Juneau Access Improvements Project
Final Supplemental Environmental Impact Statement

Revised 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 Final Supplemental Environmental Impact Statement (SEIS). In keeping with Court direction, the Alaska Department of Transportation and 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 AMHS 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, and reducing fares.

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.
- Refined the alternative to address the change from a programmed 350-foot Alaska Class Ferry (ACF) to a Day Boat ACF.
- Evaluated alternative impacts in the Draft SEIS.
- Shared information and solicited comments from agencies and the public on Alternative 1B during multiple public hearings and through a 45-day Draft SEIS review period.
- Collected and responded to comments pertaining to Alternative 1B in this Final SEIS.
- Refined the alternative based on the Draft SEIS comments and updated the analysis in this Final SEIS to reflect changes.

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 National Highway System route from Juneau to Haines and Skagway.
- No new roads or ferry terminals would be built.
- 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 outside of Lynn Canal would not be substantially affected by Alternative 1B.
- Alternative 1B keeps the motor vessel (*M/V) Malaspina* in service 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.

Mainline service would include two round-trips per week in summer and one per week in winter with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. During summer, the *M/V Malaspina* would make one round-trip per day, 5 days per week on a Skagway-Auke Bay-Skagway route. On the other 2 days it would make a Skagway-Haines-Auke Bay run on one day and a Skagway-Auke Bay-Haines run on the other day. One Day Boat ACF would make one round-trip between Auke Bay and Haines 7 days per week, and one would make two round-trips per day between Haines and Skagway 6 days per week. In 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
BC .....British Columbia
DOT&PF.....Alaska Department of Transportation and Public Facilities
Final EIS .....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
RV .....recreational vehicle
SADT .....summer average daily traffic
SEACC.....Southeast Alaska Conservation Council
SEIS .....supplemental environmental impact statement
SMAC .....Skagway Marine Access Commission
SOLAS.....Safety of Life at Sea
STIP .....Statewide Transportation Improvement Program
TSM .....Transportation System Management
USCG.....U.S. Coast Guard

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1. Introduction

1.1 Purpose

The purpose of this technical report 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 and 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 Section 3.1).
- Identified a preliminary proposal for Alternative 1B that relied on existing AMHS assets to increase frequency and capacity in Lynn Canal (see Section 3.1).
- Shared the preliminary proposal for Alternative 1B with agencies and the public during the 2012 scoping period for the SEIS (see Section 3.1).
- Received and considered scoping comments (see Section 1).
- Refined the preliminary proposal based on scoping comments, changes to the No Action Alternative 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 3.2).
- Evaluated enhancements identified by the plaintiffs and the Court for inclusion in Alternative 1B.
- Evaluated its impacts in the Draft SEIS.
- Shared information and solicited comments from agencies and the public on Alternative 1B during multiple public hearings and through a 45-day Draft SEIS review period.
- Collected and responded to comments pertaining to Alternative 1B in this Final SEIS.
- Refined the alternative based on the Draft SEIS comments and updated the analysis in this report and in this Final SEIS to reflect changes (see Section 4).

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 developed an alternative that would address the Court's directions, 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 (Final EIS) 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 [Final EIS] 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 Final EIS 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 went 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 an SEIS to include an alternative that addresses the Court order. The new alternative, Alternative 1B – Enhanced Service with Existing AHMS Assets, is a Transportation System Management (TSM) 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 AMHS 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 2 years in advance, increasing marketing, and reducing fares.

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

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

3. Alternative 1B – JAI Project Draft SEIS

To comply with the Court's ruling, DOT&PF reviewed the existing AMHS 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.

The overall goal of the development process was to address the purpose and need using these components. Addressing the purpose and need using only existing assets, however, is a challenge because elements of the purpose and need (providing increased capacity, providing travel flexibility, reducing travel time, reducing state costs, and reducing user costs) present conflicting considerations when only existing assets are evaluated. For example, emphasis on increasing capacity (e.g., using a larger vessel or additional vessel(s)) comes with a tradeoff of improving travel time (which could be achieved with a fast vehicle ferry (FVF) with less capacity). Emphasis on reducing user costs while providing greater service comes at the expense of reducing State costs. Balancing these tradeoffs was a critical consideration.

Within the "opportunity and flexibility" for travel element of the purpose and need statement, there are competing interests for the best sailing times, which reflects where vessels are home-ported. For example, many Haines and Skagway residents have stated a preference for early morning departure times so they can maximize their time in Juneau or connect with flights that minimize the need for overnight stays in Juneau. Many Juneau residents, on the other hand, prefer early morning departures from Juneau and evening arrival times back in Juneau to optimize their access to Haines and Skagway (and the connecting road system) while minimizing the need to overnight in Haines or Skagway. Neither of these operating scenarios includes the preferences of travelers in Lynn Canal, whose origin or destination is south of Juneau.

Beyond the purpose and need, there are logistical and mission critical factors that must be considered. As an example, some vessels are SOLAS[3] compliant; some are designed for the wave and weather conditions encountered while crossing the Gulf of Alaska or accessing the Aleutian Islands (among the most treacherous waters anywhere); some vessels were designed for mainline routes and have large car decks, crew quarters, and passenger accommodations for overnight travel, suited for long-distance, multi-day sailings; while others have small car decks and no crew quarters ideal for short shuttle ferry situations. In each of these cases, DOT&PF (and in particular the AMHS Division), has had to evaluate the implications of relocating the asset against the necessity to continue to meet its mission and commitments to other destinations in the system, all while considering the specific design, operating, and regulatory requirements of the available assets. Such considerations include SOLAS-compliant vessels, U.S. Coast Guard

[3] 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.

(USCG) requirements for crew work schedules, and the need for vessels to provide backup for other vessels during routine maintenance (or unscheduled or emergency repairs).

DOT&PF has undertaken this evaluation in an open and inclusive process, taking into account comments from the public and agencies through the previous 2006 EIS process, the court proceedings, the Scoping process for the 2014 Draft SEIS, and the formal comment period on the Draft SEIS. Moreover, relying on existing assets is a moving target. Availability of vessels, programming new vessels and retiring old vessels, and funding availability for operations changes almost yearly and has required modification and reconsideration of Alternative 1B at each stage of its development.

It is important to note that there are nearly infinite combinations of vessels, schedules, routes, and service levels. Plaintiffs and other commenters can always find an alternate combination of vessels, schedules, routes, and service levels they feel should be evaluated. NEPA, however, does not require that every combination of alternatives be evaluated. DOT&PF and FHWA have taken a systematic, hard look at optimizing an alternative using existing AMHS assets to try to meet the purpose and need. They have put forth an alternative that is a good enhancement alternative using existing assets that makes improvements over the No Action Alternative, and fully have analyzed that alternative as part of a reasonable range of alternatives.

The remainder of this section describes the development process for Alternative 1B, the comments received, and the changes made to reflect those comments and the ever-changing situation relative to existing assets.

3.1 Alternative 1B – Version Developed for JAI Project Draft SEIS Scoping (2012)

3.1.1 Overview

Based on the Court order and the appropriate vessel availability, 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 through an analysis of vessel characteristics and system requirements (*M/V Aurora, M/V LeConte, FVF Fairweather, and M/V Malaspina)*. See Appendix CC of the 2014 Draft SEIS). In addition, DOT&PF and FHWA considered the programmed (at that time) 350-foot Alaska Class Ferry (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 improving ferry service in the Lynn Canal corridor without eliminating existing ferry routes or jeopardizing AMHS's overall mission. Based on the planned availability of the newly programmed 350-foot ACF, DOT&PF and FHWA determined that they could keep the *M/V Malaspina* in service to add capacity in Lynn Canal and allow 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 Southeast Alaska such as Gustavus, Hoonah, Angoon, Tenakee, and Pelican. The remaining candidate ferries (the *M/V Malaspina*, *FVF Fairweather*, and the programmed 350-foot ACF) would be 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
The *M/V Malaspina* would be based in Skagway and make daily trips to Auke Bay via Haines. The *FVF Fairweather* would be based in Juneau. Five days per week, the *FVF 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 2 days, the *FVF Fairweather* would provide service between Auke Bay, Angoon, and Sitka, as the *FVF Fairweather* is the only vessel able to provide a direct connection between Angoon and Sitka[4]. The 350-foot ACF would provide one round-trip between Auke Bay and Sitka 6 days per 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 2 days per week.

