in the 2004 EIS and our Market Segment Report (_jnuhns _jnusgy).

  - The coefficient of the other interaction terms represents the passenger fare elasticity for trips between HNS and SGY (x_hnssgy_lnrtpax), between a hub and either HNS or SGY (x_sit_lnrtpax, x_psg_lnrtpax, x_wrg_lnrtpax, x_ktn_lnrtpax, x_ypr_lnrtpax, and x_bel_lnrtpax) or between the remaining smaller communities as a group and HNS or SGY (x_small_lnrtpax).

- lnrealgasolineprice: natural logarithm of the monthly average resale price per gallon of gasoline published by the Energy Information Authority (EIA, 2012) adjusted by the U.S. consumer price index CPI-U from the Bureau of Labor Statistics (BLS, 2012) to create real prices expressed in dollars of June, 2011.
- lnpopcitypair: natural logarithm of the sum of the population in the origin and destination cities, available from Alaska Department of Labor and Workforce Development (ADOLWD, 2012) for each calendar year.
- lnelapsedhrs: total travel time from start at origin to arrival at destination (including transit time and stops) expressed in the natural logarithm of number of hours, obtained from data provided by AMHS-RMS.
- lnpaxcapacity_nom: natural logarithm of the maximum number of passenger of vessel capacity, obtained from data provided by AMHS-RMS.
- lncpmiles: natural logarithm of the distance in nautical miles between a community pair, obtained from data provided by AMHS-RMS.
- lntrips: natural logarithm of the number of sailings in a month (i.e. frequency of service), obtained from data provided by AMHS-RMS.
- pct_weekend: percentage of monthly trips that depart on a weekend for a given origin-destination, obtained from data provided by AMHS-RMS.
- pct_veryearlylate: percentage of monthly trips that depart between 11pm and 5am for a given origin-destination, obtained from data provided by AMHS-RMS.
- d_recession: dummy variable for the period of economic recession (Dec 2007–Jun 2009).
- _Icym_2 to _Icym_12: indicator dummy variables for the month of the year to control for seasonality effects, obtained from data provided by AMHS-RMS. The left out category in the model is the month of January (_Icym_1).

2.2 Results

The main result from the econometric model is that ferry passenger traffic in Lynn Canal is relatively inelastic with respect to price, although the magnitude of the elasticity varies across port-pairs. Table 8 presents the details of the econometric model. The regression results are in general consistent with economic theory, and can be used by traffic forecasters to estimate passenger ridership in the future under the various alternatives that change passenger fares and/or service levels.

The first ten coefficients shown in Table 2 are the fare elasticity estimates for the different groups of port-pairs. The first three coefficients correspond to fare elasticities for trips within Lynn Canal. For example, the first coefficient (x_hnssgy_lnrtpax) shows a fare elasticity of -0.35 for trips between HNS and SGY. Similarly, the second (x_jnuhns_lnrtpax) and third (x_jnusgy_lnrtpax) coefficients indicate fare elasticities of -0.52 for trips between JNU and HNS and -0.49 for trips between JNU and SGY. The next seven coefficients represent the fare elasticity of trips that are only partially within Lynn Canal, i.e. trips between other ports (SIT, PSG, WRG, etc.) and either HNS or SGY. All the ten estimated elasticities have strong statistical significance (p-values<0.05) and have the negative sign predicted by economic theory, indicating that when a good becomes more expensive the quantity consumed decreases.

The right-most two columns of Table 8 show the estimated confidence intervals around the point estimates of fare elasticity. These are 95 percent confidence intervals and show the margin of error within which the analysts would expect the actual elasticity estimates to fall. In general, these margins of error are relatively large and reflect the relative imprecision of the model. While the analysts believe that the model is quite useful, the margins of error serve to remind users that traffic estimates generated using the model do contain a considerable amount of uncertainty.

The variable lnrealgasolineprice does not have an expected sign *a priori*; it is included in the regression as a control variable. On one hand, the price of gasoline is a proxy for the cost of travel by competing modes. In this sense, one could expect a positive coefficient; an increase in gasoline price would make other modes relatively more expensive and would increase ferry passenger travel. On the other hand, ferry passengers tend to travel with cars and higher gasoline prices could discourage travel plans.

