Juneau Access Improvements Project
Draft Supplemental Environmental Impact Statement

Appendix AA
Traffic Forecast Report

Prepared for:

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Executive Summary

The purpose of this study was to predict traffic on each of eight Juneau Access Improvement alternatives. This study was prepared in support of the Juneau Access Supplemental Environmental Impact Statement (SEIS). Alternatives evaluated included the following:

- Alternative 1 – No Action
- Alternative 1B – Enhanced Service with Existing AMHS Assets
- Alternative 2B – East Lynn Canal Highway to Katzehin, with Shuttle Service to Haines and Skagway
- Alternative 3 – West Lynn Canal Highway, with Shuttle Service from Sawmill Cove to William Henry Bay
- Alternative 4A – Fast Vehicle Ferry (FVF) Shuttle Service from Auke Bay
- Alternative 4B – FVF Shuttle Service from Sawmill Cove
- Alternative 4C – Conventional Monohull Shuttle Service from Auke Bay
- Alternative 4D – Conventional Monohull Shuttle Service from Sawmill Cove

All marine alternatives (4A, 4B, 4C, and 4D) include continued mainline service to Haines and Skagway and shuttle ferry service between Haines and Skagway. The forecast includes two horizon years: 2020, which is the first year the alternative is expected to be in place, and 2050, which is the thirtieth year the alternative would be in place.

Annual average daily traffic[1] (AADT), summer average daily traffic (SADT), winter average daily traffic (WADT) and peak week average daily traffic (PWADT) for each alternative for 2020 and 2050 are summarized in **Table ES-1**. Since growth rates are forecast to remain essentially flat, the traffic volumes in 2050 are similar to the 2020 volumes.

Table ES-1: Juneau Access Improvement Traffic Forecast by Alternative for 2020 and 2050

	2020				2050			
Alternative	**AADT**	**SADT**	**WADT**	**PWADT**	**AADT**	**SADT**	**WADT**	**PWADT**
1	90	140	50	325	90	140	50	325
1B	115	190	50	440	115	185	50	440
2B	835	1,345	460	3,160	825	1,335	460	3,135
3	655	1,060	365	2,490	650	1,055	365	2,480
4A	165	270	90	635	165	265	90	630
4B	265	430	90	1,010	265	425	90	1,000
4C	100	170	55	385	100	165	55	385
4D	245	400	55	945	245	400	55	935

Calculated by Fehr & Peers, 2013

Alternative 2B is expected to generate the highest level of traffic, since it provides the fewest constraints on travel. In 2020, Alternative 2B AADT is forecast to be 835 vehicles per day. This is a measure of total traffic in both directions. Summer traffic is forecast to average 1,345

[1] Traffic forecasts represent the average number of vehicles travelling both directions each day during the year.

vehicles per day in 2020. Alternative 3 is forecast to generate the second highest traffic volumes among the alternatives with 655 vehicles on an average day and 1,060 on a summer day.

Among the marine options, the Sawmill Cove alternatives (4B and 4D) are projected to result in more traffic than their Auke Bay counterparts (4A and 4C). The FVF alternatives (4A and 4B) are projected to result in more traffic than their monohull counterparts (4C and 4D). Alternative 4B has the highest marine alternative trip generation with AADT of 265 vehicles and 430 vehicles daily during the summer in 2020.

Alternative 1B is projected to have AADT of 110 vehicles and 285 vehicles daily during the summer. These forecasts are slightly higher than those for the No Action Alternative but lower than the other marine alternatives except for Alternative 4C.

Traffic estimates presented in Table ES-1 represent traffic moving between Juneau and northern Lynn Canal (Haines, Skagway, and points north). The estimates do not include recreational, commercial or other traffic traveling along only a portion of the highway. For example, south of Berners Bay, traffic levels will be higher as a result of local traffic originating in Juneau and traveling to Echo Cove and Berners Bay.[2] Similarly, highway traffic would be higher nearer to Haines and Skagway as a result of local traffic.

Table ES-2 shows the distribution of non-local Lynn Canal traffic between Juneau and Haines/Skagway. Each alternative shows Haines attracting a higher share of travel from Juneau, due to the shorter distance and cost. These forecasts only include traffic between Haines-Juneau and Skagway-Juneau. They do not include traffic originating in Haines with a final destination of Skagway or vice versa. This information is in a separate report[3] by the McDowell Group.

Table ES-2: Distribution of Lynn Canal Traffic between Juneau and Haines/Skagway by JAI Alternative for 2020

Alternative	2020 AADT	Haines AADT	Skagway AADT	Haines Share	Skagway Share
1 – No Action	90	55	35	61%	39%
1B – Enhanced Service	115	60	55	52%	8%
2B – East Lynn Canal Highway	835	455	380	54%	46%
3 – West Lynn Canal Highway	655	420	235	64%	36%
4A – FVF Service from Auke Bay	165	90	75	55%	45%
4B – FVF Service from Sawmill Cove	265	145	120	55%	45%
4C – Monohull Service from Auke Bay	100	55	45	55%	45%
4D – Monohull Service from Sawmill Cove	245	135	110	55%	45%

Calculated by Fehr & Peers, 2013. Note: AADT values have been rounded to the nearest five from the model results reported in Appendix D. The percentages were calculated from the rounded AADTs shown in this table.

[2] The traffic volume forecasts at Berner's Bay are discussed in Appendix E.
[3] McDowell Group, *Juneau Access Haines/Skagway Traffic Forecast,* November 2012

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List of Acronyms

AADT ....Annual Average Daily Traffic
ACF..Alaska Class Ferry
ADOT&PF.............................Alaska Department of Transportation and Public Facilities
AHTS.....................................Anchorage Household Travel Survey
AMHS....................................Alaska Marine Highway System
EIS..Environmental Impact Statement
FEIS ....Final Environmental Impact Statement
FHWA....................................Federal Highway Administration
FVF ....Fast Vehicle Ferry
JAI..Juneau Access Improvements
NEPA ....National Environmental Policy Act
NHS..National Highway System
NHTS ....National Household Travel Survey
SADT ....Summer Average Daily Traffic
WADT....................................Winter Average Daily Traffic

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1. Introduction

1.1 Purpose

The purpose of this study is to forecast traffic volumes under each of eight Juneau Access Improvement (JAI) alternatives. This study updates the work completed in the October 2004 Traffic Forecast Report for the 2006 Final Environmental Impact Statement (EIS). The traffic volumes developed in this study provide basic data for the socioeconomic, noise, land use, cost/benefit, and other elements of the EIS.

1.2 Contents

Chapter 1 provides an overview of the JAI alternatives. Chapter 2 explains the methodology used to forecast traffic demand. Chapter 3 summarizes the existing travel patterns and volumes in North Lynn Canal. Chapter 4 presents the travel demand forecasts for each alternative if they were in place in 2011. Future year demand is described in Chapter 5. That chapter also discusses ferry link volumes along and a discussion of how these forecasts differ from those presented in the October 2004 Traffic Forecast Report. A bibliography and appendices are also included.

1.3 Juneau Access Improvement Alternatives

This study predicts traffic volumes for eight JAI alternatives. The alternatives are summarized below.

Alternative 1 – No Action. The No Action Alternative (Alternative 1) includes a continuation of mainline ferry service in Lynn Canal and incorporates two Day Boat Alaska Class Ferries (ACF). The Alaska Marine Highway System (AMHS) would continue to be the (National Highway System) NHS route from Juneau to Haines and Skagway, and no new roads or ferry terminals would be built. In addition to the Day Boat ACFs, programmed improvements 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. This alternative is based on the most likely AMHS operations in the absence of any capital improvements specific to the Juneau Access Improvements (JAI) Project.

Mainline service would include two round trips per week in the summer and one per week in the winter with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. During the summer, one Day Boat ACF would make one round trip between Auke Bay and Haines six days per week, and one would make two round-trips per day between Haines and Skagway six days per week. The Day Boat ACFs would not sail on the seventh day because the mainline is on a similar schedule. In the winter, ferry service in Lynn Canal would be provided primarily by the Day Boat ACFs three times per week. The *M/V Malaspina* would no longer operate as a summer day boat in Lynn Canal.

Alternative 1B – Enhanced Service with Existing AMHS Assets. Alternative 1B includes all of the 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: a continuation of mainline ferry service in Lynn Canal; the AMHS would continue to be the NHS route from Juneau to Haines and Skagway; no new roads or ferry terminals would be built; and in addition to the Day Boat ACFs, programmed improvements include improved vehicle and passenger staging areas at the Auke Bay and Haines ferry terminals to optimize traffic flow on and off the Day Boat ACFs as well as expansion of the Haines Ferry Terminal to include a new double bow berth to accommodate the Day Boat ACFs. Service to other communities would remain the same as the No Action Alternative. Alternative 1B keeps the *M/V Malaspina* in service after the second Day Boat ACF is brought online to provide additional capacity in Lynn Canal. Enhanced services included as part of Alternative 1B are a 20 percent reduction in fares for trips in Lynn Canal and extended hours of operations for the reservation call center.

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

Alternative 2B – East Lynn Canal Highway to Katzehin, Shuttles to Haines and Skagway. Alternative 2B would construct the East Lynn Canal Highway (50.8-miles including 47.9 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove around Berners Bay to a new ferry terminal two miles north of the Katzehin River. Ferry service would connect Katzehin to Haines and Skagway. In addition, this alternative includes modifications to the Skagway Ferry Terminal to include a new end berth and construction of a new conventional monohull ferry to operate between Haines and Skagway. Mainline ferry service would end at Auke Bay. This alternative assumes the following improvements will have been made independent of the JAI Project before Alternative 2B would come on-line: two Day Boat ACFs, improved vehicle and passenger staging areas at the Haines Ferry Terminal to optimize traffic flow on and off the Day Boat ACFs, and expansion of the Haines Ferry Terminal to include two new double bow berths.

During the summer months, one Day Boat ACF would make eight round-trips per day between Haines and Katzehin, a second Day Boat ACF would make six round-trips per day between Skagway and Katzehin, and the Haines-Skagway shuttle ferry would make two trips per day. During the winter, one Day Boat ACF would make six round-trips per day between Haines and Katzehin, and a second Day Boat ACF would make four round-trips per day between Skagway and Katzehin. The Haines-Skagway shuttle would not operate; travelers going between Haines and Skagway would travel to Katzehin and transfer ferries.

Alternative 3 – West Lynn Canal Highway. Alternative 3 would upgrade/extend the Glacier Highway (5.2 miles including 2.3 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove to Sawmill Cove in Berners Bay. New ferry terminals would be constructed at Sawmill Cove in Berners Bay and at William Henry Bay on the west shore of Lynn Canal, and the Skagway Ferry Terminal would be modified to include a new end berth. A new 38.9-mile highway would be constructed from the William Henry Bay Ferry Terminal to Haines with a bridge across the Chilkat River/Inlet connecting into Mud Bay Road. A new conventional monohull ferry would be constructed and would operate between Haines and Skagway. Mainline ferry service would end at Auke Bay. This alternative assumes the following improvements will have been made independent of the JAI Project before Alternative 3 would come on-line: two Day Boat ACFs, improved vehicle and passenger staging areas at the Haines Ferry Terminal to optimize traffic flow on and off the Day Boat ACFs, and expansion of the Haines Ferry Terminal to include two new double bow berths.

During the summer, two Day Boat ACFs would make six round-trips per day between Sawmill Cove and William Henry Bay (total of 12 trips each direction), and the Haines-Skagway shuttle ferry would make six round-trips per day. During the winter, one Day Boat ACF would make four round-trips per day between Sawmill Cove and William Henry Bay, and the Haines-Skagway shuttle ferry would make four round-trips per day.

Alternatives 4A through 4D – Marine Alternatives. All four marine alternatives would include continued mainline ferry service in Lynn Canal with a minimum of two trips per week in the summer and one per week in the winter with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. Each marine alternative includes a new conventional monohull shuttle that would make two round-trips per day between Haines and Skagway six days a week in the summer and a minimum of three round-trips per week between Haines and Skagway in the winter. The AMHS would continue to be the NHS route from Juneau to Haines and Skagway. These alternatives assume the following improvements will have been made independent of the JAI Project before the alternative comes on-line: 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 expansion of the Haines Ferry Terminal to include new double bow berths.

Alternative 4A – Fast Vehicle Ferry Service from Auke Bay. Alternative 4A would construct two new fast vehicle ferries (FVF). No new roads would be built for this alternative, and the Auke Bay Ferry Terminal would be expanded to include a new double stern berth. A new conventional monohull ferry would be constructed and would operate between Haines and Skagway. The *M/V Malaspina* would no longer operate as a summer day boat in Lynn Canal, and the Day Boat ACFs would no longer operate in Lynn Canal. The FVFs would make two round-trips between Auke Bay and Haines and two round-trips between Auke Bay and Skagway per day in the summer. During the winter, one FVF would make one round-trip between Auke Bay and Haines and one round-trip between Auke Bay and Skagway each day.

Alternative 4B – Fast Vehicle Ferry Service from Berners Bay. Similar to Alternative 4A, Alternative 4B would construct two new FVFs. This alternative would upgrade/extend Glacier Highway (5.2 miles including 2.3 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove to Sawmill Cove in Berners Bay where a new ferry terminal would be constructed. The Auke Bay Ferry Terminal would be expanded to include a new double stern berth. A new conventional monohull ferry would be constructed and would operate between Haines and Skagway. The *M/V Malaspina* would no longer operate as a summer day boat in Lynn Canal, and the Day Boat ACFs would no longer operate in Lynn Canal. In the summer, the FVFs would make two round-trips between Sawmill Cove and Haines and two round-trips between Sawmill Cove and Skagway per day. During the winter, one FVF would make one round-trip between Auke Bay and Haines and one round-trip between Auke Bay and Skagway each day.

Alternative 4C – Conventional Monohull Service from Auke Bay. Alternative 4C would use Day Boat ACFs to provide additional ferry service in Lynn Canal. No new roads would be built for this alternative. The Auke Bay Ferry Terminal would be expanded to include a new double stern berth, and the Skagway Ferry Terminal would be expanded to include a new end berth. A new conventional monohull ferry would be constructed and would operate between Haines and Skagway. In the summer, one Day Boat ACF would make one round-trip per day between Auke Bay and Haines, and one Day Boat ACF would make one round-trip per day between Auke Bay and Skagway. During the winter, one Day Boat ACF would alternate between a round-trip to Haines one day and a round-trip to Skagway the next day.

Alternative 4D – Conventional Monohull Service from Berners Bay. Alternative 4D would use Day Boat ACFs to provide additional ferry service in Lynn Canal. This alternative would upgrade/extend Glacier Highway (5.2 miles including 2.3 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove to Sawmill Cove in Berners Bay where a new ferry terminal would be constructed. The Auke Bay Ferry Terminal would be expanded to include a new double stern berth, and the Skagway Ferry Terminal would be expanded to include a new end berth. This alternative includes construction of a new conventional monohull ferry that would operate between Haines and Skagway. In the summer, the Day Boat ACFs would make two trips per day between Sawmill Cove and Haines and two trips per day between Sawmill Cove and Skagway. During the winter, a Day Boat ACF would operate from Auke Bay, alternating between a round-trip to Haines one day and to Skagway the next day.

2. Methodology

This section provides a summary of the methods used to forecast traffic in Lynn Canal for the Juneau Access Alternatives. In addition, the data sources used in these analyses are listed along with key assumptions.

2.1 Forecast Methodology

The traffic forecast comprises several steps to forecast the volume of travel for the Juneau Access Alternatives. The steps are summarized below and shown as a flowchart in **Figure 2-1**. More information on each step is provided in the following chapters and in Appendices C and D.

The analysis began with an overview of existing (base year) traffic within Lynn Canal. The available data for ferry travel, air travel, and freight traffic were summarized to provide a basis for calibrating the subsequent travel models. Note that the most recent data available were for the 2011 calendar year. Key pieces of data include the number of passengers (air and ferry) and vehicles traveling in the Lynn Canal, average vehicle occupancy, average air and ferry fares, summer and winter seasonal factors, and the proportion of travelers traveling from Juneau-Haines or Juneau-Skagway.

There were two different types of models developed, a total demand model and a choice model.

2.1.1 Total Demand

The total demand volume is the "unconstrained"[1] potential for vehicular travel in Lynn Canal. This volume is the forecasted amount of traffic that could occur if a hypothetical highway were constructed between Juneau, Haines and Skagway. Each of the Juneau Access Alternatives will only capture a fraction of this demand based on service characteristics of each alternative. A total demand model was created using household travel survey information and highway traffic counts.

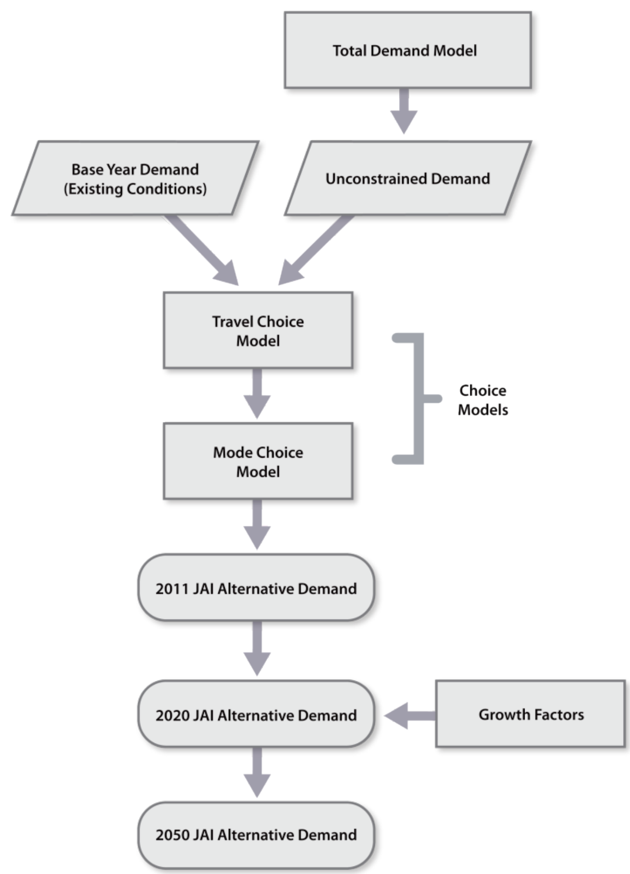


Figure 2-1: Forecasting Methodology

[1] The demand is unconstrained (or maximized) because travel on a road has the lowest cost and inconvenience of any travel alternative.

2.1.2 Choice Models

Choice models were developed to predict the percentage of total demand that would utilize each alternative. A choice model is commonly used by planners to predict the behavior of travelers when given a choice between distinct alternatives. The decision could be mode choice, route choice, or whether to make a trip at all. These models work by calculating the attractiveness (referred to as utility by travel modelers) of each choice based on time, cost, and convenience variables. For the JAI alternatives, the choice models calculated the percentage of total demand that would make a trip to or from Juneau based on the characteristics of each alternative.

The first choice model was a travel choice model, which estimated the probability that a trip would be made based on the utilities and disutilities offered by each alternative. The travel choice model separately calculated the number of persons who would travel between Juneau-Haines and Juneau-Skagway. The second choice model was a mode choice model that predicted the travel mode (automobile/ferry or air) for each trip.

The inputs to the choice models included travel time, delay time, service index—a measure of convenience, and user cost for each mode. Using vehicle occupancy data from base year travel in Lynn Canal, the person trips were converted to vehicle trips and the average annual, summer, and winter traffic volumes were calculated for each alternative. The choice models were calibrated to ensure that the models accurately estimated existing travel patterns and responded reasonably to changes in the input variables.

In the final step of the traffic forecast, growth rates were applied to predict traffic volumes in 2020 (the first year the alternatives would become available) and 2050 (thirty years after the alternatives would open to traffic).

2.2 Data Sources

A variety of data sources were used to predict traffic in Lynn Canal. These included:

- Alaska Marine Highway System (AMHS) published and unpublished traffic reports. These include the 2011 Annual Traffic Volume Report (and earlier editions), which provide link and on/off passenger and vehicle traffic. Other AMHS data utilized includes unpublished data on the hometown of ferry passengers in the Lynn Canal market.
- AMHS fare data for 2011 and earlier seasons.
- U.S. Bureau of Transportation air carrier passenger traffic data for service between the communities of Juneau, Haines and Skagway.
- Airfares from the air carriers operating in the Lynn Canal corridor.
- Alaska Department of Transportation and Public Facilities (ADOT&PF) highway traffic counts for highways in the Lynn Canal and in other areas across the State. Canadian highway traffic counts from Yukon Highways and Public Works and the British Columbia Ministry of Transportation and Infrastructure.
- Travel choice model structure and input variables from the Washington State Ferry system, BC Ferries, the Puget Sound Regional Council, and the *Travel Model Validation and Reasonability Checking Manual* (2nd Edition, 2010, Cambridge Systematics).

- Household travel survey data including the 2009 National Household Travel Survey (NHTS) and the 2002 Anchorage Household Travel Survey (AHTS)
- 2010 U.S. Census data for population and household statistics

The sources listed above were the most recently published documents available at the time data was collected in 2012. Since then, AMHS has released the 2012 Annual Traffic Volume Report. A brief comparison of the traffic volumes in Lynn Canal between 2011 and 2012 shows that volumes are slightly higher but well within the range of historic traffic levels throughout the previous decade.

Overall, traffic volumes in 2012 were 1% higher than 2011 across the entire AMHS system and 2% higher within Lynn Canal. With one exception, ferry traffic volumes have been slowly increasing throughout the last decade. There was a significant decrease in traffic from 2008 to 2009, most likely due to the recession, but volumes have been recovering since. The difference in traffic volumes in Lynn Canal between 2011 and 2012 does not represent a significant change in ridership behavior or travel patterns. As such, there is no concern continuing to use data from 2011 to represent existing conditions. Also, the traffic forecasts are based on long term population growth rates and are not impacted by minor year-to-year fluctuations in travel volumes.

The bibliography provides a summary of data sources.

2.3 Notes and Limitations

It is important to recognize the complexity and uncertainty associated with predicting traffic in Lynn Canal for eight different alternatives over a 30-year forecast period. Local population trends, visitor market trends, marketing efforts by communities, gasoline prices, local, regional and national economic conditions, international events as they affect travel, and many other forces would influence traffic under any single JAI alternative. The forecasts in this report use the best available data and traffic demand forecasting models that represent the latest thinking and state-of-the-practice in transportation planning.

3. Existing Lynn Canal Traffic

AMHS and air passenger data provide a profile of current travel demands in Lynn Canal. This section summarizes the ferry and air passenger volumes present in Lynn Canal in the base year, 2011. A qualitative discussion of freight traffic is also included.

3.1 AMHS Travel

The 2011 AMHS Annual Traffic Volume Report provided link volume data for Lynn Canal ports. Link volumes count each leg of a trip separately. For example, a passenger who traveled from Juneau to Skagway via Haines would be counted on the Juneau-Haines link as well as the Haines-Skagway link. AMHS defines the summer season as May to September and the winter season as October to April. For the following tables, only annual and summer data were reported; winter data may be calculated by subtracting the summer volumes from annual volumes.

In 2011, 40,648 passengers traveled on a ferry from Juneau to Haines or Skagway. This included all passengers who passed through Juneau while on a ferry, as well as passengers who embarked in Juneau and disembarked in Haines or Skagway. A similar number of passengers (41,538) traveled through Lynn Canal southbound on the ferry, originating in either Haines or Skagway. Considering both northbound and southbound travel, there were 82,186 passenger trips between Juneau and Haines or Skagway. In addition, the AMHS carried 12,868 vehicles from Juneau to Haines or Skagway, and 13,193 vehicles from Haines or Skagway to Juneau, totaling 26,061 vehicles in the northbound and southbound directions.

As shown in **Table 3-1**, nearly all of the Lynn Canal traffic moved through Haines. Only 14 one-way trips operated directly between Juneau and Skagway during 2011. The table also shows the average vehicle occupancy for each of the links as well as the combined average vehicle occupancy for travelling to or from Juneau. The average vehicle occupancy is slightly higher during the summer months than over the entire year.

Table 3-1: 2011 AMHS Link Volume Data

Annual	Jun-Hns	Hns-Jun	Jun-Sgy	Sgy-Jun	Total
Passengers	39,873	40,792	775	746	82,186
Vehicles	12,695	13,036	173	157	26,061
Average Occupancy	3.1	3.1	4.5	4.8	3.2
Summer	**Jun-Hns**	**Hns-Jun**	**Jun-Sgy**	**Sgy-Jun**	**Total**
Passengers	26,659	27,536	679	746	55,620
Vehicles	8,111	8,395	127	157	16,790
Average Occupancy	3.3	3.3	5.3	4.8	3.3

Source: AMHS 2011 Annual Traffic Volume Report.

The 2011 AMHS Annual Traffic Volume Report also provides port on/off volume information. These volumes only include trips that embarked or disembarked at a given port without transferring vessels. This contrasts from Table 3-1, which includes through trips that originated at or were destined for locations outside the Lynn Canal corridor. **Table 3-2** shows that 43,628 passengers travelled annually between Juneau and Haines, and 23,774 passengers travelled between Juneau and Skagway.

Table 3-2: 2011 AMHS Port-to-Port Volume Data

Annual	**Jun-Hns**	**Hns-Jun**	**Jun-Sgy**	**Sgy-Jun**	**Hns-Sgy**	**Sgy-Hns**
Passengers	21,671	21,957	11,584	12,190	7,137	6,493
Vehicles	6,959	7,202	2,917	2,908	3,277	2,844
Summer	**Jun-Hns**	**Hns-Jun**	**Jun-Sgy**	**Sgy-Jun**	**Hns-Sgy**	**Sgy-Hns**
Passengers	13,758	13,861	8,809	9,360	6,046	5,593
Vehicles	4,359	4,452	2,136	2,070	2,816	2,472

Source: AMHS 2011 Annual Traffic Volume Report.

Data from the AMHS Reservations Management System (RMS) for Lynn Canal provide more details on the distribution of traffic throughout the year, including data on vehicle type. This information is necessary for vessel sizing and subsequent environmental analyses. These unpublished data capture about 98 percent of all Lynn Canal traffic and are summarized below and in **Table 3-3**. A full discussion is provided in Appendix B.

During the summer, an average of 175 passengers traveled each day in each direction on a ferry between Juneau and Haines, along with an average of 53 vehicles (of all types and sizes). During the busiest week of the summer, an average of 360 passengers and 78 vehicles traveled northbound and 343 passengers and 80 vehicles traveled southbound between Juneau and Haines each day.

Winter traffic between Juneau and Haines averaged 62 passengers and 21 vehicles per day in each direction. Haines-Skagway link traffic is even more seasonal, with 79 percent of the passenger and vehicle traffic occurring during the summer.

In 2010, 408 RVs traveled north from Juneau to Haines.[2] A larger number, 489, traveled southbound from Haines to Juneau. The summer average was between two and three RVs per day in each direction between Juneau and Haines, with a peak of nine RVs a day (southbound) during the busiest week of the summer.

The volume of RV traffic on the Haines-Skagway link was substantially greater than RV traffic in Lynn Canal to or from Juneau. Approximately 909 RVs traveled north between Haines and Skagway in 2010 and about 723 traveled south. For the Haines-Skagway link, average daily traffic during the summer was between five and six RVs each way, with a peak of 14 RVs each day (northbound) during the busiest week. These data suggest that many RVs do not travel south of Haines or Skagway.

[2] RV data for the 2010 calendar year are included because data for 2011 were not available.

Table 3-3: 2011 AMHS Link Volume Data from Reservation Management System

Annual Traffic	**Jun-Hns**	**Hns-Jun**	**Jun-Sgy**	**Sgy-Jun**	**Hns-Sgy**	**Sgy-Hns**
Passengers	39,933	40,833	775	746	20,296	20,468
Vehicles	12,519	12,686	172	157	6,549	6,223
Average Daily Passengers	109	112	2	2	56	56
Average Daily Vehicles	34	35	0.5	0.4	18	17
Summer Traffic	**Jun-Hns**	**Hns-Jun**	**Jun-Sgy**	**Sgy-Jun**	**Hns-Sgy**	**Sgy-Hns**
Passengers	26,652	27,535	679	746	16,028	16,164
Vehicles	8,009	8,209	127	157	5,195	4,854
Average Daily Passengers	175	181	4	5	105	106
Average Daily Vehicles	53	54	1	1	34	32
Peak Week Avg. Daily Passengers	360	343	75	77	175	164
Peak Week Average Daily Vehicles	78	80	14	12	52	47
RV Traffic	**Jun-Hns**	**Hns-Jun**	**Jun-Sgy**	**Sgy-Jun**	**Hns-Sgy**	**Sgy-Hns**
Annual RVs	408	489	6	6	909	723
Summer Total	379	446	4	4	890	704
Summer Average Daily RVs	2.5	2.9	0.0	0.0	5.9	4.6
Peak Week Average Daily RVs	5.7	9.0	0.3	0.3	14.0	9.1

Note: Data on RV traffic corresponds to calendar year 2010.
Source: Data summaries generated by Northern Economics using AMHS-RMS 2012.

3.2 Air Travel

Passenger travel in Lynn Canal also includes a sizeable volume of air travel. According to data provided by the Bureau of Transportation Statistics, approximately 30,000 passengers flew between Juneau and Haines or Skagway in 2011. Approximately 5,500 people flew between Haines and Skagway.

Table 3-4: 2011 Air Travel Link Volume Data

	Jun-Hns	**Hns-Jun**	**Jun-Sgy**	**Sgy-Jun**	**Hns-Sgy**	**Sgy-Hns**
Annual	9,135	7,880	6,288	6,421	2,971	2,616
Summer	5,406	4,125	4,903	5,440	1,877	1,303

Source: Bureau of Transportation Statistics, T-100 Domestic Segment (All Carriers) Database.

3.3 Freight Traffic

Waterborne freight traffic now moving through Lynn Canal includes Alaska Marine Lines barge service and AMHS van service. Northland Services does not normally operate barges to Haines and Skagway, but regularly ships freight vans to and from these communities aboard AMHS vessels. Barged freight arrives in Haines and Skagway on a weekly basis. The 2006 FEIS reported that during the summer months, Haines received approximately 30 to 50 cargo vans per week, dropping in the winter to between 15 and 20. Skagway received approximately 30 cargo vans per week in the summer, dropping in the winter to about 10.

According to the information from the AMHS Reservation Management System in 2011, 553 vans travelled between Juneau and Haines (an average of 11 per week) and 153 vans travelled between Haines and Skagway (an average of about four per week). About three-quarters of the disembarking van traffic in Haines originated in Juneau. Approximately eight out of ten (82 percent) vans disembarking in Juneau originated in Haines.

Some of the freight traffic in the Lynn Canal serves local customers; the rest is destined for the Yukon or Interior Alaska. **Table 3-5** shows the number of vehicles and trucks using the three major border crossings between Alaska and the Yukon in 2008. Approximately 230 trucks per week crossed the border on the Alaska Highway crossing, 30 trucks per week crossed at the Haines border, and 100 trucks per week cross at the Skagway border. Truck volumes account for 12 percent of all vehicle traffic at the Alaska Highway border crossing, 4 percent at the Haines crossing and 6 percent at the Skagway crossing.

Table 3-5: 2008 Border Crossing Volume Data

	Vehicles		Trucks		
Border Crossing	**AK-Yukon**	**Yukon-AK**	**AK-Yukon**	**Yukon-AK**	**Truck Percent**
Alaska Highway	39,197	49,573	5,485	6,649	12%
Haines Highway	15,026	16,106	695	702	4%
Skagway Highway	35,336	44,640	2,660	2,596	6%

Sources: 2010 Yukon Traffic Count Summary and Bureau of Transportation Statistics, Border Crossing/Entry Data

4. Travel Demand Forecast

This chapter summarizes the travel demand forecasts for each of the eight JAI alternatives. First, base year travel demand in the Lynn Canal is summarized. Next, the total (unconstrained) demand is predicted for a hypothetical highway connecting Juneau, Haines, and Skagway. Finally, the travel choice model predicts traffic volumes for each of the eight Juneau Access Alternatives based on changes in service characteristics (e.g. cost, travel time, delay, etc.)