Winter service
During winter, the *M/V LeConte*, *FVF Fairweather*, or the 350-foot ACF would provide service between Auke Bay and Skagway (via Haines) a minimum of 3 days per week. Mainline service would continue to operate a minimum of 1 day per week.

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

3.1.2 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 Final EIS 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 were from agencies.

DOT&PF and FHWA used scoping comments to refine Alternative 1B. The following comments were received that were 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.

[4] The *M/V LeConte* and the *M/V Aurora* are the only other vessels able to sail to Angoon, but they are not able to complete the Auke Bay-Sitka-Angoon route within a 12-hour operating day.

- This alternative seems okay, but it needs a daily run in the winter, and the Taku should not turn around in Juneau.
- 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 ACFs in order to meet capacity demand in Lynn Canal and provide adequate system-wide service.

3.2 Alternative 1B as Revised and Published in the Draft SEIS (2014)

3.2.1 Overview

Subsequent to the JAI Project Draft SEIS 2012 scoping period, Alternative 1B was 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. 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 ferry[5]).

- In March 2013, litigation regarding recurrent problems with the engines of the *FVF Fairweather* and *FVF Chenega* was resolved[6]. 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 is 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 daily round-trips (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 because there are other vessels that can make one trip per day and there are other routes that need the speed of the FVFs. Extending the operating day beyond 12 hours is not possible without crew quarters[7]. Based on this development, DOT&PF and FHWA determined that their earlier decision to use the *FVF 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 *FVF Fairweather* in Lynn Canal. Many believed that the use of the *FVF 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 the paragraph above, contributed to the removal of the *FVF Fairweather* from Alternative 1B.

As a result of these changes and comments received during scoping, DOT&PF and FHWA modified Alternative 1B and evaluated its impacts in the 2014 Draft SEIS. The following is the alternative as published in the 2014 Draft SEIS:

Alternative 1B would provide an increase in summer capacity and number of sailings in Lynn Canal by using the two Day Boat ACFs in addition to the *M/V Malaspina* (rather than removing the *M/V Malaspina* from summer service in Lynn Canal, as is assumed under the No Action Alternative). Alternative 1B would include a continuation of mainline ferry service in Lynn Canal. Fares would be reduced 20 percent for Day Boat ACF, mainliner, and *M/V Malaspina* trips in Lynn Canal to increase ridership. Hours of operation for the reservation call center would be extended by 4 hours per day (20 hours per week).

[5] 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 under 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.

[6] 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.

[7] 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, and fresh water restocking would require the FVFs to return to home port (or would require capital improvements to other port/docking facilities).

No new roads or ferry terminals in Lynn Canal would be built, and there would be no improvements to existing facilities beyond those already programmed. The programmed improvements include:

- Use of two Day Boat ACFs.
- Programmed improvements to vehicle and passenger staging areas at the Auke Bay and Haines Ferry Terminals.
- Programmed expansion of the Haines Ferry Terminal to include a new double end berth for bow loading/unloading of the Day Boat ACFs.

The ferry routing for Alternative 1B is described below.

Summer: Mainline service would include two round-trips per week. 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 seventh day because the mainliner would be on a similar schedule.

Winter: Mainline Service would include one round-trip per week. One Day Boat ACF would make one round-trip between Auke Bay and Haines three times per week, and one Day Boat ACF would make two round-trips three times per week between Haines and Skagway.

3.2.2 Draft SEIS Comments on Alternative 1B

The comment period for the JAI Project Draft SEIS was from September 18 to November 25, 2014, to obtain input from agencies and the public on the project. A total of 42,214 communications (e.g., web submittals, emails, faxes, and public testimony) were received from State, federal, and local agencies, as well as the public (approximately 41,000 were form letters). Within these communications, more than 2,200 distinct issues, or comments, were identified.

Of these comments, 22 comments (not including form letters) were identified as pertaining to Alternative 1B. Of the communications registering an opinion about alternatives, 130 commenters indicated that they supported Alternative 1B, while 5 commenters indicated they were against Alternative 1B. Some commenters suggested possible changes to Alternative 1B as described in the JAI Project Draft SEIS. The following comments were received during the public comment period on the JAI Project Draft SEIS that were related to Alternative 1B. These comments (and responses), can be found in Appendix JJ of this Final SEIS.

Alternative 1B / Service

- DOT&PF should modify Alternative 1B because deploying the *M/V Malaspina* on the Juneau/Skagway run is not an efficient use of assets (e.g., mainliners have large crews and 24/7 crewing requirements, making them expensive to operate, and they also have more capacity than is needed).
- The *M/V Malaspina* should run between Skagway and Haines daily as a true day boat.

- DOT&PF should modify Alternative 1B to eliminate mainliner connections north of Auke Bay because the new Day Boat ACF vessels are more cost effective.
- DOT&PF should consider whether the ferries could profitably accommodate more cars per day during the summer tourist season than stated for Alternative 1B (i.e., more runs or more ferries).

Alternative 1B / Schedule

- DOT&PF should modify Alternative 1B because the *M/V Malaspina* cannot operate seven days per week; it can only operate six days per week since one day is needed for drills and testing.
- DOT&PF should consider a real/better TSM alternative and/or consider revising Alternative 1B to use the FVF Fairweather on a twice-daily Haines/Juneau route, one Day Boat ACF for the Skagway/Juneau route, and the other (or perhaps a different, more optimal vessel) for the Haines/Skagway route.

Alternative 1B / Alternative Revisions

- DOT&PF should consider the Skagway Marine Access Commission's (SMAC's) proposed optimization of Alternative 1B.

Some commenters indicated potential issues with Alternative 1B and its analysis as published in the JAI Project Draft SEIS:

Alternative 1B / Does not Meet Purpose and Need

- Alternative 1 does not withstand scrutiny in the context of designing marine options that best meet purpose and need while not inflating costs (i.e., reducing fares 20 percent and adding staff for the call center will add costs).

Alternative 1B / Analysis Lacking Information

- Alternative 1B lacks a system-wide analysis of traffic, fares, needs, and capacity that is necessary to optimize the use of the existing ferry system assets.
- Alternative 1B should incorporate the results of the fare study into the analysis.
- Alternative 1B fails to explain why the Taku, Matanuska, and Kennicott are required elsewhere in the AMHS.
- Alternative 1B lacks descriptions of vessels used in Southeast Alaska concerning relative need or demand on the routes each serves.
- Alternative 1B lacks adequate discussion regarding rerouting existing ferries.
- Alternative 1B lacks the rigor needed to explore a reasonable version of Alternative 1B, resulting in almost insignificant differences between the No Action Alternative and Alternative 1B.

Alternative 1B / Fails to Meet the Court Mandate

- Alternative 1B fails the Court's mandate to "rigorously explore an alternative aimed at providing improved and more efficient ferry service."
- Because Alternative 1B was presented to DOT&PF's marine consultant as-is, the State did not look for or evaluate a better option.

- For the State to make a good faith effort to comply with the Court order, it would have had to configure a true TSM alternative.

