Island-Wide Transportation Feasibility Study for Kodiak Island, Alaska

Prepared for:
Kodiak Island Borough

Research-Based Consulting
Juneau
Anchorage

Prepared in association with:
Coastwise Corporation

February 2011

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Executive Summary

The purpose of the *Island-Wide Transportation Feasibility Study for Kodiak Island, Alaska* was to assess the feasibility of a Kodiak Island-wide transportation system connecting the Island's outlying communities to the city of Kodiak. The key component of this transportation system is a ferry dedicated to connecting the Island's outlying communities to the community of Kodiak. This transportation system is also envisioned to include road connections, road extensions, and new marine terminals (docks). This study considers the possible components of such a system, the cost to develop and maintain system components, the demand for such a system, and how much revenue it might generate.

The executive summary compiles key findings from a comprehensive, detailed 100-plus page technical report.

Service Area Profile

In considering the feasibility of a marine transportation system, three factors are critical; the size of the market (population base), travel times (distances) between ports of call, and sea conditions along routes between communities. Relevant characteristics of the Kodiak Island area include the following:

- The proposed ferry system would link the community of Kodiak with the six outlying communities of Akhiok, Old Harbor, Karluk, Larsen Bay, Port Lions and Ouzinkie. These six communities had a total year-round population of approximately 730 residents in 2009.
- Most communities have been experiencing declining populations over the past decade, including Port Lions (down 26 percent since 2000), Ouzinkie (down 25 percent), Old Harbor (down 22 percent), Larsen Bay (down 42 percent), and Akhiok (down 40 percent).
- Kodiak Island's outlying communities are widely dispersed over a very large coastal area. Ouzinkie is nearest to the city of Kodiak, at 14 nautical miles from Kodiak. Akhiok is the most distant from Kodiak, at 134 nautical miles. A round-island ferry calling on all six communities and the city of Kodiak would travel a total distance of 350 nautical miles.
- Marine travel around Kodiak Island includes exposure to long stretches of open water, strong currents, and ocean capes. This environment, coupled with high winds and cold temperatures, can result in severe marine operating conditions, especially during the winter. Sea keeping, the ability of a vessel to transit rough water safely and with minimal discomfort to passengers, is a substantial ferry system design challenge for many Kodiak Island vessel routes.

Ferry Demand and Revenue Analysis

The number of passengers and vehicles transported on any particular ferry system is the result of a complex blend of market size and characteristics, ferry service frequency, fare structure and travel time, and the cost of alternative modes of transportation. A variety of information was compiled to support the analysis of revenue potential for a dedicated Kodiak Island ferry. This information is summarized below.

TELEPHONE SURVEY RESULTS

- The primary market for a Kodiak Island ferry service is the residents of the Island's outlying communities. A telephone survey was conducted with a randomly-selected sample of Kodiak Island households, to gauge potential use of an Island-wide ferry system. A total of 419 Kodiak Island Borough households were surveyed in April 2010, including 301 households from the community of Kodiak and 118 households from the six outlying communities. Among residents of the outlying communities, the survey measured strong demand for ferry service and strong support for the concept of a ferry connection to their own communities.

- The borough's population center around the community of Kodiak represents an additional source of passenger travel, as residents seek recreational opportunities and travel to visit with friends and relatives. Social and cultural ties exist between residents of the city and residents of outlying communities, and enhanced transportation infrastructure and service could spur additional personal travel as transportation costs and convenience barriers are reduced.

FERRY SYSTEM CASE STUDY REVIEW

Understanding the potential for a dedicated Kodiak Island ferry service to generate revenue, regardless of actual fares or service frequency, can be framed by examination of revenue generated by ferry service in other small communities in coastal Alaska. This study included case study analysis of Alaska Marine Highway System (AMHS) ferry service to Port Lions, dedicated AMHS service between Metlakatla and Ketchikan in Southeast Alaska, and dedicated Inter-Island Ferry Authority service between Prince of Wales Island and Ketchikan (also in Southeast Alaska). The focus of these case studies was on the revenue-generating implications of these ferry connections. These case studies also provided an indication of costs associated with ferry operations in Alaska.

Case Study: Port Lions AMHS Service

Port Lions, a community of about 200 residents, enjoys regular AMHS service. In 2009, the M/V *Tustumena* made a total of 117 sailings between Port Lions and Kodiak, a 48-nautical mile trip, including 55 trips from Kodiak to Port Lions and 62 trips from Port Lions to Kodiak.