As expected, there is a strongly significant and negative relationship between the passenger count and the duration of the trip (lnelapseddays). The longer it takes to travel between a given origin-destination pair, the less attractive the trip.

As expected, there is a positive relationship between passenger ridership and the variables that represent level of service: passenger capacity (lnpaxcapacity_nom) and sailing frequency (lntrips).

Strong seasonal effects are captured by introducing dummy variables for months. January is the baseline from which other months are measured. The dummy variables reveal the expected pattern with the estimated coefficients increasing from the January baseline until July and then diminishing until the end of the year.

The variable representing distance between the origin and destination ports (lncpmiles) is included in the regression as a control variable. The estimated coefficients for the other variables are not statistically significantly different than zero (lnpopcitypair, pct_weekend, pct_veryearlylate, and d_recession).

Table 8. Regression Results for Passenger Model

Random-effects GLS Regression		No. of observations =	4,548			
Group Variable: id_portpair		No. of groups =	54			
R-sq: within =	0.6486	Obs. per group:	min = 1			
R-sq: between =	0.9792		avg = 84.2			
R-sq: overall =	0.8978		max = 144			
Wald chi^2 (30) =	39,660.13					
corr(u_i, X) = 0 (assumed)		Prob. > chi^2 =	0.0000			
Variable Name	**Coefficient**	**Standard Error**	**z-value**	**P>|z|**	**95 % Confidence Interval**	
x_hnssgy_lnrtpax	-0.3550	0.1511	-2.35	0.019	-0.6511	-0.0589
x_jnuhns_lnrtpax	-0.5205	0.1702	-3.06	0.002	-0.8541	-0.1869
x_jnusgy_lnrtpax	-0.4923	0.1623	-3.03	0.002	-0.8104	-0.1742
x_sit_lnrtpax	-0.9036	0.1744	-5.18	0.000	-1.2454	-0.5617
x_psg_lnrtpax	-1.0159	0.1695	-5.99	0.000	-1.3481	-0.6837
x_wrg_lnrtpax	-1.0632	0.1697	-6.26	0.000	-1.3958	-0.7306
x_ktn_lnrtpax	-0.9458	0.1634	-5.79	0.000	-1.2661	-0.6255
x_ypr_lnrtpax	-0.8300	0.1594	-5.21	0.000	-1.1425	-0.5175
x_bel_lnrtpax	-0.6526	0.1571	-4.15	0.000	-0.9605	-0.3447
x_small_lnrtpax	-0.9871	0.1763	-5.6	0.000	-1.3326	-0.6416
lnrealgasolineprice	-0.0853	0.0378	-2.26	0.024	-0.1594	-0.0113
lnpopcitypair	0.0009	0.1062	0.01	0.993	-0.2073	0.2091
lnelapsedhrs	-0.6518	0.0699	-9.33	0.000	-0.7888	-0.5148
lnpaxcapacity_nom	0.5155	0.1015	5.08	0.000	0.3164	0.7145
lncpmiles	1.4014	0.1646	8.52	0.000	1.0788	1.7239
lntrips	0.9828	0.0202	48.72	0.000	0.9433	1.0223
pct_weekend	-0.0472	0.0374	-1.26	0.206	-0.1204	0.0260
pct_veryearlylate	0.0135	0.0393	0.34	0.731	-0.0635	0.0905
d_recession	0.0369	0.0321	1.15	0.249	-0.0259	0.0998
_Icym_2	-0.0013	0.0479	-0.03	0.979	-0.0952	0.0927
_Icym_3	0.2476	0.0480	5.15	0.000	0.1534	0.3417
_Icym_4	0.2500	0.0480	5.21	0.000	0.1559	0.3442
_Icym_5	0.4727	0.0489	9.67	0.000	0.3768	0.5685
_Icym_6	0.7689	0.0518	14.85	0.000	0.6674	0.8704
_Icym_7	1.0126	0.0529	19.13	0.000	0.9088	1.1163
_Icym_8	0.9135	0.0522	17.51	0.000	0.8113	1.0158
_Icym_9	0.5813	0.0508	11.45	0.000	0.4818	0.6808
_Icym_10	0.3039	0.0473	6.43	0.000	0.2112	0.3965
_Icym_11	0.1573	0.0466	3.38	0.001	0.0661	0.2485
_Icym_12	-0.0399	0.0473	-0.84	0.400	-0.1326	0.0529
_cons	-2.8240	1.1442	-2.47	0.014	-5.0667	-0.5813
sigma_u	0.0000					
sigma_e	0.6104					
Rho	0.0000	(fraction of variance due to u_i)				

Source: Estimated by Northern Economics.