3.3 Post-DSEIS Changes Affecting Alternative 1B

Since the Draft SEIS was published, AMHS has made several changes that affect Alternative 1B and require reconsideration of the alternative's composition, including the following:

- Due to funding levels, AMHS took the *M/V Taku* out of service and sold the vessel. The *M/V Taku* was the smallest of the AMHS mainliners and was in poor condition.
- AMHS has placed the *FVF Chenega* in long-term layup. The *FVF Chenega* could return to AMHS service if AMHS determines there is a need for it and they have the funding to operate it. Returning the *FVF Chenega* to service from long-term storage would require an up-front refurbishment. Given that the *FVF Chenega* is currently laid up, it could be deployed without decreasing service elsewhere in the AMHS system.
- DOT&PF is currently in the process of replacing the *M/V Tustumena*. The *M/V Tustumena* was built in 1964 and serves the communities of Southcentral, Kodiak Island, and Southwest Alaska. The *M/V Tustumena* is in poor condition and is under-capacity for the Aleutian route. It is one of two ocean-class vessels in the AMHS fleet. Because of its size and design, it is the only AMHS vessel capable of serving all 13 ports of call between Homer and Unalaska. The replacement vessel is designed to meet these needs and has slightly more capacity. The project is in the current Statewide Transportation Improvement Program (STIP), with initial funding programmed for 2018.
- Between 2005 and 2012, AMHS planned to retire the *M/V Malaspina* and replace it with a new ferry (now the Day Boat ACF). AMHS has reconsidered its decision to retire the *M/V Malaspina* and now plans to keep it as part of its fleet, using it during shoulder seasons as a backup vessel but laying it up during summers. It remains an existing asset that could be deployed as part of Alternative 1B during summer.
- AMHS made substantial improvements to their online reservation system, including enhancing their reservation website, to make it easier to use. As a result, Alternative 1B no longer includes additional enhancements to the reservation system.

4. Alternative 1B – JAI Project Final SEIS

Based on the changes that have occurred since the Draft SEIS was published and on the comments that were received on the 2014 Draft SEIS, DOT&PF has updated the analysis and development of Alternative 1B. This section describes the final configuration of Alternative 1B and the updated analysis for this Final SEIS.

4.1 Alternative 1B as Revised and Published in the Final SEIS

Alternative 1B includes all components of Alternative 1 – No Action, but focuses on enhancing service using existing AMHS assets without major initial capital expenditures. Alternative 1B includes the following elements:

- Mainline ferry service in Lynn Canal would continue.
- In addition to the Day Boat ACFs[8], programmed improvements would include improved vehicle and passenger staging areas at the Auke Bay and Haines ferry terminals to optimize traffic flow, as well as expansion of the Haines Ferry Terminal to include a new double bow berth to accommodate the Day Boat ACFs.
- The *M/V Malaspina* would be employed to provide additional summer capacity.
- Enhancements would include a 20 percent reduction in fares for trips in Lynn Canal.

The revised Alternative 1B summer and winter service used in the JAI Project Final 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 7 days per week.
- The *M/V Malaspina* would homeport in Skagway and would make one round-trip to Auke Bay per day; 5 days per week,[9] routing would be Skagway-Auke Bay-Skagway. On the other 2 days, the *M/V Malaspina* would make the loop clockwise (Skagway-Auke Bay-Haines-Skagway) one day and counterclockwise (Skagway-Haines-Auke Bay-Skagway) on a different day[10].

[8] As of August 2017, the ACFs are under construction. The Haines Ferry Terminal construction is expected to be completed in spring 2019.

[9] The Day Boat ACFs cannot reasonably be scheduled to make daily round-trips between Auke Bay and Skagway within a 12-hour timeframe. The USCG limits crew availability due to rest rules, and the Day Boat ACFs are designed for a single crew only with no crew berths. Therefore, the Skagway-Auke Bay run cannot be completed daily using a Day Boat ACF.

[10] Because the Malaspina has crew quarters, it can make the Skagway-Auke Bay run by carrying sufficient crew to run 24 hours per day. Since it carries a sufficient crew, it has the ability to schedule the complete loop run. Operationally, AMHS has the ability to modify this schedule to reflect demand as the service develops. Public comments make the point that Haines/Auke Bay traffic is greater than Skagway/Auke Bay traffic, and, as such, the Alternative 1B Auke Bay to Haines route should have more capacity. Increasing the ACF trips from 6 days to 7 and routing the *M/V Malaspina* through Haines twice per week would provide flexibility in meeting demand. AMHS could run the loop service more days per week if necessary. Operational schedule modifications are typically made on an annual basis.

- 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 6 days a week[11] (as a Haines-Skagway shuttle).
- 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 3 days that the ferry operates from Auke Bay to Haines, the Haines-Skagway shuttle would make two round-trips. On the other 4 days, the Day Boat ACFs would not operate. When each of the Day Boat ACFs is in an annual overhaul, service would 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 in summer (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 is provided on all routes.
- 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.

Figure 4-1 shows the resulting Alternative 1B.