4.1 Base Year Demand Volume (2011)

The choice models forecast the number of trips for each Juneau Access Alternative as a proportion of the total unconstrained demand. The models were calibrated to match base year travel behavior in Lynn Canal.

Currently, the only way to travel from Juneau to Haines and Skagway is by ferry or air. Therefore, the base demand is the sum of the ferry and air passenger travel in 2011. Table 4-1 summarizes the ferry and air passenger data from Chapter 3. The volumes include travel on the Juneau-Haines and Juneau-Skagway links in both directions. These link volumes include trips that originate both inside and outside Lynn Canal. Local travel on the Haines-Skagway link is not included. This projection is documented in a separate report[3] by the McDowell Group.

Table 4-1 provides average daily demand for the entire year, the summer (May-September), the winter (October-April), and the peak week. Average daily demand was calculated by summing the passenger volumes on the Juneau-Haines and Juneau-Skagway links and dividing by the number of days in the period. The summer is assumed to be 153 days and the winter 212 days.

Table 4-1: 2011 Lynn Canal Passenger Travel Demand

	Ferry	Air	Total
Annual Average Daily Travel Demand	225	81	306
Summer Average Daily Travel Demand	364	130	494
Winter Average Daily Travel Demand	125	46	171
Peak Week Average Daily Travel Demand	855	N/A	N/A

Source: AMHS 2011 Annual Traffic Volume Report, AMHS Reservation Management System, and Bureau of Transportation Statistics, T-100 Domestic Segment (All Carriers) Database.

As shown above, on average, 306 people travel between Juneau and Haines or Skagway each day. The table also shows the seasonal fluctuations in travel. Summer average daily travel demand is 1.61 times annual average daily travel demand. Likewise, winter average daily travel demand is 0.56 times annual average daily travel demand. These values were used to calculate SADT and WADT throughout this report. The peak week AADT is provided as a point of reference, but is not used in the forecasting model.

[3] McDowell Group, *Juneau Access Haines/Skagway Traffic Forecast,* November 2012

The data in Chapter 3 also provided information on the percentage of people that travel between Juneau-Haines and Juneau-Skagway during the summer. These destination splits were calculated from the Port Volumes in Table 3-2 and the Air Travel Link Data in Table 3-4. The modal split information is from Table 4-1.

Table 4-2: 2011 Destination and Modal Splits for Lynn Canal Summer Passenger Travel

	Ferry	**Air**
Modal Split	74%	26%
	Juneau-Haines	**Juneau-Skagway**
Ferry Passenger Destination Split	60%	40%
Air Passenger Destination Split	48%	52%

Sources: AMHS 2011 Annual Traffic Volume Report and Bureau of Transportation Statistics, T-100 Domestic Segment (All Carriers) Database.

4.2 Total Demand Volume

This section describes the total demand model used to predict the vehicular volume on a hypothetical highway in Lynn Canal. The total demand volume, or "unconstrained" travel demand, is the volume of traffic that would occur on a hypothetical highway connecting Juneau, Haines, and Skagway. An "all-road" alternative was used to estimate total demand, because it would generate the most travel between these communities. The travel time would be considerably less than taking a ferry, there would be no fare associated with an airplane or ferry, and travel decisions would not be hindered by a reservation requirement or the limitations associated with a set number of sailings or flights. For these reasons, the potential total demand for travel in the Lynn Canal is much greater than the current travel within the corridor.

This total demand volume was estimated using two independent models to predict how many trips would be made between Juneau, Haines, and Skagway. Two different models were used to ensure a reasonable demand forecast, since there is no established method for determining the total demand for highway travel from a community without road access. The first total demand model was based on household survey data to estimate trip generation and dissipation. In this model, households were the basic unit of analysis used to estimate total demand. The second model was based on actual highway traffic volumes observed near similar communities. In this second model, community population was the basic unit of analysis. Each model used a trip generation rate based on households or population and then a dissipation function to estimate the length of the trips. Each model predicted the volume of through trips between these communities; any trips that would be made to an intermediate destination on the highway were not accounted for. Consequently, the actual volume of travel could be higher in certain locations if intermediate destinations were to be considered in forecasting traffic along the highway.

For this analysis, Haines and Skagway were each considered to be 90 miles (two hours via the hypothetical highway) from Juneau. Whitehorse was assumed to be 180 miles (three hours via highway) from Juneau. The results of the two models were averaged to estimate the total demand volume for the "all-road" alternative. A summary of the results of these models is included below, and a full discussion including model validation results can be found in Appendix C.

4.2.1 Household Survey Model

The results from the 2009 National Household Transportation Survey (NHTS) and 2002 Anchorage Household Travel Survey (AHTS) were used to develop trip generation and trip dissipation rates for the total demand model. Household travel surveys are called 'revealed preference' surveys, in that they record the trips that people actually make in the survey day[4]. While revealed preference surveys have been shown to be good predictors of household travel patterns, they can understate household trip generation, because people sometimes forget to record all trips. However, the reporting of average trip duration (time) in the surveys is typically not affected.

Trip generation rates were evaluated from the NHTS, AHTS, and traffic counts in Juneau. A household daily trip rate of 9.2 vehicle trips per household from the AHTS was selected as being most consistent with travel patterns in Alaska for a community with highway access. A full discussion of trip generation rates is provided in Appendices A and C.

The NHTS results were filtered to vehicle trips (including personal and commercial travel) from households that had similar geographic characteristics to households in Juneau. The NHTS data were analyzed to calculate the percentage of personal vehicle trips that have a travel time longer than a) two and b) three hours. These results are shown in **Table 4-3**. The percentage of trips longer than two hours was 0.9 percent, and the percentage of trips longer than three hours was 0.4 percent.

Table 4-3: NHTS Trip Distribution Percentages

Travel Time (min)	> 0	> 30	> 60	> 90	> 120	> 180
Cumulative Percentage	100%	6.9%	2.9%	1.6%	0.9%	0.4%

Source: National Household Transportation Survey, 2009.

Using data from the AHTS, NHTS, and the number of households, the volume of through trips on a hypothetical highway along the Lynn Canal was estimated. Trips would be generated in Juneau, Haines, Skagway, and Whitehorse and were separately calculated from the total number of households in each location. The percentage of trips from each city that would travel on the highway and that would traverse the entire length of the highway varies for each city.

Table 4-4 shows a summary of these calculations. All through trips leaving Juneau would head north on the new highway. Approximately 20 percent of traffic leaving Whitehorse currently heads south towards Skagway on the Klondike Highway. With the construction of a hypothetical highway, this percentage was assumed to increase slightly to 25 percent. This implies that some trips from Whitehorse, which currently travel elsewhere, would shift their destination to Juneau. As it is not currently possible to drive to Juneau from Haines or Skagway, this analysis assumed that half of the long distance trips from each town would head towards Juneau, since Juneau is approximately the same size and distance from Haines and Skagway as the next closest town,

[4] The 'revealed preference' household surveys contrast with the 'stated preference' surveys used in the 2005 JAI traffic report. 'Stated preference' surveys indicate the number of trips people think they will make rather than the actual number of trips made.

Whitehorse. Applying this model predicted a total demand volume of approximately 1,130 AADT.

Table 4-4: Total Demand Volume Prediction using Household Survey Data

	Juneau	Haines	Skagway	Whitehorse
Households	12,005	782	410	9,649
Daily Vehicle Trips	110,446	7,194	3,772	88,771
Percentage of Trips Longer than 2 (or 3) Hours	0.9%	0.9%	0.9%	0.4%
Trips Longer than 2 (or 3) Hours	994	65	34	355
Percentage of Trips to/from Juneau	100%	50%	50%	25%
Lynn Canal Highway Through Trips	994	33	17	89
Total Daily Through Vehicle Trips	1,133			

Values calculated by Fehr & Peers, 2013

4.2.2 Highway Traffic Dissipation Model

The total demand volume was separately estimated using traffic counts on rural highways throughout Alaska and Western Canada. For each highway studied, traffic volumes were found to decrease at a predictable rate based on the distance from the edge of the urban area. This relationship was used to develop a trip dissipation curve that described the distribution of trip lengths from the city's edge. A trip generation rate was estimated using population as a predictor. Two different trip rates were used for this model to predict a range of total demand volumes. A full discussion of why two different rates were used is included below.

This model forecasted total demand using the traffic volume at the "edge" of a city. This rate can be expressed as AADT per 10,000 residents and, combined with the trip dissipation function, can predict the volume of traffic on a rural highway with limited intervening destinations. **Table 4-5** and **Figure 4-1** show trip generation rates and populations for cities in Alaska, Yukon Territory, and British Columbia. These areas can be grouped into regional centers or coastal communities. The smaller coastal communities have much higher trip rates per 10,000 residents than the larger regional centers. In Skagway, the "edge" trip rate is 14,400 AADT per 10,000 residents and the equivalent rate in Anchorage is only 1,600 AADT per 10,000 residents. This disparity reflects the fact that as a city grows in size, more trips will be captured internally.

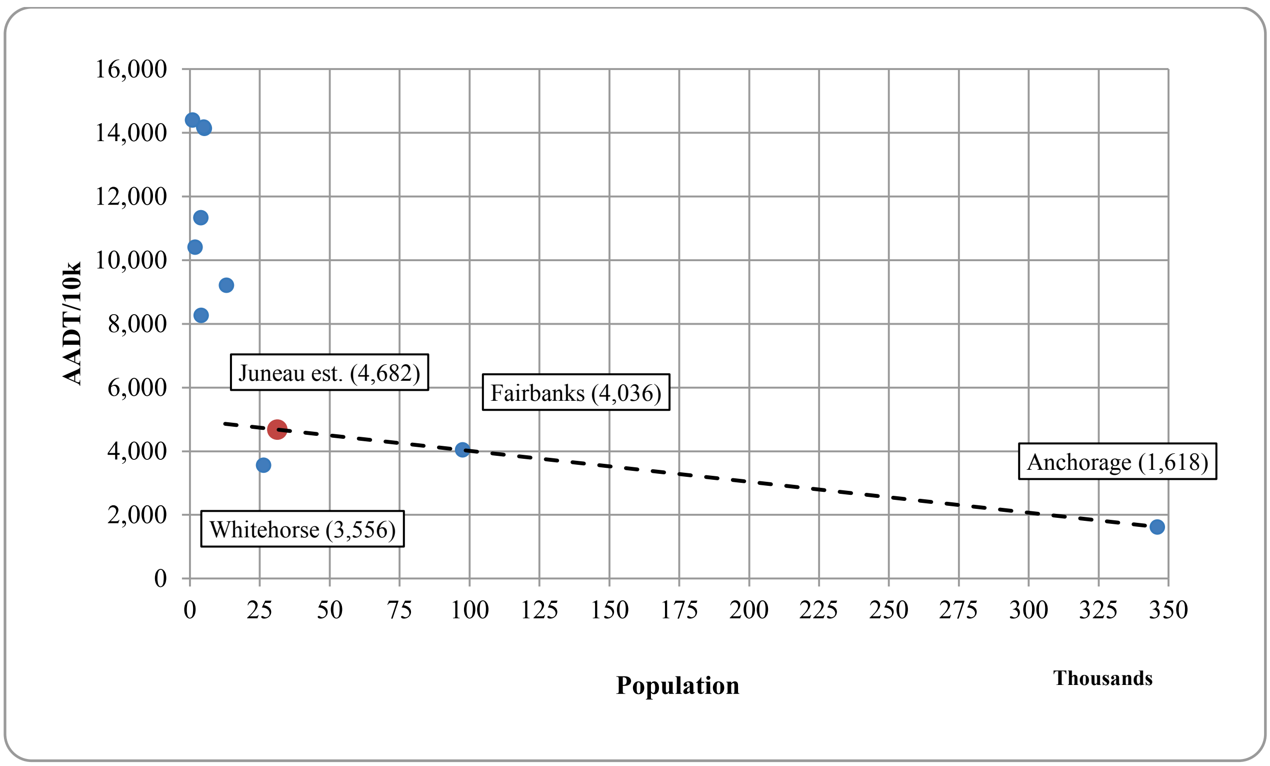
Based on its population, Juneau's trip rate would be consistent with the other regional centers. Since Whitehorse has roughly the same population and is located a similar distance from Haines and Skagway, Whitehorse's trip rate (3,556) provides one good approximation for Juneau's trip rate. However, as discussed in Appendix C, Canadians on average travel less than Americans. To account for this difference, a second trip rate (4,682) was estimated from a linear approximation of the trip rates and populations from the two regional centers (Anchorage and Fairbanks). These two trip rates, shown in Figure 4-1, provide a low and high estimate for Juneau's trip rate.

Table 4-5: "Edge" Traffic Rates for Comparison Cities

Regional Centers	Population	"Edge" AADT	AADT/10k Population
Greater Anchorage Area, AK	345,970	55,994	1,618
Fairbanks North Star Borough, AK	97,581	39,388	4,036
Whitehorse, YT	26,418	9,393	3,556
Coastal Communities	**Population**	**"Edge" AADT**	**AADT/10k Population**
Prince Rupert, BC	13,085	12,045	9,205
Seward, AK	5,191	7,340	14,140
Homer, AK	5,003	7,094	14,179
Port Hardy. BC	4,008	3,311	8,261
Valdez, AK	3,976	4,505	11,330
Haines, AK	1,852	1,928	10,410
Skagway, AK	920	1,325	14,402

Values calculated by Fehr & Peers, 2013

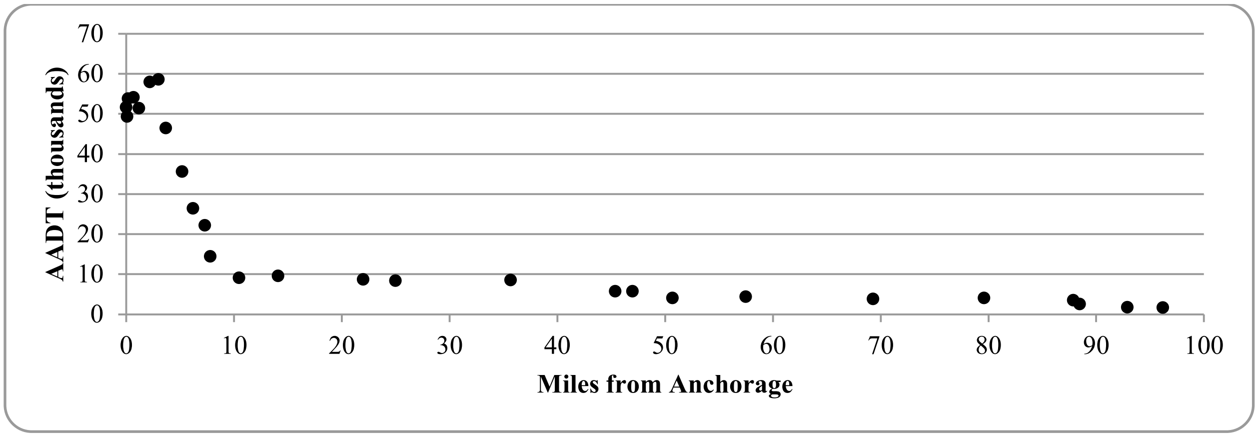
Figure 4-1: "Edge" Traffic Rates



Traffic volumes fluctuate within the urban area of a city, but dramatically drop off at the edge of a city. This edge could be the actual boundary of a city or where the land uses transition from urban to rural. At this "edge" point, traffic volumes decrease exponentially until leveling off at a particular volume. This dissipated volume remains constant until the highway meets an interchange or another population center and then grows again.

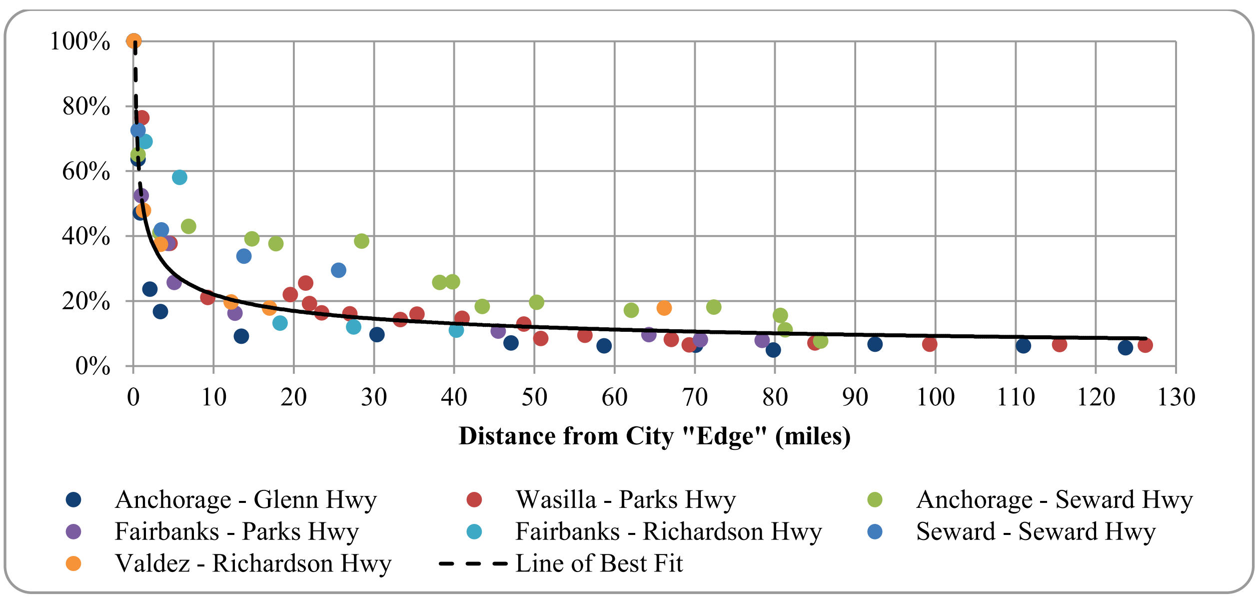
Figure 4-2 shows a profile of Seward Highway to demonstrate this relationship. Distances are measured from the beginning of the highway in Anchorage. This relationship can be modeled with a power function to calculate the percentage of "edge" traffic volume that remains on a highway at a given distance outside of the urban area.

Figure 4-2: Seward Highway Volume Profile



To further develop the model, highway traffic counts were collected for seven sections of rural highways throughout Alaska. **Figure 4-3** shows the composite traffic dissipation curve that was used in the model, based on these data.

Figure 4-3: Composite Dissipation Curve



This model estimated traffic on a rural highway between two population centers. The dissipation curve was applied from two ends: Juneau and Haines/Skagway. The population of Juneau is so much larger than the populations of Haines and Skagway that the dissipation curves meet just outside the edges of Haines and Skagway. At this location, approximately 10 percent of the edge trips generated in Juneau would remain on the highway and are considered to be 'through trips'. . **Table 4-6** summarizes the model application using the low and high city-edge trip rates (Figure 4-1) and the results from the dissipation curve (Figure 4-3). The model produced a low estimate of total demand volume of 1,112 AADT and a high estimate of 1,464 AADT.

Table 4-6: Total Demand Volume Predictions (Vehicle Trips) using Highway Traffic Counts

	Low	High
Juneau Population	31,275	31,275
"Edge" AADT/10k Residents	3,556	4,682
Total "Edge" Trips	11,121	14,643
Percentage of Through Trips	10.0%	10.0%
Total Lynn Canal Highway Through Trips	1,112	1,464

Values calculated by Fehr & Peers, 2013.

4.2.3 Total Demand Model Summary

Averaging the three total demand estimates (1,133 AADT, 1,112 AADT, and 1,464 AADT) from the two models resulted in a total demand of approximately 1,240 AADT, shown in **Table 4-7**. This is the estimated number of "through" vehicle trips travelling between Juneau, Haines, Skagway, and Whitehorse on a hypothetical highway along the Lynn Canal.

Table 4-7: Total Demand Volume Prediction (Vehicle Trips)

	AADT
Household Travel Survey Total Demand Volume	1,133
Highway Traffic Counts Total Demand Volume (Low)	1,112
Highway Traffic Counts Total Demand Volume (High)	1,464
Average Total Demand Volume (Rounded)	1,240

Values calculated by Fehr & Peers, 2013. This volume does not include people who would continue to travel by air between the cities.

4.3 Choice Models

As described in Section 2.1.2, two choice models were developed to predict the percentage of total demand that would utilize each alternative. The first model was a 'travel choice model', followed by application of a 'mode choice model'. Traditional logit models were used for this analysis. A logit model estimates the probability that a travel choice will be made based on the utilities and disutilities offered by each alternative. In this case, two logit models were used to determine 1) whether a trip would be made, and 2) if a trip were made, which mode (air or auto/ferry) would be used. The inputs into the models are described in the following section. A full discussion of the models is provided in Appendix D.

The travel choice model starts with the total demand for travel in Lynn Canal. This value is measured in person trips and includes travel made by both auto/ferry and air. The auto/ferry volumes are based on the results from the total demand model, shown in Table 4-7. The total vehicle trip demand volume was converted to person trips using a vehicle occupancy of 2.3 persons per vehicle. This rate was calculated based on highway vehicle occupancies from NHTS data. The volume of air travel that would still exist in an "all-road" alternative was separately calculated using the mode choice model. The sum of the auto/ferry and air person trip demand equals the total demand for travel used in the travel choice model.

The travel choice model predicted the number of person trips that would be made between Juneau-Haines and Juneau-Skagway for each alternative, by applying the model's estimated probability that the trip would be made to the total demand. After the total person trips were estimated, the mode choice model predicted the number of air travelers and ferry travelers for each alternative.

The results from the travel choice model were the converted from persons back to vehicles using two different vehicle occupancies based on the predominant mode of each alternative. Alternatives 2B and 3 used the highway vehicle occupancy of 2.3 persons per vehicle, since these are predominantly roadway alternatives. For Alternatives 1, 1B, 4A, 4B, 4C, and 4D, (also called the marine alternatives) a vehicle occupancy of 3.3 persons per vehicle was used based on the average summer occupancy on the Juneau-Haines and Juneau-Skagway ferry links, as shown in Table 3-1.
The two models were calibrated to match base year travel behavior in Lynn Canal including: ferry volume, air volume and the destination split between Haines and Skagway for each mode.[5] Lastly, the number of person trips using the ferry was then converted to Average Annual Daily Traffic (AADT) using the vehicle occupancies cited above. Once the AADT was estimated, the Summer Average Daily Traffic (SADT) and Winter Average Daily Traffic (WADT) were calculated using the seasonal factors presented in Chapter 3.[6]

[5] As described in Appendix D, the choice models were calibrated to replicate annual person trips as observed under existing conditions, along with the summer destination split between Haines and Skagway.
[6] Note that Alternatives 1B, 4B and 4D provide winter service equivalent to 1, 4A and 4C respectively, so the WADT forecasts for these three alternatives (1B, 4B and 4D) were set equal to the forecasts from the equivalent service.

4.3.1 Model Inputs

This section summarizes the inputs to the choice models. **Table 4-8** shows the input values for each alternative for travel between Juneau-Haines and Juneau-Skagway. Many of the values were weighted across the types of service available within each alternative. For instance, ferry travel time differed between mainline and FVF service. For an alternative with both types of service, those travel times were weighted based on the number of departures and capacity of each boat to determine a single weighted travel time for the alternative[7]. A more detailed table is included in Appendix D.

Auto Travel Time

Auto travel time was calculated using the distance for the roadway portions of the alternative and an assumed speed of 45 miles per hour. The starting point for each alternative was the Auke Bay ferry terminal. The end point for each alternative was either downtown Haines (defined as Third Avenue & Main Street) or the ferry terminal in Skagway.

Auto Cost

Auto cost was the product of roadway distance and vehicle operating cost. The vehicle operating cost is assumed to be 26 cents per mile[8] (additional information can be found in Appendix A).

Ferry Travel Time

Ferry travel time was based on information provided by Alaska DOT&PF.

Ferry Cost

Average ferry cost was calculated per user. The cost of one vehicle fare was divided by the average vehicle occupancy and added to the price of one adult fare. For example, if the vehicle fare was $86.00, the adult fare was $37.00, and the average vehicle occupancy was 3.3, then the cost per user was calculated as $63.06 ($86.00/3.3 + $37.00). Additional information regarding how the fares were calculated may be found in Appendix A.

Ferry Delay

Total ferry delay included delay associated with wait time, check-in time, load time, and unload time. For Alternatives 2B and 3, the delays were associated with waiting for a ferry and did not include any check in-time as in the other alternatives. The delay for these alternatives was set equal to a quarter of the ferry headway (time between arrivals)[9]. The check-in, load, and unload times were provided by was based on information provided by Alaska DOT&PF.[10]

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7 Capacity for mainline vessels was based on the typical available capacity for travel between Haines/Skagway and Juneau as reported by AMHS. The full capacity of the mainline vessels was not considered as part of this calculation. See Appendix D for details.

8 This value is less than the IRS reimbursement rate because it does not include vehicle depreciation as an operating cost. The primary automobile operating cost is the purchase of fuel.

9 This value assumes that half of the ferry travelers will arrive randomly due to the frequency of the ferry schedule, while the other half will time their arrival to match the schedule. .

10 Passengers traveling to or from Skagway in Alternatives 1 and 3 would be required to take two ferries to reach their final destination. The ferry delay for these passengers takes into account any highway travel time between ferry terminals as well as the waiting or loading time to catch the next ferry. Connecting ferry service is also provided in Alternative 1B for Skagway travelers in addition to direct service to/from Juneau on the Malaspina and mainline service.

Service Index

A service index was developed as a measure of each alternative's relative travel convenience. This value captures the relative attractiveness of an alternative based on factors beyond the ones previously listed. This measure was developed in an effort to quantify some of the more intangible qualities that travelers consider when making their choices. For instance, the ability to depart at any time is more convenient than planning a trip in advance to coordinate with the ferry schedule. As another example, low capacity/high demand service may require reservations, limiting the ability to make spontaneous trips.

The service index used in the Travel Choice Model was based on one developed for the *Break-Even Demand on Alternative Ferry Systems in Lynn Canal* published by Northern Economics in February 1999. Alternatives were considered to be more convenient with more vessel capacity, more frequent sailings, and more regularly scheduled service (service arrives and/or departs at more convenient times—between 7 AM and 9 PM). Improvements in each of these areas would reduce the need to make reservations for the ferry, makes travel less burdensome, and allows for more spontaneous travel. The service index considered three factors:

- Capacity: The nominal 20-foot vehicle capacity of the vessels on the route, multiplied by the number of vessel departures.[11]
- Departures: The number of departures from the origin to the destination.
- Departure Times: Each departure was assigned a score based on the departure time. Those scores were summed and then divided by the number of departures. Departures that were regularly scheduled daily service or could be completed between 7AM and 9PM were assigned a 1, and all other trips are assigned a 2. A final score of 1.0 indicated that all departures were convenient. Values higher than 1.0 indicated less convenient departure times.

The relative convenience of each alternative was calculated by taking the ratio of each score to the score for the base year (existing conditions), and calculating the service index based on the formula below. Existing service had a service index of 2 since all of the ratios are equal to 1 by definition. Values greater than 2 indicated more convenient service than existing service.

$$Service\ Index = \frac{Capacity\ Ratio + Departure\ Ratio}{Departure\ Time\ Ratio}$$

The capacity ratio required some additional analysis. The daily round trip vehicle capacity is the average number of vehicles that may travel between Juneau and Haines or Skagway each day. This was calculated by taking a weekly total and averaging over seven days. Using data from service changes in Lynn Canal in the mid-2000s, the capacity ratio was reduced for Alternatives 1,1B, and 4C to reflect the finding that moderate changes in ferry service do not have a strong impact on ferry demand. A full discussion of this calibration is provided in Appendix D.

[11] Based on the known capacity of existing AMHS vessels or the previously planned capacities for certain vessels in Alternatives 3, 4A, and 4B. Final capacity for all vessels will be determined based on forecasts.

Table 4-8: JAI Travel Choice Model Inputs

Juneau-Haines *Auke Bay Terminal to 3rd Avenue/Main Street*	**Auto Travel Time (minutes)**	**Auto Cost (dollars)**	**Ferry Travel Time (minutes)**	**Ferry Cost (dollars)**	**Ferry Delay (minutes)**	**Service Index**
Existing Service	6	$1.12	270	$63.06	156	2.00
1 – No Action	6	$1.12	276	$63.06	83	2.01
1B – Enhanced Service	6	$1.12	276	$50.45	83	2.01
2B – East Lynn Canal Highway	107	$20.96	27	$11.02	44	22.67
3 – West Lynn Canal Highway	96	$18.75	44	$15.70	39	27.30
4A – FVF Service from Auke Bay	6	$1.12	160	$63.06	78	5.53
4B – FVF Service from Sawmill Cove	45	$8.88	97	$37.64	78	5.60
4C – Monohull Service from Auke Bay	6	$1.12	277	$63.06	76	2.16
4D – Monohull Service from Sawmill Cove	46	$8.89	173	$37.60	73	5.73
Juneau-Skagway *Auke Bay Terminal to Skagway Ferry Terminal*	**Auto Travel Time (minutes)**	**Auto Cost (dollars)**	**Ferry Travel Time (minutes)**	**Ferry Cost (dollars)**	**Ferry Delay (minutes)**	**Service Index**
Existing Service	0	$0.00	390	$83.64	156	2.00
1 – No Action	0	$0.00	337	$83.64	134	2.01
1B – Enhanced Service	0	$0.00	286	$66.91	139	3.04
2B – East Lynn Canal Highway	102	$19.84	51	$18.43	51	17.00
3 – West Lynn Canal Highway	102	$19.86	95	$32.76	124	8.48
4A – FVF Service from Auke Bay	0	$0.00	176	$83.64	78	5.53
4B – FVF Service from Sawmill Cove	39	$7.76	119	$54.93	78	5.60
4C – Monohull Service from Auke Bay	0	$0.00	315	$83.64	76	2.16
4D – Monohull Service from Sawmill Cove	40	$7.77	207	$54.89	73	5.73

Values compiled by Fehr & Peers, 2013. Existing service conditions are used to calibrate the model. Alternative 1 (No Action) has characteristics that are substantially different than existing conditions.

5. Traffic Forecasts

This chapter explains the growth rate assumptions for Lynn Canal traffic and how they were applied to the base year volumes. Two future years were considered. The first year of operation for each JAI alternative was assumed to be 2020. Traffic was also forecasted for the thirtieth year of operation, 2050.

5.1 Growth Rate Assumptions

Population forecasts were developed by Northern Economics; the full memorandum may be found in Appendix B. **Table 5-1** summarizes the population forecasts for Juneau, Haines, and Skagway into two growth rates: one for population growth between 2011 and 2020 and another for population growth between 2011 and 2050.

Between 2011 and 2020, the population is expected to grow by 0.065 percent annually, which equates to a total growth of one percent over the nine year period. The population is expected to decrease between 2020 and 2050, falling slightly below the current level. From 2011 to 2050, population is projected to decrease by 0.004 percent annually or a total of 0.16 percent over the 39-year period.

Table 5-1: Growth Rate Assumptions

Location	2011	2020	2050
Juneau Population	32,290	32,381	32,080
Skagway Population	965	1,064	1,126
Haines Population	2,620	2,639	2,613
Total Population	**35,875**	**36,084**	**35,819**
Annual Growth Rate from 2011	**-**	**0.065%**	**-0.004%**

Source: Updated Population Estimates and Forecasts for the JAIP EIS, Northern Economics, September 7, 2012.

5.2 First Year (2020) Traffic Forecasts

Table 5-2 summarizes the first year traffic forecasts by alternative for Haines and Skagway, respectively. The base year AADT represents the forecasts directly from the Travel Choice Model.

The base year AADT was then scaled up using the growth rates from Table 5-1 to determine 2020 AADT. Seasonal factors were applied to determine SADT, WADT, and PWADT based on information provided in Chapter 3.