3 Car Fare Elasticity

The study estimated car fare elasticity using a model similar to the one used for passengers in the previous section. The difference is that the dependent variable in this case is the natural logarithm of the total monthly cars travelling between an origin-destination pair (lncarcount). The main explanatory variables are the interaction terms using the real tariffs for cars transported one way between a given origin-destination pair (expressed in natural logarithms). Indicator variables that take the values 0 or 1 were included to identify each port-pair group added to the model. The remaining variables are analogous to the ones already described in Section 2.1.

Table 9 below presents the detailed results for the econometric model that explains the number of cars (lncarcount) transported by ferry via Lynn Canal. The estimated coefficients in the model are in general consistent with economic theory.

- All car fare elasticities (x_lnrtcar) are statistically significant (p-values<0.10), except for Sitka. All have a negative sign as predicted by economic theory, except in the case of small villages. However, the magnitude of the coefficients varies widely across port-pairs.
- The variable lnpopcitypair has the expected positive sign; a larger population fosters more ferry ridership.
- The negative relationship between the number of cars and the duration of the trip (lnelapseddays) indicates that slower trips discourage ridership for a given origin-destination pair.
- As expected, there is a positive relationship between cars and the sailing frequency (lntrips).
- The positive sign for pct_weekend suggests that sailings concentrated on weekends tend to transport more cars. This would suggest the existence of a recreational market (as opposed to commuters).
- The variable d_recession does not have an *a priori* expected sign; it is included in the regression as a control variable. On one hand, a negative coefficient would reflect that a slowdown in the U.S. economy decreases the general demand for travel. On the other hand, a positive coefficient would reflect that people substitute away from more expensive modes and destinations and choose to travel to the study area instead. Again, the net effect does not have an *a priori* expected sign and the variable is included in the regression only as a control variable.
- The variable lncpmiles is included in the regression as a control variable. The estimated coefficients for the other variables are not statistically significant (lnrealgasolineprice, lnpaxcapacity_nom, and pct_veryearlylate).

All estimated car fare elasticities are negative as predicted by economic theory, except in the case of smaller Southeast Alaska villages.[2] Internal Lynn Canal pairs have fare elasticities of magnitudes that can be considered consistent with previous evidence in the literature.[3] The estimated fare elasticity for cars moving between JNU and HNS or between JNU and SGY is -1.3. These coefficients are relatively close to a unitary fare elasticity of -1, which would indicate that changes in fares would have small effects in revenues. However, these estimates have wide confidence intervals that include values both greater and less than -1 (see Table 9), which precludes definite conclusions regarding the revenue effects of changes in fares.

Some of the estimated vehicle fare elasticities for other port-pairs are of surprising magnitudes. For example, the elasticities for BEL and YPR are suspiciously high, even though demand tends to be more elastic at high prices and when there is an option to divert from the ferry system and drive on the highway. Further research is recommended before any decision regarding changes in car fares for these non-Alaska hubs. Together BEL and YPR represent 18 percent of the total car volume and, furthermore, they have the highest fares because they are the longest trips. Therefore, even a small

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[2] The number of cars transported between small Southeast Alaska villages and HNS/SGY is very small, and therefore the counterintuitive positive elasticity is not relevant for policy purposes.

[3] Erickson (1993) estimated the price elasticity for vehicles on AMHS ferries to be –0.69. British Columbia Ferries estimated vehicle elasticities ranging from –0.58 to –0.78 (IBI Group, 1998).

percentage change in fares could have a significant impact on revenues, both through the impact of high current fare levels and high volumes. Particular attention is advised for BEL-HNS since it represents 11 percent of the total volume of cars transported by ferry via Lynn Canal—the fourth port-pair in importance after the three port-pairs strictly within Lynn Canal.