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

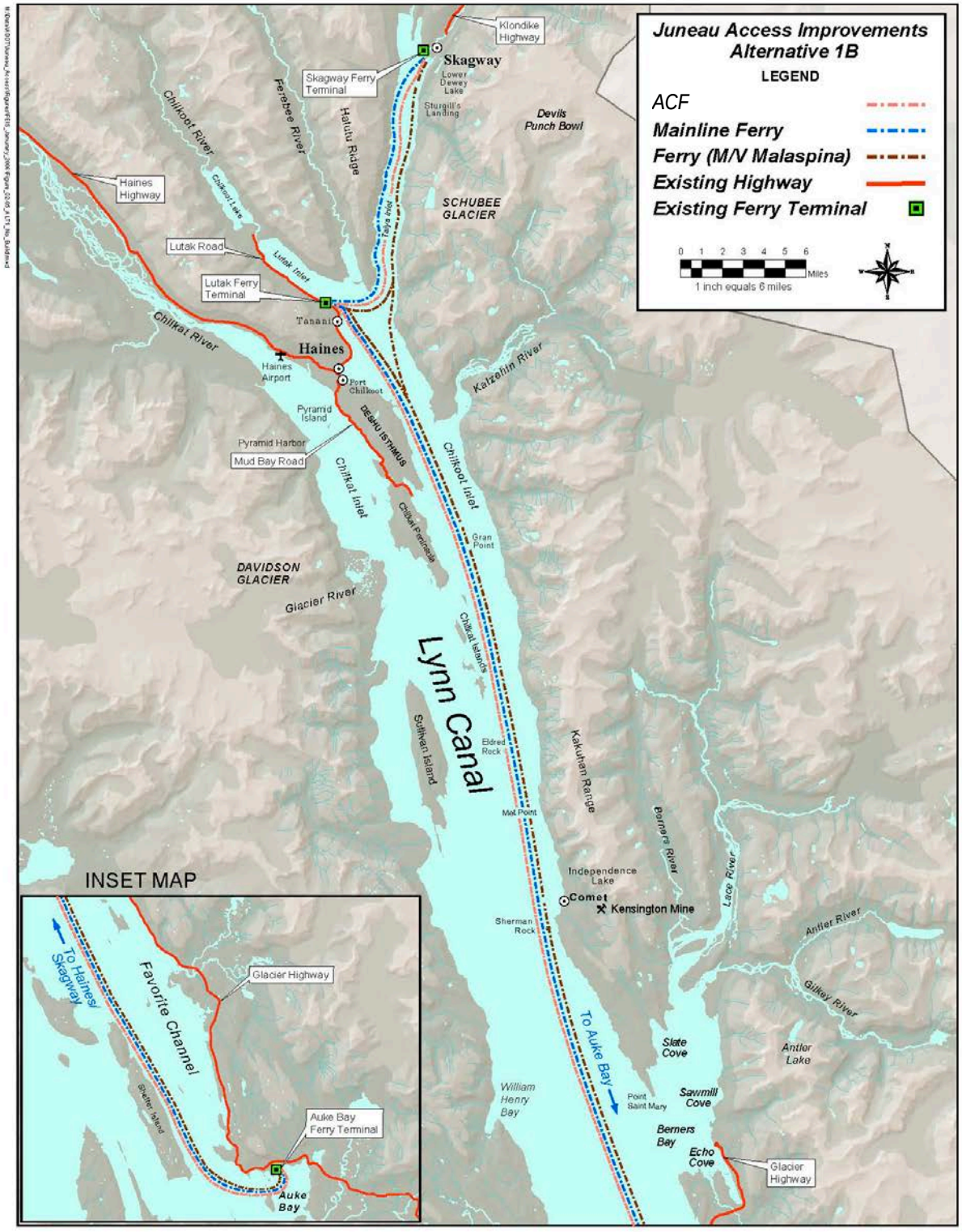


Figure 4-1. Alternative 1B – Enhanced Service with Existing AMHS Assets

4.2 Evaluation of Existing AMHS Assets

Because of the changes to ferry schedules and vessel deployment, DOT&PF has updated the analysis and reevaluated the currently available (and programmed) AMHS assets. This section summarizes that analysis. DOT&PF considered factors such as the vessel's size, the loading configuration relative to 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), and the implications to other communities of reassigning vessels to Lynn Canal relative to AMHS's overall mission. Three levels of screening and evaluation were considered. Level 1 screening was considered a "fatal flaw" screening. Vessels screened out at this level had physical limitations for service in Lynn Canal or were designed specifically for service elsewhere in the system. The second level of screening considered the overall AMHS mission. Vessels necessary for service elsewhere in the system that could not be relocated without jeopardizing the overall AMHS mission were eliminated. Remaining vessels were compared against each other to identify the reasonable vessel fleet-mix available for use in Lynn Canal as part of Alternative 1B.

Mission. **(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, and currently provides regularly scheduled passenger and vehicle service to 33 communities in Alaska, plus Bellingham, Washington, and Prince Rupert, British Columbia (BC). 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 annual funding to supplement system generated revenue), which effectively establishes possible service level. For the purpose of defining Alternative 1B, AMHS will continue to provide service to all served communities at the same or similar frequency as would be provided under Alternative 1 – No Action.

Existing Assets. There are currently 10 vessels in the AMHS fleet, and 3 additional vessels are programmed to be constructed. Table 4-1 provides a summary of the characteristics of each vessel in the AMHS fleet, including those currently programmed to be constructed, that could potentially be used to comprise Alternative 1B.

Table 4-1. AMHS Vessel Characteristics

Vessel	Vessel Class	Year Built	Length (feet)	Pass.	Alaska Standard Vehicle	Crew	Crew Quarters	Staterooms / Berths	Travel Speed (Knots)	Open-Ocean Capable	SOLAS[1] Compliant
M/V Columbia	Mainliner[2]	1974	418	499	133	63	Yes	104/298	17.3	No	No
M/V Kennicott	Mainliner	1998	382	450	78	55	Yes	109 /320	16.8	Yes	Yes
M/V Tustumena[3]	Mainliner	1964	296	160	34	38	Yes	24/60	13.3	Yes	No
M/V Lituya	Shuttle[4]	2004	181	125	15	5	No	0/0	11.5	No	No

Vessel	Vessel Class	Year Built	Length (feet)	Pass.	Alaska Standard Vehicle	Crew	Crew Quarters	Staterooms / Berths	Travel Speed (Knots)	Open-Ocean Capable	SOLAS[1] Compliant
M/V Matanuska	Mainliner	1963	408	450	83	48	Yes	106/243	16.5	No	Yes
M/V Malaspina	Mainliner	1963	408	450	83	47	Yes	72/234	16.5	No	No
FVF Chenega	Shuttle	2005	235	210	31	10	No	0/0	32	No	Yes[5]
FVF Fairweather	Shuttle	2004	235	210	31	10	No	0/0	32	No	Yes[5]
M/V Aurora	Day boat[6]	1977	235	250	33	24	Yes	0/0	14.5	No	No
M/V LeConte	Day boat	1974	235	225	33	24	Yes	0/0	14.5	No	No
Day Boat[7] ACF-1	Day boat	2018	280	300	53	9	No	0/0	16	No	No
Day Boat[7] ACF-2	Day boat	2018	280	300	53	9	No	0/0	16	No	No
M/V Tustumena Replacement Vessel[3]	Mainliner	2017/2019	330	250	54		Yes	/104	15	Yes	No

[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] Mainline vessels are the largest ships in the fleet and typically take more than 1 day to travel between start and end ports that provide road access. These vessels offer all the amenities needed for passengers who may be onboard overnight or for multiple days. http://www.dot.state.ak.us/amhs/fleet.shtml

[3] The *M/V Tustumena* is at the end of its useful life and is programmed to be replaced. A replacement vessel for the *M/V Tustumena* has been designed and construction of the replacement vessel is estimated to be completed in 2021.

[4] Shuttle ferries are a sub-class of the day boat ferries. These vessels provide round-trip service between two or three communities in a day. Passenger services are limited on these ships. http://www.dot.state.ak.us/amhs/fleet.shtml

[5] High-speed vessel code meets SOLAS requirements.

[6] Day boats connect smaller communities with each other and with the mainline vessel routes. Cabins are not available for overnight accommodation. http://www.dot.state.ak.us/amhs/fleet.shtml

[7] The Day Boat ACFs are under construction now, and are expected to be operating in 2018.

Existing Asset Screening

This section provides a brief overview of each ferry and summarizes its potential for use in Lynn Canal as part of Alternative 1B through a three-level screening process.

Level 1 Screening, Fatal Flaws. The first level of screening considers the appropriateness of the vessels to safely and efficiently provide Lynn Canal Service without requiring major up-front capital improvements to either the terminal facilities or the vessels themselves. The following criteria were considered:

- **Dock Adequacy:** The ferry has the ability to load/unload at Auke Bay, Haines, and Skagway without the need for an up-front capital expenditure to the terminal or vessel to allow it to safely dock and load/unload.
- **Ferry Adequacy:** Considers the age and condition of the vessel to safely traverse Lynn Canal without needing a major capital outlay to upgrade the vessel.

- **Design Limitations:** Some ferries are designed for specific routes, taking into considerations such characteristics as capacity, operating speed, draft, SOLAS requirements, and wave conditions.

Table 4-2 provides a summary analysis of each vessel as part of the Level 1 Screening against these criteria to gauge its suitability for service in Lynn Canal. Ferries that do not satisfy these criteria are not suitable.

Table 4-2. AMHS Vessel Analysis (Level 1 Screening)

Vessel	Capable of Docking at Lynn Canal Ports	Ferry Condition Adequate	Designed for Specific AMHS Service Needs with No Reasonable Vessel Substitute?	Screening Result
M/V Columbia	Yes	Yes	No. Designed for mainline service.	Move to Level 2 Screening
M/V Kennicott	Yes	Yes	Yes. Designed for ocean-going mainline service. Only the Kennecott, Tustumena, & Tustumena replacement vessel are ocean-going vessels.	Rejected
M/V Tustumena	Yes	No. AMHS has concluded the vessel condition does not warrant further capital investment.	Yes. Vessel is designed for Aleutian conditions and shallow harbors.	Rejected
M/V Lituya	Yes	Yes	Yes. Designed for shuttle service. Specific size and operating parameters for Metlakatla-Ketchikan Service.	Rejected
M/V Matanuska	Yes	Yes	No. Designed for mainline service.	Move to Level 2 Screening
M/V Malaspina	Yes	Yes	No. Designed for mainline service.	Move to Level 2 Screening
FVF Chenega	Yes	Yes	No. Designed for day boat service.	Move to Level 2 Screening
FVF Fairweather	Yes	Yes	No. Designed for day boat service.	Move to Level 2 Screening
M/V Aurora	Yes	Yes	No. Designed for day boat service.	Move to Level 2 Screening
M/V LeConte	Yes	Yes	No. Designed for day boat service.	Move to Level 2 Screening
Day Boat ACF-1	Yes	Yes	No. Designed for day boat service.	Move to Level 2 Screening
Day Boat ACF-2	Yes	Yes	No. Designed for day boat service.	Move to Level 2 Screening
M/V Tustumena Replacement Vessel	Yes	Yes	Yes. Vessel specifically designed for Aleutian conditions and shallow harbors.	Rejected

The following vessels were rejected for further consideration as part Alternative 1B:

- The ***M/V Kennicott*** was built in 1998. It carries a crew of 55 and has a maximum capacity of 450 passengers, 78 cars, including 17 vans. It has 109 staterooms (320 berths). It has a service speed of 16.8 knots. The *M/V Kennicott* is one of two accredited ocean-going vessels in the AMHS fleet (the other is the *M/V Tustumena*). The run across the Gulf of Alaska 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. For this reason, the *M/V Kennicott* was **not considered reasonable** by FHWA and DOT&PF for use in Alternative 1B in Lynn Canal.