Table 5-2: First Year (2020) Traffic Forecast by Alternative

Juneau-Haines	**Base Year AADT**	**2020 AADT**	**2020 SADT**	**2020 WADT**	**2020 PWADT**
1 – No Action	55	55	85	30	200
1B – Enhanced Service	60	60	100	30	235
2B – East Lynn Canal Highway	450	455	730	250	1,720
3 – West Lynn Canal Highway	420	420	680	235	1,595
4A – FVF Service from Auke Bay	90	90	150	50	350
4B – FVF Service from Sawmill Cove	145	145	235	50	555
4C – Monohull Service from Auke Bay	55	55	95	30	215
4D – Monohull Service from Sawmill Cove	135	135	220	30	520
Juneau-Skagway	**Base Year AADT**	**2020 AADT**	**2020 SADT**	**2020 WADT**	**2020 PWADT**
1 – No Action	35	35	55	20	125
1B – Enhanced Service	55	55	90	20	205
2B – East Lynn Canal Highway	375	380	615	210	1,440
3 – West Lynn Canal Highway	235	235	380	130	895
4A – FVF Service from Auke Bay	75	75	120	40	285
4B – FVF Service from Sawmill Cove	120	120	195	40	455
4C – Monohull Service from Auke Bay	45	45	75	25	170
4D – Monohull Service from Sawmill Cove	110	110	180	25	425

Values calculated by Fehr & Peers, 2013. The 2020 Opening Year forecasts do not account for any ramp-up period during which full travel demand volumes would not be achieved. Traffic volumes have been rounded to the nearest five. As the growth rate between the Base Year and project opening (2020) is low, traffic volume changes are not discernible due to this rounding (except for Alternative 2B).

5.2.1 Ramp-Up Volumes

The project team considered whether there would be a "ramp-up" period after implementing the alternative before the full travel demand is achieved. Selected case studies in which new infrastructure or services were implemented were examined to determine if there would be a ramp-up effect.

For the marine alternatives, the project team considered two AMHS service changes: the introduction of the Malaspina day boat in 1998 and the increase of FVF Fairweather service from 2005 to 2007. For Alternatives 2B and 3, the project team considered cases in which bridges replaced ferry service. Appendix F provides additional information.

The case studies indicated that a two to four year ramp-up period could occur for the marine alternatives. The ferry-to-bridge examples showed immediate use of the new bridges, some with an initial spike in traffic volumes as people tried out the new road. Subsequently, the traffic patterns stabilized over a period of years. A similar pattern could occur for Alternatives 2B and

3. Given the relatively short ramp-up periods identified and the limited sources of data, no ramp-up effects were incorporated into the traffic forecasts.

5.3 30-Year (2050) Traffic Forecasts

Table 5-3 summarizes the 30-year traffic forecasts by alternative for Haines and Skagway.

Table 5-3: 30-Year (2050) Traffic Forecast by Alternative

Juneau-Haines	AADT	SADT	WADT	PWADT
1 – No Action	55	85	30	200
1B – Enhanced Service	60	100	30	235
2B – East Lynn Canal Highway	450	725	250	1,705
3 – West Lynn Canal Highway	415	675	235	1,585
4A – FVF Service from Auke Bay	90	145	50	345
4B – FVF Service from Sawmill Cove	145	235	50	550
4C – Monohull Service from Auke Bay	55	90	30	215
4D – Monohull Service from Sawmill Cove	135	220	30	515
Juneau-Skagway	**AADT**	**SADT**	**WADT**	**PWADT**
1 – No Action	35	55	20	125
1B – Enhanced Service	55	85	20	205
2B – East Lynn Canal Highway	375	610	210	1,430
3 – West Lynn Canal Highway	235	380	130	895
4A – FVF Service from Auke Bay	75	120	40	285
4B – FVF Service from Sawmill Cove	120	190	40	450
4C – Monohull Service from Auke Bay	45	75	25	170
4D – Monohull Service from Sawmill Cove	110	180	25	420

Values calculated by Fehr & Peers, 2013

5.4 Summary Discussion

Table 5-4 shows combined Juneau-Haines and Juneau-Skagway traffic forecasts for 2020 and 2050. Alternative 2B is forecasted to generate the most traffic, since it provides the fewest constraints on travel. In 2050, Alternative 2B annual average vehicle traffic would be 825 vehicles per day (450 to/from Haines and 375 to/from Skagway). This is a measure of total traffic in both directions. Summer traffic would average 1,335 vehicles per day in 2050. Alternative 3 is expected to generate the second highest traffic among the alternatives with 650 vehicles on an average day.

Among the marine options, the Sawmill Cove alternatives (4B and 4D) are projected to result in more traffic than their Auke Bay counterparts (4A and 4C). The FVF alternatives (4A and 4B) are projected to result in more traffic than their monohull counterparts (4C and 4D). Alternative 4B is forecasted to have the highest marine alternative trip generation with average annual daily traffic of 265 vehicles and 425 vehicles daily during the summer in 2050.

Alternative 1B is projected to have average annual traffic of 110 vehicles and 185 vehicles daily during the summer. These forecasts are slightly higher than those for the No Action Alternative, but lower than the other marine alternatives except for Alternative 4C.

Table 5-4: Combined Traffic Forecasts by Alternative for 2020 and 2050

	2020				2050			
Alternative	**AADT**	**SADT**	**WADT**	**PWADT**	**AADT**	**SADT**	**WADT**	**PWADT**
1	90	140	50	325	90	140	50	325
1B	115	190	50	440	115	185	50	440
2B	835	1,345	460	3,160	825	1,335	460	3,135
3	655	1,060	365	2,490	650	1,055	365	2,480
4A	165	270	90	635	165	265	90	630
4B	265	430	90	1,010	265	425	90	1,000
4C	100	170	55	385	100	165	55	385
4D	245	400	55	945	245	400	55	935

Values calculated by Fehr & Peers, 2013

5.5 Ferry Link Traffic Forecasts

In this section, traffic on each ferry link for each JAI alternative is summarized. These estimates are required for the design and sizing of ferries for each marine segment. Ferry traffic includes traffic moving between Juneau and Haines/Skagway; it does not include traffic moving only between Haines and Skagway.

Table 5-5 summarizes ferry link volumes on all JAI alternatives. Traffic predictions are for 2050, in terms of AADT and SADT.

Table 5-5: 2050 Ferry Link Volume Forecasts

Alt	Auke Bay-Haines	Auke Bay-Skagway	Haines-Skagway*	Katzehin-Haines	Katzehin-Skagway	Sawmill-William Henry Bay	Sawmill-Haines	Sawmill-Skagway
				AADT				
1	85		35					
1B	90	25	25					
2B				450	375			
3			235			650		
4A	90	75						
4B							145	120
4C	55	45						
4D							135	110
				SADT				
1	140		55					
1B	145	45	45					
2B				725	610			
3			380			1050		
4A	145	120						
4B							235	190
4C	90	75						
4D							220	180

Values calculated by Fehr & Peers, 2013
** This volume represents the portion of Juneau traffic that would use the shuttle ferry service between Haines and Skagway. It does not include local traffic between Haines and Skagway.*

Table 5-6 provides an analysis of the average daily summer vehicle capacity and vehicle occupancy for ferry links under each of the alternatives. The purpose of this analysis was to preliminarily determine whether there is adequate vehicle capacity on ferries within Lynn Canal to meet the average daily summer vehicle demand in 2050. The capacities of the vessels were assumed to be designed to meet summer demand without providing excess capacity.

Several key factors are built into the analysis, as follows:

- The analysis assumed that demand is evenly dispersed throughout the day (and week) and does not account for hourly periods of peak demand.
- For several alternatives, the vessels will be sized based on summer forecasts to ensure that there is adequate capacity. The ferry capacities that are yet to be determined are the Haines-Skagway shuttle in Alternative 3 and the Fast Vehicle Ferries in Alternatives 4A and 4B. In Table 5-6, the capacities and occupancies for these alternatives are not listed with the understanding that these vessels will be built with sufficient available capacity.
- The mainline ferry was only used to accommodate vehicle overflow. The choice models separately forecast demand to Haines and Skagway but do not forecast demand for specific ferries within a given alternative. In Table 5-6, demand was only assigned to the mainline ferry if the other, more frequent ferry service, was calculated to be over-capacity. In all likelihood, a portion of travelers would continue to use the mainline service in order to have access to amenities that are not available on smaller vessels, or because the mainline schedule is a better match to their desired travel time. Therefore, the occupancy estimates in Table 5-6 are conservatively high for alternatives that include mainline service.

The preliminary results show that there would be adequate vessel capacity to accommodate average daily summer demand in 2050. In Alternatives 1, 1B, and 4D the mainline is needed to meet the total demand of each alternative. However, no alternative is over-capacity when the mainline is included.

Table 5-6: 2050 Ferry Link Vehicle Capacity Analysis

Alt	Auke Bay-Haines	Auke Bay-Skagway	Haines-Skagway*	Katzehin-Haines	Katzehin-Skagway	Sawmill-William Henry Bay	Sawmill-Haines	Sawmill-Skagway
Average Daily Summer Vehicle Capacity								
1	91 (63)		91 (63)					
1B	91 (63)	176	91 (63)					
2B				848	636			
3			N/A			1,272		
4A	N/A (63)	N/A	(63)					
4B	(63)		(63)				N/A	N/A
4C	106 (63)	106	(63)					
4D	(63)		(63)				212	212
Average Daily 2050 Summer Vehicle Occupancy								
1	100% (76%)		58% (0%)					
1B	100% (83%)	25%	48% (0%)					
2B				85%	96%			
3			N/A			83%		
4A	N/A	N/A	N/A					
4B	(47%)		(0%)				N/A	N/A
4C	87% (0%)	69%	(0%)					
4D	(13%)		(0%)				100%	84%

Values calculated by Fehr & Peers, 2013.
Note: The capacity and occupancy for the mainline ferries are shown in parentheses
Note: The Skagway demand for Alternative 1B is evenly split between the Malaspina and the New Day Boats.
N/A - Vessel capacities will be determined based on traffic forecasts.
** These values do not include local traffic between Haines and Skagway.*

5.6 Comparison with Traffic Forecasts Prepared for 2006 FEIS

Table 5-6 compares the AADT forecasts from the 2006 FEIS and the current Draft SEIS analysis. Forecasts for the opening year (2008 in the FEIS and 2020 in the Draft SEIS) and the 30-year horizon (2038 in the FEIS and 2050 in the Draft SEIS) are shown.

Table 5-7: Annual Daily Traffic Forecasts by Alternative – 2006 FEIS and 2014 Draft SEIS

	2006 FEIS		2014 Draft SEIS	
Juneau-Haines/Skagway	**Opening Year**	**30th Year**	**Opening Year**	**30th Year**
1 – No Action	90	130	90	90
1B – Enhanced Service	N/A	N/A	115	115
2B – East Lynn Canal Highway	380	670	835	825
3 – West Lynn Canal Highway	310	530	655	650
4A – FVF Service from Auke Bay	140	220	165	165
4B – FVF Service from Sawmill Cove	170	270	265	265
4C – Monohull Service from Auke Bay	100	150	100	100
4D – Monohull Service from Sawmill Cove	130	200	245	245

Source: Fehr & Peers calculations (2013) and 2006 FEIS.

Several differences can be noted between the current work and previous forecasts in addition to the forecasts having different methodologies. The previous forecasts underestimated the latent demand within the corridor, but started with higher existing travel volumes in Lynn Canal and used higher population growth rates over 30 years. In the current study, the higher forecasts for latent demand are offset by very low growth predictions. As a result, the opening year forecasts are quite different between the two studies, but the 30-year forecasts are fairly similar.

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APPENDIX A

DATA COLLECTION

HDR Ferry Fares Memo
Fehr & Peers Data Collection Memo

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FEHR PEERS

MEMORANDUM

Date: June 13, 2013

To: Laurie Cummings and Kevin Doyle, HDR

From: Donald Samdahl, Fehr & Peers

Subject: ***Juneau Access Improvements***
Appendix A: Data Collection

SE12-0266

INTRODUCTION

This memorandum summarizes the data collection undertaken as part of the Juneau Access Improvements travel demand modeling. Some of the data were used directly as model inputs, while other data were simply collected as background information, helping to guide the development of the forecasting approach.

Data Collection Sources

Fehr & Peers collected various data needed for the Juneau Access Improvements travel demand modeling. This includes the following:

- Vehicular volume counts
- Ferry traffic counts
- Vehicle occupancy
- Air carrier passenger traffic and fare data for service between Juneau, Haines, and Skagway
- Seasonal volumes
- Vehicle operating cost

Each of these items is discussed in more detail below.

Vehicular Volume Counts

ADOT&PF conducted counts at two locations within the City and Borough of Juneau to determine local trip generation rates. The counts were taken at locations where there is only a single access route in and out for the residences in that area. These locations are:

- Sixth Street northeast of East Street/Basin Road
- Pioneer Avenue south of Fairbanks Street

Trip generation rates were calculated using the counts and the number of houses within the cul-de-sac, as shown in **Table 1**.

Table 1: 2012 Juneau Trip Generation Rates

Location	Total Trips from Tuesday to Thursday	Number of Households	Daily Trips per Household
Sixth Street	1,080	42	8.57
Pioneer Avenue	1,573	61	8.60
Total	**2,653**	**103**	**8.59**

Source: Alaska Department of Transportation & Public Facilities, July 2012.

Ferry Traffic Counts

Ferry traffic counts were collected from the 2011 Alaska Marine Highway System (AMHS) Annual Traffic Volume Report. **Table 2** summarizes the key data used for travel demand forecasting. The summer season is defined as May through September and the winter season is defined as October through April.

Table 2. 2011 Alaska Marine Highway System Link Volume Data

	Jun-Hns	Hns-Jun	Jun-Sgy	Sgy-Jun	TOTAL
Annual					
Passenger	39,873	40,792	775	746	82,186
Vehicles	12,695	13,036	173	157	26,061
Vehicle Occupancy	3.1	3.1	4.5	4.8	3.2
Summer					
Passenger	26,659	27,536	679	746	55,620
Vehicles	8,111	8,395	127	157	16,790
Vehicle Occupancy	3.3	3.3	5.4	4.8	3.3

Source: 2011 AMHS Annual Traffic Volume Report.

Using the data shown in Table 2, we also calculated the annual average daily traffic (AADT), summer average daily traffic (SADT), and winter average daily traffic (WADT). Winter traffic volumes are the difference between annual and summer traffic volumes. These measures shown in **Table 3** include both directions of travel on the Juneau-Haines and Juneau-Skagway links. The summer season is assumed to have 153 days and the winter season is assumed to have 212 days.

Table 3: 2011 Lynn Canal Ferry Passenger Traffic Calculations

	Ferry Passenger Volume
Annual Average Daily Traffic	225
Summer Average Daily Traffic	364
Winter Average Daily Traffic	125

Source: 2011 AMHS Annual Traffic Volume Report.

Additional data related to the market shares of ferry passengers was provided by Northern Economics and is included in Appendix A. Note that the link volumes are slightly different that those reported in the 2011 AMHS Annual Traffic Volume Report. This is because Northern Economics produces their data from the AMHS reservation system, which results in small differences during data aggregation.

Vehicle Occupancy

Annual vehicle occupancy is also shown in Table 2. The total number of passengers on the Juneau-Haines and Juneau-Skagway links was divided by the total number of vehicles on the Juneau-Haines and Juneau-Skagway links, resulting in a ferry passenger to vehicle ratio of 3.2. The vehicle occupancy during the summer was also calculated; it is slightly higher than the annual occupancy at 3.3 people per vehicle.

The average vehicle occupancy for highway trips was derived from the 2009 National Household Travel Survey dataset. To estimate the occupancy for long distance road trips originating in a location similar to Juneau, the data were filtered to include only those trips associated with households in small to medium sized cities in rural states that are not included in Metropolitan Statistical Areas.[1] That subset of data was further refined to include only trips between two and three hours in length, to replicate the characteristics of the trips between Juneau and Haines/Skagway. The vehicle occupancy for these trips is 2.3 persons per vehicle.

Air Carrier Passenger Data

Air carrier passenger data were collected from the TranStats tool provided on the Research and Innovative Technology Administration/Bureau of Transportation Statistics website. These data are included in the T-100 Domestic Segment (All Carriers) database. **Table 4** summarizes the air passenger link volumes between Juneau, Haines, and Skagway.

[1] This approach was consistent with the filters that were applied to this data for use in the Total Demand Model.

Table 4. 2011 Lynn Canal Air Travel Link Volumes

		Destination		
	Origin	**Juneau**	**Haines**	**Skagway**
Annual Total	Juneau	N/A	9,135	6,288
	Haines	7,880	N/A	2,971
	Skagway	6,421	2,616	N/A
Summer Total	Juneau	N/A	5,406	4,903
	Haines	4,125	N/A	1,877
	Skagway	5,440	1,303	N/A

Source: Bureau of Transportation Statistics, T-100 Domestic Segment (All Carriers) Database, 2012.

The data shown in Table 4 were converted into AADT, SADT, and WADT using the same methodology as that used for ferry traffic. **Table 5** summarizes those calculations and shows the current ferry and air mode share in North Lynn Canal.

Table 5: 2011 Lynn Canal Passenger Traffic Calculations

	Ferry Passenger Volume	**Air Passenger Volume**	**Ferry Passenger Share**	**Air Passenger Share**
Annual Average Daily Traffic	225	81	73.4%	26.6%
Summer Average Daily Traffic	364	130	73.7%	26.3%
Winter Average Daily Traffic	125	46	73.0%	27.0%

Source: Bureau of Transportation Statistics, T-100 Domestic Segment (All Carriers) Database, 2012 and 2011 AMHS Annual Traffic Volume Report.

Seasonal Factors

Seasonal factors were determined using the same methodology as was used for the User Benefit Analysis (Appendix E of the 2005 Supplemental Draft EIS). Specifically, average daily passenger volumes on each of the links were calculated for the entire year, the summer (May-September), and the winter (October to April). Ratios were calculated to determine the average seasonal factors, as shown in **Table 6**.

Table 6: 2011 Seasonal Factors

	Ferry Passenger Volume	Air Passenger Volume	Total	Seasonal Factor Relative to AADT
Annual Average Daily Traffic	225	81	306	1.00
Summer Average Daily Traffic	364	130	494	1.61
Winter Average Daily Traffic	125	46	171	0.56

Source: Bureau of Transportation Statistics, T-100 Domestic Segment (All Carriers) Database, 2012 and 2011 AMHS Annual Traffic Volume Report.

Vehicle Operating Cost

Current vehicle operating cost was calculated using information from the American Automobile Association (AAA). AAA provides nationwide vehicle operating cost for five types of vehicles: small sedan, medium sedan, large sedan, 4 wheel drive SUV, and minivan. The largest portion of operating cost is gas. To provide a more accurate local estimate of vehicle operating cost for the North Lynn Canal area, the gas prices were adjusted to reflect the higher fuel cost in Alaska. Using data from AAA's Daily Fuel Gauge Report on July 9, 2012, we found that gas in Alaska costs roughly 28 percent more than the nationwide average. The vehicle operating cost was also tailored to the local conditions by weighting the operating cost according to the fleet mix of the area. Fleet mix estimates were developed using ADOT&PF's Southeast Region 2009 Traffic and Safety Report Table 11 and the Alaska Department of Administration, Division of Motor Vehicles' statistics regarding currently registered vehicles in the City and Borough of Juneau. **Table 7** shows the calculations, which resulted in a final vehicle operating cost of 26 cents per mile.

Table 7. Vehicle Operating Cost (in Cents per Mile)

	Small Sedan	Medium Sedan	Large Sedan	4WD SUV	Minivan
Alaska Fuel Cost	14.6	18.7	21.1	23.9	20.7
Maintenance Cost	4.2	4.3	4.9	4.9	4.4
Tires Cost	0.7	1.1	1.2	1.3	0.8
Total	19.5	24.2	27.2	30.0	25.9
Fleet Mix	15%	25%	20%	30%	10%
Fleet Weighted Average					**26.0**

Source: AAA 2012 Your Driving Costs and AAA Daily Fuel Gauge Report 7/9/12.

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APPENDIX B

AMHS LYNN CANAL MARKET DATA AND POPULATION FORECAST

Northern Economics Market Segments Memo
Northern Economics Population Forecast Memo

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Memorandum

Date: September 7, 2012

To: Laurie Cummings, HDR-Alaska

From: Alejandra Palma-Riedel and Marcus Hartley

Re: Updated Population Estimates and Forecasts for the JAIP EIS

This updated Population Memo provides updated historic population estimates and revised population forecasts out through 2050 for the Haines Borough, City and Borough of Juneau, Municipality of Skagway Borough, Klukwan, City and Borough of Sitka, Petersburg Census Area, the rest of Southeast Alaska[1], the rest of Alaska with road access[2], and the rest of Alaska without road access[3].

- Section 1 provides a summary of the methodologies used to develop the population forecasts.
- Section 2 provides tables and figures showing the population data and preliminary population forecasts for the direct project area. Included in this section are data and forecasts for Haines Borough, the City and Borough of Juneau, the Municipality of Skagway Borough, and Klukwan.
- Section 3 provides tables and figures showing the population data and preliminary population forecasts for areas of interest outside the direct project area. Included in this section are data and forecasts for the City and Borough of Sitka, Petersburg Census Area, the rest of Southeast Alaska, the rest of Alaska with road access, and the rest of Alaska without road access.

We note that our population estimates may be revised with the collection of new information on expected economic developments in the area that we plan to gather from interviews.

1 Population Sources and Forecasting Methodology

The data sources used in the original Environmental Impact Statement (EIS) are Alaska Department of Labor and Workforce Development (ADOLWD) annual population estimates for the interim non-Census years and Census data for the decadal years; we have used the same primary data sources. Historic population data were provided in the original EIS for Juneau for the years 1970–2002 and for the City of Skagway and Haines Borough for 1980–2002. We have updated the historic population data since 1980 and extended it out to 2011 for the direct project area. In addition, we included

[1] Comprises all of the Hoonah Angoon Census Area excluding Klukwan, Ketchikan Gateway Borough, Prince of Wales-Hyder Census Area, the City and Borough of Wrangell, and the City and Borough of Yakutat.

[2] Comprises all of the Municipality of Anchorage, Kenai Peninsula Borough, Matanuska-Susitna Borough, Denali Borough, Fairbanks North Star Borough, Southeast Fairbanks Census Area, and Valdez-Cordova Census Area.

[3] Comprises the Kodiak Island Borough, Yukon-Koyukuk Census Area, Nome Census Area, North Slope Borough, Northwest Arctic Borough, Aleutians East Borough, Aleutians West Census Area, Bethel Census Area, Bristol Bay Borough, Dillingham Census Area, Lake and Peninsula Borough, and Wade Hampton Census Area.

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population estimates for the City and Borough of Sitka and the Petersburg Census Area, as well as for the rest of Southeast Alaska (as one group consisting of all the communities in Southeast Alaska that are not Sitka, in the Petersburg Census Area, or part of the direct project area) and the rest of Alaska (all Alaskan communities except for the ones in the Southeast Region). The latter will be subdivided into two groups: 1) the rest of Alaska with road access to Southeast Alaska, and 2) the rest of Alaska without road access to Southeast Alaska.

1.1 Mid-range Forecasts of Population

Mid-range population forecasts are based on ADOLWD forecasts for boroughs and census areas.[4] These forecasts are available for five year intervals for the years 2015–2035, and are based on demographic and migration trends. We estimated populations for intermediate years (e.g. 2012–2014, and 2016–2019) using imputed compound growth rates between the two most recent years for which ADOLWD forecasts are available. As the ADOLWD forecast only goes to 2035, for the years from 2036-2050 we have assumed zero growth from the level projected for 2035. For example, the imputed annual compound growth rate for the City and Borough of Juneau from ADOLWD forecasts for 2012 and 2016 is -0.194 percent, and the ADOLWD population forecast for 2012 was 32,227. Therefore, our 2013 forecast for the City and Borough of Juneau will be 32,165 (i.e. 2012 forecast population × -0.194 percent), and 32,102 for 2014. Forecasts for the years 2036 through 2050 will all be a continuation of the forecast for the year 2035 with a zero percent growth rate, which for the City and Borough of Juneau is estimated at 32,080.

ADOLWD does not provide population forecasts for individual communities or census designated places (CDPs). Therefore a different methodology is used to estimate populations of communities and census designated places (CDPs) within each borough or census area in the direct project area. Population forecasts for Klukwan—part of the Hoonah Angoon Census Area—will rely on this CDP forecast methodology, as do forecasts for the City of Haines and the five CDPs within the Haines Borough.[5] While the population of the Municipality of Skagway Borough is similarly subdivided into the Skagway CDP and a "remainder population", the Skagway CDP accounts for 95 percent of the borough's population. As a result, separate population forecasts for the CDP and the remainder population will not be provided. Finally, the ADOLWD population forecasts for the City and Borough of Juneau do not list populations of any CDPs.

The CDP population forecast methodology utilizes a simple regression starting with the population in the year 2000, where population of the CDP (or community) is the dependent variable and the natural log of year in the independent variable. The natural log of year is used because it tends to provide a better fit with long-run ADOLWD forecasts. Using the log will flatten out or moderate the predominant trend over longer periods. If the actual population is increasing for example, using the natural log of year will generate forecasts that continue to increase over time but at a decreasing rate.[6]

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[4] Alaska Department of Labor and Workforce Development (ADOLWD). 2012. "Population Estimates - Economic Regions and Boroughs/Census Areas, Population 2000-2011 (Excel)." Accessed on July 10, 2012. http://labor.alaska.gov/research/pop/popest.htm.

[5] The five CDPs are: 1) Covenant Life CDP, 2) Lutak CDP, 3) Mud Bay CDP, 4) Excursion Inlet CDP, and 5) Mosquito Lake CDP. According to ADOLWD data, these CDPs and a "remainder population" accounted for 31 percent of the borough's population in 2011.

[6] If in contrast a simple linear regression were used for populations that were declining, the forecast would very possibly go to zero and even turn negative within project timeline.

A separate regression is estimated for each population component (CDPs, cities, remainders) within the census area or borough. We then compare the sum of the CDP forecast population of the all of the components to the ADOLWD-based forecast for the census area or borough for the year, and calculate the difference. The difference (either positive or negative) is distributed back to each component proportionally, using the previous year's adjusted forecast population as the basis.

1.2 High and Low Forecasts of Population

The 2004 Socioeconomic Technical Report for the 2006 EIS provides high, medium, and low forecasts of population for the City and Borough of Juneau, the Haines Borough, and the City of Skagway, although the methodology for generating these forecasts is not explained. It appears, however, that the high forecast has been based on the 20-year annual growth rate up through the most recent year of ADOLWD population data, i.e. the reported annual growth rate from 1982–2002. The low forecast appears to be based on the difference between the medium and the high forecasts. We generated high and low forecasts for populations using this same general approach.

The population forecasts through the year 2035 are projected as follows. The mid-range population forecast corresponds to ADOLWD's forecast and is used as the midpoint between the high-end and low-end rates. One of these end-forecasts is set to grow at the actual 20-year rate of change observed during 1991-2011, while the other is calculated as the mirror difference with respect to the mid-range forecast. For the remaining years 2036-2050 the forecasts assume that population remains constant at the 2035 level projected under each scenario. The second section provides high and low forecasts for boroughs in the direct study area (Juneau, Haines, and Skagway, as well as for Klukwan). We also develop in the third section high and low forecast populations for the City and Borough of Sitka, Petersburg Census Area, the Rest of Southeast Alaska, and the Rest of Alaska with and without road access to Southeast Alaska.

2 Historic and Forecast Population for the Direct Project Area

This section contains historic population data and forecasts for the Haines Borough, the City and Borough of Juneau, the Municipality of Skagway Borough, and Klukwan, each in its own subsection. Each subsection contains two tables and a figure. The first table shows available historical population estimates up to 2011. The second table shows population forecasts from 2012–2050, including high and low forecasts. The figure shows historical population as well as the low, mid, and high forecast population. For the Haines Borough, an additional table and figure show historical population from 2000 and the mid-range forecasts of cities and CDPs within the borough.

2.1 Historic and Forecast Population for Haines Borough

Table 1. Historical Population of Haines Borough

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1980	1,680					
1981	1,803	123	7.3%			
1982	1,886	83	4.6%			
1983	1,950	64	3.4%			
1984	2,051	101	5.2%			
1985	2,034	(17)	-0.8%			
1986	2,036	2	0.1%	2.5%		
1987	1,971	(65)	-3.2%			
1988	1,956	(15)	-0.8%			
1989	2,058	102	5.2%			
1990	2,117	59	2.9%			
1991	2,242	125	5.9%	1.9%	2.2%	
1992	2,230	(12)	-0.5%			
1993	2,293	63	2.8%			
1994	2,331	38	1.7%			
1995	2,280	(51)	-2.2%			
1996	2,352	72	3.2%	1.0%	1.5%	
1997	2,404	52	2.2%			
1998	2,461	57	2.4%			
1999	2,475	14	0.6%			
2000	2,392	(83)	-3.4%			
2001	2,405	13	0.5%	0.4%	0.7%	1.5%
2002	2,412	7	0.3%			
2003	2,391	(21)	-0.9%			
2004	2,343	(48)	-2.0%			
2005	2,312	(31)	-1.3%			
2006	2,357	45	1.9%	-0.4%	0.0%	0.7%
2007	2,387	30	1.3%			
2008	2,464	77	3.2%			
2009	2,453	(11)	-0.4%			
2010	2,508	55	2.2%			
2011	2,620	112	4.5%	2.1%	0.9%	0.8%

Source: Table developed by Northern Economics using population data from ADOLWD.