Table 9. Cars Regression Results

Random-effects GLS Regression		No. of observations =	4,185			
Group Variable: id_portpair		No. of groups =	47			
R-sq: within =	0.5565	Obs per group:	min = 1			
R-sq: between =	0.9523		avg = 89.0			
R-sq: overall =	0.8777		max = 144			
Wald chi^2 (40) =	N/A					
corr(u_i, X) = 0 (assumed)		Prob. > chi^2 =	N/A			
Variable Name	**Coefficient**	**Standard Error**	**z-value**	**P>|z|**	**95 % Confidence Interval**	
x_hnssgy_lnrtcar	-0.8163	0.4237	-1.93	0.054	-1.6468	0.0142
x_jnuhns_lnrtcar	-1.2845	0.5140	-2.5	0.012	-2.2918	-0.2771
x_jnusgy_lnrtcar	-1.3356	0.7012	-1.9	0.057	-2.7099	0.0386
x_sit_lnrtcar	-0.2516	0.3513	-0.72	0.474	-0.9402	0.4370
x_psg_lnrtcar	-0.8361	0.4714	-1.77	0.076	-1.7601	0.0878
x_wrg_lnrtcar	-2.7658	0.5350	-5.17	0.000	-3.8143	-1.7173
x_ktn_lnrtcar	-5.6724	0.5059	-11.21	0.000	-6.6640	-4.6808
x_ypr_lnrtcar	-3.3867	0.5773	-5.87	0.000	-4.5182	-2.2552
x_bel_lnrtcar	-9.5702	0.6152	-15.56	0.000	-10.7759	-8.3645
x_small_lnrtcar	2.7569	0.5104	5.4	0.000	1.7566	3.7573
lnrealgasolineprice	0.0599	0.0529	1.13	0.258	-0.0439	0.1636
lnpopcitypair	1.7083	0.1524	11.21	0.000	1.4097	2.0070
lnelapsedhrs	-0.4408	0.0832	-5.3	0.000	-0.6039	-0.2776
lnvehcapacity_nom	0.1075	0.0720	1.49	0.135	-0.0336	0.2485
lncpmiles	-1.1670	0.4060	-2.87	0.004	-1.9627	-0.3712
lntrips	0.8117	0.0236	34.41	0.000	0.7654	0.8579
pct_weekend	0.0994	0.0438	2.27	0.023	0.0135	0.1852
pct_veryearlylate	0.0513	0.0449	1.14	0.254	-0.0368	0.1393
d_recession	0.1510	0.0346	4.37	0.000	0.0833	0.2187
tm	0.0023	0.0005	4.68	0.000	0.0014	0.0033
lc_hnssgy	-63.8978	4.3639	-14.64	0.000	-72.4509	-55.3447
lc_jnuhns	-62.4738	4.5155	-13.84	0.000	-71.3240	-53.6236
lc_jnusgy	-61.7918	5.0342	-12.27	0.000	-71.6585	-51.9250
lc_sit	-64.8458	4.3801	-14.8	0.000	-73.4307	-56.2609
lc_psg	-61.2452	4.6703	-13.11	0.000	-70.3987	-52.0916
lc_wrg	-49.6696	4.8691	-10.2	0.000	-59.2129	-40.1263
lc_ktn	-32.4126	4.8025	-6.75	0.000	-41.8252	-22.9999
lc_bel	0.0000	(omitted)				
lc_ypr	-45.2756	5.3946	-8.39	0.000	-55.8488	-34.7024
lc_small	-78.9467	4.8391	-16.31	0.000	-88.4312	-69.4622
_Icym_2	0.0270	0.0533	0.51	0.613	-0.0775	0.1314
_Icym_3	0.3269	0.0527	6.2	0.000	0.2236	0.4302
_Icym_4	0.5031	0.0525	9.58	0.000	0.4001	0.6061
_Icym_5	0.6410	0.0542	11.82	0.000	0.5347	0.7472
_Icym_6	0.7602	0.0578	13.16	0.000	0.6470	0.8734
_Icym_7	0.9283	0.0585	15.88	0.000	0.8137	1.0429
_Icym_8	0.8745	0.0578	15.13	0.000	0.7613	0.9878
_Icym_9	0.7368	0.0553	13.33	0.000	0.6285	0.8452
_Icym_10	0.5677	0.0514	11.04	0.000	0.4670	0.6685
_Icym_11	0.3497	0.0515	6.79	0.000	0.2488	0.4507
_Icym_12	0.1091	0.0529	2.06	0.039	0.0054	0.2127
_cons	57.2561	4.6319	12.36	0.000	48.1778	66.3345
sigma_u	0.0000					
sigma_e	0.5404					
rho	0.0000	(fraction of variance due to u_i)				

Source: Estimated by Northern Economics.