- The motor vessel ***M/V Tustumena*** was built in 1964. It carries a crew of 38 and has a maximum capacity of 160 passengers, 34 vehicles, including 6 vans, and has a service speed of 13.3 knots. This ferry has 24 staterooms (60 berths). The *M/V Tustumena* is one of two ocean-going vessels in the AMHS fleet. In January 2016, cracks were discovered in the vessel. The cracks are a result of the age of the vessel and cumulative fatigue on the steel from wave action over time. Due to its age and the ongoing cost of repairs, the *M/V Tustumena* is now scheduled to be replaced when construction funding for its replacement is available. However, without major capital refurbishment, the *M/V Tustemena* is not suitable to continue long-term service as part of Alternative 1B. For these reasons, the *M/V Tustemena* was **not considered reasonable** by FHWA and DOT&PF use in Alternative 1B in Lynn Canal.

- 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, space for 15 vehicles and 125 passengers, and a service speed of 11.5 knots (the slowest vessel in the AMHS fleet). The use of the *M/V Lituya* was **not considered reasonable** by FHWA and DOT&PF for use in Alternative 1B in Lynn Canal because it was too slow and has insufficient capacity.

- The ***M/V Tustumena* Replacement Vessel** is specifically being designed to provide Homer-Kodiak-Aleutian Island service. This means it will meet specific criteria for this run, including the ability to handle vehicles, heavy construction equipment, and trailers (on an elevator for use at docks that do not have dedicated ferry ramps or other standard loading facilities; serve Southwest Alaska routes and docks with design challenges due to draft limits while maneuvering at low tide and small dock sizes; and sail in unprotected North Pacific waters. Using this ferry to provide service in Lynn Canal would require the elimination of ferry service for the Aleutian chain – a run for which it is being specifically designed. For these reasons, this vessel was not **considered reasonable** by FHWA and DOT&PF for use in Lynn Canal, and therefore the *M/V Tustumena* replacement vessel was not considered further for use in Alternative 1B.

Level 2 Screening. In the Level 2 screening (Table 4-3), DOT&PF considered the remaining vessels and the current mission they are undertaking in the system. Certain vessel characteristics make them critical to providing service links that no other vessels in the system can provide. Alternatives that would relocate vessels from a critical link in the system, and that were thus deemed to jeopardize the AMHS mission, were eliminated from further consideration.

Table 4-3. AMHS Vessel Analysis (Level 2 Screening)

Vessel	AMHS Mission?	Screening Result
M/V Columbia	Mission Jeopardized. Mainliner needed for Bellingham run (*Columbia's* speed and capacity are needed). Other mainliners have less capacity and slower speeds. *Columbia* is well over capacity for what is needed for dedicated Lynn Canal service.	Rejected
M/V Matanuska	Mission Jeopardized. Because of its SOLAS compliance, the *Matanuska* is required for Prince Rupert service. The *Kennecott* is needed for cross-Gulf service. No other SOLAS vessel is available.	Rejected
M/V Malaspina	Because the *Malaspina* is operating only in the shoulder season, it can supply Lynn Canal service in summer to supplement other vessels that are temporarily out for maintenance without jeopardizing AMHS service elsewhere.	Move to Level 3 Screening
Chenega	Because the *Chenega* is laid up in long-term storage, it is available for consideration for use in Alternative 1B without jeopardizing AMHS service elsewhere.	Move to Level 3 Screening
Fairweather	Mission Jeopardized. The FVF's speed is needed for same time of day service to Sitka. Only the *Chenega* or *Fairweather* can provide this service - only one of the two FVFs can move forward to Level 3 screening without cutting this service to Sitka.	Rejected
M/V Aurora	Mission Jeopardized. Either the *Chenega* or *Aurora* is needed for Prince William Sound (PWS) service. Both have adequate capacity. AMHS has determined that the *Aurora* is the more appropriate vessel for PWS Service (it is less expensive to operate and can better handle winter weather).	Rejected
M/V LeConte	Mission Jeopardized. Of the vessels that can make the Pelican, Hoonah, Tenakee, and Gustavus run, the *LeConte* or the *Aurora* is most appropriately sized for the demand. (The *Aurora* could provide this service, but is needed in PWS.) Day Boat ACFs are oversized and cannot service Pelican and Tenakee in time available.	Rejected
Day Boat ACF-1	The Day Boat ACF's priority #1 is Lynn Canal Service.	Move to Level 3 Screening
Day Boat ACF-2	The Day Boat ACF's priority #1 is Lynn Canal Service.	Move to Level 3 Screening

The following existing ferry assets were considered but rejected for additional or dedicated use in Lynn Canal as part of Alternative 1B due to their importance in fulfilling AMHS specific needs:

- The ***M/V Columbia*** was built in 1974 and can transport 133 vehicles and 499 passengers at a service speed of 17.3 knots. With 104 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. Because it is the only ferry large enough and fast enough to provide efficient service on the Bellingham to Skagway route, using the *M/V Columbia* in Lynn Canal only was **not considered reasonable** for additional or dedicated use as part of Alternative 1B in Lynn Canal.

- 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 SOLAS-compliant and the *M/V Malaspina* was not. The *M/V Matanuska* carries 48 crew, 450 passengers, 83 vehicles, including 10 vans, and has 106 staterooms (243 berths). Its service speed is 16.5 knots. Using the *M/V Matanuska* in Lynn Canal would mean

eliminating service on the Prince Rupert route. With the *M/V Taku* sold, the *M/V Matanuska* is even more critical for providing Prince Rupert service. 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 ***FVF Fairweather*** is an FVF that was built in 2004. It carries a crew of 10, and has a maximum capacity of 210 passengers, 31 vehicles, including 3 vans, and a service speed of 32 knots. The *FVF 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 Sergius Narrows, meaning that only the *FVF Fairweather* or the *FVF Chenega* (its sister ship) could provide this same-time-of-day service and is moved to Level 3 Screening. The *FVF Fairweather* is also one of four AMHS ferries (the others being the *FVF Chenega, M/V Aurora,* and the *M/V LeConte*) that are small enough to enter Killisnoo Harbor to provide service to Angoon. However, while other AMHS ferries are capable of sailing between Auke Bay and Sitka, they are not capable of providing same-time-of-day service. Same day service to/from Sitka is provided less than 7 days per week, which leaves the *FVF Fairweather* potentially available for several Lynn Canal weekly sailings. This would be a small increase in capacity and frequency, and would not eliminate the need for another Lynn Canal dedicated vessel. This variation does not warrant standalone analysis. As a result, the *FVF Fairweather* was **not considered reasonable** to provide service in Lynn Canal in Alternative 1B, as it is needed to provide the mission critical link between Auke Bay and Sitka.