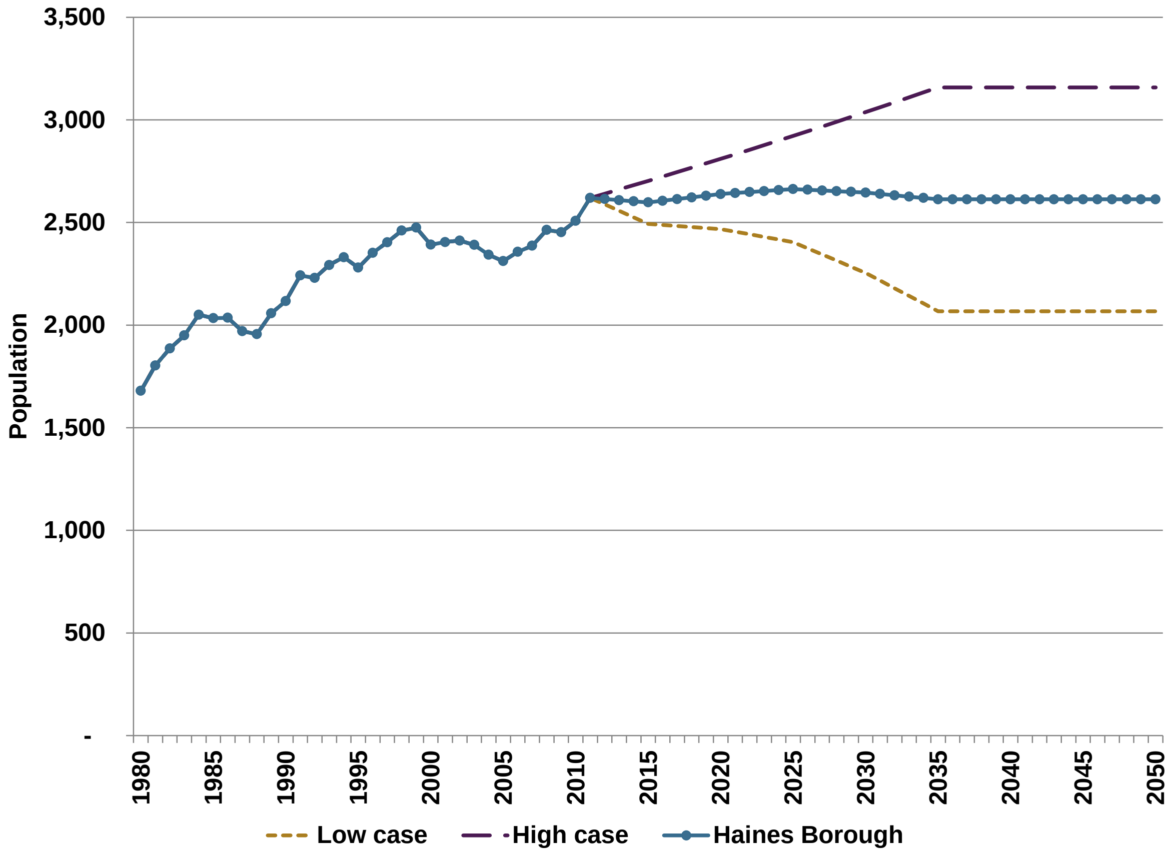
Table 2. Population Forecasts for the Haines Borough

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	2,614			2,588	2,640
2013	2,609	(6)	-0.2%	2,557	2,661
2014	2,603	(5)	-0.2%	2,525	2,682
2015	2,598	(5)	-0.2%	2,493	2,703
2016	2,606	8	0.3%	2,488	2,724
2017	2,614	8	0.3%	2,483	2,745
2018	2,623	8	0.3%	2,478	2,767
2019	2,631	8	0.3%	2,473	2,788
2020	2,639	8	0.3%	2,468	2,810
2021	2,644	5	0.2%	2,455	2,832
2022	2,649	5	0.2%	2,443	2,854
2023	2,653	5	0.2%	2,430	2,877
2024	2,658	5	0.2%	2,417	2,899
2025	2,663	5	0.2%	2,404	2,922
2026	2,660	(3)	-0.1%	2,374	2,945
2027	2,656	(3)	-0.1%	2,345	2,968
2028	2,653	(3)	-0.1%	2,315	2,991
2029	2,649	(3)	-0.1%	2,284	3,014
2030	2,646	(3)	-0.1%	2,254	3,038
2031	2,639	(7)	-0.3%	2,217	3,062
2032	2,633	(7)	-0.3%	2,180	3,086
2033	2,626	(7)	-0.3%	2,142	3,110
2034	2,620	(7)	-0.3%	2,105	3,134
2035	2,613	(7)	-0.3%	2,067	3,159
2036	2,613	-	0.0%	2,067	3,159
2037	2,613	-	0.0%	2,067	3,159
2038	2,613	-	0.0%	2,067	3,159
2039	2,613	-	0.0%	2,067	3,159
2040	2,613	-	0.0%	2,067	3,159
2041	2,613	-	0.0%	2,067	3,159
2042	2,613	-	0.0%	2,067	3,159
2043	2,613	-	0.0%	2,067	3,159
2044	2,613	-	0.0%	2,067	3,159
2045	2,613	-	0.0%	2,067	3,159
2046	2,613	-	0.0%	2,067	3,159
2047	2,613	-	0.0%	2,067	3,159
2048	2,613	-	0.0%	2,067	3,159
2049	2,613	-	0.0%	2,067	3,159
2050	2,613	-	0.0%	2,067	3,159

Note: For 2012-2035 the high-end population forecast uses an annual rate of change of -0.78 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 1. Historical and Forecast Population for the Haines Borough



Note: For 2012-2035 the high-end population uses an annual rate of change of 0.78 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

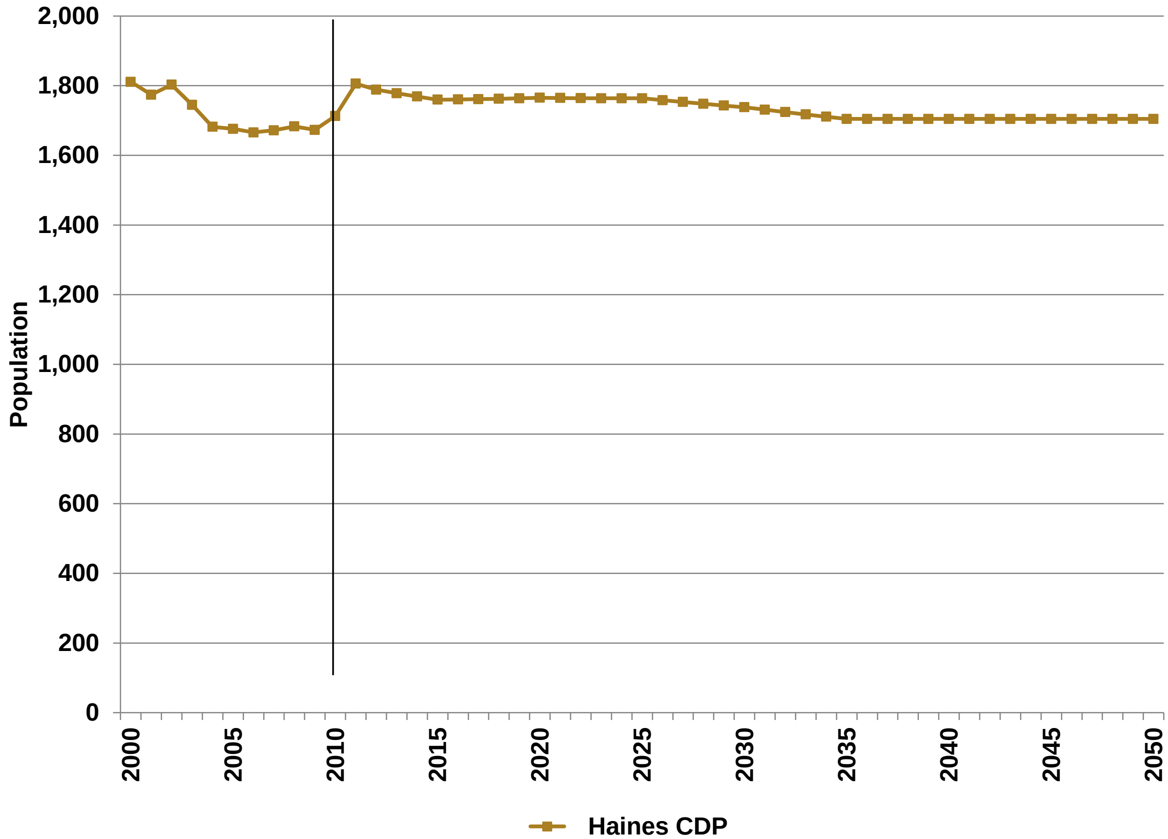
Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

Table 3. Historical and Forecast Populations of Cities and CDPs in the Haines Borough

Year	Covenant Life CDP	Excursion Inlet CDP	City of Haines	Lutak CDP	Mosquito Lake CDP	Mud Bay CDP	Borough Remainder	Haines Borough Total
2000	102	10	1,811	39	221	137	72	2,392
2001	79	15	1,774	44	266	160	67	2,405
2002	71	10	1,803	41	266	151	70	2,412
2003	76	13	1,745	38	287	154	78	2,391
2004	75	11	1,682	42	270	162	101	2,343
2005	72	11	1,676	39	264	157	93	2,312
2006	81	10	1,666	51	275	158	116	2,357
2007	77	15	1,672	47	279	165	132	2,387
2008	80	15	1,683	60	315	167	144	2,464
2009	69	13	1,673	44	322	189	143	2,453
2010	86	12	1,713	49	309	212	127	2,508
2011	85	14	1,806	49	311	213	142	2,620
Mid-Range Forecasts								
2012	80	14	1,789	52	329	202	147	2,614
2013	79	14	1,778	53	332	203	150	2,609
2014	79	14	1,769	53	333	204	152	2,603
2015	78	14	1,760	53	334	205	154	2,598
2016	78	14	1,761	54	337	207	156	2,606
2017	78	14	1,761	54	340	209	159	2,614
2018	78	14	1,762	54	342	210	161	2,623
2019	77	14	1,764	55	345	212	163	2,631
2020	77	15	1,765	55	347	214	166	2,639
2021	77	15	1,765	55	349	215	167	2,644
2022	77	15	1,764	56	351	217	169	2,649
2023	77	15	1,764	56	353	218	171	2,653
2024	77	15	1,764	56	355	219	173	2,658
2025	77	15	1,764	57	356	220	174	2,663
2026	76	15	1,758	57	357	221	176	2,660
2027	76	15	1,753	57	358	221	177	2,656
2028	76	15	1,748	57	358	222	178	2,653
2029	75	15	1,743	57	359	222	179	2,649
2030	75	15	1,738	57	359	223	179	2,646
2031	75	15	1,731	57	359	223	180	2,639
2032	74	15	1,724	57	359	223	181	2,633
2033	74	15	1,718	57	359	223	181	2,626
2034	74	15	1,711	57	359	223	182	2,620
2035	73	15	1,704	57	359	223	182	2,613
2036	73	15	1,704	57	359	223	182	2,613
2037	73	15	1,704	57	359	223	182	2,613
2038	73	15	1,704	57	359	223	182	2,613
2039	73	15	1,704	57	359	223	182	2,613
2040	73	15	1,704	57	359	223	182	2,613
2041	73	15	1,704	57	359	223	182	2,613
2042	73	15	1,704	57	359	223	182	2,613
2043	73	15	1,704	57	359	223	182	2,613
2044	73	15	1,704	57	359	223	182	2,613
2045	73	15	1,704	57	359	223	182	2,613
2046	73	15	1,704	57	359	223	182	2,613
2047	73	15	1,704	57	359	223	182	2,613
2048	73	15	1,704	57	359	223	182	2,613
2049	73	15	1,704	57	359	223	182	2,613
2050	73	15	1,704	57	359	223	182	2,613

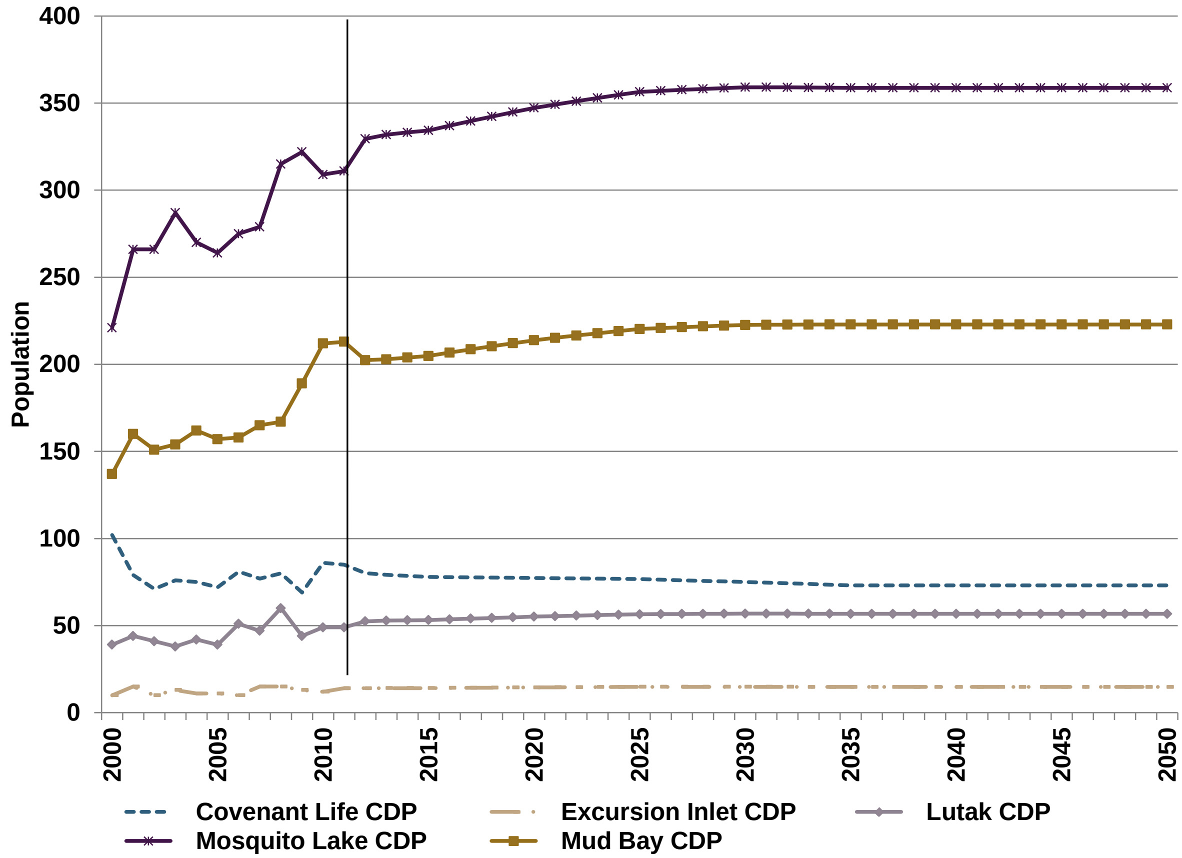
Source: Table developed by Northern Economics using population data and forecasts from ADOLWD.

Figure 2. Historical and Mid-Range Forecast Population for the City of Haines



Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

Figure 3. Historical and Mid-Range Forecast Populations of CDPs in the Haines Borough



Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

2.2 Historic and Forecast Population for the City and Borough of Juneau

Table 4. Historical Population of the City and Borough of Juneau

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1970	13,556					
1971	14,600	1,044	7.7%			
1972	15,200	600	4.1%			
1973	15,700	500	3.3%			
1974	16,100	400	2.5%			
1975	16,400	300	1.9%			
1976	17,000	600	3.7%	3.1%		
1977	17,500	500	2.9%			
1978	18,000	500	2.9%			
1979	18,900	900	5.0%			
1980	19,528	628	3.3%			
1981	21,329	1,801	9.2%	4.6%	3.9%	

1982	22,451	1,122	5.3%			
1983	24,007	1,556	6.9%			
1984	25,268	1,261	5.3%			
1985	26,037	769	3.0%			
1986	25,998	(39)	-0.1%	4.0%	4.3%	
1987	24,966	(1,032)	-4.0%			
1988	24,655	(311)	-1.2%			
1989	25,100	445	1.8%			
1990	26,751	1,651	6.6%			
1991	27,579	828	3.1%	1.2%	2.6%	3.2%
1992	28,253	674	2.4%			
1993	28,448	195	0.7%			
1994	28,454	6	0.0%			
1995	28,700	246	0.9%			
1996	29,230	530	1.8%	1.2%	1.2%	2.7%
1997	29,713	483	1.7%			
1998	30,021	308	1.0%			
1999	30,189	168	0.6%			
2000	30,711	522	1.7%			
2001	30,482	(229)	-0.7%	0.8%	1.0%	1.8%
2002	31,047	565	1.9%			
2003	31,364	317	1.0%			
2004	31,213	(151)	-0.5%			
2005	31,340	127	0.4%			
2006	30,943	(397)	-1.3%	0.3%	0.6%	0.9%
2007	30,350	(593)	-1.9%			
2008	30,554	204	0.7%			
2009	30,946	392	1.3%			
2010	31,275	329	1.1%			
2011	32,290	1,015	3.2%	0.9%	0.6%	0.8%

Source: Table developed by Northern Economics using population data from ADOLWD.

Table 5. Population Forecasts for the City and Borough of Juneau

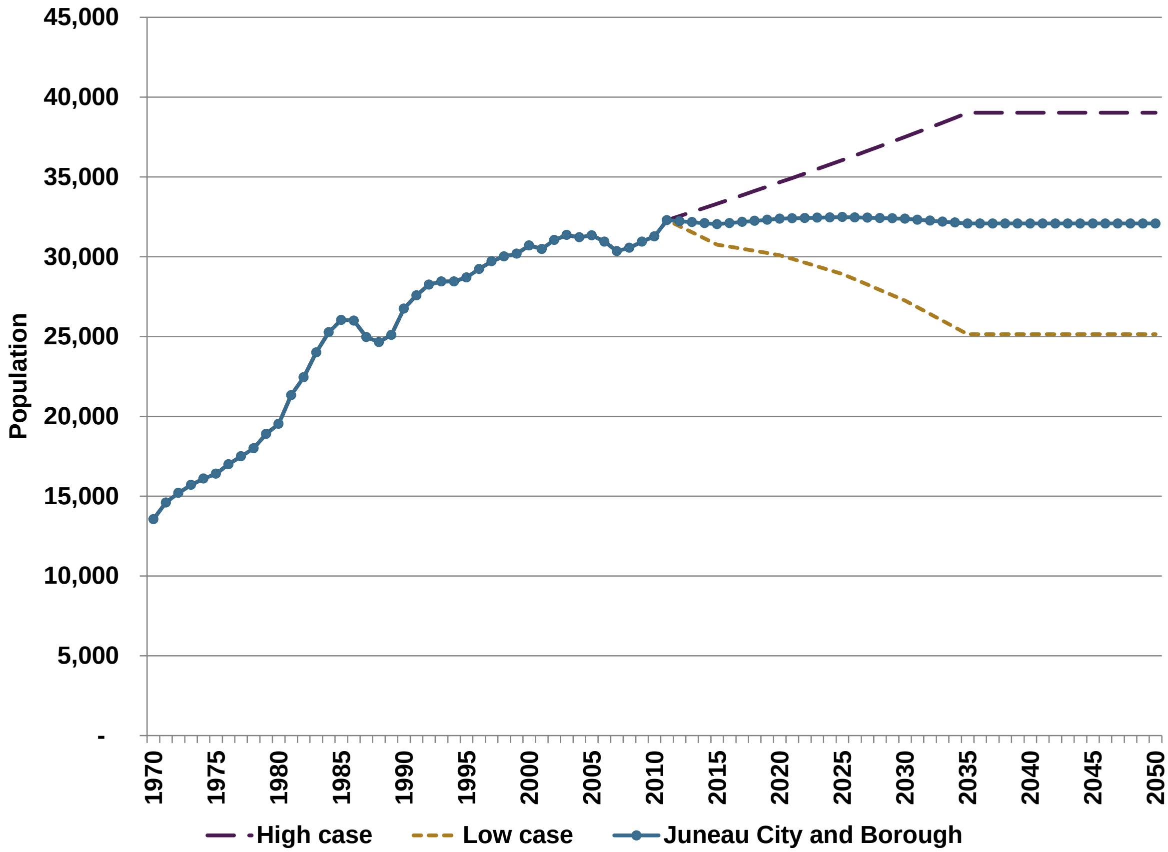
Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	32,227			31,909	32,546
2013	32,165	(63)	-0.2%	31,526	32,803
2014	32,102	(62)	-0.2%	31,142	33,063
2015	32,040	(62)	-0.2%	30,755	33,325
2016	32,108	68	0.2%	30,627	33,588
2017	32,176	68	0.2%	30,498	33,854
2018	32,244	68	0.2%	30,366	34,122
2019	32,313	68	0.2%	30,233	34,393
2020	32,381	68	0.2%	30,097	34,665
2021	32,402	21	0.1%	29,864	34,939
2022	32,423	21	0.1%	29,629	35,216
2023	32,443	21	0.1%	29,392	35,495
2024	32,464	21	0.1%	29,153	35,776
2025	32,485	21	0.1%	28,911	36,059
2026	32,464	(21)	-0.1%	28,583	36,344

2027	32,443	(21)	-0.1%	28,253	36,632
2028	32,421	(21)	-0.1%	27,921	36,922
2029	32,400	(21)	-0.1%	27,586	37,214
2030	32,379	(21)	-0.1%	27,249	37,509
2031	32,319	(60)	-0.2%	26,832	37,806
2032	32,259	(60)	-0.2%	26,413	38,105
2033	32,199	(60)	-0.2%	25,992	38,407
2034	32,140	(60)	-0.2%	25,568	38,711
2035	32,080	(60)	-0.2%	25,143	39,017
2036	32,080	-	0.0%	25,143	39,017
2037	32,080	-	0.0%	25,143	39,017
2038	32,080	-	0.0%	25,143	39,017
2039	32,080	-	0.0%	25,143	39,017
2040	32,080	-	0.0%	25,143	39,017
2041	32,080	-	0.0%	25,143	39,017
2042	32,080	-	0.0%	25,143	39,017
2043	32,080	-	0.0%	25,143	39,017
2044	32,080	-	0.0%	25,143	39,017
2045	32,080	-	0.0%	25,143	39,017
2046	32,080	-	0.0%	25,143	39,017
2047	32,080	-	0.0%	25,143	39,017
2048	32,080	-	0.0%	25,143	39,017
2049	32,080	-	0.0%	25,143	39,017
2050	32,080	-	0.0%	25,143	39,017

Note: For 2012-2035 the high-end population uses an annual rate of change of 0.79 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 4. Historical and Forecast Population for the City and Borough of Juneau



Note: For 2012-2035 the high-end population uses an annual rate of change of 0.79 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

2.3 Historic and Forecast Population for the Municipality of Skagway Borough

Table 6. Historical Population of the Municipality of Skagway Borough

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1980	768					
1981	819	51	6.6%			
1982	790	(29)	-3.5%			
1983	782	(8)	-1.0%			
1984	652	(130)	-16.6%			
1985	610	(42)	-6.4%			
1986	714	104	17.0%	-2.7%		
1987	709	(5)	-0.7%			
1988	704	(5)	-0.7%			
1989	718	14	2.0%			
1990	692	(26)	-3.6%			
1991	726	34	4.9%	0.3%	-1.2%	
1992	758	32	4.4%			
1993	786	28	3.7%			
1994	798	12	1.5%			
1995	775	(23)	-2.9%			
1996	778	3	0.4%	1.4%	0.9%	
1997	815	37	4.8%			
1998	811	(4)	-0.5%			
1999	825	14	1.7%			
2000	862	37	4.5%			
2001	848	(14)	-1.6%	1.7%	1.6%	0.2%
2002	861	13	1.5%			
2003	868	7	0.8%			
2004	907	39	4.5%			
2005	875	(32)	-3.5%			
2006	905	30	3.4%	1.3%	1.5%	1.2%
2007	900	(5)	-0.6%			
2008	911	11	1.2%			
2009	944	33	3.6%			
2010	968	24	2.5%			
2011	965	(3)	-0.3%	1.3%	1.3%	1.4%

Note: The population numbers for the years 1980 – 2006 include the City of Skagway and the "remainder population of the Skagway Census Sub-area. In 2007 the City Skagway was dissolved, and the Municipality of Skagway Borough was formed. The new borough includes entirety of the former Skagway Census Sub-area, including the former City of Skagway (now a CDP) and the remainder of the former Skagway Census Sub-area.

Source: Table developed by Northern Economics using population data from ADOLWD.

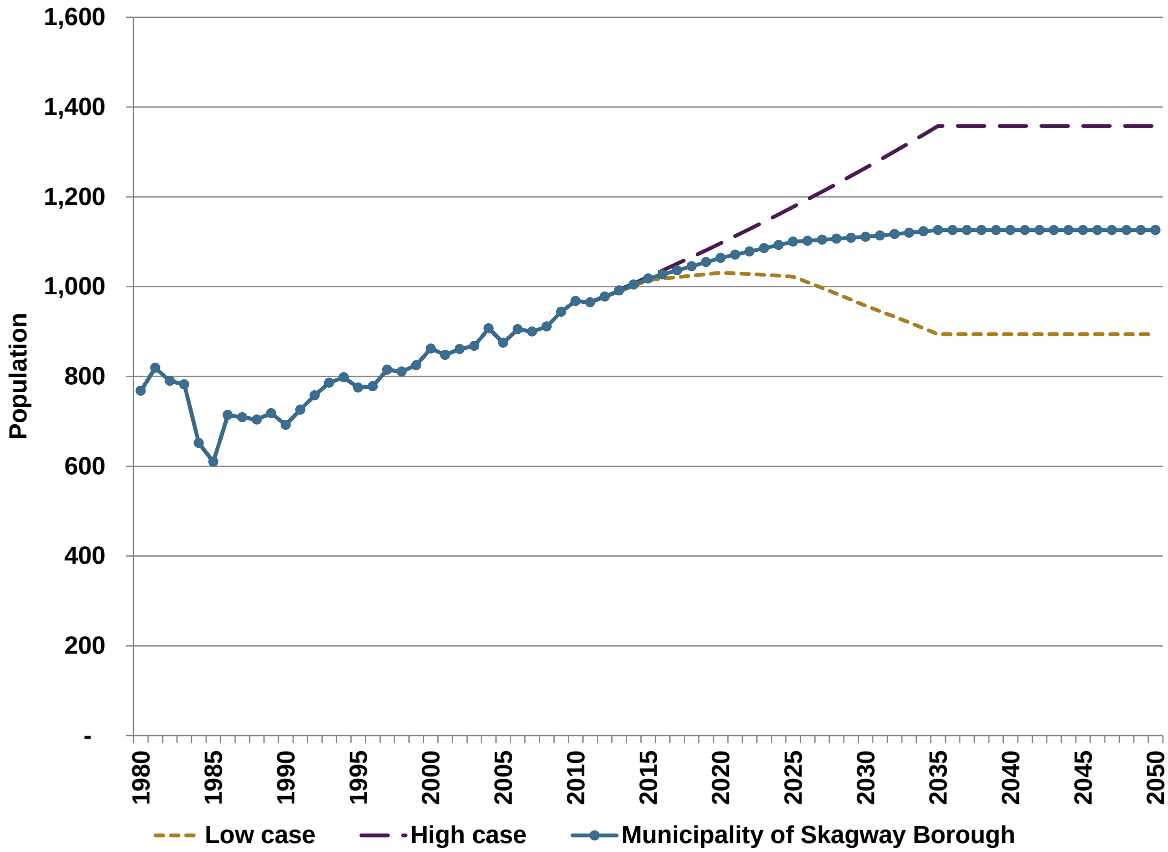
Table 7. Population Forecasts for the Municipality of Skagway Borough

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	978			977	979
2013	991	13	1.3%	989	993
2014	1,004	13	1.3%	1,002	1,007
2015	1,018	14	1.3%	1,014	1,022
2016	1,027	9	0.9%	1,018	1,036
2017	1,036	9	0.9%	1,021	1,051
2018	1,045	9	0.9%	1,025	1,066
2019	1,055	9	0.9%	1,028	1,081
2020	1,064	9	0.9%	1,031	1,097
2021	1,071	7	0.7%	1,030	1,113
2022	1,078	7	0.7%	1,028	1,129
2023	1,085	7	0.7%	1,026	1,145
2024	1,093	7	0.7%	1,024	1,161
2025	1,100	7	0.7%	1,022	1,178
2026	1,102	2	0.2%	1,010	1,195
2027	1,104	2	0.2%	997	1,212
2028	1,107	2	0.2%	984	1,229
2029	1,109	2	0.2%	971	1,247
2030	1,111	2	0.2%	957	1,265
2031	1,114	3	0.3%	945	1,283
2032	1,117	3	0.3%	933	1,301
2033	1,120	3	0.3%	920	1,320
2034	1,123	3	0.3%	907	1,339
2035	1,126	3	0.3%	894	1,358
2036	1,126	-	0.0%	894	1,358
2037	1,126	-	0.0%	894	1,358
2038	1,126	-	0.0%	894	1,358
2039	1,126	-	0.0%	894	1,358
2040	1,126	-	0.0%	894	1,358
2041	1,126	-	0.0%	894	1,358
2042	1,126	-	0.0%	894	1,358
2043	1,126	-	0.0%	894	1,358
2044	1,126	-	0.0%	894	1,358
2045	1,126	-	0.0%	894	1,358
2046	1,126	-	0.0%	894	1,358
2047	1,126	-	0.0%	894	1,358
2048	1,126	-	0.0%	894	1,358
2049	1,126	-	0.0%	894	1,358
2050	1,126	-	0.0%	894	1,358

Note: For 2012-2035 the high-end population uses an annual rate of change of 1.43 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 5. Historical Skagway Population and Forecast Population for the Municipality of Skagway Borough



Note: The population numbers for the years 1980 – 2006 include the City of Skagway and the "remainder population of the Skagway Census Sub-area. In 2007 the City Skagway was dissolved, and the Municipality of Skagway Borough was formed. The new borough includes entirety of the former Skagway Census Sub-area, including the former City of Skagway (now a CDP) and the remainder of the former Skagway Census Sub-area.

Note: For 2012-2035 the high-end population uses an annual rate of change of 1.43 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

2.4 Historic and Forecast Population for Klukwan

Table 8. Historical Population of Klukwan

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1986	151	151				
1987	153	2	1.3%			
1988	151	(2)	-1.3%			
1989	189	38	25.2%			
1990	129	(60)	-31.7%			
1991	129	0	0.0%	-3.1%		
1992	130	1	0.8%			
1993	135	5	3.8%			
1994	140	5	3.7%			
1995	165	25	17.9%			
1996	140	(25)	-15.2%	1.7%	-0.8%	
1997	160	20	14.3%			
1998	141	(19)	-11.9%			
1999	136	(5)	-3.5%			
2000	142	6	4.4%			
2001	119	(23)	-16.2%	-3.2%	-0.8%	
2002	105	(14)	-11.8%			
2003	112	7	6.7%			
2004	118	6	5.4%			
2005	104	(14)	-11.9%			
2006	108	4	3.8%	-1.9%	-2.6%	-1.7%
2007	94	(14)	-13.0%			
2008	75	(19)	-20.2%			
2009	76	1	1.3%			
2010	95	19	25.0%			
2011	98	3	3.2%	-1.9%	-1.9%	-1.4%

Source: Table developed by Northern Economics using population data from ADOLWD.

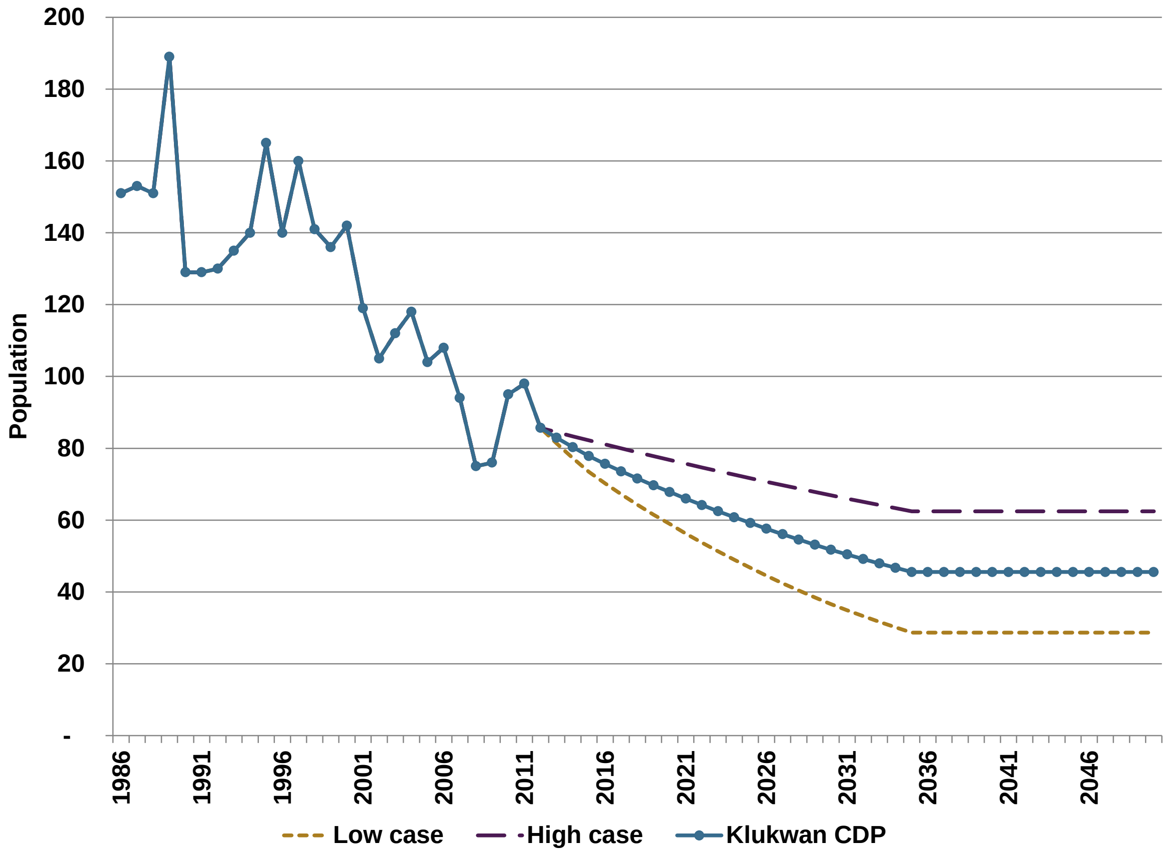
Table 9. Population Forecasts for Klukwan

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	86			86	86
2013	83	(3)	-3.2%	81	85
2014	80	(3)	-3.2%	77	83
2015	78	(2)	-3.1%	73	82
2016	76	(2)	-2.8%	70	81
2017	74	(2)	-2.7%	67	80
2018	72	(2)	-2.7%	64	79
2019	70	(2)	-2.7%	62	78
2020	68	(2)	-2.6%	59	77
2021	66	(2)	-2.7%	56	76
2022	64	(2)	-2.7%	54	75
2023	62	(2)	-2.7%	51	74
2024	61	(2)	-2.7%	49	73
2025	59	(2)	-2.6%	47	72
2026	58	(2)	-2.7%	45	71
2027	56	(2)	-2.7%	42	70
2028	55	(1)	-2.7%	40	69
2029	53	(1)	-2.6%	38	68
2030	52	(1)	-2.6%	37	67
2031	50	(1)	-2.5%	35	66
2032	49	(1)	-2.5%	33	65
2033	48	(1)	-2.5%	32	64
2034	47	(1)	-2.5%	30	63
2035	46	(1)	-2.5%	29	62
2036	46	-	0.0%	29	62
2037	46	-	0.0%	29	62
2038	46	-	0.0%	29	62
2039	46	-	0.0%	29	62
2040	46	-	0.0%	29	62
2041	46	-	0.0%	29	62
2042	46	-	0.0%	29	62
2043	46	-	0.0%	29	62
2044	46	-	0.0%	29	62
2045	46	-	0.0%	29	62
2046	46	-	0.0%	29	62
2047	46	-	0.0%	29	62
2048	46	-	0.0%	29	62
2049	46	-	0.0%	29	62
2050	46	-	0.0%	29	62

Note: For 2012-2035 the high-end population uses an annual rate of change of -1.36 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 6. Historical and Forecast Population for Klukwan



Note: For 2012-2035 the high-end population uses an annual rate of change of -1.36 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

3 Historic and Forecast Population for Areas of Interest outside the Direct Project Area

This section contains historical population data and low, mid-range and high population forecasts for areas of interest outside the Direct Project Area. These areas include the City and Borough of Sitka, the Petersburg Census Area, the Rest of Southeast Alaska, the Rest of Alaska with Road Access, and the Rest of Alaska without Road Access. Because of changing geographic definitions, we have limited the historical period in this section to include 1990–2011.