4 RV Fare Elasticity

The study estimated RV fare elasticity using a similar model to the one used in the previous sections. The model details and results are shown in Table 10. All estimated RV fare elasticities have negative signs and plausible magnitudes. Most coefficients are close to -1 (unitary fare elasticities).

Table 10. RVs Regression Results

Random-effects GLS Regression		No. of observations =	1,841			
Group Variable: id_portpair		No. of groups =	36			
R-sq: within =	0.6361	Obs. per group:	min = 1			
R-sq: between =	0.9066		avg = 51.1			
R-sq: overall =	0.7588		max = 122			
Wald chi^2 (31) =	5,689.53					
corr(u_i, X) = 0 (assumed)		Prob. > chi2 =	0.0000			
Variable Name	**Coefficient**	**Standard Error**	**z-value**	**P>|z|**	**95 % Confidence Interval**	
x_hnssgy_lnrtrv	-0.0499	0.4505	-0.11	0.912	-0.9328	0.8330
x_jnuhns_lnrtrv	-1.0509	0.4175	-2.52	0.012	-1.8691	-0.2327
x_jnusgy_lnrtrv	-0.9781	0.4048	-2.42	0.016	-1.7714	-0.1848
x_sit_lnrtrv	-0.9999	0.4296	-2.33	0.020	-1.8420	-0.1578
x_psg_lnrtrv	-0.9197	0.4174	-2.20	0.028	-1.7377	-0.1017
x_wrg_lnrtrv	-0.8986	0.4202	-2.14	0.032	-1.7222	-0.0750
x_ktn_lnrtrv	-1.0351	0.4119	-2.51	0.012	-1.8424	-0.2279
x_ypr_lnrtrv	-0.8873	0.4092	-2.17	0.030	-1.6894	-0.0853
x_bel_lnrtrv	-1.0493	0.4200	-2.50	0.012	-1.8725	-0.2261
x_small_lnrtrv	-0.5327	0.4329	-1.23	0.218	-1.3813	0.3158
lnrealgasolineprice	-0.1269	0.0928	-1.37	0.172	-0.3088	0.0551
lnpopcitypair	0.8112	0.3380	2.40	0.016	0.1487	1.4737
lnelapsedhrs	-0.1829	0.1897	-0.96	0.335	-0.5547	0.1890
lnvehcapacity_nom	0.3614	0.1427	2.53	0.011	0.0818	0.6411
lncpmiles	1.0807	0.5554	1.95	0.052	-0.0079	2.1693
lntrips	0.7045	0.0466	15.11	0.000	0.6131	0.7959
pct_weekend	0.0021	0.1086	0.02	0.984	-0.2107	0.2150
pct_veryearlylate	-0.1225	0.0957	-1.28	0.200	-0.3101	0.0650
d_recession	-0.0180	0.0634	-0.28	0.777	-0.1422	0.1063
Tm	-0.0015	0.0009	-1.73	0.084	-0.0032	0.0002
_Icym_2	0.1226	0.1613	0.76	0.447	-0.1935	0.4388
_Icym_3	0.0505	0.1413	0.36	0.721	-0.2264	0.3274
_Icym_4	0.5650	0.1361	4.15	0.000	0.2982	0.8317
_Icym_5	1.3096	0.1354	9.67	0.000	1.0441	1.5750
_Icym_6	1.8176	0.1377	13.20	0.000	1.5476	2.0876
_Icym_7	1.9780	0.1388	14.25	0.000	1.7059	2.2500
_Icym_8	1.8263	0.1388	13.16	0.000	1.5543	2.0984
_Icym_9	1.3232	0.1357	9.75	0.000	1.0572	1.5893
_Icym_10	0.6563	0.1345	4.88	0.000	0.3927	0.9199
_Icym_11	0.0867	0.1450	0.60	0.550	-0.1975	0.3709
_Icym_12	-0.1494	0.1683	-0.89	0.375	-0.4793	0.1805
_cons	-9.9118	4.3117	-2.30	0.022	-18.3627	-1.4610
sigma_u	0.0000					
sigma_e	0.7300					
rho	0.0000	(fraction of variance due to u_i)				

Source: Estimated by Northern Economics.