- Traffic between the two communities included a total of 929 passengers boarding in Port Lions and disembarking in Kodiak and a similar number (925) of passengers boarding in Kodiak and disembarking in Port Lions. Port Lions passenger traffic also included 427 passengers boarding in Port Lions and disembarking in Homer and 429 passengers doing the reverse.

- AMHS ferry service between Port Lions and Kodiak in 2009 generated a total of $81,345 in revenue, including $30,080 in passenger fare revenue and $51,265 in car deck revenue. This data does not include revenue generated by passengers and vehicles traveling between Port Lions and Homer. If all the Port Lions/Homer traffic moved through Kodiak, one direction or the other, another $42,000 in annual revenue would be generated, based on average per passenger and per vehicle rates for travel between Port Lions and Kodiak in 2009. As such, frequent ferry service to Port Lions, the largest community in the study area, accounted for just under $125,000 in revenue in 2009.

- Based on this level of total annual revenue, Port Lions generated approximately $625 in revenue for each of its 200 residents. Per capita revenue is a proxy measure that captures all household, government, and commercial traffic associated with ferry service to an individual community.

Case Study: Metlakatla M/V Lituya Service

Metlakatla is a community of approximately 1,385 residents located in southern Southeast Alaska. Metlakatla is served by the M/V *Lituya*, a 181-foot AMHS ferry with capacity for 149 passengers and 18 vehicles. The *Lituya* provides dedicated twice-daily round-trip service between Metlakatla and Ketchikan, over a one-way route of about 16 nautical miles.

- In 2009, the *Lituya* made a total of 940 one-way sailings between Metlakatla and Ketchikan, carrying a total of 30,357 passengers and 10,637 vehicles.

- In FY 2009, the *Lituya* generated total operating revenues of $639,000. In terms of per capita revenue (for Metlakatla's population of 1,385 residents), the *Lituya's* FY09 operating revenues were the equivalent of about $460 per person.

- M/V *Lituya* annual operating expenditures totaled $1,189,000 in FY09. This does not include reservations, shore operations, administration or marine engineering costs associated with *Lituya* service between Metlakatla and Ketchikan. *Lituya's* operating revenue and expenditure performance in FY09 indicates a net operating subsidy of $550,000 was required.

Case Study: Prince of Wales Island M/V Prince of Wales

The Inter-Island Ferry Authority (IFA) operates the M/V *Prince of Wales*, a 198-foot ferry with capacity for 160 passengers and 30 vehicles. The *Prince of Wales* provides daily service between Hollis (on Prince of Wales Island) and Ketchikan, a 45-nautical mile voyage requiring about 3 hours. The IFA serves the residents of Prince of Wales Island (2009 population of 3,920), plus residents of Ketchikan traveling to Prince of Wales Island for business or recreation, as well as non-Alaskan visitors.

- In 2009 the *Prince of Wales* carried 51,700 passengers and 11,400 vehicles. The ferry service generated service revenues of $3.68 million. IFA revenues are the equivalent of about $940 per capita for the Island's 3,920 residents.

- IFA expenses included $3.6 million in annual operations expenses and $745,000 in administration expenses for this one-vessel, two-port ferry service.

Overview of Alaska Ferry Operations Economics

Experience has shown public ferry systems in Alaska do not generate revenues sufficient to cover operating costs. The case studies described above illustrate this point, as does other AMHS data. For example, in FY09, the *Tustumena* generated $2,992,000 in total revenues, while costing $6,642,000 to operate, indicating an annual operating subsidy of $3,650,000. The AMHS overall generated $46.2 million in operating revenues in FY09, compared to expenditures of $124.5 million.

DEDICATED KODIAK ISLAND FERRY SERVICE REVENUE POTENTIAL

Two different modeling approaches were utilized to assess the revenue generating potential of a ferry that connects the outlying communities of Kodiak Island to the community of Kodiak. The first approach considered ranges of predicted resident travel frequency, fare assumptions (based on route distances), non-resident travel revenue generation, ratios of passengers to vehicles, and other factors. A second, simpler model was based on per capita-equivalent revenue assumptions.

- Based on the travel frequency model, total potential annual revenues range between approximately $500,000 and $750,000.
- Based on per capita revenue estimates ranging from $600 to $900, total potential annual revenues range between $440,000 and $657,000.