3.1 Historic and Forecast Population for the City and Borough of Sitka

Table 10. Historical Population of the City and Borough of Sitka

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1990	8,588					
1991	8,878	290	3.4%			
1992	9,059	181	2.0%			
1993	9,083	24	0.3%			
1994	8,941	(142)	-1.6%			
1995	8,868	(73)	-0.8%			
1996	8,650	(218)	-2.5%	-0.5%		
1997	8,708	58	0.7%			
1998	8,722	14	0.2%			
1999	8,681	(41)	-0.5%			
2000	8,835	154	1.8%			
2001	8,737	(98)	-1.1%	0.2%	-0.2%	
2002	8,812	75	0.9%			
2003	8,918	106	1.2%			
2004	8,860	(58)	-0.7%			
2005	8,990	130	1.5%			
2006	9,043	53	0.6%	0.7%	0.4%	
2007	8,678	(365)	-4.0%			
2008	8,698	20	0.2%			
2009	8,730	32	0.4%			
2010	8,881	151	1.7%			
2011	8,985	104	1.2%	-0.1%	0.3%	0.1%

Source: Table developed by Northern Economics using population data from ADOLWD.

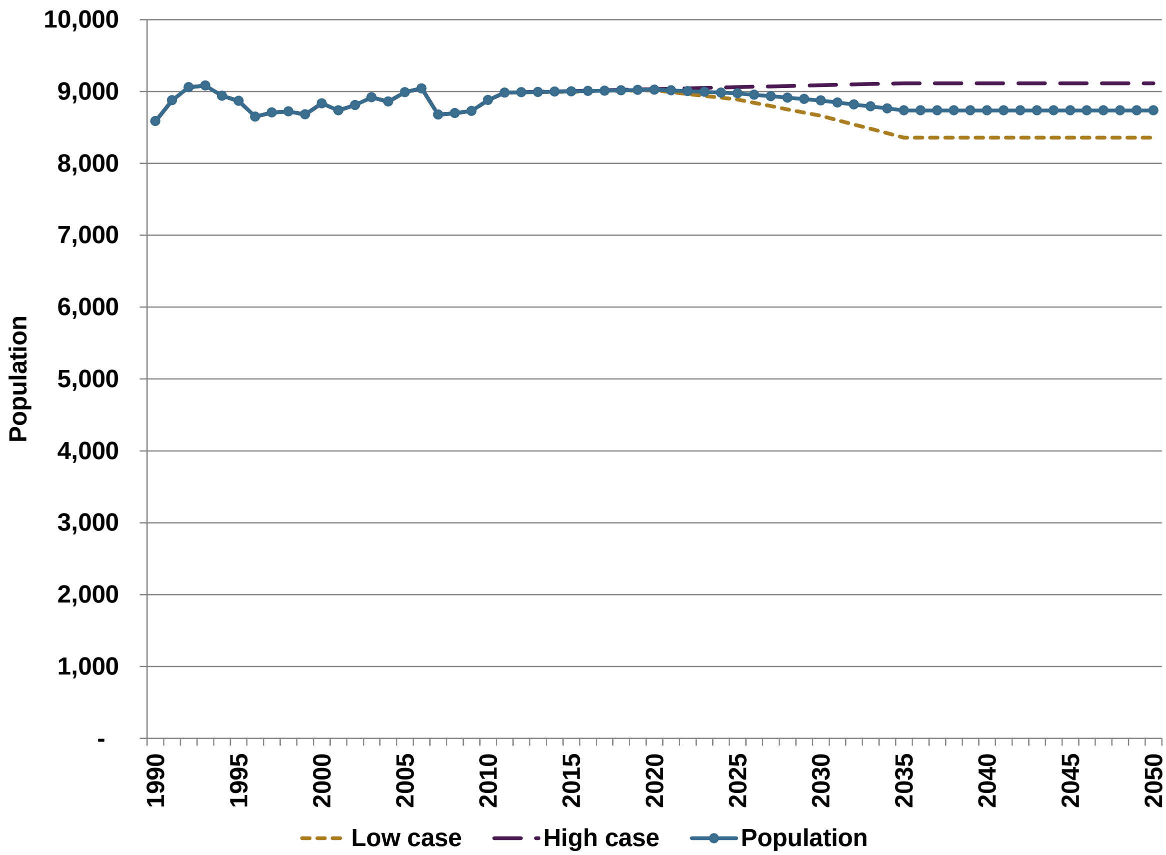
Table 11. Population Forecasts for the City and Borough of Sitka

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	8,989			8,988	8,990
2013	8,993	4	0.0%	8,991	8,996
2014	8,998	4	0.0%	8,994	9,001
2015	9,002	4	0.0%	8,997	9,007
2016	9,007	5	0.1%	9,002	9,012
2017	9,012	5	0.1%	9,006	9,017
2018	9,016	5	0.1%	9,010	9,023
2019	9,021	5	0.1%	9,014	9,028
2020	9,026	5	0.1%	9,018	9,034
2021	9,016	(10)	-0.1%	8,992	9,039
2022	9,005	(10)	-0.1%	8,966	9,044
2023	8,995	(10)	-0.1%	8,940	9,050
2024	8,984	(10)	-0.1%	8,914	9,055
2025	8,974	(10)	-0.1%	8,887	9,061
2026	8,954	(20)	-0.2%	8,842	9,066
2027	8,934	(20)	-0.2%	8,797	9,072
2028	8,914	(20)	-0.2%	8,752	9,077
2029	8,895	(20)	-0.2%	8,707	9,082
2030	8,875	(20)	-0.2%	8,662	9,088
2031	8,847	(28)	-0.3%	8,601	9,093
2032	8,820	(28)	-0.3%	8,540	9,099
2033	8,792	(28)	-0.3%	8,480	9,104
2034	8,764	(28)	-0.3%	8,419	9,110
2035	8,737	(27)	-0.3%	8,359	9,115
2036	8,737	-	0.0%	8,359	9,115
2037	8,737	-	0.0%	8,359	9,115
2038	8,737	-	0.0%	8,359	9,115
2039	8,737	-	0.0%	8,359	9,115
2040	8,737	-	0.0%	8,359	9,115
2041	8,737	-	0.0%	8,359	9,115
2042	8,737	-	0.0%	8,359	9,115
2043	8,737	-	0.0%	8,359	9,115
2044	8,737	-	0.0%	8,359	9,115
2045	8,737	-	0.0%	8,359	9,115
2046	8,737	-	0.0%	8,359	9,115
2047	8,737	-	0.0%	8,359	9,115
2048	8,737	-	0.0%	8,359	9,115
2049	8,737	-	0.0%	8,359	9,115
2050	8,737	-	0.0%	8,359	9,115

Note: For 2012-2035 the high-end population uses an annual rate of change of 0.06 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 7. Historical and Forecast Population for the City and Borough of Sitka



Note: For 2012-2035 the high-end population uses an annual rate of change of 0.06 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.
Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

3.2 Historic and Forecast Population for the Petersburg Census Area

Table 12. Historical Population of the Petersburg Census Area

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1990	4,407					
1991	4,492	85	1.9%			
1992	4,537	45	1.0%			
1993	4,507	(30)	-0.7%			
1994	4,400	(107)	-2.4%			
1995	4,408	8	0.2%			
1996	4,494	86	2.0%	0.0%		
1997	4,513	19	0.4%			
1998	4,517	4	0.1%			
1999	4,500	(17)	-0.4%			
2000	4,260	(240)	-5.3%			
2001	4,260	-	0.0%	-1.1%	-0.5%	
2002	4,191	(69)	-1.6%			
2003	4,115	(76)	-1.8%			
2004	4,167	52	1.3%			
2005	4,127	(40)	-1.0%			
2006	4,056	(71)	-1.7%	-1.0%	-1.0%	
2007	3,993	(63)	-1.6%			
2008	3,931	(62)	-1.6%			
2009	3,904	(27)	-0.7%			
2010	3,815	(89)	-2.3%			
2011	3,951	136	3.6%	-0.5%	-0.8%	-0.6%

Source: Table developed by Northern Economics using population data from ADOLWD.

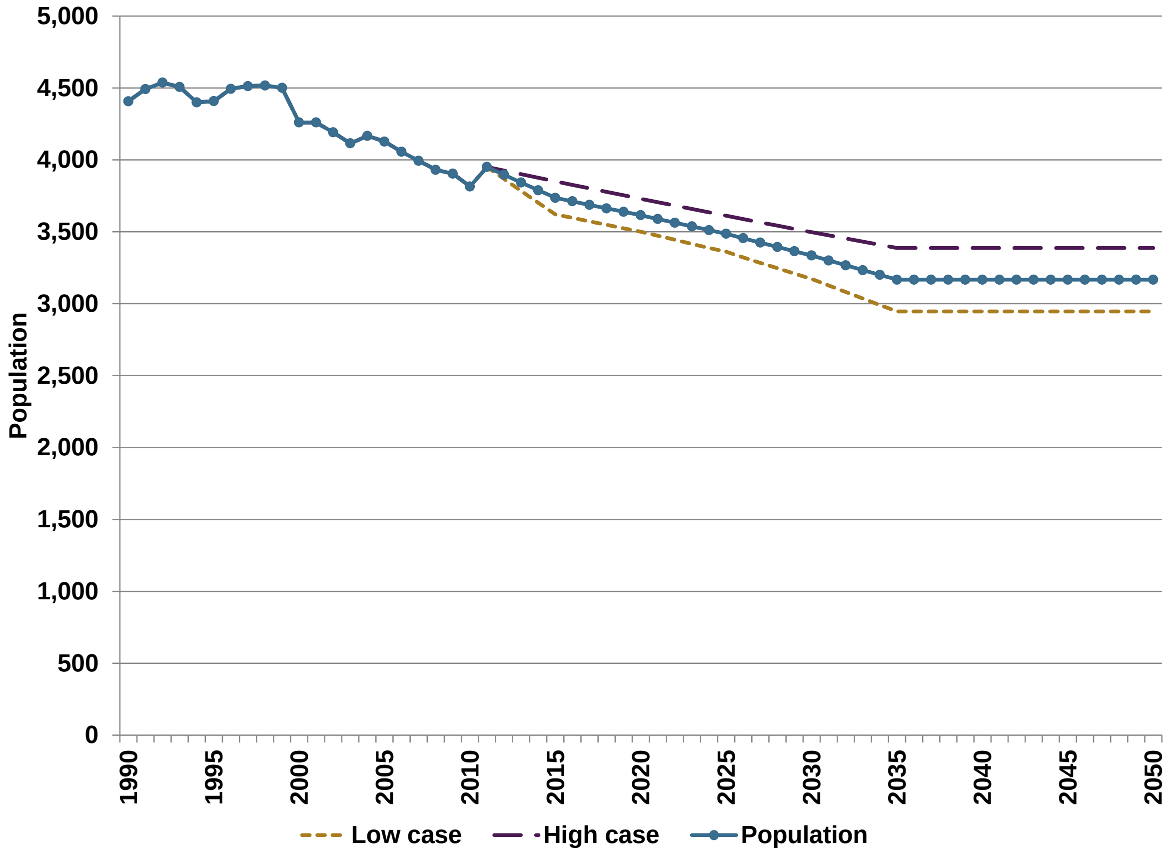
Table 13. Population Forecasts for the Petersburg Census Area

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	3,896			3,867	3,926
2013	3,842	(54)	-1.4%	3,783	3,901
2014	3,789	(53)	-1.4%	3,702	3,876
2015	3,736	(53)	-1.4%	3,621	3,851
2016	3,711	(25)	-0.7%	3,597	3,826
2017	3,687	(24)	-0.7%	3,572	3,802
2018	3,663	(24)	-0.7%	3,548	3,777
2019	3,639	(24)	-0.7%	3,524	3,753
2020	3,615	(24)	-0.7%	3,501	3,729
2021	3,589	(26)	-0.7%	3,472	3,705
2022	3,563	(26)	-0.7%	3,444	3,682
2023	3,537	(26)	-0.7%	3,416	3,658
2024	3,511	(26)	-0.7%	3,388	3,635
2025	3,486	(25)	-0.7%	3,360	3,612
2026	3,455	(31)	-0.9%	3,322	3,588
2027	3,425	(30)	-0.9%	3,284	3,566
2028	3,395	(30)	-0.9%	3,246	3,543
2029	3,365	(30)	-0.9%	3,209	3,520
2030	3,335	(30)	-0.9%	3,172	3,498
2031	3,301	(34)	-1.0%	3,126	3,475
2032	3,267	(34)	-1.0%	3,081	3,453
2033	3,233	(34)	-1.0%	3,035	3,431
2034	3,200	(33)	-1.0%	2,991	3,409
2035	3,167	(33)	-1.0%	2,947	3,387
2036	3,167	-	0.0%	2,947	3,387
2037	3,167	-	0.0%	2,947	3,387
2038	3,167	-	0.0%	2,947	3,387
2039	3,167	-	0.0%	2,947	3,387
2040	3,167	-	0.0%	2,947	3,387
2041	3,167	-	0.0%	2,947	3,387
2042	3,167	-	0.0%	2,947	3,387
2043	3,167	-	0.0%	2,947	3,387
2044	3,167	-	0.0%	2,947	3,387
2045	3,167	-	0.0%	2,947	3,387
2046	3,167	-	0.0%	2,947	3,387
2047	3,167	-	0.0%	2,947	3,387
2048	3,167	-	0.0%	2,947	3,387
2049	3,167	-	0.0%	2,947	3,387
2050	3,167	-	0.0%	2,947	3,387

Note: For 2012-2035 the high-end population uses an annual rate of change of -0.64 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 8. Historical and Forecast Population for the Petersburg Census Area



Note: For 2012-2035 the high-end population uses an annual rate of change of -0.64 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.
Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

3.3 Historic and Forecast Population for the Rest of Southeast Alaska

This section summarizes historical population data and population forecasts for the "Rest of Southeast Alaska." The Rest of Southeast Alaska comprises all of the Hoonah Angoon Census Area excluding Klukwan, Ketchikan Gateway Borough, Prince of Wales-Hyder Census Area, the City and Borough of Wrangell, and the City and Borough of Yakutat.

Table 14. Historical Population of the Rest of Southeast Alaska

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1990	25,014					
1991	25,796	782	3.1%			
1992	26,430	634	2.5%			
1993	26,745	315	1.2%			
1994	26,819	74	0.3%			
1995	26,708	(111)	-0.4%			
1996	26,901	193	0.7%	0.8%		
1997	26,431	(470)	-1.7%			
1998	26,033	(398)	-1.5%			
1999	25,487	(546)	-2.1%			
2000	25,883	396	1.6%			
2001	25,002	(881)	-3.4%	-1.5%	-0.3%	
2002	24,786	(216)	-0.9%			
2003	24,482	(304)	-1.2%			
2004	23,938	(544)	-2.2%			
2005	23,964	26	0.1%			
2006	23,987	23	0.1%	-0.8%	-1.1%	
2007	23,817	(170)	-0.7%			
2008	23,871	54	0.2%			
2009	24,088	217	0.9%			
2010	24,122	34	0.1%			
2011	24,617	495	2.1%	0.5%	-0.2%	-0.2%

Source: Table developed by Northern Economics using population data from ADOLWD.

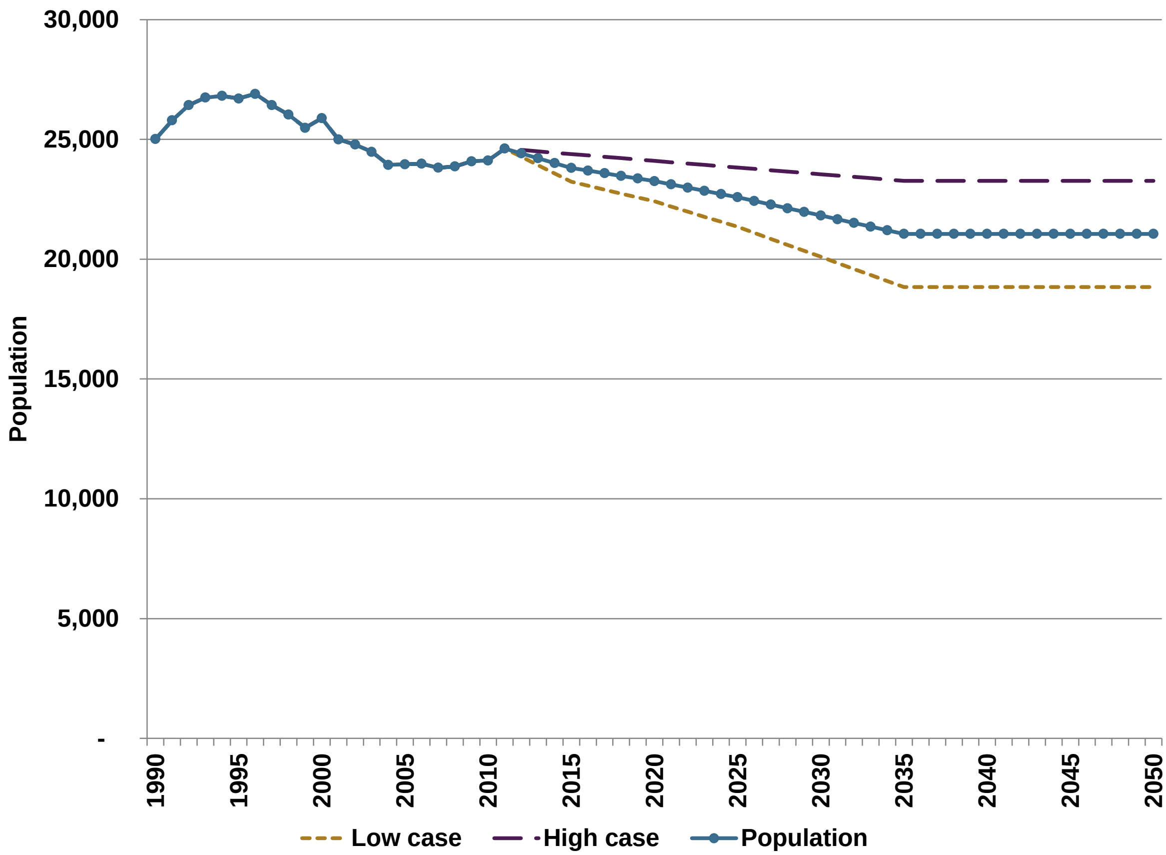
Table 15. Population Forecasts for the Rest of Southeast Alaska

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	24,418			24,384	24,559
2013	24,213	(205)	-0.8%	24,154	24,502
2014	24,011	(202)	-0.8%	23,925	24,445
2015	23,811	(200)	-0.8%	23,699	24,388
2016	23,699	(112)	-0.5%	23,475	24,331
2017	23,588	(111)	-0.5%	23,253	24,274
2018	23,477	(110)	-0.5%	23,033	24,217
2019	23,368	(109)	-0.5%	22,815	24,161
2020	23,259	(109)	-0.5%	22,600	24,104
2021	23,123	(136)	-0.6%	22,386	24,048
2022	22,988	(135)	-0.6%	22,174	23,992
2023	22,853	(134)	-0.6%	21,965	23,936
2024	22,721	(133)	-0.6%	21,757	23,880
2025	22,589	(132)	-0.6%	21,551	23,824
2026	22,433	(156)	-0.7%	21,347	23,768
2027	22,279	(154)	-0.7%	21,145	23,713
2028	22,126	(153)	-0.7%	20,946	23,657
2029	21,974	(152)	-0.7%	20,747	23,602
2030	21,824	(150)	-0.7%	20,551	23,547
2031	21,668	(157)	-0.7%	20,357	23,492
2032	21,513	(155)	-0.7%	20,164	23,437
2033	21,359	(154)	-0.7%	19,974	23,382
2034	21,206	(152)	-0.7%	19,785	23,328
2035	21,055	(151)	-0.7%	19,598	23,273
2036	21,055	-	0.0%	19,598	23,273
2037	21,055	-	0.0%	19,598	23,273
2038	21,055	-	0.0%	19,598	23,273
2039	21,055	-	0.0%	19,598	23,273
2040	21,055	-	0.0%	19,598	23,273
2041	21,055	-	0.0%	19,598	23,273
2042	21,055	-	0.0%	19,598	23,273
2043	21,055	-	0.0%	19,598	23,273
2044	21,055	-	0.0%	19,598	23,273
2045	21,055	-	0.0%	19,598	23,273
2046	21,055	-	0.0%	19,598	23,273
2047	21,055	-	0.0%	19,598	23,273
2048	21,055	-	0.0%	19,598	23,273
2049	21,055	-	0.0%	19,598	23,273
2050	21,055	-	0.0%	19,598	23,273

Note: For 2012-2035 the high-end population uses an annual rate of change of -0.23 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 9. Historical and Forecast Population for the Rest of Southeast Alaska



Note: For 2012-2035 the high-end population uses an annual rate of change of -0.23 percent (equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.
Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

3.4 Historic and Forecast Population for the Rest of Alaska with Road Access

This section summarizes historical population data and population forecasts for the "Rest of Alaska with Road Access." The Rest of Alaska with Road Access comprises all of the Municipality of Anchorage, Kenai Peninsula Borough, Matanuska-Susitna Borough, Denali Borough, Fairbanks North Star Borough, Southeast Fairbanks Census Area, and Valdez-Cordova Census Area.

Table 16. Historical Population of the Rest of Alaska with Road Access

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1990	402,172					
1991	418,049	15,877	3.9%			
1992	430,360	12,311	2.9%			
1993	439,848	9,488	2.2%			
1994	446,605	6,757	1.5%			
1995	447,793	1,188	0.3%			
1996	450,803	3,010	0.7%	1.5%		
1997	455,187	4,384	1.0%			
1998	462,364	7,177	1.6%			
1999	466,297	3,933	0.9%			
2000	470,398	4,101	0.9%			
2001	478,388	7,990	1.7%	1.2%	1.4%	
2002	486,553	8,165	1.7%			
2003	493,670	7,117	1.5%			
2004	504,916	11,246	2.3%			
2005	512,289	7,373	1.5%			
2006	521,130	8,841	1.7%	1.7%	1.5%	
2007	528,500	7,370	1.4%			
2008	534,741	6,241	1.2%			
2009	544,592	9,851	1.8%			
2010	552,293	7,701	1.4%			
2011	560,561	8,268	1.5%	1.5%	1.6%	1.5%

Source: Table developed by Northern Economics using population data from ADOLWD.

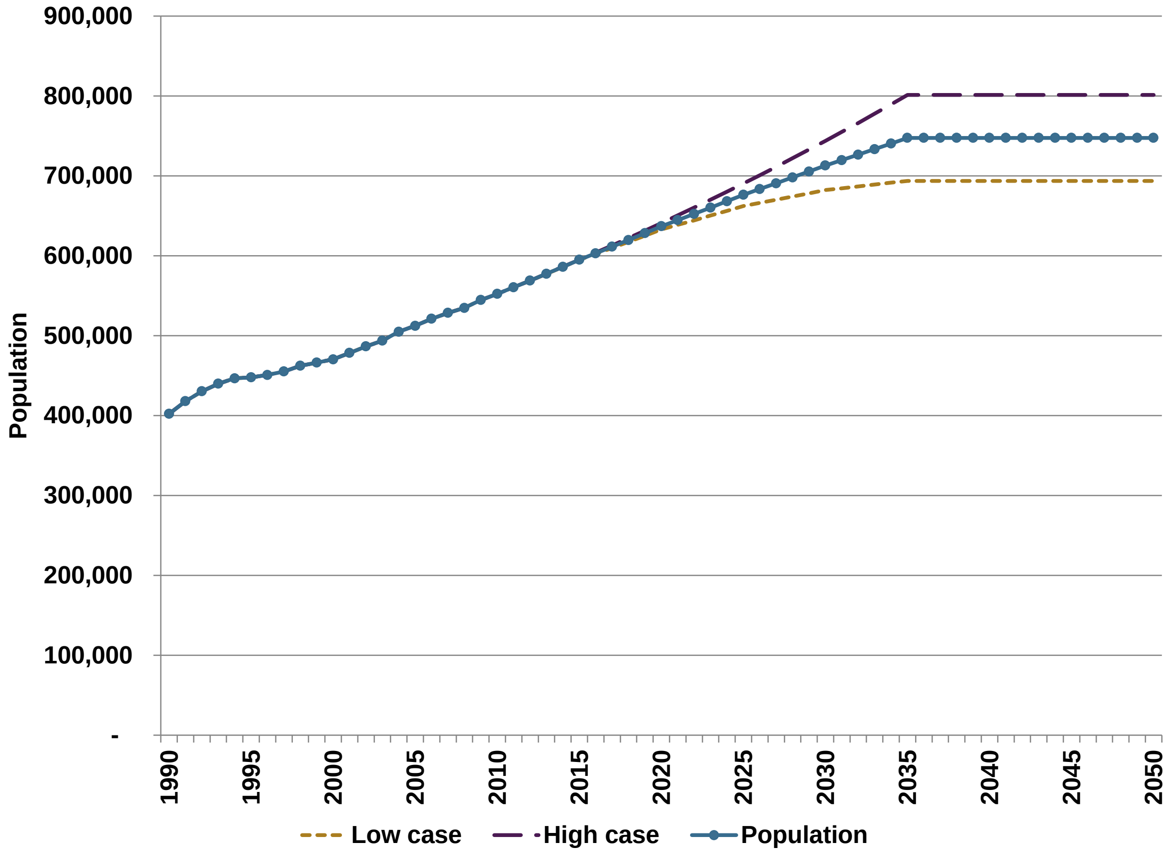
Table 17. Population Forecasts for the Rest of Alaska with Road Access

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	568,908			568,847	568,969
2013	577,428	8,520	1.5%	577,352	577,504
2014	586,123	8,696	1.5%	586,080	586,167
2015	594,999	8,876	1.5%	595,039	594,959
2016	603,119	8,120	1.4%	602,354	603,883
2017	611,371	8,253	1.4%	609,801	612,942
2018	619,760	8,389	1.4%	617,384	622,136
2019	628,287	8,527	1.4%	625,106	631,468
2020	636,955	8,668	1.4%	632,970	640,940
2021	644,601	7,646	1.2%	638,649	650,554
2022	652,362	7,761	1.2%	644,412	660,312
2023	660,239	7,877	1.2%	650,261	670,217
2024	668,234	7,995	1.2%	656,197	680,270
2025	676,349	8,115	1.2%	662,224	690,474
2026	683,487	7,138	1.1%	666,143	700,831
2027	690,722	7,235	1.1%	670,100	711,344
2028	698,055	7,333	1.1%	674,096	722,014
2029	705,487	7,432	1.1%	678,130	732,844
2030	713,021	7,534	1.1%	682,205	743,837
2031	719,754	6,733	0.9%	684,513	754,994
2032	726,569	6,816	0.9%	686,819	766,319
2033	733,469	6,900	0.9%	689,124	777,814
2034	740,454	6,985	1.0%	691,427	789,481
2035	747,526	7,072	1.0%	693,728	801,324
2036	747,526	-	0.0%	693,728	801,324
2037	747,526	-	0.0%	693,728	801,324
2038	747,526	-	0.0%	693,728	801,324
2039	747,526	-	0.0%	693,728	801,324
2040	747,526	-	0.0%	693,728	801,324
2041	747,526	-	0.0%	693,728	801,324
2042	747,526	-	0.0%	693,728	801,324
2043	747,526	-	0.0%	693,728	801,324
2044	747,526	-	0.0%	693,728	801,324
2045	747,526	-	0.0%	693,728	801,324
2046	747,526	-	0.0%	693,728	801,324
2047	747,526	-	0.0%	693,728	801,324
2048	747,526	-	0.0%	693,728	801,324
2049	747,526	-	0.0%	693,728	801,324
2050	747,526	-	0.0%	693,728	801,324

Note: For 2012-2035 the high-end population uses an annual rate of change of 1.50 percent (approximately equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 10. Historical and Forecast Population for the Rest of Alaska with Road Access



Note: For 2012-2035 the high-end population uses an annual rate of change of 1.50 percent (approximately equal to the 20-year rate of change trough 2011). The low-end population forecast is projected using the difference between the mid-range and the high-end forecasts.
Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

3.5 Historic and Forecast Population for the Rest of Alaska without Road Access

This section summarizes historical population data and population forecasts for the "Rest of Alaska without Road Access." The Rest of Alaska without Road Access comprises the Kodiak Island Borough, Yukon-Koyukuk Census Area, Nome Census Area, North Slope Borough, Northwest Arctic Borough, Aleutians East Borough, Aleutians West Census Area, Bethel Census Area, Bristol Bay Borough, Dillingham Census Area, Lake and Peninsula Borough, and Wade Hampton Census Area.

Table 18. Historical Population of the Rest of Alaska without Road Access

Year	Population	Annual Number Change	Annual Percent Change	5-Year Rate of Change	10-Year Rate of Change	20-Year Rate of Change
1990	80,173					
1991	81,163	990	1.2%			
1992	84,965	3,802	4.7%			
1993	85,061	96	0.1%			
1994	82,134	(2,927)	-3.4%			
1995	81,884	(250)	-0.3%			
1996	81,864	(20)	0.0%	0.2%		
1997	81,724	(140)	-0.2%			
1998	82,012	288	0.4%			
1999	83,410	1,398	1.7%			
2000	83,452	42	0.1%			
2001	82,475	(977)	-1.2%	0.1%	0.2%	
2002	82,962	487	0.6%			
2003	83,546	584	0.7%			
2004	83,191	(355)	-0.4%			
2005	83,145	(46)	-0.1%			
2006	82,054	(1,091)	-1.3%	-0.1%	0.0%	
2007	81,450	(604)	-0.7%			
2008	81,573	123	0.2%			
2009	82,095	522	0.6%			
2010	86,274	4,179	5.1%			
2011	88,103	1,829	2.1%	1.4%	0.7%	0.4%

Source: Table developed by Northern Economics using population data from ADOLWD.