5 Van Fare Elasticity

Container vans moving on the AMHS are primarily being transported for commercial transportation companies rather than the ultimate customer. Freight service is available on many but not all AMHS routes. Some ports cannot take 40-foot vans because the ramp is too steep and some ferries cannot take 40-foot vans or can only take a limited number.

The study estimated van fare elasticity using a similar model to the one used in the previous sections. However, the sample of observations was limited due to service levels and low volumes of vans transported between port-pairs that provide the service. As a result, elasticity coefficients were estimated for more aggregated groupings than in the previous sections.

Table 11 highlights the main results. The estimated coefficients in the model are in general consistent with economic theory. All container van fare elasticity estimates have negative signs and are highly elastic. Furthermore, the confidence intervals for the estimated fare elasticities clearly indicate absolute values greater than 1, i.e. they have elastic demand. This result is consistent with the fact that companies are more sensitive to prices than individuals. For the majority of travelers, price is just one of many factors considered in the whole experience of traveling by ferry. In contrast, price is probably the major or only focus for shipping companies because it directly affects their profits. Another factor that explains high elasticity estimates is the fact that there are alternative transport modes, such as barges, that compete with AMHS.

The other statistically significant coefficients suggest that vans tend to be loaded on weekdays and at early or late hours. The positive and significant coefficient for very early or very late sailing times suggests considering an off-peak discount for freight vans. Gasoline prices, population levels, and slower trips do not have a significant impact for vans (contrary to the results in previous sections for passengers, cars, and RVs). Control variables have expected signs.

Table 11. Vans Regression Results

Random-effects GLS Regression		No. of observations =	1,198			
Group Variable: id_portpair		No. of goups =	13			
R-sq: within =	0.2072	Obs per group:	min = 1			
R-sq: between =	0.8551		avg = 92.2			
R-sq: overall =	0.6578		max = 144			
Wald chi^2 (25) =	N/A					
corr(u_i, X) = 0 (assumed)		Prob. > chi2 =	N/A			
Variable Name	**Coefficient**	**Standard Error**	**z-value**	**P>|z|**	**95 % Confidence Interval**	
x_jai_lnrtvan	-2.9970	0.4464	-6.71	0.000	-3.8719	-2.1221
x_hub3_lnrtvan	-2.8515	0.5226	-5.46	0.000	-3.8758	-1.8273
x_ktn_lnrtvan	-2.5953	0.5041	-5.15	0.000	-3.5834	-1.6072
x_ypr_lnrtvan	0.0000	(omitted)				
x_bel_lnrtvan	-2.5372	0.4559	-5.57	0.000	-3.4306	-1.6437
x_small_lnrtvan	0.0000	(omitted)				
lnrealgasolineprice	0.1019	0.1031	0.99	0.323	-0.1002	0.3040
lnpopcitypair	0.3432	0.2442	1.41	0.160	-0.1354	0.8218
lnelapsedhrs	-0.3111	0.2293	-1.36	0.175	-0.7606	0.1383
lnvehcapacity_nom	-0.3096	0.1695	-1.83	0.068	-0.6419	0.0227
lncpmiles	1.3421	0.5072	2.65	0.008	0.3480	2.3363
lntrips	0.6215	0.0638	9.75	0.000	0.4966	0.7465
pct_weekend	-0.7858	0.1765	-4.45	0.000	-1.1318	-0.4399
pct_veryearlylate	0.9221	0.1256	7.34	0.000	0.6759	1.1683
d_recession	0.2403	0.0688	3.49	0.000	0.1054	0.3751
tm	-0.0082	0.0009	-8.70	0.000	-0.0100	-0.0063
_Icym_2	0.0162	0.1037	0.16	0.876	-0.1871	0.2194
_Icym_3	0.0978	0.0989	0.99	0.323	-0.0960	0.2916
_Icym_4	0.3079	0.1009	3.05	0.002	0.1102	0.5056
_Icym_5	0.1652	0.1092	1.51	0.130	-0.0487	0.3792
_Icym_6	0.1046	0.1265	0.83	0.408	-0.1433	0.3524
_Icym_7	-0.0063	0.1297	-0.05	0.961	-0.2604	0.2478
_Icym_8	-0.0390	0.1305	-0.30	0.765	-0.2947	0.2167
_Icym_9	-0.1052	0.1147	-0.92	0.359	-0.3300	0.1197
_Icym_10	0.1764	0.0998	1.77	0.077	-0.0193	0.3720
_Icym_11	0.1249	0.1012	1.23	0.217	-0.0735	0.3234
_Icym_12	-0.0803	0.1024	-0.78	0.433	-0.2809	0.1204
_cons	9.5272	3.2137	2.96	0.003	3.2286	15.8259
sigma_u	0.0000					
sigma_e	0.5548					
rho	0.0000	(fraction of variance due to u_i)				