- The ***M/V Aurora*** was built in 1977, carries 24 crew, and has a maximum capacity of 250 passengers, 33 vehicles, including 7 vans. It has a service speed of 14.5 knots. The *M/V Aurora* currently provides service in Prince William Sound, but has previously operated in Lynn Canal. Until recent budget cuts, both the *M/V Aurora* and the *FVF Chenega* were operating in Prince William Sound. Because of its high operating costs and operational challenges in winter conditions, the *FVF Chenega* has been laid up for long-term storage, leaving only the *M/V Aurora* to operate in Prince William Sound. As a result of this mission-critical role, the *M/V Aurora* was **deemed unreasonable for further consideration** for use in Alternative 1B.

- The ***M/V LeConte*** was built in 1974. It has a crew capacity of 24 and a maximum capacity of 225 passengers, 33 cars, including 8 vans, and a service speed of 14.5 knots. The *M/V LeConte* is one of two stern-loading ferries (the other is the *M/V Aurora*) that are small enough to provide service to Pelican, Hoonah, and Tenakee Springs, so it does have mission-critical commitments elsewhere in the system. Because the *M/V Aurora* is needed in Prince William Sound, the *M/V LeConte* is critical to serving these communities. The Day Boat ACFs are over capacity for this run serving small communities, and the *M/V LeConte* is under capacity for Lynn Canal service. For these reasons, DOT&PF and FHWA **deemed it unreasonable for further consideration** for providing additional or dedicated service in Lynn Canal in Alternative 1B.

Level 3 Screening. After the Level 1 and Level 2 screenings, the four remaining vessels (Day Boat ACF-1 and ACF-2, the *M/V Malaspina*, and the *FVF Chenega*) were evaluated to identify the final vessel mix for use in Alternative 1B (Table 4-4). These vessels are existing or programmed assets that could provide service in Lynn Canal without cutting into service elsewhere in the system. They have the vessel characteristics necessary to operate in Lynn Canal, and would not require major modification of terminals. These vessels were evaluated and compared against each other with respect to efficiency/travel speed (i.e., vessels need to be able to make a round-trip within 12 hours or must have crew quarters on board to allow adequate crew to travel on the route); consistency with the purpose and need for the project (i.e., capacity, travel time, and cost considerations); and the flexibility to meet other needs within the AMHS mission. Vessels better suited to Lynn Canal conditions, with greater capacity, greater speed, lower operating costs, and more flexibility to meet other AMHS needs (i.e., are able to operate in more conditions or can fill in for a greater number of other vessels) were deemed more appropriate.

Table 4-4. AMHS Vessel Analysis (Level 3 Screening)

Vessel	Efficiency/Travel Speed		Purpose and Need Considerations			Flexibility for other AMHS Mission Needs	Screening Result
	Haines	Skagway	Vehicle Capacity	Operating Speed	Operating Costs		
M/V Malaspina	Can make trip in 12 hours.	Can't make the round-trip in 12 hours with a single crew. Does have crew quarters to make such a trip possible.	Highest Vehicle Capacity (83). Has capacity for peak periods (e.g., peak week or peak days)	16.5 knots		Provides flexibility for off-peak backup service for other runs (has capacity comparable to mainliners and Day Boat ACFs).	Recommended for Use in Alternative 1B
FVF Chenega	Can make trip in less than 12 hours.	Can make trip in less than 12 hours.	Lowest Vehicle Capacity (31). Under capacity to support peak periods.	32 knots. Fastest vessel. Best for travel time.	Is in extended lay-up due to high operating costs. Bringing the vessel in and out of storage for the peak summer season adds costs beyond normal operating costs.	Does not provide flexibility for backing up other runs (in winter and shoulder seasons) due to limited capacity and vessel design limitations.	Rejected
Day Boat ACF-1	Can make trip in less than 12 hours.	Can't make trip in less than 12 hours. Can't carry extra crew[1].	Medium Capacity (53)	Vessel speed not verified.		Consistent with plans. Designed for Lynn Canal. Able to operate on multiple runs in SE.	Recommended for Use in Alternative 1B
Day Boat ACF-2	Can make trip in less than 12 hours.	Can't make trip in less than 12 hours. Can't Carry extra crew[1].	Medium Capacity (53)	Vessel speed not verified.		Consistent with plans. Designed for Lynn Canal. Able to operate on multiple runs in SE.	Recommended for Use in Alternative 1B

[1] The Skagway-Auke Bay-Skagway route requires a 12.3-hour crew day, even with the night crew completing vessel startup and shutdown. The Day Boat ACF is designed for a single crew only, with no berths. Regulations dictate that a typical sailing schedule be completed in 12 hours, that crew members have 70 hours of rest within a 7-day period, and that the crew cannot be scheduled to work more than 12 hours in a 24-hour work day. Therefore, this route cannot be completed daily using a Day Boat ACF and the existing AMHS terminals.

SE = Southeast.

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

- The ***FVF Chenega*** is an FVF built in 2005. It carries 10 crew, 210 passengers, 31 vehicles, including 3 vans, and a service speed of 32 knots. The *FVF 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. It has the lowest capacity and offers the least flexibility for use during off-peak seasons. In particular, during winter, when other vessels are in for routine maintenance, the *FVF Chenega* offers the least amount of flexibility for supporting these other runs because it has limited capacity, has no crew quarters, and does not have the staterooms or berths needed to fill in for mainline vessels. As a result of reduced budgets for ferry operations, the *FVF Chenega* is in indefinite layup status. It is not reasonable to activate the vessel for summer service only and to continue operating/maintaining the *M/V Malaspina* for winter service. For these reasons, DOT&PF and FHWA **deemed *FVF Chenega* unreasonable for further consideration** for providing additional or dedicated service in Lynn Canal in Alternative 1B.

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

- The ***M/V Malaspina*** was built in 1963. It carries 47 crew, 450 passengers, 83 vehicles, including 10 vans, and has a service speed of at 16.5 knots. It has 72 staterooms (234 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. Because of its size, it does have the advantage over the *FVF Chenega* of offering greater capacity for peak times. The Skagway/Auke Bay/Skagway direct service requires a FVF or a vessel with crew quarters. An advantage of including a vessel with crew quarters is that it provides the flexibility of including service to Haines as demand warrants. In addition, it has greater flexibility to fill in for other vessels during winter conditions and has the size and facilities to meet the needs of mainliner vessels. Because the *M/V Malaspina* 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.

- As part of its routine operational planning, AMHS identified and requested funding for replacement vessels with new vessel design, intended primarily for use in Lynn Canal. These ferries are denoted as ACF vessels. State funds for design and construction of two ACF vessels have been approved by the State Legislature and, as of August 2017, are under construction. These ferries will have a capacity of 300 passengers and 53 vehicles, and will carry nine crew. There will not be overnight accommodations for their crews. These programmed assets were considered during 2014 Draft SEIS to be available as an "existing asset" for use in Alternative 1B because the funds had already been committed and programmed[12], regardless of the outcome of the JAI Project. For these reasons,

[12] 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 3.1.

DOT&PF and FHWA **deemed Day Boat ACFs reasonable for further consideration** for dedicated service in Lynn Canal in Alternative 1B.

Based on the analysis above, DOT&PF and FHWA advanced the two Day Boat ACFs and the *M/V Malaspina* as the vessels to use in Alternative 1B.

4.3 Management 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 Final EIS, wherein the plaintiffs described a "Better Ferry Service" alternative (SEACC, Alaska Transportation Priorities Project, et al.). The plaintiffs' "Better Ferry Service" alternative requested consideration of the following management changes:

- Increasing staff at the ferry terminals to ease delay;
- Instituting reservation enhancements, including:
    1. Expanding the hours of call center operation to increase the ease of reserving space on the ferry system;
    2. Upgrading the reservation website and schedule to make both more user-friendly;
- Producing and maintaining a reliable schedule 2 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.

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

4.3.1 Increased Staff at Terminals

It was suggested that adding staff members at terminals would increase the efficiency of loading and unloading for the ferries, thereby reducing the overall trip time. AMHS management and operations examined the shoreside operations at Haines, Skagway, and Auke Bay to determine whether additional staff would result in measurable benefits to overall travel time in the corridor.