Table 1: Kodiak Island Ferry System Annual Revenue Potential

	Passenger Revenue	Car Deck Revenue	Total Revenue
Travel Frequency Model			
Low-Case	$168,000	$337,000	$505,000
Mid-Case	210,000	421,000	631,000
High-Case	252,000	505,000	757,000
Per Capita Revenue Model			
Low-Case	$146,000	$294,000	$440,000
Mid-Case	182,000	368,000	550,000
High-Case	215,000	442,000	657,000

It is important to recognize these estimates represent *potential* revenue. These levels of revenue are possible if all six outlying communities are served by regular, reasonably frequent ferry service (service similar to that currently enjoyed by the residents of Port Lions). These totals also assume all of the ferry revenue now generated by Port Lions would be earned by the dedicated ferry service (rather than the *Tustumena*).

"Long-List" Transportation Concept Analysis

A broad range of transportation enhancement concepts were identified for preliminary analysis and screening for detailed cost and service analysis. This "long-list" of concepts included:

- Enhanced *Tustumena* Service
- Dedicated 24-Hour Ferry
- Dedicated Passenger/Cargo Vessel
- Dedicated Conventional "Day-Boat" Ferry
- Dedicated Landing Craft Ferry, Conventional Hull
- Dedicated Landing Craft Ferry, Catamaran
- Cargo-Only Landing Craft
- Tug and Barge or Other Cargo-Only Vessel Service
- Passenger-Only Ferry

- Enhanced Airfreight Transportation Service

Among the ten concepts considered, only three were carried forward for additional analysis. Those three were Enhanced *Tustumena* Service, Dedicated Conventional "Day-Boat" Ferry, and Dedicated Landing Craft Ferry, Conventional Hull. Reasons for eliminating other alternatives from more detailed analysis are summarized below.

Dedicated 24-Hour Ferry: This type of service would require a large crew and large vessel, including staterooms for passengers and crew. Crew costs for a ferry operating 24 hours a day (requires two full deck crews plus passenger/crew services personnel, plus relief crews) would be prohibitive in relation to the revenue potential for this market. This is the only service concept that could provide round-Island passenger service. Ferry construction/acquisition costs would also be very high.

Dedicated Passenger/Cargo Vessel: This alternative would provide service similar to existing regional cargo vessels, though also capable of passenger service. This type of vessel is now rarely built due to the high level of regulatory complexity required to safely support both cargo and passenger missions. Also operated on a 24-hour basis, this concept involves operating costs significantly above potential revenue.

Dedicated Landing Craft Ferry, Catamaran: The tall height of a catamaran makes beach landing more difficult than a conventional landing craft. The vessel would need to slow substantially when waves begin hitting the wet deck. It would be difficult to control this vessel on the beach in wind and current. This vessel would have limited service reliability as sea keeping limitations will force frequent trip cancelations.

Cargo-Only Landing Craft: This concept would be contentious as it would be in direct competition with private sector operators. Because of this, public funding would be difficult to obtain. By not providing passenger transportation this concept fails to meet a key purpose of ferry service to outlying communities.

Tug and Barge or Other Cargo-Only Vessel Service: This concept would be in direct competition with private sector freight carriers and therefore public funding would be difficult to obtain. This concept also fails to provide passenger transportation and, thus, meet a key purpose of ferry service to outlying communities.

Passenger-Only Ferry: A high-speed (30 knots) passenger-only vessel would offer reduced transit times (relative to conventional hull passenger and vehicle ferries). However, this type and size of vessel would experience frequent weather-related trip cancelations and would generally be unable to provide service during the winter and shoulder seasons. If vessel size were increased to improve for sea keeping, fuel costs would rise sharply. It would compete with existing air taxi operators, who currently provide a high level of service. Because a passenger-only ferry could not carry vehicles and other heavy freight, it fails to satisfy a critical need for ferry service to outlying communities.

Enhanced Airfreight Transportation Service: The cost to transport heavy airfreight in general is high relative to land or marine transport. Only large volumes of high-value, time-sensitive materials would warrant regular air cargo service to the outlying communities, beyond what is now available. Air transportation of fuel is a means of last resort and is employed in Alaska only when no other alternatives exist. Kodiak Island communities do have marine alternatives that are lower cost than air transport.