Source: Estimated by Northern Economics.

6 Conclusions and Limitations

If increasing ridership is an objective, then AMHS could achieve it by lowering fares and/or improving ferry service attributes (frequency, schedule convenience, speed, etc.). However, one of the main results of this study is that lowering fares for passengers traveling within Lynn Canal will result in less than proportional increases in ridership—ridership will increase but total revenue from passengers will decrease. This is because Lynn Canal passenger traffic is inelastic with respect to fares. The econometric model suggests that a 10 percent decrease in real fares would result in a 5.20 percent increase in the number of passenger trips between Juneau and Haines, and 4.92 percent increase between Juneau and Skagway.

Passenger ridership is more inelastic for Internal Lynn Canal port-pairs than for other pairs, and therefore lower fares would have a relatively small effect on incentivizing ridership. Conversely, because of this inelastic demand, Lynn Canal port-pairs could sustain higher percentage increases in fares while still increasing revenues. Changes in fares between JNU and HNS/SGY should be considered with special care because together these segments represent the majority (almost 70 percent) of the total passenger traffic within and through Lynn Canal.

Car fare elasticity estimates for Internal Lynn Canal port-pairs are relatively close to -1. In this situation, a percentage change in price causes an equal (proportional) change in quantity in the opposite direction. As a result, car volumes are likely to be unaffected because the two effects cancel each other out. Most of the other port-pairs have estimated car elasticities of questionable magnitudes. Coefficients vary widely across other port-pairs with no clear general policy recommendation.

RV fares seem to be close to point of where elasticity is equal to -1.0. If AMHS wishes to increase RV ridership it could lower fares and achieve a proportional increase in ridership without sacrificing revenues.

Freight container vans for all port-pair groups show very high fare elasticities. The implication is that fare decreases would further increase van volumes.

6.1 Limitations

The study has limitations that are associated with the use of aggregated data and with the fact that there has been little variation in fares over the study period. Nominal fares have not changed in recent years, and real fares have remained almost constant due to relatively low levels of inflation. The lack of variability in this critical explanatory variable is the root cause of imprecise estimates reflected in the wide confidence intervals.

Because of data limitations, the fare elasticity estimates are not extremely stable in the sense that changes in the model specifications resulted in different elasticity estimates. The elasticity findings in this report should therefore be considered as indications of the order of magnitude of the true underlying elasticities, rather than precise measures. Some of the mentioned limitations could be overcome using detailed survey data at the level of individual travelers.

Fares changes in recent years have been minor. Therefore, the results of this study must be used carefully if they are used to predict responses to changes to other than the variables included in the model or if the changes are of significant magnitude.

Appendix A

Part 2

Draft JAI Alternative 1B Fare Sensitivity Analysis

Fehr and Peers, October 2, 2013

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FEHR PEERS

MEMORANDUM

Date: October 2, 2013

To: Laurie Cummings and Kevin Doyle, HDR

From: Donald Samdahl and Jeff Pierson, Fehr & Peers

Subject: DRAFT JAI Alternative 1B Fare Sensitivity Analysis

SE12-0266

Alternative 1B of the Juneau Access Improvement (JAI) project utilizes existing Alaska Marine Highway System (AMHS) assets to improve service characteristics in Lynn Canal. As a way to provide additional value to travelers, the benefits of fare reductions were also explored. This memo summarizes the results of a fare sensitivity analysis for Alternative 1B, and compares these results to previous research.