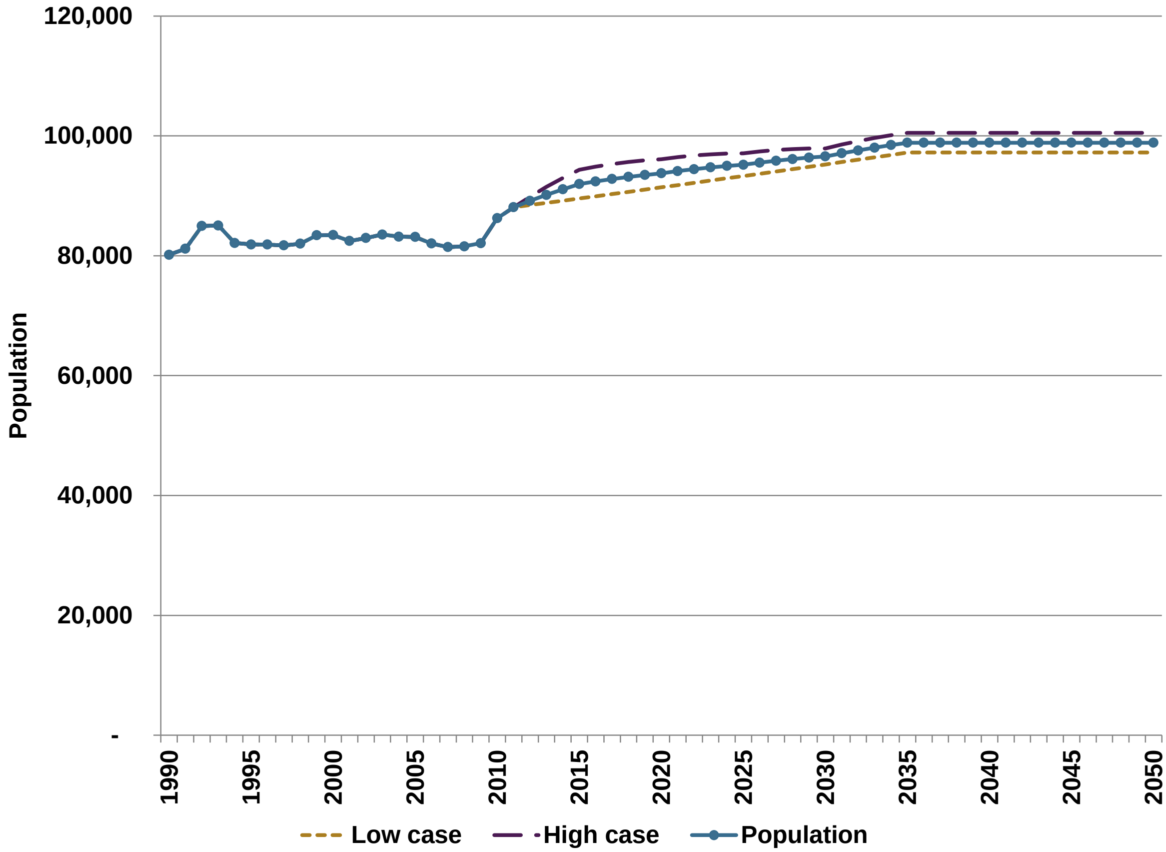
Table 19. Population Forecasts for the Rest of Alaska without Road Access

Year	Mid-Range Population Forecast	Annual Number Change	Annual Percent Change	Low-End Population Forecast	High-End Population Forecast
2012	89,163			88,465	89,860
2013	90,161	998	1.1%	88,829	91,493
2014	91,095	934	1.0%	89,194	92,995
2015	91,962	867	1.0%	89,561	94,363
2016	92,402	440	0.5%	89,929	94,875
2017	92,803	401	0.4%	90,298	95,307
2018	93,163	360	0.4%	90,670	95,656
2019	93,481	318	0.3%	91,042	95,919
2020	93,755	274	0.3%	91,417	96,093
2021	94,122	367	0.4%	91,792	96,452
2022	94,451	329	0.3%	92,170	96,732
2023	94,740	289	0.3%	92,549	96,932
2024	94,988	248	0.3%	92,929	97,047
2025	95,194	206	0.2%	93,311	97,077
2026	95,545	351	0.4%	93,695	97,395
2027	95,860	315	0.3%	94,080	97,640
2028	96,138	278	0.3%	94,467	97,810
2029	96,379	240	0.3%	94,855	97,902
2030	96,580	201	0.2%	95,245	97,915
2031	97,097	517	0.5%	95,636	98,558
2032	97,585	488	0.5%	96,030	99,140
2033	98,042	457	0.5%	96,424	99,659
2034	98,468	426	0.4%	96,821	100,114
2035	98,861	393	0.4%	97,219	100,503
2036	98,861	-	0.0%	97,219	100,503
2037	98,861	-	0.0%	97,219	100,503
2038	98,861	-	0.0%	97,219	100,503
2039	98,861	-	0.0%	97,219	100,503
2040	98,861	-	0.0%	97,219	100,503
2041	98,861	-	0.0%	97,219	100,503
2042	98,861	-	0.0%	97,219	100,503
2043	98,861	-	0.0%	97,219	100,503
2044	98,861	-	0.0%	97,219	100,503
2045	98,861	-	0.0%	97,219	100,503
2046	98,861	-	0.0%	97,219	100,503
2047	98,861	-	0.0%	97,219	100,503
2048	98,861	-	0.0%	97,219	100,503
2049	98,861	-	0.0%	97,219	100,503
2050	98,861	-	0.0%	97,219	100,503

Note: For 2012-2035 the low-end population uses an annual rate of change of 0.41 (equal to the 20-year rate of change trough 2011). The high-end population forecast is projected adding the difference between the mid-range and the high-end forecasts.

Source: Table developed by Northern Economics using population forecasts from ADOLWD.

Figure 11. Historical and Forecast Population for the Rest of Alaska without Road Access



Source: Figure developed by Northern Economics using population data and forecasts from ADOLWD.

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Lynn Canal Ferry Market Segments

Date: October 25, 2012

To: Laurie Cummings, HDR-Alaska

From: Alejandra Palma-Riedel and Marcus Hartley, Northern Economics

Re: Lynn Canal Market Segment Report - Draft

This report focuses on updating the *Lynn Canal Ferry Markets* section of Appendix C – Traffic Forecast Report of the JAIP EIS. The report provides a breakdown of historic ferry traffic in Lynn Canal by "residency category" using the Alaska Marine Highway System (AMHS) reservations data on the traveler's home town.

To be consistent with previous documents, the updated text follows as closely as possible the JAIP EIS.

1 EIS Update - Lynn Canal Ferry Markets Section

1.1 AMHS Traffic Characteristics

Lynn Canal ferry traffic includes approximately 40,000 passengers and 12,500 vehicles transported each way between Juneau and Haines, and approximately 20,300 passengers and 6,500 vehicles transported each way between Haines and Skagway on an annual basis (Table 1).

Table 1. 2011 Alaska Marine Highway System Link Volume Data

	Jun-Hns		Hns-Jun		Hns-Sgy		Sgy-Hns	
Market	Passenger	Vehicles	Passenger	Vehicles	Passenger	Vehicles	Passenger	Vehicles
2003	48,796	13,698	47,356	13,139	30,309	8,278	28,564	7,624
2004	42,238	11,872	41,442	11,691	21,898	6,374	20,980	5,882
2005	39,069	11,239	38,922	11,017	19,011	5,726	18,461	5,226
2006	37,953	11,301	38,006	11,215	18,223	5,392	16,767	4,656
2007	35,622	10,861	36,486	10,985	14,423	4,726	13,743	4,127
2008	42,344	12,827	41,800	12,400	21,930	6,540	20,636	5,976
2009	37,554	11,867	38,684	12,138	20,548	6,525	20,355	6,194
2010	39,211	12,043	40,741	12,508	20,561	6,559	21,279	6,566
2011	39,933	12,519	40,833	12,686	20,296	6,549	20,468	6,223

Source: Data summaries generated by Northern Economics using AMHS-RMS 2012.

Data from the AMHS Reservations Management System (RMS) for Lynn Canal provides more detail on the distribution of traffic throughout the year, and by type of vehicle. This unpublished data captures about 98 percent of all Lynn Canal traffic. The data indicates that about 67 percent of all passenger traffic and 64 percent of all vehicle traffic between Juneau and Haines occurs during the May through September summer season. During the summer, an average of 175 passengers traveled each day on a ferry between Juneau and Haines, along with an average of 53 vehicles (of all types and sizes). During the busiest week of the summer, an average of 360 passengers and 78 vehicles traveled northbound between Juneau and Haines each day. Daily traffic southbound between Haines and Juneau had a slightly lower number of passengers (343 passengers a day) during the busiest week, but slightly higher number of vehicles (80 per day)

Winter (October through April) traffic between Juneau and Haines averaged 62 passengers and 21 vehicles per day, with about the same level of traffic between Haines and Juneau. Haines – Skagway traffic is even more seasonal, with 79 percent of the passenger traffic and vehicle traffic occurring during the summer.

In 2010,[2] 408 RVs traveled north between Juneau and Haines. A larger number, 489, traveled southbound from Haines to Juneau. The summer average is between two and three RVs per day, with a peak of 9 RVs a day (southbound) during the busiest week of the summer.

The volume of RV traffic on the Haines-Skagway link is substantially greater than RV traffic in Lynn Canal to or from Juneau. Approximately 909 RVs traveled from Haines to Skagway in 2010, and about 723 traveled from Skagway to Haines. For the Haines/Skagway link, average daily traffic during the summer was between five and six RVs each way, with a peak of 14 RVs each day (northbound) during the busiest week.

Well over 90 percent of Lynn Canal RV traffic occurs during the summer, including the Juneau/Haines link (92 percent) and the Haines/Skagway link (98 percent).

Lynn Canal van traffic is higher in summer than in winter. For 2011 overall, the AMHS carried 192 vans from Juneau to Haines, 361 vans from Haines to Juneau, 81 vans from Haines to Skagway and 72 from Skagway to Haines.

[2] RV data for calendar year 2010 was the most recent data available at the time of the analysis.

Table 2. 2011 Lynn Canal AMHS Traffic (Link Volume)

	Jun-Hns	Hns-Jun	Hns-Sgy	Sgy-Hns
Annual Traffic				
Annual Passengers	39,933	40,833	20,296	20,468
Annual Vehicles	12,519	12,686	6,549	6,223
Summer Traffic				
Summer Total Passengers	26,652	27,535	16,028	16,164
Percent of Annual Total	67%	67%	79%	79%
Summer Total Vehicles	8,009	8,209	5,195	4,854
Percent of Annual Total	64%	65%	79%	78%
Summer Average Daily Passengers	175	181	105	106
Summer Average Daily Vehicles	53	54	34	32
Summer Peak Week Average Daily Passengers	360	343	175	164
Summer Peak Week Average Daily Vehicles	78	80	52	47
Winter Traffic				
Winter Total Passengers	13,281	13,298	4,268	4,304
Percent of Annual Total	33%	33%	21%	21%
Winter Total Vehicles	4,510	4,477	1,354	1,369
Percent of Annual Total	36%	35%	21%	22%
Winter Average Daily Passengers	62	62	20	20
Winter Average Daily Vehicles	21	21	6	6
RV Traffic (2010 Calendar Year)				
Annual RVs	408	489	909	723
Summer Total	379	446	890	704
Percent of Annual Total	93%	91%	98%	97%
Summer Average Daily RVs	2.5	2.9	5.9	4.6
Summer Peak Week Average Daily RVs	5.7	9.0	14.0	9.1
Van Traffic				
Annual Vans	192	361	81	72
Summer Total	102	186	51	35
Summer Average Daily Vans	0.7	1.2	0.3	0.2
Summer Peak Week Average Daily Vans	0.6	0.9	1.3	1.9
Winter Average Daily Vans	0.4	0.8	0.1	0.2

Note: Data on RV Traffic corresponds to calendar year 2010.

Source: Data summaries generated by Northern Economics using AMHS-RMS 2012.

1.2 Lynn Canal Ferry Markets

Other data from the AMHS RMS database provides an indication of the size of various ferry markets and the seasonality of those markets. Based on the place of residence of ticket purchasers, ten ferry traveler markets have been quantified. Table 3 shows that in 2011, non-Alaska residents accounted for about 22.7 percent of passengers traveling north in Lynn Canal on a ferry from Juneau to Haines (17.4 percent other US residents and 5.3 percent from other countries). Non-residents accounted for 30.4 percent of this traffic during the summer. Non-residents account for about the same share of ridership traveling on ferries from Haines to Juneau.

For the year 2011 overall, Juneau residents accounted for 29.8 percent of the ferry travel between Juneau and Haines. Haines residents accounted for about one-third of this market (35.4 percent of the Juneau to Haines market and 35.7 percent of the Haines to Juneau market).

Table 3. 2011 Lynn Canal AMHS Passenger Market Estimates (Juneau-Haines and Haines-Juneau)

	Jun-Hns			Hns-Jun		
Market	**Summer**	**Winter**	**Year (%)**	**Summer**	**Winter**	**Year (%)**
Direct Project Area residents	7,883	6,279	65.4%	7,828	6,597	65.7%
Juneau	*4,487*	*1,969*	*29.8%*	*4,495*	*2,046*	*29.8%*
Haines	*3,380*	*4,286*	*35.4%*	*3,313*	*4,525*	*35.7%*
Skagway	*16*	*24*	*0.2%*	*20*	*26*	*0.2%*
Other Alaska residents	1,692	883	11.9%	1,814	830	12.0%
Sitka	*328*	*142*	*2.2%*	*266*	*84*	*1.6%*
Petersburg	*32*	*19*	*0.2%*	*60*	*22*	*0.4%*
Rest SE AK	*230*	*244*	*2.2%*	*238*	*227*	*2.1%*
Rest of AK—with Road Access	*941*	*397*	*6.2%*	*1,095*	*421*	*6.9%*
Rest of AK—w/o Road Access	*161*	*81*	*1.1%*	*155*	*76*	*1.1%*
Other US residents	3,153	606	17.4%	3,238	529	17.2%
Other Country (non-residents)	1,027	125	5.3%	978	133	5.1%
Market Total	**13,755**	**7,893**	**100.0%**	**13,858**	**8,089**	**100.0%**

Source: Data summaries generated by Northern Economics using AMHS-RMS 2012.

Table 4 shows that non-resident passenger traffic in Lynn Canal traveling to or from Skagway was about half of the volume for Haines shown in Table 3. Approximately 2,550 non-resident passengers traveled north between Juneau and Skagway, while 2,220 traveled southbound between Skagway and Juneau. Non-residents accounted for about 20.9 percent of the ferry passenger traffic between Juneau and Skagway, and 19.2 percent of the Skagway to Juneau traffic. Juneau residents accounted for slightly less than a third of this market, while Skagway residents accounted for approximately 15 percent.

Table 4. 2011 Lynn Canal AMHS Passenger Market Estimates (Juneau-Skagway and Skagway-Juneau)

	Jun-Sgy			Sgy-Jun		
Market	**Summer**	**Winter**	**Year (%)**	**Summer**	**Winter**	**Year (%)**
Direct Project Area resident	3,726	1,917	46.3%	3,513	1,819	46.0%
Juneau	*2,906*	*717*	*29.7%*	*2,838*	*726*	*30.8%*
Haines	*44*	*9*	*0.4%*	*26*	*31*	*0.5%*
Skagway	*776*	*1,191*	*16.1%*	*649*	*1,062*	*14.8%*
Other Alaska resident	685	210	7.3%	756	244	8.6%
Sitka	*86*	*12*	*0.8%*	*107*	*23*	*1.1%*
Petersburg	*34*	*7*	*0.3%*	*22*	*14*	*0.3%*
Rest SE AK	*140*	*92*	*1.9%*	*146*	*99*	*2.1%*
Rest of AK—with Road Access	*387*	*80*	*3.8%*	*446*	*75*	*4.5%*
Rest of AK—w/o Road Access	*38*	*19*	*0.5%*	*35*	*33*	*0.6%*
Other US resident	2,873	226	25.4%	2,832	197	26.2%
Other Country (non-resident)	2,076	475	20.9%	1,707	513	19.2%
Market Total	**9,360**	**2,828**	**100.0%**	**8,808**	**2,773**	**100.0%**

Source: Data summaries generated by Northern Economics using AMHS-RMS 2012.

Table 5 provides link volume, by passenger market, for Lynn Canal ferry traffic. Link volume is the total number of passengers on the ferry between two ports, regardless of port of origin or port of destination. This is essentially the sum of Juneau-Haines and Juneau-Skagway passenger traffic. In 2011 Juneau-Haines link volume included 9,603 Juneau resident passengers (6,910 in summer and 2,693 in winter). Haines-Juneau link volume totaled 9,666 Juneau residents.

Table 5. 2011 Lynn Canal Passenger Link Volume

	Jun-Hns		Hns-Jun		Hns-Sgy		Sgy-Hns	
Market	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**
Direct Project Area residents	11,074	8,513	11,235	8,898	3,908	2,357	3,883	2,512
Juneau	*6,910*	*2,693*	*6,890*	*2,776*	*2,541*	*769*	*2,464*	*753*
Haines	*3,494*	*4,633*	*3,536*	*4,778*	*475*	*274*	*407*	*291*
Skagway	*670*	*1,187*	*809*	*1,344*	*892*	*1,314*	*1,012*	*1,468*
Other Alaska residents	3,232	1,841	4,056	2,498	1,273	389	1,605	406
Sitka	*458*	*240*	*455*	*245*	*130*	*102*	*133*	*109*
Petersburg	*148*	*63*	*155*	*65*	*50*	*16*	*52*	*15*
Rest of SE AK	*580*	*442*	*543*	*437*	*173*	*116*	*190*	*129*
Rest of AK—with Road Access	*1,768*	*927*	*2,585*	*1,565*	*860*	*120*	*1,147*	*130*
Rest of AK—w/o Road Access	*278*	*169*	*318*	*186*	*60*	*35*	*83*	*23*
Other US residents	8,705	2,234	8,111	1,197	5,615	483	4,907	495
Other Country (non-residents)	3,641	693	4,133	705	5,232	1,039	5,769	891
Market Total	**26,652**	**13,281**	**27,535**	**13,298**	**16,028**	**4,268**	**16,164**	**4,304**

Source: Data summaries generated by Northern Economics using AMHS-RMS 2012.

This ferry traffic data can be further consolidated to produce total bi-directional traffic (Table 6). For example, in 2011, Lynn Canal ferry passengers included approximately 9,172 non-residents traveling northbound and 12,931 traveling southbound. About 85 percent of that non-resident travel occurred in the summer season (from May through September).

Table 6. 2011 Lynn Canal AMHS Passenger Link Volumes, by Market, Bi-Directional Totals (Juneau-Haines/Skagway and Haines-Skagway)

	Jun-Hns/Sgy		Hns-Sgy	
Market	**Summer**	**Winter**	**Summer**	**Winter**
Direct Project Area residents	22,309	17,411	7,791	4,869
Juneau	*13,800*	*5,469*	*5,005*	*1,522*
Haines	*7,030*	*9,411*	*882*	*565*
Skagway	*1,479*	*2,531*	*1,904*	*2,782*
Other Alaska residents	7,288	4,339	2,878	795
Sitka	*913*	*485*	*263*	*211*
Petersburg	*303*	*128*	*102*	*31*
Rest of SE AK	*1,123*	*879*	*363*	*245*
Rest of AK—with Road Access	*4,353*	*2,492*	*2,007*	*250*
Rest of AK—w/o Road Access	*596*	*355*	*143*	*58*
Other US residents	16,816	3,431	10,522	978
Other Country (non-residents)	7,774	1,398	11,001	1,930
Market Total	**54,187**	**26,579**	**32,192**	**8,572**

Source: Data summaries generated by Northern Economics using AMHS-RMS 2012.

2 Air Passenger Data

Passenger travel in Lynn Canal also includes a significant volume of air travel (Table 7). According to data provided by the Bureau of Transportation Statistics (BTS 2012a), approximately 15,000 passengers flew between Juneau and Haines or Skagway and less than 3,000 flew between Haines and Skagway in 2011 (in each direction). Seasonal estimates show that summer travel accounts for two-thirds of the total air travel between Juneau and Haines or Skagway and about half of the total between Haines and Skagway. Annual air passenger arrivals to Juneau from all origins for 2000 – 2011 are shown in Table 8.

Table 7. 2011 Lynn Canal Air Travel Link Volumes, by Season

Origin-Destination	Annual Total	Est. Summer Total	Est. Winter Total
Jun-Hns/Sgy	15,423	10,309	5,114
Hns/Sgy-Jun	14,301	9,565	4,736
Hns-Sgy	2,971	1,877	1,094
Sgy- Hns	2,616	1,303	1,313

Source: Data summaries generated by Northern Economics using USDOT-BTS 2012a.

Table 8. Airline Passengers Arriving in Juneau from all Origins, 2000 to 2011

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Arriving Passengers (thousands)	255.3	258.6	271.4	279.9	287.6	294.7	300.8	309.3	290.9	264.1	285.8	291.2

Source: Data summaries generated by Northern Economics using USDOT-BTS 2012b.

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APPENDIX C

TOTAL DEMAND MODEL

Fehr & Peers Total Demand Model Memo

MEMORANDUM

Date: June 13, 2013

To: Laurie Cummings and Kevin Doyle, HDR

From: Donald Samdahl, Fehr & Peers

Subject: ***Juneau Access Improvements***
Appendix C: Total Demand Model

SE12-0266

INTRODUCTION

The travel choice model used in the Traffic Forecast Report forecasts the volume of travel for each Juneau Access Improvement (JAI) alternative as a proportion of the total travel demand volume in Lynn Canal. This volume, also called "unconstrained demand"[1], is defined as travel that would occur if a roadway were present that connects Juneau to both Haines and Skagway. This hypothetical roadway would provide unimpeded access between these communities at any time of the day or week. The total travel demand represents the upper limit of demand within the corridor. Each JAI alternative demand volume would then fall somewhere between this upper limit and the demand forecasted for the No Action alternative (Alternative 1).

Two independent total demand models were used to predict the average annual daily traffic (AADT) that would occur on a hypothetical roadway in Lynn Canal. The first model used household survey data from the 2009 National Household Travel Survey (NHTS) and the 2002 Anchorage Household Travel Survey (AHTS). The second model used observed AADT counts on major highways provided by the appropriate state, provincial, or territorial Department of Transportation (DOT). These sources were used to calculate trip generation rates, and trip duration or trip dissipation rates. Each model estimates the number of trips that would be generated in the corridor, based on the number of households or total population, and then calculates the volume of through trips that would travel between Juneau, Haines and Skagway in Alaska, Whitehorse in the Yukon Territory, and other locations via the Alcan Highway.

HOUSEHOLD SURVEY MODEL

Household travel surveys provide a database of self-reported 24-hour travel diaries for households within the study area. Household travel surveys are called 'revealed preference' surveys, in that they record the trips that people actually make in the survey day[2]. While revealed preference surveys have been shown to be good predictors of household travel patterns, they can understate household trip generation, because people sometimes forget to record all trips.

The 2009 National Household Travel Survey (NHTS) samples households across the United States while the 2002 Anchorage Household Travel Survey (AHTS) provides data for households within the

[1] The term "unconstrained" in this context is relative. In reality there is no such thing as unconstrained travel, since all travel requires time and out-of-pocket costs. In this analysis, unconstrained refers to the relatively convenient and inexpensive travel in cars/trucks, compared to the more time consuming or expensive travel by ferry or plane.
[2] The 'revealed preference' household surveys contrast with the 'stated preference' surveys used in the 2005 JAI traffic report.

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Municipality of Anchorage. The data are aggregated at the household, person, vehicle, and trip level. The survey results are collected for all seven days of the week and weighted to provide an annual average. Each trip record includes a variety of statistics for classification purposes and these records can be used to calculate trip generation and trip dissipation rates.

Ideally, this information would be calculated from Alaskan households with similar geographic characteristics to Juneau: medium sized, urban population, isolated, and on the coast. However, households in the NHTS dataset can only be selected by state, Metropolitan Statistical Area (MSA), or urban/rural classification. Juneau, with a population of 31,275 people, is not large enough to qualify as an MSA. Anchorage and Fairbanks are the only MSA's in Alaska and households in these cities would have different travel behavior than households in a small or medium size city like Juneau. Specifically, based on Fehr & Peers research of the NHTS data, the percentage of trips leaving a larger city is less than the percentage leaving a smaller community with fewer resources or attractions.

The number of records for Alaskan households, outside of the Anchorage and Fairbanks MSA's, was too limited to provide a complete picture of travel patterns for small and medium sized cities in Alaska. To obtain more complete data, the national NHTS dataset was filtered to limit the results to households that would have similar geographic characteristics to Juneau. The first step restricted the results to the following states that have relatively isolated, rural population centers, consistent with Alaska's sparsely populated geography: Alaska, Idaho, Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and Utah. The next step limited the results to households that were outside an MSA but were located in an urban area.[3] These two filters provide a dataset for small or medium sized isolated cities, similar to Juneau.

Trip Generation

In 2012, the Alaska Department of Transportation & Public Facilities (DOT&PF) counted the number of vehicle trips generated by households in Downtown Juneau and West Juneau and calculated an average trip rate of 8.6 vehicle trips per household.[4] The Institute of Transportation Engineers (ITE) *Trip Generation Manual 9^th^ Edition* reports 9.5 vehicle trips per household for single family homes. Finally, the AHTS calculated a trip rate of 9.2 vehicle trips per household.[5] Calculating the number of total trips using a household trip generation rate underestimates the total of number of trips, because some trip types, commercial shipping for example, are not generated at the household level. However, these trip types tend to be a small percentage of urban travel, and the results of the model should not be dramatically affected by leaving them out. Note that the second model described later includes all trip types.

As noted above, the observed household trip rate in Juneau is slightly lower than the AHTS and ITE trip rates. While there is no definitive research on why Juneau residents generate fewer vehicle trips than their counterparts in Anchorage or the rest of the country, it is reasonable that at least a portion of the lower trip generation rate can be explained by Juneau's isolation and the difficulty of making long-distance trips by car. For this analysis, the trip rate from AHTS will be used, since it is based on travel behavior for Alaskans and reflects the increased travel that could be expected in Juneau with the construction of a Lynn Canal Highway.

[3] The 2009 NHTS urban areas are consistent with the urbanized areas in the 2000 U.S. Census: a built up area surrounding a central core (or central city), with a population density of at least 1,000 persons per square mile.
[4] This data collection is further discussed in Appendix A.
[5] As a point of comparison, the daily trip generation rate for households in the restricted NHTS sample is 5.4 vehicle trips per household. This rate is considered to be low due to unreported trips. The 2000-2001 California Statewide Household Travel Survey provides a discussion on underreported trips and through GPS data collection estimated that only 60% of trips were reported in its survey results.

Trip Duration

The NHTS results provide trip duration percentages for the restricted sample described previously. Although the NHTS trip rate is lower than expected, evidence from a variety of other travel surveys and travel models suggests that the trip duration percentages should remain unaffected by the underreported trips. **Table 1** shows the travel time distribution for the households in the states selected above that are outside of an MSA but within an urban area. On average, approximately 3% of all personal vehicles trips made by households in these communities are longer than one hour. Approximately 1% of trips are longer than two hours. These percentages only include trips made without stopping at an intermediate destination (e.g. to buy gas, eat lunch, etc.). If these stops (linked trips) were included, the percentages would be higher. The following percentages, therefore, provide a conservatively low estimate for the number of trips that travel for a given duration.

Table 1. NHTS Trip Duration

Travel time (min)	*> 0*	*> 30*	*> 60*	*> 90*	*> 120*	*> 180*
Cumulative Percentage	100%	6.9%	2.9%	1.6%	0.9%	0.4%

Validation

A Household Travel Survey model can be used to predict the volume of long distance travel by calculating the number of trips generated by the households in an area and using the trip duration percentages to estimate the number of vehicle trips at a given distance based on how long it would take to travel there. These calculations only include trips from the “home” city and do not include travel generated by households or other locations “down the road.” As such, this model can only be applied to cities that are served by a limited number of roadways and experience minimal through traffic.

The model was validated against observed highway counts for four small, coastal communities and two large cities in Alaska. Distances were chosen to coincide with DOT & PF count locations that were far enough away from the city centers to exclude local traffic.

Table 2 shows validation calculations for the four small, coastal communities in Alaska.[6] Each of these communities only has one access road and matches the filters applied to the NHTS data.

A limitation of this “one-sided” model is that it only considers trips generated from the households in one city. Traffic that is generated by non-residential uses within the city or traffic that originated in another location is not accounted for in this application. Thus, the model under predicts the number of trips generated in Valdez and Seward. Traffic volumes in Valdez include trips associated with the Port of Valdez, and traffic volumes in Seward likely include trips from Anchorage and the Kenai Peninsula. For Haines and Skagway, the model slightly over predicts the traffic volumes on the highway leaving each city. This is likely due to a small number of people making long distance trips via the ferry instead of on the highway. Subtracting these ferry volumes from the predicted trips would improve the validation results. Additional delays at the U.S./Canadian border may also suppress trips. Overall, the volume of trips predicted by the Household Travel Survey Model is within a reasonable range of the observed trips.

[6] Port Hardy and Prince Rupert in British Columbia were considered for validation but lack sufficient traffic data. Whitehorse in the Yukon Territory was also considered as its population is similar to Juneau’s but has too many through trips for this type of analysis to be applied.

Table 2. One-way Household Travel Survey Model Validation Results (Small Communities)

Category	Valdez	Seward[7]	Haines	Skagway
2010 Households[8]	1,573	1,763	782	410
Daily Vehicle Trips[9]	14,472	16,220	7,194	3,772
Observed Count Location (Min. from City Center)	60	30	30	30
NHTS Trip Percentage	2.9%	6.9%	6.9%	6.9%
Model Predicted Trips	420	1,119	496	260
Highway	Richardson	Seward	Haines	Klondike
Milepost on Highway	69.5	28.8	26[10]	15[11]
2010 Observed Trips on Highway	555	1,572	472	239
Model Percent of Observed Trips	76%	71%	105%	109%

Calculated by Fehr & Peers, 2013.

Table 3 shows the results of the model validation for the two large cities: Municipality of Anchorage and Matanuska-Susitna Borough (MOA/MSB) and the greater Fairbanks area. Note that Fairbanks North Star area does not include the entire Fairbanks North Star Borough (FNSB). There are three highways leaving MOA/MSB: Glenn, Parks, and Seward and also three highways leaving the Fairbanks North Star area: Parks, Richardson, and Steese. Only two highways were used in each validation, as the observed volumes of traffic south of the Municipality of Anchorage and north of Fairbanks are difficult to capture for the given travel times.[12] The highway percentages in the table below reflect the relative volume of traffic leaving town on each highway.

Since the characteristics of the greater Anchorage area and Fairbanks are not consistent with the filters applied to the NHTS data, different trip percentages were used for this validation. These two areas are large, regional centers and as such have fewer external trips than small, rural cities. The AHTS calculated trip percentages for 30 minute trips (5%) and 60 minute trips (2%). These values are approximately 30% less than the corresponding percentages from the NHTS results. The trip percentages in Table 3 were reduced by 30% to account for the difference in travel behavior between large and small cities.

Although the predicted number of trips is slightly higher than observed counts for Anchorage and Fairbanks, the model provides a reasonable estimate of travel behavior. The percentage of travel on each highway was based on observed traffic counts just outside each city. This method assumes that the observed proportion of travel at each gateway is consistent 90 or 120 minutes from the city center. An origin-destination study would provide more accurate percentages.