"Short-List" Transportation Concept Analysis

Three ferry service concepts were carried forward for further consideration. Those three are Enhanced *Tustumena* Service, Dedicated Conventional "Day-Boat" Ferry, and Dedicated Landing Craft Ferry, Conventional Hull. These are described in more detail, below.

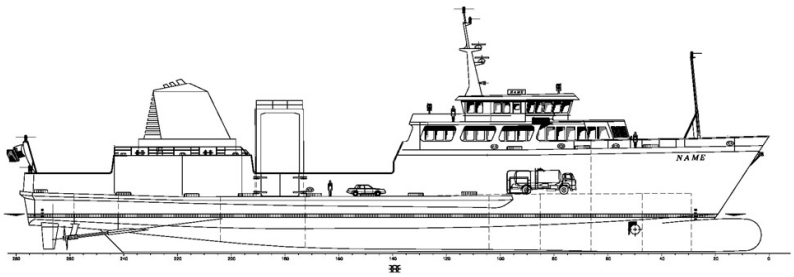
TUSTUMENA SERVICE

The Enhanced *Tustumena* Service concept requires little technical analysis. The vessel has proven itself successful over the course of almost 50 years of service to Kodiak Island. However, adding Kodiak Island port calls for the *Tustumena* will not be easy, because the vessel is already fully scheduled. Adding service to a new Kodiak port means reducing service somewhere else. Of course, AMHS managers must also consider the cost and revenue implications of reducing service in one area while increasing service in another.

Tustumena service should play some role in any effort to improve marine transportation to Kodiak Island communities. Even if no effort is made to develop a dedicated Kodiak ferry service, *Tustumena* (or its replacement) will continue to serve Port Lions, and both Ouzinkie and Old Harbor will have docks suitable for serving the vessel. Coupled with development of a dedicated Kodiak ferry service, the *Tustumena* could provide needed service to Old Harbor (and Akhiok if it had a dock), while the dedicated vessel provided much more frequent service (utilizing a smaller vessel than would otherwise be required) to communities on the west side of the Island.

DEDICATED CONVENTIONAL "DAY-BOAT" FERRY

Figure 1: Conceptual Rendering of Conventional "Day-Boat" Ferry



- **Concept advantages**: The benefits of a day-boat are greatly reduced operating costs. A day-boat can be smaller than a 24-hour ferry, allowing for slightly more appropriate sizing relative to the market demand. Vessel construction costs are significantly lower than the cost of a larger 24-hour vessel.

- **Concept disadvantages**: The most significant near-term disadvantage with this concept is its inability to serve Akhiok, Karluk and Larsen Bay (communities without suitable docks). In addition, with long distances between Kodiak Island communities, the service design challenge is finding routes acceptable for day-boat service. Route analysis indicates there are three possible day-boat routes: 1) Kodiak – Old Harbor, 2) Kodiak – Port Lions/Ouzinkie, 3) Kodiak – Larsen Bay/Karluk. Akhiok might be reached on a calm day with minimum current. Until improvements can be made to

reduce route distances, operation to Old Harbor (and perhaps Larsen Bay) will require the vessel and crew to overnight at the outlying port. Normally, a day-boat returns its crew to the original sailing port and the vessel is moored overnight at an unattended, floating dock, which provides vessel support services.

- **Concept Variations:** Since route lengths are at the maximum allowed for one-way travel, roadway improvements and new terminal construction are required to deliver optimum day-boat benefits. A road connection between Karluk and Larsen Bay, a road east from Old Harbor to a new terminal location, and terminals at Anton Larsen, Pasagshak all have important implications for day-boat scheduling and frequency of service.

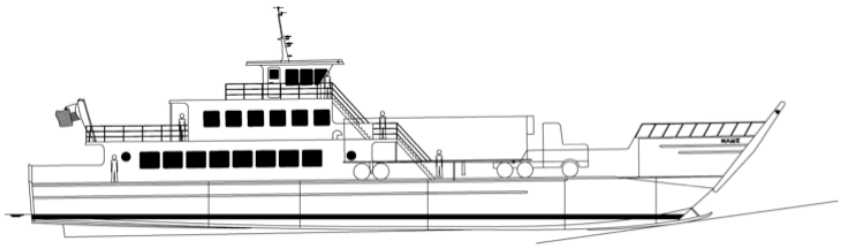
The improvement with the largest benefit would be a floating terminal at Anton-Larsen Bay. A terminal in this location would reduce the distance to all north side communities, increase sailing frequency, eliminate ocean exposure, and provide for overnight mooring.