Alternative 1B

JAI Alternative 1B provides services in Lynn Canal with two new Day Boat Alaska Class Ferries (ACFs), the *M/V Malaspina*, and the mainline ferries. During the summer, mainline service would operate two round trips per week with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. One Day Boat ACF would make one round trip per day between Auke Bay and Haines, and the other ACF would make two round trips per day between Haines and Skagway. These vessels would operate six days a week, since the mainline provides a similar service on the seventh day. The *M/V Malaspina* would make one round trip per day, seven days a week, on a Skagway-Auke Bay-Skagway route. In addition to other programmed ferry service improvements for this alternative, fares were also reduced by twenty percent for all trips in Lynn Canal.

Table 1 provides a summary of the key service characteristics of Alternative 1B. These characteristics served as the inputs to the ridership forecast model and are based on summer service levels. There would be less service in the winter, which is accounted for by seasonal adjustment factors in the model.

TABLE 1. ALTERNATIVE 1B CHOICE MODEL INPUTS

Destination	Auto Time (minutes)	Auto Cost (dollars)	Ferry Time (minutes)	Ferry Cost (dollars)	Ferry Delay (minutes)	Service Index[1]
Haines	6	$1.12	276	$50.45	83	2.0
Skagway	0	$0.00	286	$66.91	139	3.0

Service characteristics provided in Alternative Travel Time, Capacity, and Frequency memos, HDR, May 2013.
A full discussion of the forecasting model is provided in the JAI Traffic Forecast Report, July 2013, Revision 4.
[1]Calculated by Fehr & Peers, 2013.

FEHR PEERS

Fare Sensitivity Results

The fare reduction percentage was varied to test the sensitivity of the ridership demand forecasting model to changes in fare. **Table 2** shows the 2050 annual average daily traffic (AADT) and summer average daily traffic (SADT) forecasts for four different scenarios. The model was first run with fares equivalent to Alternative 1 fares, followed by reductions of ten, twenty, and thirty percent respectively. The table shows the forecasted daily traffic for each scenario and changes relative to the 'No Reduction' scenario. The final column estimates the fare elasticity.[1] The forecasting model does use elasticities but does include price as one of a number of factors used to forecast demand. However, a simply elasticity can be estimated from the forecasted results. Note that the volumes reported in the table have been rounded to the nearest five trips however, the percent change and elasticity were calculated using unrounded volumes and rounded to two significant figures.

TABLE 2. FARE SENSITIVITY RESULTS

Scenario[1]	2050 AADT	Change	Percent Change[2]	Elasticity[2]	2050 SADT	Change	Percent Change[2]	Elasticity[2]
No Reduction	100	-	-	-	155	-	-	-
10% Reduction	110	10	10%	-1.0	175	20	10%	-1.0
20% Reduction	115	15	20%	-1.0	185	30	19%	-1.0
30% Reduction	125	25	31%	-1.0	205	50	31%	-1.0

[1] Fare reductions compared to Alternative 1 fares.
[2] Calculated using unrounded forecast volumes.
Calculated by Fehr & Peers, 2013.

The results from the ridership forecasting model show that each ten percent reduction in fares results in approximately fifteen additional vehicles during an average summer day. Calculating elasticities compared to the no reduction scenario shows that the forecast demand, on average, has an elasticity of approximately -1.0.

A 1993 report[2] cited in Northern Economics' *Break-Even Demand on Alternative Ferry Systems in Lynn Canal* (1999) estimated the price elasticity on AMHS ferries as -0.69 for vehicles. While this value represents a lower elastic demand compared with the results from the current forecasting model, care should be taken when making a direct comparison between these values. Elasticities can only be applied within a narrow price window and when other circumstances are similar. Without more information about how the observed elasticity was calculated in 1993 and the service characteristics at the time of those calculations, it is difficult to speculate whether that elasticity is applicable to the 2050 forecast scenario.

If the -0.69 elasticity was applied to the current data, the increases in summer volumes would be 10, 20, and 30 vehicles respectively for each reduction scenario. These estimates are in the same order of magnitude as the forecasting results and would not materially impact the results of the overall alternatives analysis.

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[1] Elasticity is calculated as the percent change in forecast ridership divided by the percent change in fare.
[2] Erickson and Associates. *Long-Range AMHS Business Planning Analysis.* Prepared for the Alaska Marine Highway System, Alaska Department of Transportation and Public Facilities. Juneau, Alaska. 1993