As previously discussed, this model only considers vehicle trips generated by households in one city. However, traffic on a hypothetical Lynn Canal Highway would include travel from Juneau, Haines, Skagway, and Whitehorse. Accordingly, the model was tested to calculate the volume of traffic travelling

[7] Includes Bear Creek households.
[8] Household estimates from 2010 U.S. Census.
[9] Daily vehicle trips estimated using a trip generation rate of 9.2 vehicle trips per household from AHTS data.
[10] The Southeast Region of Alaska DOT&PF reports traffic volumes by segment, not milepost, so the reported milepost is approximate.
[11] This count is taken at the U.S./Canada border crossing.
[12] Two hours south of Anchorage is beyond the Seward Highway and Sterling Highway interchange. Traffic data is limited two hours north of Fairbanks on Elliott and Steese Highways.

between two cities. Parks Highway, between Anchorage and Fairbanks, was the only location in Alaska identified to validate this assumption. For no other stretch of highway was it reasonable to assume that traffic was primarily travelling between two cities.

Table 3. One-way Household Travel Survey Model Validation Results (Large Cities)

Category	**Municipality of Anchorage & Matanuska-Susitna Borough**		**Fairbanks North Star Area[13]**	
2010 Households[14]	136,683		30,199	
Daily Vehicle Trips[15]	1,257,484		277,831	
Observed Count Location (Min. from City Center)	120		90	
AHTS Trip Percentage (est.)	0.6%		1.1%	
Highway	Parks	Glenn	Parks	Richardson
Percentage on Highway	22%	18%	59%	34%
Model Predicted Trips	3,018		2,838	
Milepost on Highway	68.8	110.2	240.2	279.1
Observed Trips on Highway	1,648	1,040	1,186	1,300
2010 Total Observed Trips	2,688		2,486	
Model Percent of Observed Trips	112%		114%	

Calculated by Fehr & Peers, 2013.

Table 4 shows the results of this validation. The observed traffic count was taken approximately half-way between the two cities on the Parks Highway. The NHTS trip percentage for 180 minute trips was reduced by 30% as in the previous validation. The percentage of trips on Parks Highway from each city was consistent with the previous validation.

A limitation of applying this method for a six hour trip is that NHTS could report a long road trip as several shorter trips. For example, if someone were driving from Anchorage to Fairbanks and stopped for lunch and then gas, that journey would be counted as three different trips. For this reason, the NHTS trip percentage for a purely long trip (e.g. 6 hour trips) is very low and was not used for this calculation. A three hour trip time was used as a compromise to account for trips with one stop along the highway.

As in the previous validation for Anchorage and Fairbanks, this application slightly over predicted the volume of traffic on Parks Highway. Nonetheless, the model generally predicted travel volumes that are of similar order of magnitude compared to observed traffic counts.

[13] This area only includes census tracts 1-16 within the Fairbanks North Star Borough and does not encompass the entire Fairbanks North Star Borough.
[14] Household estimates from 2010 U.S. Census.
[15] Daily vehicle trips estimated using a trip generation rate of 9.2 vehicle trips per household from AHTS data.

Table 4. Two-way Household Travel Survey Model Validation Results

Category	**Municipality of Anchorage & Matanuska-Susitna Borough**	**Fairbanks North Star Area[16]**
2010 Households[17]	136,683	30,199
Daily Vehicle Trips[18]	1,257,484	277,831
Observed Count Location (Min. from City Center)	180	180
AHTS Trip Percentage (est.)	0.3%	0.3%
Highway	Parks	Parks
Percentage on Highway	22%	59%
Predicted Trips	830	492
Total Predicted Trips	1,322	
Milepost on Highway	138.7	
2010 Total Observed Trips	1,119	
Percent of Observed Trips	118%	

Calculated by Fehr & Peers, 2013.

Lynn Canal Traffic Forecast using Household Travel Survey Model

Table 5 shows the estimate for traffic volume on a hypothetical Lynn Canal Highway. Only through trips between Juneau, Haines, Skagway, and Whitehorse were estimated using the Household Travel Survey Model. It was assumed that a trip between Juneau and Haines or Skagway would take two hours and a trip between Juneau and Whitehorse would take five hours. However, the three hour trip percentage was used instead for the Whitehorse estimation for the reasons cited previously. Trips to an intermediate destination on the highway less than two hours from Juneau (three hours from Whitehorse) were not included in these calculations.

Based on observed traffic counts, approximately 20 percent of traffic heading to or from Whitehorse travels on the Klondike Highway. This percentage was assumed to increase to 25% if a Lynn Canal Highway were constructed. Currently, it is not possible to drive to Juneau from Haines or Skagway. So, conservatively, 50% of traffic from these two cities was assumed to head south toward Juneau. The final forecast was calculated by summing the trips from each of these four cities. This represented the volume of through traffic that could occur on a hypothetical Lynn Canal Highway if it were open to traffic in 2011.

[16] This area only includes census tracts 1-16 within the Fairbanks North Star Borough and does not encompass the entire Fairbanks North Star Borough.
[17] Household estimates from 2010 U.S. Census.
[18] Daily vehicle trips estimated using a trip generation rate of 9.2 vehicle trips per household from AHTS data.

Table 5. Household Survey Total Demand Model Estimate

Category	Juneau	Haines	Skagway	Whitehorse
2010 Households[19]	12,005	782	410	9,649
Daily Vehicle Trips[20]	110,446	7,194	3,772	88,771
Percentage of Trips Longer than 2 (or 3) Hours	0.9%	0.9%	0.9%	0.4%
Trips Longer than 2 (or 3) Hours	994	65	34	355
Percentage of Trips to/from Juneau	100%	50%	50%	25%
Lynn Canal Highway Through Trips	994	33	17	89
Total Daily Through Vehicle Trips	1,133			

Calculated by Fehr & Peers, 2013.

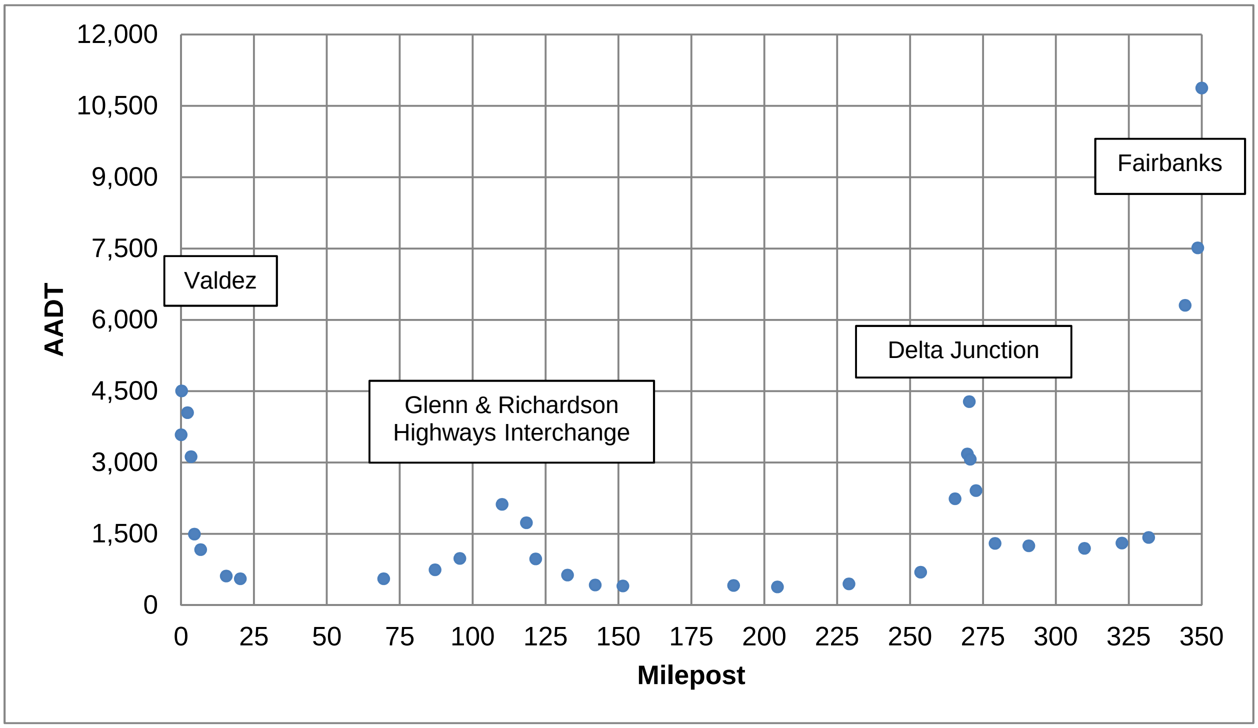
HIGHWAY TRAFFIC DISSIPATION MODEL

The Highway Traffic Dissipation Model used existing traffic volumes on highways throughout Alaska along with population of nearby cities to calculate trip generation and trip dissipation rates. The volume of traffic leaving (or approaching) cities in Alaska follows predictable patterns based on distance and population. These relationships were used to build a model for hypothetical traffic volumes along a Lynn Canal roadway. The model calculates trip generation and trip dissipation rates at the “edge” of a city. The “edge” location was chosen based on a transition from urban to rural land use or where traffic volumes began to drop rapidly.

For example, **Figure 1** shows the profile of traffic volume on Richardson Highway between Valdez (milepost 0) and Fairbanks (milepost 350). This profile is similar to highways throughout Alaska, in that traffic volumes within cities are much higher than on rural stretches of highway with limited road-side attractions. The number of vehicles on a highway increases and decreases exponentially when approaching or departing a city. Once traffic volumes have decreased outside of town, they stabilize at a particular volume. This volume remains fairly constant until the highway meets an interchange or approaches another population center, at which point volumes begin to increase. Figure 1 shows how traffic volumes increase at the Glenn Highway and Richardson Highway Interchange (milepost 110) and in Delta Junction (milepost 270) but are relatively stable between these locations.

[19] Household estimates from 2010 U.S. Census.
[20] Daily vehicle trips estimated using a trip generation rate of 9.2 vehicle trips per household from AHTS data.

Figure 1. Richardson Highway Traffic Volume Profile[21]



Trip Generation

To use this model to predict the number of trips on a hypothetical Lynn Canal Highway, the "edge" traffic volume must be known for each city on the highway. For Haines and Skagway, the existing "edge" volume was used but the traffic volume for Juneau must be estimated, since no road currently exists. The trip rate for Juneau can be predicted from "edge" traffic rates for comparable cities.

Table 6 shows the population, "edge" traffic volumes and the trip generation rates calculated as the number of annual average daily trips (AADT) per ten thousand people for ten comparison cities. These locations were chosen because they are regional centers or small coastal cities with ferry service. [22] For cities with more than one access highway, traffic counts were taken on each highway entering the city. The locations are listed in order of decreasing population.

[21] The traffic volume at the end of Richardson Highway (milepost 365) is approximately 20,000 AADT and was not included in the chart to better highlight traffic patterns.
[22] The low volume of ferry traffic compared to the "edge" AADT counts suggests that factoring out these trips would not make a substantial difference in these calculations.

Table 6. "Edge" Traffic Counts for Comparison Cities

Regional Centers	Population[23]	Highway	2010 "Edge" AADT	AADT/10k
Greater Anchorage Area, AK[24]	345,970	Seward	22,090	1,618
		Glenn	16,333	
		Parks	17,571	
Fairbanks North Star Borough, AK	97,581	Parks	15,268	4,036
		Richardson	24,120	
Whitehorse, YT	26,418	Alaska	4,122	3,556
		Alaska	5,271	
Coastal Communities	**Population[21]**	**Highway**	**2010 "Edge" AADT**	**AADT/10k**
Prince Rupert, BC	13,085	Yellowhead	12,045	9,205
Seward, AK	5,191	Seward	7,340	14,140
Homer, AK	5,003	Sterling	7,094	14,179
Port Hardy, BC	4,008	Bear Cove	3,311	8,261
Valdez, AK	3,976	Richardson	4,505	11,330
Haines, AK	1,852	Haines	1,928	10,410
Skagway, AK	920	Klondike	1,325	14,402

Calculated by Fehr & Peers, 2013.

There is a wide variation in the "edge" traffic rate calculated as AADT/10k persons. As population decreases, the trip rate increases but, as **Figure 2** shows, the data is clustered into two groups. Larger regional centers (Anchorage, Fairbanks, and Whitehorse) have lower trip rates than small coastal cities with higher trip rates. As cities grow in size there appears to be a threshold at which a larger volume of trips is internally captured.

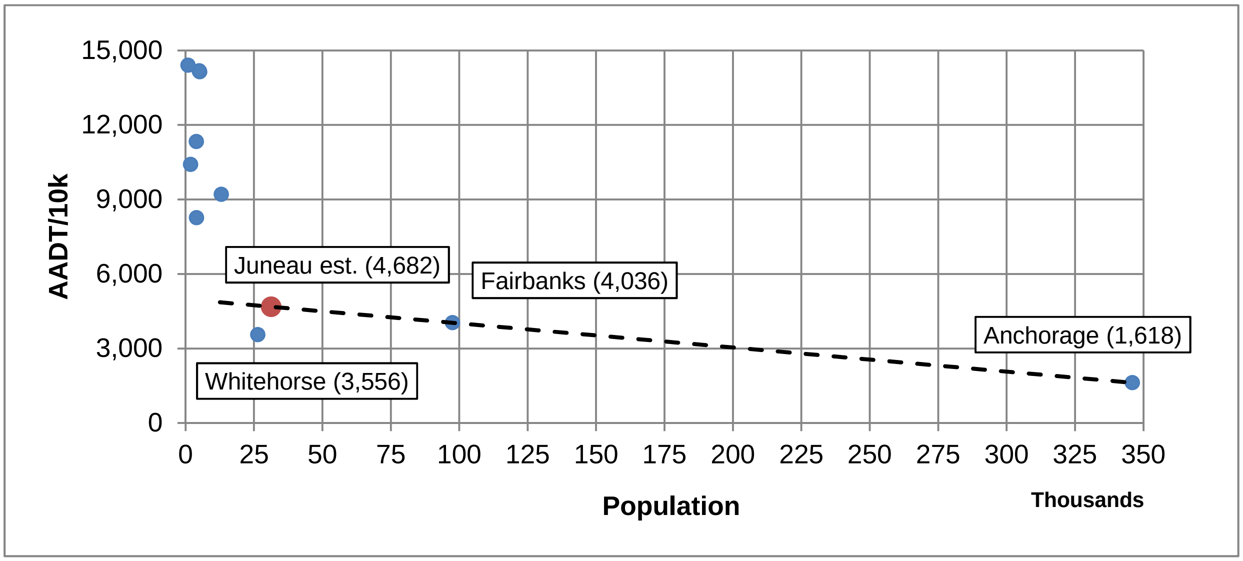
It should also be noted that the trip rates for the two small Canadian coastal communities are lower than the rates for the U.S. cities in the same cluster. The trip rate for Whitehorse, YT is also lower than would be expected based on a linear fit of the Anchorage and Fairbanks trip rates. This result is consistent with broader travel patterns in the United States and Canada. In 2010, vehicle-miles travelled per capita were fifty percent higher in the United States than in Canada.[25]

[23] Population estimates from 2010 U.S. Census and 2011 Canada Census.

[24] The greater Anchorage area includes the Municipality of Anchorage and the towns of Willow, Houston, Meadow Lakes, Big Lake, Knik-Fairview, Wasilla, Gateway, Fishhook, Palmer and Sutton-Alpine.

[25] Transport Canada's Transportation in Canada 2010 report estimates 6,437 vehicles miles traveled per capita in Canada. The FHWA's Highway Statistics 2010 report estimates 9,661 vehicles miles traveled per capita in the United States. According to these statistics, on average Americans travel 50% more than Canadians.

Figure 2. Comparison City "Edge" Trip Rates per Population



Based on its size, Juneau would likely have a trip rate more consistent with the larger cities than with the smaller coastal cities. For this prediction, two "edge" trip rates were used for Juneau to create a volume range. The first trip rate was set equal to the trip rate for Whitehorse (3,556 AADT/10k), since it is approximately the same size as Juneau and located approximately the same distance away from Skagway. However, Whitehorse residents would likely travel less than Juneau residents because of differences in Canadian and American travel patterns. A second, higher trip rate was estimated from a linear approximation (shown as a dashed line in Figure 2) of the Anchorage and Fairbanks trip rates and used to forecast a volume range. The second trip rate (4,682 AADT/10k) is higher than the trip rate for Anchorage, Fairbanks or Whitehorse but significantly less than the rate for the coastal cities.

Trip Dissipation

The highway segments on Richardson, Parks, Glenn, and Seward Highways near the cities of Anchorage, Fairbanks, Seward, and Valdez were analyzed to produce a normalized dissipation curve that could be applied to cities in Lynn Canal. Each of the segments begins at the "edge" locations and continues until volumes begin to increase. Highways were chosen that would not have a high volume of through traffic, so that the volume could be largely attributed to the city that the highway originated in. For cities with multiple highways, each highway was separately included in the model.[26]

To normalize the results from each highway, the traffic volumes were shown as a percentage of the initial volume at the "edge" of the city. The milepost at the "edge" was set to zero for each highway segment so that each curve begins with 100% of traffic volumes at milepost zero. **Figure 3** shows the normalized decay curves for each highway segment as well as a line of best fit.[27]

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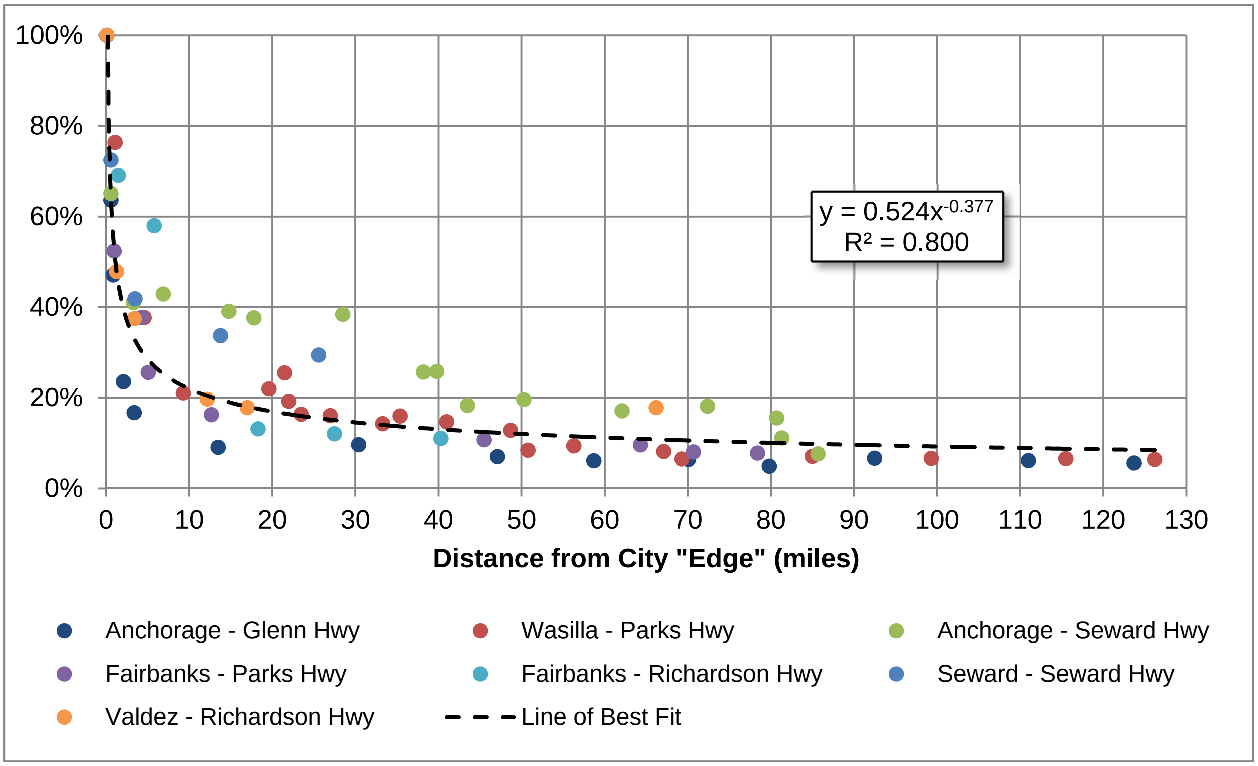
[26] The following locations were considered for this analysis but were excluded because of geography or lack of traffic data: Homer, Port Hardy, Prince Rupert and Whitehorse.
[27] The R^2 value indicates that power curve equation reasonably explains the relationship between the percentage of traffic volume remaining on a highway and the distance from the closest city.

Figure 3. Normalized Highway Segment AADT Percentages



Validation

Using the traffic volume occurring at the "edge" of a city, this model was validated. The towns of Haines and Skagway were chosen to validate the model as neither of these cities were used to build the model.

Table 7 shows the results of the validation calculations. The observed trip counts were obtained at the US/Canada border crossings. The distance was calculated from the milepost at which the "edge" traffic count is taken to the milepost of the border crossing. The trip percentage was calculated from the power curve fit equation in Figure 3. The validation showed a reasonable prediction of traffic volumes using the "edge" traffic volume for each city.

Table 7. Highway Traffic Volume Model Validation Results

Category	**Haines**	**Skagway**
2010 "Edge" Vehicle Trips	1,928	1,325
Distance (miles)	39	13
Trip Percentage	13%	20%
Predicted Trips (at US/Canada Border)	251	265
2010 Observed Trips (at US/Canada Border)	246	239
Percent of Observed Trips	102%	111%

Calculated by Fehr & Peers, 2013.

Lynn Canal Traffic Forecast using Highway Traffic Dissipation Model

The traffic forecasts using this model are shown in **Table 8**. The model was applied from two directions: 1) Juneau and 2) Haines and Skagway. As previously discussed, two “edge” traffic rates were used for Juneau (3,556 and 4,682 trips per 10k population) to forecast a volume range. Using Juneau’s population, the “edge” traffic range at the Auke Bay Ferry Terminal is 11,121 to 14,463 daily trips.

Table 8. Highway Traffic Volume Model Estimates

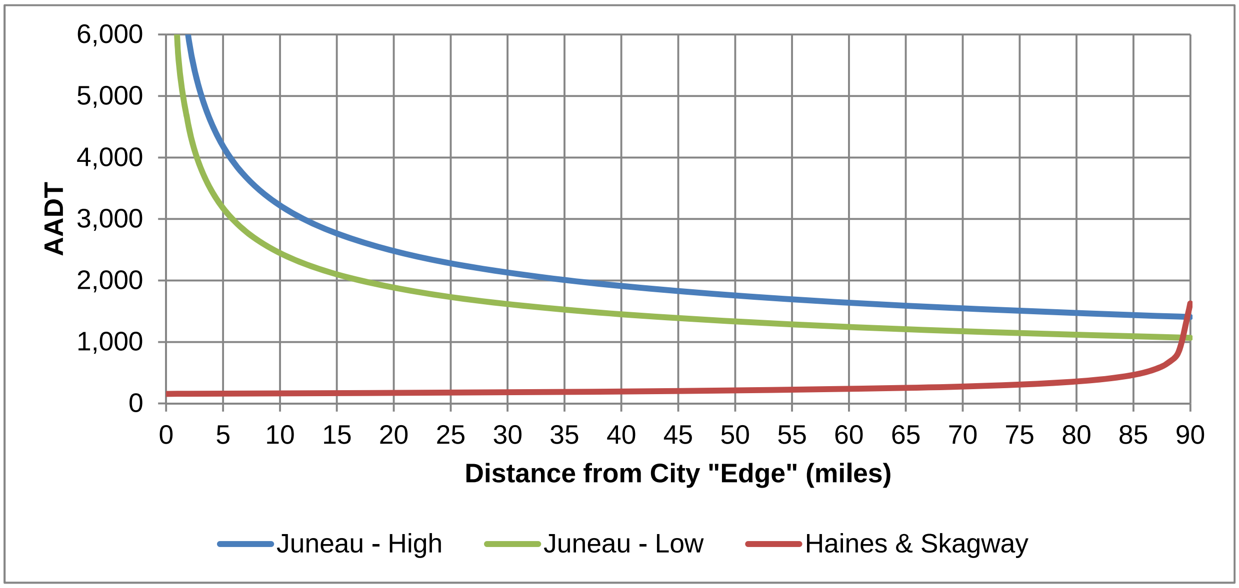
Category	**Low Estimate**	**High Estimate**
2010 Juneau Population	31,275	
“Edge” AADT/10k Population	3,556	4,682
Total “Edge” Trips	11,121	14,463
Percentage of Trips Remaining at 90 Miles (Figure 3)	10%	
Total Lynn Canal Highway Through Trips	1,112	1,464

Calculated by Fehr & Peers, 2013.

Haines and Skagway were treated as a single location approximately 90 miles from Juneau. Consistent with the assumptions in the Household Travel Survey Model, 50 percent of vehicle traffic from Haines and Skagway was assumed to travel south on the Lynn Canal Highway towards Juneau. The “edge” traffic for Haines and Skagway was calculated by combining the observed trips shown in Table 7 and dividing in half. The combined “edge” traffic for Haines and Skagway is 1,627 trips.

Next, the dissipation curves were applied to the “edge” traffic volumes. **Figure 4** shows the two dissipation curves from Juneau and the combined dissipation curve from Haines and Skagway. The start of the dissipation curves for Juneau (11,121 trips and 14,463 trips) are not shown on the figure since these volumes are so much greater than the “edge” volume for the combined Haines and Skagway curve (1,627 trips).

Figure 4. Juneau and Haines/Skagway Dissipation Curves



As the figure shows, the dissipation curves meet just outside the towns of Haines and Skagway. This indicates that traffic on the hypothetical Lynn Canal Highway would be dominated by trips related to Juneau's population. The percentage of trips remaining at 90 miles based on the line of best fit shown in Figure 3 is 10%. The resulting traffic forecasts range from 1,112 to 1,464 AADT.

CONCLUSION

Table 9 summarizes the results of the two total demand models and shows the average of all three results. The models predicted an average of 1,240 vehicles on the hypothetical Lynn Canal Highway if it were available today.

Table 9. Total Demand Volume Predictions

	AADT
Household Travel Survey Total Demand Volume	1,133
Highway Traffic Counts Total Demand Volume (Low)	1,112
Highway Traffic Counts Total Demand Volume (High)	1,464
Average Total Demand Volume (Rounded)	1,240

Calculated by Fehr & Peers, 2013.

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APPENDIX D

CHOICE MODELS

Fehr & Peers Choice Models Memo

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MEMORANDUM

Date: October 2, 2013

To: Laurie Cummings and Kevin Doyle, HDR

From: Donald Samdahl, Fehr & Peers

Subject: ***Juneau Access Improvements***
Appendix D: Choice Models

SE12-0266

INTRODUCTION

The choice models estimate the volume of travel that would use each Juneau Access Improvement (JAI) Alternative. This section describes the two choice models used in this analysis. Both choice models are based on the logit formulation, which is a common type of model used by transportation planners to predict travel outcomes. The first choice model described is a travel choice model, which estimates the probability that a trip will be made based on the utilities and disutilities offered by each alternative. The second choice model is a mode choice model that predicts the mode of travel (in this case air or ferry/car) that a traveler will use. This appendix describes the development, application, and results of the choice models for each of the Juneau Access Improvements.

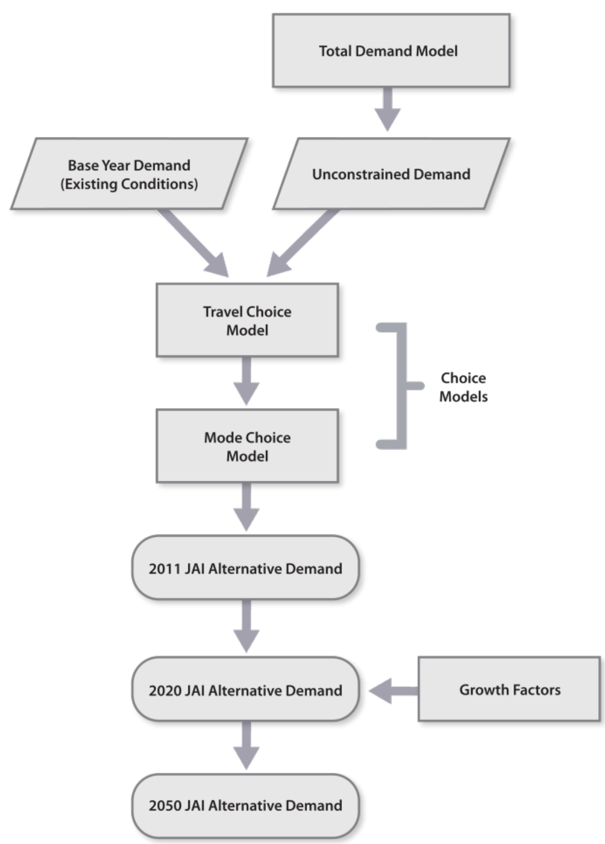

Figure 1. JAI Model Structure

The travel choice model uses the total person demand for travel (by any mode)[1] in Lynn Canal and forecasts the number of vehicle trips that would use each alternative. The annual average daily traffic (AADT) forecast volume is then used to predict summer average daily traffic (SADT) and winter average daily traffic (WADT) volumes. The summer (May-September) and winter (October-April) periods are consistent with the Alaska Marine Highway System (AMHS) summer and winter schedule periods. Lastly, growth forecasts are used to estimate the volumes for each alternative in 2020 and 2050. The structure of the model is shown in **Figure 1**.

[1] Refer to Appendix C for a description of the Total Demand Model.

The travel choice model addresses the issue of latent demand in the Lynn Canal corridor. Latent demand is unrealized demand for travel that is currently suppressed (i.e. not made today) because of high travel time and costs. The travel choice model predicts the proportion of the total unconstrained demand that would travel under each JAI alternative, based on the relative costs, convenience, and travel time offered by each alternative. The basis for the travel choice model is that the unconstrained total demand represents the predicted travel that would occur if a road were constructed between Juneau and Haines/Skagway. Since all of the alternatives impose additional travel time and out of pocket costs, each alternative has a degree of latent demand when compared to the unconstrained scenario. In addition to predicting the total travel volumes in the Lynn Canal corridor, the travel choice model separately calculates the travel demand to Haines and Skagway and thus is able to capture increases in travel between Juneau-Haines and Juneau -Skagway.

The model was designed to only capture changes in travel patterns within Lynn Canal and thus it is not able to capture the resulting reduction in travel between Skagway and Whitehorse (i.e. destination shift). The choice model also does not include the effects of induced growth and economic activity that could occur along Lynn Canal after the construction of each alternative. This conservative approach limits the results of the choice model to the immediate effects of offering different alternatives for travel within Lynn Canal.

TRAVEL CHOICE MODEL INPUT VARIABLES

The travel choice model calculates the probability of travel based on several input variables as described below. The input data were developed for summer travel conditions in Lynn Canal. The values for each of these inputs for the access alternatives are shown in **Table 2**.

Auto Travel Time

Auto travel time is calculated using the distance for the roadway portions of the alternative and an assumed speed of 45 miles per hour (defined by Alaska Department of Transportation & Public Facilities-DOT&PF). The starting point for each alternative is the Auke Bay ferry terminal. The end point is either downtown Haines (defined as Third Avenue & Main Street) or the ferry terminal in Skagway.

Auto Cost

Auto cost is the product of roadway distance and vehicle operating cost. The vehicle operating cost is assumed to be 26 cents per mile (additional information may be found in Appendix A).

Ferry Travel Time

Ferry travel time was based on information from Alaska DOT&PF.

Ferry Cost

Ferry cost is calculated per user; it is the sum of one adult fare and each traveler's share of the total vehicle fare (e.g., vehicle fare divided by the average vehicle occupancy). Vehicle fares assume a 16-19ft vehicle. Fares were updated from the 2006 FEIS. Additional information regarding how the fares were calculated may be found in Appendix A.

Ferry Delay

Total ferry delay includes delay associated with wait time, check-in time, load time, and unload time. Alternatives 2B and 3 include delay associated with waiting for a ferry and do not include any check in-time. The decision to include check-in time for the predominantly ferry alternatives (1, 1B, 4A, 4B, 4C, and 4D) was based on discussions with AMHS, since they currently require that vehicles check-in to make the loading of the ferries more efficient. In Alternatives 2B and 3, no check-in time was assumed, since these ferries are assumed to operate more like short-run ferries in British Columbia and Washington State, which do not require check-in times. The delay for these alternatives was set equal to a quarter of the ferry headway (time between arrivals).[2] The check-in, load, and unload times were based on information from Alaska DOT&PF.