One way to improve shoreside operations and loading efficiencies would be to provide separation between pedestrians and vehicles to allow simultaneous loading and unloading. There are two areas of conflict where separation might improve loading efficiency: (1) the car deck and (2) the loading ramp. In the first case, there is no way to safely provide separation on the car deck. Pedestrian movement conflicts with vehicle movement. As they are currently configured on existing vessels, there is no means to provide unimpeded pedestrian and vehicle simultaneous movements because the stairs and elevator are in the middle of vessel, and pedestrians have to cross vehicle traffic. In the second case, given the narrow ramps, the only way to ensure safe separation would be to construct ferry terminal improvements such as a pedestrian cage similar to the FVF ramp at Auke Bay, which was ruled out because of its capital cost and is not warranted because of the on-deck problems. In either case, additional manpower will not facilitate safe simultaneous movement of pedestrians and vehicles.

There are currently enough staff members to direct and assist with the loading process. Typically, the vessel crew facilitates vessel loading (sometimes assisted by terminal staff). Adding either vessel crew or terminal staff to assist in loading would result in having staff with no other need or function except to assist with loading. Adding such staff would increase cost, but with no discernable benefit in loading time, because load times are a primary function of vehicle speed and driver skill, not of available crew giving directions.

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, with side stairs and elevator, which improves loading and unloading time and reduces the need for additional staff.

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 cars on the vessel will get off at the same place. This not only reduces the loading and unloading time, it reduces staffing needs. In Alternative 1B, one of the Day Boat ACFs would provide point-to-point service from Auke Bay to Haines, and the *M/V Malaspina* would provide point-to-point service from Auke Bay to Skagway 5 days per week. As a result, the check-in time needed would be reduced from 2 hours (required today) to 1 hour under Alternative 1B. This benefit would also be realized under the No Action Alternative, but only for the Auke Bay-Haines route, as there is no 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, and therefore is not reasonable to be incorporated as a component of Alternative 1B.**

4.3.2 Reservation Enhancements

For the 2014 Draft SEIS, DOT&PF examined the AMHS reservation system and determined that additional staffing and longer hours would do little to improve ridership, but would improve customer service. As a result of the analysis, DOT&PF included reservation system improvements as part of Alternative 1B, which included longer hours and additional staff. Since the Draft SEIS was published, AMHS replaced the 15-year-old reservation system with a new automated system and enhanced their reservation website to make it easier to use.

[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.

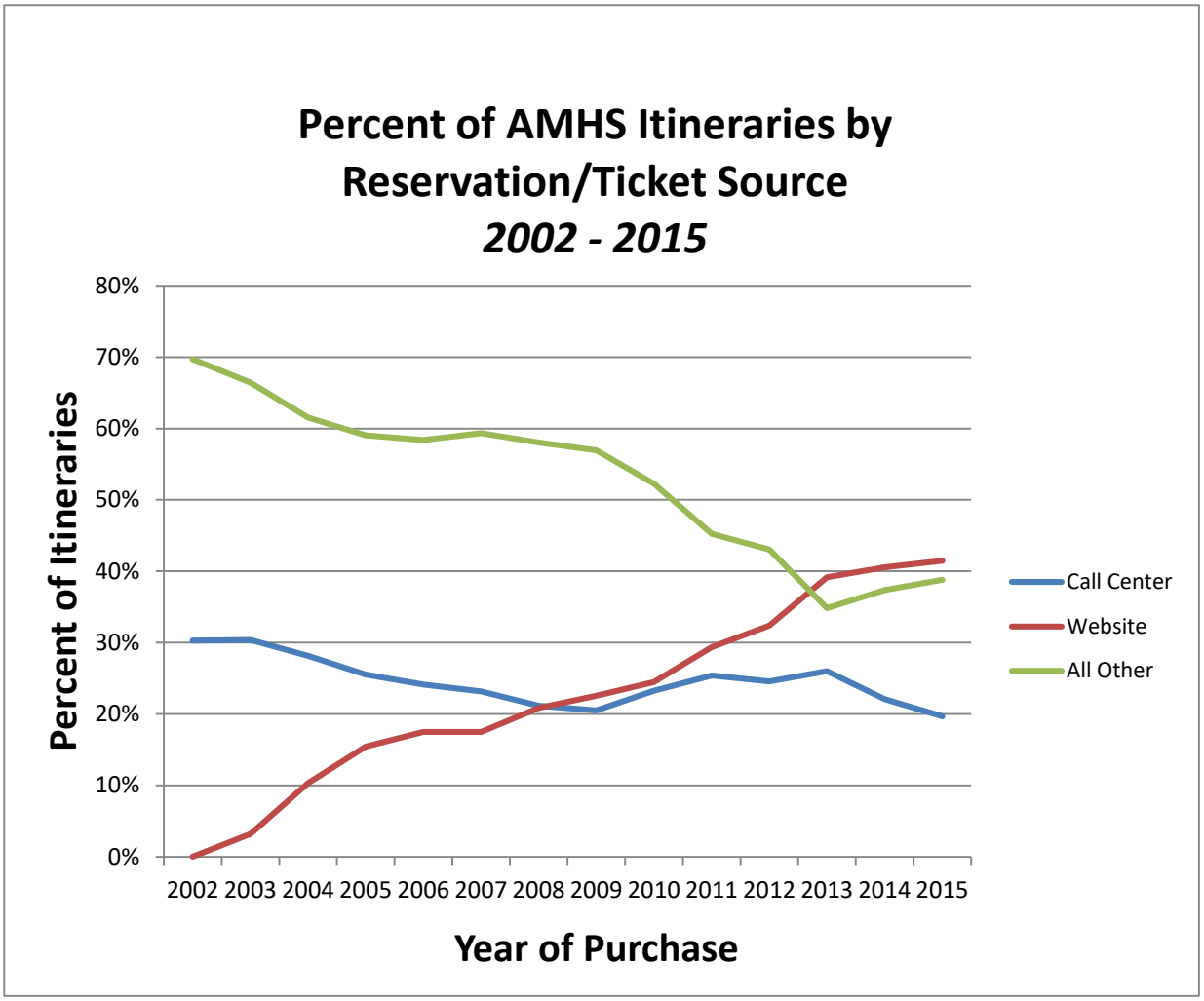
The AMHS reservation call center is open Monday through Friday from 7:00 a.m. to 5:00 p.m. In fiscal year 2009, the call center had 24 full-time positions: 22 were in Juneau, and 2 were in Ketchikan. In 2012, the call center had 21 positions. In 2015, the call center had 19 positions.

Figure 4-2 depicts the percentage of itineraries initiated through the call center, the website, and other venues (e.g., walk-ins). An "itinerary" is a trip reservation or booking. Each itinerary includes 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 that a vehicle space is reserved (AMHS 2012 (Leary, personal communication 2012a) and AMHS 2015 (Call-Bookings Count for JCO 2015)).

Current trends indicate that use of the reservation call center and other reservation venues has been decreasing, as compared to website bookings. The AMHS reservation website was put into service in 2002. As shown on Figure 4-2, the percentage of bookings made online continues to increase. In fact, reservations booked using the AMHS website overtook the percentage booked through the call center in 2008, and overtook the percentage booked through all other means in 2013[14]. Website bookings have steadily increased, while call center and other bookings have declined.

[14] Because of the growing importance of online reservations, AMHS retooled its reservation website to make it more user-friendly and launched the new reservation website in May 2016.

Figure 4-2. Percentage of AMHS Itineraries by Reservation/Ticket Source 2002–2015



Source: AMHS 2012 (Leary, personal communication 2012a) and AMHS 2015 (Call-Bookings Count for JCO 2015)

Table 4-5 presents information about the number of telephone calls coming into the AMHS Call Center in Juneau for fiscal years 2011, 2012, and 2015. As can be seen from Table 4-5, 9,193 calls were abandoned in 2011, 7,205 were abandoned in 2012, and 6,688 were abandoned in 2015 (approximately 7 to 8 percent of all calls presented).

Table 4-5. Fiscal Years (FY) 2011, 2012, and 2015 Juneau Call Center Log

Month	Calls Presented			Calls Answered			Average Hold Time in Seconds			Calls Abandoned		
	2011	2012	2015	2011	2012	2015	2011	2012	2015	2011	2012	2015
Totals	114,121	99,467	97,536	104,926	92,262	90,234	76	71	82	9,193	7,205	6,688

Source: AMHS 2012 (Leary, personal communication 2012a) and AMHS 2015 (Call-Bookings Count for JCO 2015)

A review of the call center logs also indicates that 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 advise 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 per week from May through August. Based on a review of the incoming call times, AMHS found that being open 7 days per 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 the current schedule of Monday through Friday from 7:00 a.m. to 5:00 p.m. AMHS staff also indicated that the call center had previously been open during the evening, but that call center activity was very light during that time, so the decision was made 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.

The number of calls the reservation call center is receiving is declining, due in part to the increased usage of AMHS's enhanced reservation website. With declining call center usage, extending the call center hours of operation would do little to increase ridership or improve customer service; however, it would increase the cost of AMHS operations. As a result, DOT&PF has determined that **extending the call center hours for improved customer service is no longer considered reasonable for inclusion in Alternative 1B**.

4.3.3 Two-Year Schedule

Plaintiffs and others have indicated that having a set schedule would improve reliability and have a positive effect on ridership. Plaintiffs suggested that setting a 2-year schedule should be considered. DOT&PF agrees that setting a 2-year schedule may have a positive effect on tourist ridership, but not on resident ridership. Issues for residents are capacity, availability, and cost. AMHS has been striving to maintain a stable summer schedule in Lynn Canal and other service areas; however, the schedule is subject to available funding levels, which are set by the State Legislature. The availability of funding is both political and subject to forces beyond DOT&PF's control (e.g., the price of oil). Additionally, the yearly schedule is subject to the availability of vessels used in the Southeast part of the system, three of which are over 50 years old. Such funding volatility and vessel availability are evidenced in more recent schedule fluctuations. The schedules for 2015 and 2016 had substantial changes due to the fact that some maintenance activities on older vessels took longer than anticipated and because AMHS did not receive sufficient revenue and Legislative funding to maintain the previous levels of service. While DOT&PF can set a 2-year schedule in Lynn Canal, that schedule must have the flexibility to change with reduced funding levels and/or vessel availability. Lynn Canal cannot maintain a fixed schedule to the detriment of the rest of the system. **As a result, DOT&PF cannot commit to a 2-year fixed schedule.**

4.3.4 Fare Reductions

Plaintiffs suggested that reducing prices would have a beneficial effect 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 of a good or service demanded 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:

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 the 2014 Draft SEIS effort, DOT&PF commissioned a new analysis of fare elasticity in Lynn Canal (Draft SEIS, 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, recreational vehicles (RVs), and container vans. The calculated elasticities are reported in Table 4-6.

Table 4-6. 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. 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 does not generally hold for passengers or for 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. 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 (0.17 per day) for a 10 percent price reduction, and 122 RVs per year (0.33 per day) for a 20 percent price reduction. For container van trips, the increase would have been 61 vans per year (0.17 per day) for a 10 percent price reduction, and 122 vans per year (0.33 per day) for a 20 percent price reduction.

In the travel forecasting completed for the JAI Project, Fehr & 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 & 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 4-7 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

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

have been rounded to the nearest five trips; however, the percent change and elasticity were calculated using unrounded volumes and rounded to two significant digits.

Table 4-7. 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.

The results from the ridership forecasting model show that each 10 percent reduction in fares would result in approximately 15 additional vehicles during an average summer day in 2055 (the JAI Project Final 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 percent 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 in which drivers rode for free during summer and another in which winter prices were reduced by 30 percent. 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. Given this reasoning, DOT&PF determined that no more than **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**.

[16] Fares for mainline service were unchanged.

4.3.5 Increased 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 airlines and cruise ships, is not. The limited level of marketing in which AMHS engages 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. For these reasons, **increasing marketing on the Lynn Canal Route as part of Alternative 1B as an enticement for people to use it was not considered reasonable**.

4.4 Frequency, Capacity, and Travel Time

Alternative 1B, with the inclusion of the components described in this report, increases vessel frequency and capacity, and reduces travel time using existing AMHS assets. During summer, when demand is highest, Alternative 1B would increase the number of sailings between Auke Bay and Haines with two additional round-trip sailings more than is 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. Additionally, it provides direct sailings from Auke Bay to Skagway that are not provided for in the No Action Alternative. In winter, when demand is low, no additional sailings are proposed.

During summer, Alternative 1B would provide capacity for an additional 140 vehicles per day between Auke Bay and Skagway compared to the No Action Alternative. The capacity between Auke Bay and Haines would increase by 36 vehicles per day.

Table 4-8 presents the anticipated travel times for Alternatives 1 and 1B. Direct travel to and from Auke Bay to Haines would be provided by the mainline vessels or the new Day Boat ACF under both Alternatives 1 and 1B, and thus the travel times are the same for both alternatives. The shortest travel time for the No Action Alternative between Auke Bay and Skagway is 8.1 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, could be made under Alternative 1B; however, because the *M/V Malaspina* would make a direct run between Auke Bay and Skagway, the shortest Auke Bay-Skagway travel time is 6.8 hours (1.3 hours faster than in the No Action Alternative).

Table 4-8. Travel Times (hours)

Route	Alternative 1	Alternative 1B
Auke Bay-Haines	6.2	6.2
Auke Bay-Skagway	8.1	6.8

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

Based on Alternative 1B as described, 2055 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 4-9. In summer, compared to the No Action Alternative, Alternative 1B would increase the direct sailings between Auke Bay and Skagway from 0 to 6 and between Auke Bay and Haines 8 to 10. During winter, Alternatives 1 and 1B would have the same schedule, and thus would have the same anticipated demand.

Table 4-9. Traffic Forecast for 2055, Alternatives 1 and 1B

Alternative	Annual Average Daily Traffic	Summer Average Daily Traffic	Winter Average Daily Traffic
1	80	125	50
1B	135	210	50
Difference	+55	+85	-

Calculated by Fehr & Peers, 2016.

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APPENDIX A

FARE ELASTICITY

Estimated Ferry Travel on Internal Lynn Canal Links with Price Reductions; Northern Economics, Inc., September 30, 2013

Draft JAI Alternative 1B Fare Sensitivity Analysis; Fehr & Peers, October 2, 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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Northern Economics

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

			With 10% Fare Decrease		With 20% Fare Decrease	
Port Pairs	Passengers in 2011	Fare Elasticity Estimate	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.
- $\text{lnrealtariff\_passage}_{ijk}$: 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 $\text{lnrealtariff\_passage}_{ijk}$ 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
_lcym_2	-0.0013	0.0479	-0.03	0.979	-0.0952	0.0927
_lcym_3	0.2476	0.0480	5.15	0.000	0.1534	0.3417
_lcym_4	0.2500	0.0480	5.21	0.000	0.1559	0.3442
_lcym_5	0.4727	0.0489	9.67	0.000	0.3768	0.5685
_lcym_6	0.7689	0.0518	14.85	0.000	0.6674	0.8704
_lcym_7	1.0126	0.0529	19.13	0.000	0.9088	1.1163
_lcym_8	0.9135	0.0522	17.51	0.000	0.8113	1.0158
_lcym_9	0.5813	0.0508	11.45	0.000	0.4818	0.6808
_lcym_10	0.3039	0.0473	6.43	0.000	0.2112	0.3965
_lcym_11	0.1573	0.0466	3.38	0.001	0.0661	0.2485
_lcym_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

[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.

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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.

[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