Service Index

The service index is a measure of each alternative's relative travel convenience based on factors that are outside of those defined above. This measure was developed in an effort to quantify some of the intangible qualities that travelers consider when making their choices. For instance, the ability to depart at any time is more convenient than planning a trip in advance to coordinate with the ferry schedule. Also, reservation requirements can make a spontaneous trip impractical if there are no spaces left on the vessel.

The service index used in the Travel Choice Model is based on one developed for the *Break-Even Demand on Alternative Ferry Systems in Lynn Canal* published by Northern Economics in February, 1999. Alternatives are considered to be more convenient if there is more capacity, are more sailings, and with more regularly scheduled service (service that departs after 7 AM and arrives prior to 9 PM). Improvements in each of these areas reduce the need to make reservations for the ferry, allow travelers to arrive at more convenient times, and increase the likelihood that the decision to travel in the future will be more spontaneous. The service index considers three factors:

- Capacity: The nominal 20-foot vehicle capacity of the vessels on the route, multiplied by the number of vessel departures.[3]
- Departures: The number of departures from the origin to the destination.
- Departure Times: Each departure is assigned a score based on the departure time. Those scores are summed and then divided by the number of departures. Departures that are regularly scheduled daily service or irregularly scheduled, but can be completed between 7AM and 9PM are assigned a 1, and all other trips are assigned a 2. A final score of 1.0 indicates all departures are convenient. Values higher than 1.0 indicate less convenient departure times.

The relative convenience of each alternative was calculated by taking the ratio of each score to the score for base year (existing service), and calculating the service index based on the formula below. Existing service has a service index of 2.0 since all of the ratios are equal to 1.0. Values greater than 2.0 indicate more convenient service than existing.

$$Service\ Index = \frac{Capacity\ Ratio + Departure\ Ratio}{Departure\ Time\ Ratio}$$

[2] One quarter of the headway time reflects an assumption that half of the passengers arriving at a shuttle ferry will time their departure (from Juneau, Haines, or Skagway) to arrive shortly before the ferry departs, while the other half of passengers will arrive randomly. This arrival pattern is similar to what is assumed by the Washington State Ferry System. Passengers traveling to or from Skagway in Alternative 3 must take two ferries to reach their final destination. The ferry delay for these passengers takes into account the travel time between ferry terminals as well as the preliminary ferry schedule for this alternative. The delay for the first ferry was assumed to be a quarter of the ferry headway, as it was for Alternative 2B and for Haines travelers in Alternative 3. The delay for the second ferry is the amount of time spent waiting for the ferry after arriving at the second ferry terminal.

[3] Based on the known capacity of existing AMHS vessels or the previously planned capacities for certain vessels in Alternatives 3, 4A, and 4B. Final capacity for all vessels will be determined based on forecasts.

The 1999 study laid the basis for the service index structure. In order to calibrate the index for the travel choice model, the results of observed change in travel demand were examined in response to service changes in the Lynn Canal Corridor that occurred in the mid-2000s. Between 2004 and 2007, AMHS introduced the Fairweather, a fast vehicle ferry, which provided several direct trips a week between Juneau/Haines and Juneau/Skagway. AMHS ridership data indicated that while the Fairweather reduced the travel time and increased the vehicle capacity to Haines and Skagway, there was little change in overall demand for travel in the Lynn Canal during this time period. It is noteworthy, however, that while total travel demand didn't change during this time, there was a noticeable increase in demand between Juneau and Skagway due to the direct service provided by the Fairweather fast ferry, which greatly reduced travel times between the two communities.

Several conclusions were drawn based on the AMHS data from the mid-2000s along with other observed travel data (e.g., change in demand resulting in earlier but more dramatic service changes in the late-1990s and observed roadway volumes between cities elsewhere in Alaska). For moderate changes in ferry service, increasing vessel capacity does not by itself have a strong impact on ferry demand. For this reason, the capacity ratios for several alternatives were scaled back to reduce the influence of capacity on travel demand (which is consistent with the observed data from the mid-2000s). In this case, the capacity ratios for Alternatives 1, 1B and 4C were set equal to 1.0 (meaning that there is no induced demand from additional capacity relative to existing conditions), since these alternatives are similar in nature to the mid-2000s Lynn Canal service, which did not result in increased demand.

The capacity ratios for the other alternatives were left unchanged because these provide substantially better ferry service. Results from the *Break-Even Demand on Alternative Ferry Systems in Lynn Canal* study indicated that more dramatic improvements in service do result in more substantial shifts in travel demand. As a test, the demand response from the *Break-Even Demand* study was compared to the results of the travel choice model for Alternatives 2B, 3, and 4B. The choice model predicted less demand response to the changes in service than the *Break-Even Demand* study; however, this result is reasonable given that the travel choice model considers many more variables than the *Break-Even Demand* study. The final conclusion was that it is necessary to adjust the influence of the capacity ratio in the travel choice model to reflect the observed demand response to changes in travel service that have occurred in Lynn Canal over the last 20 years.

TRAVEL CHOICE MODEL INPUT VARIABLE VALUES

The travel choice model separately calculates the demand for travel between Juneau-Haines and Juneau-Skagway. For many of the alternatives, there are two (or more) ferry configurations that travel between Juneau, Haines, and Skagway. For example, the mainline ferry that provides service to Prince Rupert, BC and Bellingham, WA operates in Lynn Canal in Alternatives 1, 1B, 4A, 4B, 4C, and 4D. Alternative 1B also retains the Malaspina in addition to the Day Boat ACF and mainline service.

The travel choice model was not set up to forecast demand for a given ferry but rather for the alternative as a whole, so the input values were weighted based on the available capacity of each ferry. For example, Alternative 4B uses a fast vehicle ferry (FVF) travelling between Skagway and Sawmill Cove and a mainline ferry travelling between Skagway and Auke Bay. The FVF has a roundtrip capacity of 102 Alaska Standard Vehicles (ASV) and makes 14 roundtrips a week. The average daily roundtrip capacity for the FVF is 204 ASV's. The mainline ferry has a roundtrip capacity of 56 ASV's[4] and makes 2 roundtrips per week. Since only half of the mainline capacity is available for Skagway travelers, the average daily roundtrip capacity for the mainline ferry is 8 ASV's. The FVF serves 96% (204 out of 212) of the total available capacity to Skagway on this alternative. To weight the inputs appropriately, the FVF characteristics were multiplied by 96%, the mainline characteristics were multiplied by 4% and the results were summed. **Table 1** shows the results of these calculations for Alternative 4B. The same methodology was used for each of the other alternatives but the detailed calculations are not shown.

Table 1: Alternative 4B Weighted Travel Choice Model Input Calculations (Juneau to Skagway)

Ferry	Auto Travel Time (minutes)	Auto Cost (dollars)	Ferry Travel Time (minutes)	Ferry Cost (dollars)	Ferry Delay (minutes)
FVF	41	$8.06	108	$53.82	75
Mainline	0	$0.00	390	$83.64	156
Weighted Average	39	$7.76	119	$54.93	78

Calculated by Fehr & Peers, 2013.

[4] The mainline capacity is assumed to be a quarter of the total available capacity, which was calculated as the average of the roundtrip capacities of the Matanuska (176 ASV's) and the Columbia (268 ASV's). This capacity reflects utilization of mainline service by Lynn Canal travelers and not total available spaces.

Table 2 presents the summary of the input variable values.

Table 2: Travel Choice Model Input Variable Values

Haines	Auto Travel Time (minutes)	Auto Cost (dollars)	Ferry Travel Time (minutes)	Ferry Cost (dollars)	Ferry Delay (minutes)	Service Index
All-Road	109	$21.22	0	0	0	N/A
Existing	6	$1.12	270	$63.06	156	2.00
Alt 1	6	$1.12	276	$63.06	83	2.01
Alt 1B	6	$1.12	276	$50.45	83	2.01
Alt 2B	107	$20.96	27	$11.02	44	22.67
Alt 3	96	$18.75	44	$15.70	39	27.30
Alt 4A	6	$1.12	160	$63.06	78	5.53
Alt 4B	45	$8.88	97	$37.64	78	5.60
Alt 4C	6	$1.12	277	$63.06	76	2.16
Alt 4D	46	$8.89	173	$37.60	73	5.73
Skagway	**Auto Travel Time (minutes)**	**Auto Cost (dollars)**	**Ferry Travel Time (minutes)**	**Ferry Cost (dollars)**	**Ferry Delay (minutes)**	**Service Index**
All-Road	127	$24.78	0	0	0	N/A
Existing	0	$0.00	390	$83.64	156	2.00
Alt 1	0	$0.00	337	$83.64	134	2.01
Alt 1B	0	$0.00	286	$66.91	139	3.04
Alt 2B	102	$19.84	51	$18.43	51	17.00
Alt 3	102	$19.86	95	$32.76	124	8.48
Alt 4A	0	$0.00	176	$83.64	78	5.53
Alt 4B	39	$7.76	119	$54.93	78	5.60
Alt 4C	0	$0.00	315	$83.64	76	2.16
Alt 4D	40	$7.77	207	$54.89	73	5.73

Calculated by Fehr & Peers, 2013.
Note: Data reflect summer travel conditions.

TRAVEL CHOICE MODEL STRUCTURE

As described earlier, the travel choice model calculates the probability of travel for a given alternative by comparing the utility of an alternative with the utility of the hypothetical “all-road” concept (the all road concept is the basis for the unconstrained travel demand estimate). This utility maximization calculation is based on a microeconomics theory of decision-making that quantifies the usefulness (or attractiveness) of an alternative into utility values. A traditional logit choice model calculates likelihood with the following formula:

$$P_a = \frac{e^{U_a}}{e^{U_r}}$$

Where:

- P_a = the probability of making a trip for improvement Alternative “a”
- U_a = the utility/disutility of Alternative “a” in the following form:

$$U_a = aX + bZ + h$$

Where:

- *X* and *Z* = vectors of alternative characteristics
- *a* and *b* = vectors of logit model parameters
- *h* = the “mode specific constant” which captures aspects not captured by the other parameters
- *r* = the All-Road Alternative: the alternative with the greatest utility

The choice model coefficients were taken from the Puget Sound Regional Council (PSRC) travel demand forecasting model and were verified against the *Travel Model Validation and Reasonability Checking Manual* (2nd Edition, 2010, Cambridge Systematics). The PSRC coefficients were chosen since it is one of the few major travel models in the US that includes a substantial amount of ferry travel. The *Travel Model Validation and Reasonability Checking Manual* is a document that evaluated a dozen MPO mode choice models to determine typical logit parameter values for travel cost, in vehicle time, and waiting time. In addition, parameter values from the Washington State Ferries choice model were reviewed to refine in-ferry travel time utility weights as opposed to in-car travel time utility weights.

The parameter values were then calibrated uniformly to match the observed travel patterns in Lynn Canal. In other words, the relative differences between cost, travel time, and waiting time were not adjusted in the calibration process; however, the overall magnitude of the parameters had to be adjusted to account for the long distances, high costs, and long travel times in the Lynn Canal.

The model coefficients are:

- Auto time (in minutes): -1.27×10^{-3}
- Auto cost (in year 2012 cents): -1.27×10^{-4}
- Ferry in-vehicle time (in minutes): -1.01×10^{-3}
- Ferry waiting time (in minutes): -2.85×10^{-3}
- Ferry cost (in cents): -9.73×10^{-5}

These coefficients can be interpreted as follows:

- In-ferry vehicle time is more valuable (has higher utility) than in-auto travel time
- Waiting for a ferry is 2.8 times more onerous than traveling in a ferry
- Out-of-pocket auto costs are 1.3 times more onerous than ferry fares (on a dollar-per-dollar basis)

The last bullet indicates that, all else being equal, people would rather pay slightly more for ferry service than driving. This reflects the lower-stress nature of ferry travel.

The utility of each alternative is summed from seven values: the six factors listed in Tables 2 and a mode-specific constant. The utility of the first five variables is calculated using the coefficients listed above. The utility of the service index is calculated by taking the negative reciprocal. Lastly, the mode-specific constant is a calibration term to allow the travel choice model to more closely match observed conditions. In statistical terms, this factor represents characteristics of the mode that are not captured by the input variables above, but which impact the choice to travel.

APPLYING THE TRAVEL CHOICE MODEL

Based on the analysis described above, the travel choice model was applied to each of the JAI alternatives. **Table 3** shows the percentage of trips that each alternative captures relative to the All-Road Alternative.

Table 3: Percentage of Travel Captured

	All-Road	Existing	Alt 1	Alt 1B	Alt 2B	Alt 3	Alt 4A	Alt 4B	Alt 4C	Alt 4D
Haines	100%	12%	15%	17%	73%	68%	23%	35%	15%	33%
Skagway	100%	9%	10%	15%	62%	39%	19%	29%	13%	27%

Calculated by Fehr & Peers, 2013.

The percentages in this table reflect the percent of total passenger travel in Lynn Canal for each alternative before modes are assigned or the number of vehicles is calculated.

MODE CHOICE MODEL STRUCTURE

The travel choice model estimates the percentage of people that make a trip in Lynn Canal by comparing each alternative to the all-road or “unconstrained” scenario. The next step in the overall travel choice model process is the mode choice model, which predicts the mode that travelers will use to make their trip. In Lynn Canal, the only two available modes are auto/ferry and airplane.

The mode choice model was applied in a similar fashion to the travel choice model. Compared to all other alternatives, under existing conditions, air travel is the most competitive and therefore has the highest total travel volume. Since the other alternatives tend to reduce travel time and out-of-pocket costs, the total amount of air travel demand is assumed to decrease for all other alternatives. Thus, while the total demand for travel increases with improved service in the Lynn Canal corridor (i.e., more latent demand is realized), there is no induced demand for air travel associated with more ferry service or longer road connections.

Given these assumptions, a mode choice model was applied using similar travel cost and travel time logit model coefficients applied in the travel choice model. For the mode choice model, the following one-way

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air service characteristics were assumed based on data from air carrier websites and phone calls with air carrier representatives.[5]

- In-air travel time: 45 minutes
- Airfare per person: $113
- Check-in/unload time: 45 minutes[6]

The coefficients for these variables, calibrated to existing conditions, are:

- In-air travel time (in minutes): $-1.01\text{x}10^{-3}$
- Air waiting time (in minutes): $-2.85\text{x}10^{-3}$
- Air cost (in cents): $-3.42\text{x}10^{-4}$

The mode choice model calculated the percentage of trips that would make a trip in Lynn Canal via airplane by calculating the ratio of the utility of air travel to the utility of ferry travel for each alternative. Each of these ratios was compared to the ratio for existing conditions using the following formula to calculate the percentage of air travel under each alternative.

$$P_a = 1 - \left(\frac{e^{U_t}}{e^{U_c}} - \frac{e^{U_t}}{e^{U_a}} \right)$$

Where:

- P_a = the probability of making a trip via air for Alternative "a"
- U_t = the total air utility based on existing service levels
- U_c = the total ferry utility of existing service
- U_a = the total ferry utility of Alternative "a"

APPLYING THE MODE CHOICE MODEL

The results of the mode choice model are shown below as the percentage of existing conditions air travel demand captured under each alternative. A percentage less than 100% indicates that some passengers have switched from air travel to ferry travel (relative to existing conditions). In contrast to the results from the previous section, smaller percentages do not show less travel overall, only less travel via air. The total passenger demand for each alternative is unchanged based on these results. As shown, the air mode share is relatively inelastic, which was expected since many air passengers are not price sensitive and value the travel time savings afforded by the mode.

[5] Two regional airlines serve Haines and Skagway from Juneau, Air Excursions LLC and Wings of Alaska.
[6] Check-in time is 30 minutes based on information from the air carrier websites. Unload time is assumed to be 15 minutes.

Table 4: Percentage of Air Travel Captured

	All-Road	Existing	Alt 1	Alt 1B	Alt 2B	Alt 3	Alt 4A	Alt 4B	Alt 4C	Alt 4D
Haines	80%	100%	96%	94%	81%	82%	89%	85%	95%	86%
Skagway	72%	100%	97%	88%	73%	76%	83%	78%	91%	79%

Calculated by Fehr & Peers, 2013.

CHOICE MODELS CALIBRATION

The travel choice model and mode choice model were calibrated to existing conditions in Lynn Canal and to the total demand for travel from the total demand model. **Table 5** summarizes the existing demand for travel in Lynn Canal.

Table 5: Existing Travel Demand in Lynn Canal

Mode	AADT	SADT	WADT
Ferry Passengers	225	364	125
Air Passengers	81	130	46
Total Passengers	306	494	171

Source: AMHS 2011 Annual Traffic Volume Report.

The model was calibrated to AADT passenger volumes for both existing conditions and total demand. The total demand model forecasted 1,240 AADT on an all-road scenario. Along with predicted air travel, this translates into an average annual daily passenger volume of 2,913 (the text below describes how this number was calculated). Existing conditions indicate that on average 306 passengers travel each day in Lynn Canal. While the volumes were calibrated to annual characteristics, the remaining statistics reflect summer travel in Lynn Canal. Travel behavior in Lynn Canal varies seasonally and the model was designed to accurately reflect travel during the highest demand period (i.e. summer months). The ratio of air travel to ferry travel is consistent throughout the year and using AADT travel volumes will not affect the results of the model.

The travel choice model separately forecasted demand for Haines and Skagway. **Table 6** shows the existing destination splits for travel between Juneau-Haines and Juneau-Skagway for air and ferry travel during the summer.

Table 6: Destination Split for Summer Travel in Lynn Canal

Mode	Juneau-Haines		Juneau-Skagway	
	Volume*	Percentage	Volume*	Percentage
Ferry Vehicles	27,619	60%	18,169	40%
Air Passengers	9,531	48%	10,343	52%

Sources: AMHS 2011 Annual Traffic Volume Report and Bureau of Transportation Statistics, T-100 Domestic Segment (All Carriers) Database.
** Total volume from May to September.*

Finally, the travel choice model converted from passengers to vehicles. Passengers were converted to vehicles using two occupancy rates. For the marine alternatives (1, 1B, 4A, 4B, 4C, and 4D), the current summer AMHS vehicle occupancy rate was used, 3.3 passengers per vehicle. For Alternatives 2B and 3, which are primarily highway alternatives with convenient ferry connections, a vehicle occupancy rate of 2.3 passengers per vehicles was used.[7] Vehicle occupancy is higher for ferry travel than it is for highway travel. Due to walk-on ferry passengers and the higher relative cost of ferry travel, different occupancies were used to reflect the change in vehicle occupancy behavior that would likely occur among the different alternatives.

CHOICE MODEL RESULTS

Table 7 shows the results of combining the travel choice and mode choice models. The forecasts for Haines and Skagway show total travel demand in Lynn Canal. The AADT was calculated by subtracting the air passengers from total passengers and then applying the ferry or road vehicle occupancy. The SADT, WADT, and PWADT forecasts were calculated using seasonal factors described in Appendix A. Summer travel volumes increases by 61% from annual volumes, winter travel volumes decrease by 44% from annual volumes, and peak week travel volumes increase by 280% from annual volumes. The table also includes the percentage of ferry travel between Juneau-Haines and Juneau-Skagway for each alternative.

Table 7: Travel Choice Model Results

Alternative	Total Daily Passengers	Daily Air Passengers	AADT	SADT	WADT[8]	PWADT	Haines Share*	Skagway Share*
All-Road	2,913	61	1,240	2,002	692	4,712	50%	50%
Existing	306	81	68	110	38	258	60%	40%
1	362	78	86	139	38	327	62%	38%
1B	457	73	116	187	3	441	53%	47%
2B	1,965	63	827	1,335	462	3,143	54%	46%
3	1,566	64	653	1,054	365	2,481	64%	36%
4A	616	70	166	268	93	631	55%	45%
4B	938	66	264	426	93	1,003	55%	45%
4C	411	75	102	165	57	388	56%	44%
4D	880	66	247	399	57	939	55%	45%

Calculated by Fehr & Peers, 2013.
Note: Volumes in this table were taken directly from the model. For reporting purposes in the Traffic Forecast Report, the values were rounded.
** For all alternatives the share percentage is based on AADT volumes.*

[7] A discussion on how these vehicle occupancies were calculated is provided in Appendix A.
[8] Alternatives 1B, 4B and 4D provide winter service equivalent to 1, 4A and 4C respectively, so the WADT forecasts for these three alternatives (1, 4B and 4D) were set equal to the forecasts from the equivalent service.

LONG-TERM TRAFFIC FORECASTS

The results from the choice models can be used to forecast opening year and thirty year volumes for each alternative. The design opening year is 2020 and thirty years from opening is 2050. **Table 8** shows the population growth rate assumptions for Lynn Canal.

Table 8: Lynn Canal Population Growth Forecasts

Location	2011	2020	2050
Juneau Population	32,290	32,381	32,080
Skagway Population	965	1,064	1,126
Haines Population	2,620	2,639	2,613
Total Population	**35,875**	**36,084**	**35,819**
Annual Growth Rate from 2011	**-**	**0.065%**	**-0.004%**

Source: Updated Population Estimates and Forecasts for the JAIP EIS, Northern Economics, September 7, 2012.

Using the forecasted population growth rates, the 2020 and 2050 volume forecasts are shown in **Table 9**. The same seasonal factors are applied from the previous section. The results for Juneau-Haines and Juneau-Skagway are shown separately.

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Table 9: Lynn Canal Long-Term Traffic Forecasts

Juneau-Haines	2011 AADT	2020 AADT	SADT	WADT	PWADT	2050 AADT	SADT	WADT	PWADT
Alternative 1	53	53	87	30	201	53	86	30	201
Alternative 1B	62	62	101	30	236	62	100	30	236
Alternative 2B	450	453	730	252	1,721	449	725	251	1,706
Alternative 3	418	420	679	235	1,596	417	674	234	1,585
Alternative 4A	91	92	148	51	350	91	147	51	346
Alternative 4B	145	146	235	51	555	145	234	51	551
Alternative 4C	57	57	93	32	217	57	92	32	217
Alternative 4D	136	137	221	32	521	136	220	32	517
Juneau-Skagway	**2011 AADT**	**2020 AADT**	**SADT**	**WADT**	**PWADT**	**2050 AADT**	**SADT**	**WADT**	**PWADT**
Alternative 1	33	33	53	18	125	33	53	18	125
Alternative 1B	54	54	88	18	205	54	87	18	205
Alternative 2B	377	379	613	212	1,440	376	608	211	1,429
Alternative 3	235	236	381	132	897	235	378	131	893
Alternative 4A	75	75	122	42	285	75	121	42	285
Alternative 4B	119	120	193	42	456	119	192	42	452
Alternative 4C	45	45	73	25	171	45	73	25	171
Alternative 4D	111	112	180	25	426	111	179	25	422

Calculated by Fehr & Peers, 2013.
Note: Volumes in this table were taken directly from the model. For reporting purposes in the Traffic Forecast Report, the values were rounded.

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APPENDIX E

BERNERS BAY TRAFFIC VOLUMES

Fehr & Peers Berners Bay Traffic Volumes Memo

FEHR & PEERS

MEMORANDUM

Date: July 10, 2013

To: Laurie Cummings and Kevin Doyle, HDR

From: Donald Samdahl, Fehr & Peers

Subject: ***Juneau Access Improvements***
Appendix E: Berners Bay Volumes

SE12-0266

Throughout the Traffic Forecast Report, the travel volumes presented for the Lynn Canal corridor were based on through trips between Juneau-Haines and Juneau-Skagway (as well as other destinations beyond Haines, Skagway and Juneau). However, because the total demand models rely on identifying trip dissipation curves (i.e., the rate that traffic dissipates as it leaves an area), the total demand research can also be used to calculate the total mix of through and local traffic at a given point along any new road constructed as part of the improvement. The local traffic is anticipated to be largely composed of travelers accessing recreational areas (camping, hunting, fishing, mining, etc.) along the highway, along with visitor travel exploring the area. Note that the forecasts do not assume any land growth inducing impacts that would cause new developed areas to attract additional trips. As part of the analysis, it was requested that the estimated traffic volumes at Berners Bay be estimated to support other elements of the EIS. The results are summarized below.

The traffic volume at Berners Bay will substantially increase under several of the JAI Alternatives. Alternative 2B would construct a highway along Berners Bay to the Katzehin Delta. Alternatives 3, 4B and 4D would all extend Glacier Highway to Sawmill Cove with a new ferry terminal at Berners Bay. The new terminal would be 32 miles from the Auke Bay Ferry Terminal and the traffic volume at that point can be estimated using the trip dissipation curve from the highway count total demand model. At 32 miles, 14.6 percent of the total "edge" traffic remains on the highway. This is 1.46 times greater than the traffic volume at 90 miles on the dissipation curve. The volumes at Berners Bay can be estimated using this factor and the 2020 traffic volumes. The results are presented below.

Table 1: Berners Bay Traffic Volumes (2020) by Alternative

Alternative	AADT	SADT	WADT
2B – East Lynn Canal Highway	1,215	1,960	675
3 – West Lynn Canal Highway	960	1,550	535
4B – FVF Service from Sawmill Cove	390	625	-
4D – Monohull Service from Sawmill Cove	365	585	-

Source: Fehr & Peers, 2013. Winter service in Alternatives 4B and 4D is provided out of Auke Bay.

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APPENDIX F

RAMP-UP ANALYSIS

Fehr & Peers Ramp-Up Analysis Memo

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FEHR & PEERS

MEMORANDUM

Date: July 10, 2013

To: Laurie Cummings and Kevin Doyle, HDR

From: Donald Samdahl, Fehr & Peers

Subject: Juneau Access Improvements
Appendix F: Ramp-Up Analysis

SE12-0266

INTRODUCTION

One consideration in the travel forecasting is whether there will be a 'ramp-up' period after implementing the alternative before the full travel demand is achieved. In order to examine this effect, the project team investigated case study experiences at other locations where new transportation infrastructure or services were implemented. There are two types of situations for which the ramp-up period may be different: (1) increased service levels and capacity, and (2) replacement of ferry with a road or bridge.

INCREASED SERVICE LEVELS AND CAPACITY

Substantial changes in ferry service have occurred twice within Lynn Canal during the past 20 years. The first occurred in 1998 with the introduction of the Malaspina as a day boat serving Juneau, Haines, and Skagway. Northern Economics analyzed this addition of service in the 1999 *Break-Even Demand on Alternative Ferry Systems in the Lynn Canal* and found that the introduction of the Malaspina combined with a fare surcharge increased demand in Lynn Canal by 32%. The report indicated that this increase occurred relatively quickly over a few months during 1999, although detailed month-by-month data were not provided.

From 2005 to 2007, AMHS increased the ferry service, with the FVF Fairweather making five weekly roundtrips between Juneau and Haines/Skagway in addition to the daily mainline ferry service. During this time, ridership fluctuated seasonally, but remained generally flat over the three-year period when the Fairweather was in operation. No discernible ramp-up effect was observed.[1]

Other sources of data include roadway or public transit services where new or expanded facilities/services have been provided. While there are no industry standards, our professional experience and discussions with colleagues indicate that many toll road and new transit projects use a 1-2 year ramp-up period to account for demand build-up. This ramp-up period gives agencies a cushion to account for delays in full project implementation and to allow people to become familiar with the changes.

NEW BRIDGE REPLACING FERRIES

There are some examples around the world of bridges replacing ferry services. Three relevant projects are highlighted below: Skye Bridge in Scotland, Great Belt Fixed Link in Denmark, and the Confederation Bridge to Prince Edward Island, Canada.

[1] AMHS ridership data. Refer to Appendix D for further description.

Skye Bridge

The Skye Bridge replaced ferry service on a short (1 km) link between mainland Scotland and the Isle of Skye. Due to the short length, the in-vehicle travel time savings were only 14 minutes, but the bridge eliminated ferry queues that reached up to 4 hours in summer peak times. In the bridge's first year of operation (1995), it recorded traffic of 612,000 vehicles, approximately 20 percent more than reported by the previous ferry service. This was despite a high toll that was similar to the fares previously charged on the ferries[2]. The 20 percent increase was considered to be on the high side, since the ferry counts had been likely underreported. After 1996, traffic volumes grew at around 3 percent annually until 2004, when the tolls were removed. In the two years after toll removal, the volumes increased over 40 percent. There is no indication of what the original forecast was for bridge traffic, but given the change in service quality with the bridge, one might have expected a fairly large increase in demand. The traffic counts demonstrated a relatively small initial jump in demand followed by steady growth until the tolls were removed, when a large increase occurred. These findings would indicate that the high tolls dampened demand sufficiently to create a ramp-up period of several years until full demand was realized. This example may have limited applicability to the JAI given the interplay of the tolls and other demographic factors affecting demand across the Skye Bridge.

Great Belt Fixed Link Project

The Great Belt Fixed Link project provided a new 6.7 km bridge connecting the Danish islands of Zealand and Funen across the Great Belt waterway. The link replaced ferry service in 1997, initially with a rail bridge followed in 1998 by road traffic. Prior to the bridge, vehicle travel times were approximately 90 minutes, including ferry wait times (longer during peak times). Once the bridge opened, the travel time dropped to 10-15 minutes[3].

In the month after opening in 1998, the Great Belt Fixed Link Bridge carried 717,000 vehicles, almost a threefold increase from the ferry volumes[4]. In the comparable month in 1999, the volumes were 775,000, a further 8 % increase. Similar increases were recorded for annual growth in 1999 and 2000. Volume growth leveled off to the 3-5 annual percentage range from 2002 to 2011. Volumes in 2011 were 57 percent higher than in the first full year of operation (1999).

There were no data available on the forecasted demand for the bridge, but it seems that volume demand started quickly and continued to grow. The higher growth rates from 1998 through 2000 would suggest a 1 to 2 year ramp-up period until more steady growth rates were realized.

Confederation Bridge

The other comparable site is the Confederation Bridge to Prince Edward Island (PEI), Canada, which opened in 1998. This bridge replaced the Borden-Carleton to Cape Tormentine Ferry, which connected PEI to the mainland. Before the toll bridge opened in May 1997, the ferry served around 950,000 annual vehicles. In 1998, the new bridge carried 1.6 million vehicles, staying at that level for 3 years until the volumes dropped to around 1.5 million vehicles for several years thereafter[5]. The initial spike in demand after opening probably demonstrates the latent demand that had built up, combined with the novelty factor of the new bridge. Again, there were no forecast data for the bridge, but the large increase in demand right after opening would indicate that there was no ramp-up period; conversely, there was an initial demand spike followed by a lower, but steady demand after a couple of years.

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[2]DHC, *Highlands and Islands Enterprise and HITRANS: Evaluation of the Economic and Social Impacts of the Skye Bridge*, Final Report, February 2007. Also various UK web sources.
[3]Wikipedia
[4]Danish traffic records, *Storebaelt*, web link from Wikipedia
[5]PEI Department of Transportation & Infrastructure Renewal, Traffic Data, July 2012

RECOMMENDED RAMP-UP PERIOD

The ramp-up period to meet the forecasted demand will likely vary between alternatives. For the marine alternatives (e.g. Alternatives 1B and 4s), the ramp-up could take 2-4 years, taking into consideration the experiences during the 2005-7 service changes. Exogenous variables including the economy will affect this period.

For the roadway alternatives (e.g. Alternatives 2B and 3), the ramp-up period is likely to be very short, within 1-2 years. These alternatives, particularly Alternative 2B, provide an entirely new travel option that will initially attract people to 'try it out' followed by a more sustained travel demand due to the reliability and flexibility of the road/shuttle ferry journey. Alternative 3 would provide a similar level of service between Juneau and Haines, while the demand for Juneau to Skagway may lag due to the need to coordinate two ferry trips.

Given that the population forecasts for the corridor are essentially flat between the opening year (2020) and the horizon year (2050), one would expect the traffic demands to level off once the ramp-up period is complete.

The traffic forecasts for the 2020 Opening Year do not account for any ramp-up period as there is not sufficient data available to quantify this effect. As such, the 2020 forecasts represent the total demand for travel and likely slightly overestimate the actual volume of travel due to a short ramp-up period.

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