A marine terminal to the east of Old Harbor and one located at Pasagshak would significantly reduce route length and reduce ocean exposure. These terminals would allow for very efficient day-boat operation to Old Harbor. However, terminal and road costs are high and there is concern a road to Bush Point may impact subsistence fishing.

DEDICATED LANDING CRAFT FERRY

This concept would provide passenger and vehicle ferry service to Kodiak Island communities using a 150-foot conventional (slow speed) landing craft ferry. The vessel would have capacity of up to 150 passengers and 14 vehicles. It would operate as a day-boat, with a crew of five.

Figure 2: Conceptual Rendering of Landing Craft Ferry



- **Concept advantages**: A conventional style landing craft can provide service to all Kodiak Island communities, including those without piers. The vessel would require very minimal investment in dock/landing facilities. This concept involves relatively low vessel acquisition costs, at approximately $19 million for a newly constructed vessel. Annual operating costs would be approximately $1.7 million. The vessel could also generate revenue by providing one-time or occasional service to other areas of Kodiak Island (resource development camps, remote lodges, fish processing facilities, etc.)

- **Concept disadvantages**: While versatile, a conventional landing craft is slow (less than 10 knots) and not a good sea keeping vessel, even at 150 feet in length. Poor sea keeping characteristics result in a

comparatively unreliable service schedule and passenger discomfort while underway. The trade-off with this vessel is very versatile service at the cost of long, rough trips. Also, it will be difficult to control this vessel on the beach in wind and current and bow loading will require vehicles to back down the beach and go up the ramp in reverse. It is not possible to reach Akhiok in a 12-hour operational day with this vessel.

- **Concept Variations:** It may be possible to have the crew live aboard this vessel so it can overnight at any port, but still provide day-boat (12 hour) service with passengers. It may also be possible to have the vessel run to Akhiok (in excess of 12 hours) if it were only carrying cargo.

FERRY OPERATING COSTS

For Kodiak Island, the ferry service planning and operations challenge is to define a service model that maximizes revenue and minimizes ferry system operating costs, while still providing essential ferry service when and where it is needed most. This is a challenge for any ferry system serving coastal Alaska, where markets are small (sometimes very small), distances between ports sometimes great, and sea conditions such that vessel sizing is driven by sea keeping requirements (passenger comfort and safety) rather than expected passenger and vehicle traffic (average payload).

Given the small market and limited revenue generating potential of the Kodiak Island service area, ferry system operating costs must be minimized. Crew and fuel are the largest sources of operating costs. Controlling crew costs is critical to achieve lowest-possible cost operations in a small-market service area. The most effective way to control crew costs is to limit service to day-boat operations, with one crew working for no more than 12 hours a day. This has important service frequency and port-call scheduling implications, as described in the following section of this summary report.

Detailed operating cost analysis was conducted for the conventional day-boat ferry and the conventional landing craft ferry concepts. Key cost components include crew, totaling just over $400,000 annually for both the day-boat and landing craft. These costs are fully-loaded labor costs, including benefits and other labor overhead.

Fuel is also a very large cost component, totaling $900,000 for the day-boat and just over $400,000 for the landing craft. The larger day-boat would burn fuel at about twice the rate of the landing craft (187 gallons per hour versus 96 gallons per hour). Fuel costs are based on a diesel price of $3.14 per gallon.

Administrative overhead includes shore personnel (a system manager, bookkeeper, sales & procurement staff (1), and a night watchman). Shore personnel costs also include part-time salaries for ferry system representatives in each outlying community. Other administrative costs include contractual (rent, utilities, supplies, professional services) and insurance.

In total, annual operating, maintenance and administrative costs for the day-boat are estimated at $2.3 million. Annual landing craft costs total $1.7 million.

Table 2: Day-Boat and Landing Craft
Annual Operating, Maintenance and Administrative Costs

	Day-Boat	Landing Craft
Crew Cost		
Captain	$105,000	$105,000
Mate	91,000	91,000
Engineer	84,000	84,000
Sr. Deckhand	70,000	70,000
Deckhand	56,000	56,000
Vessel Consumables		
Fuel Oil	$900,300	$408,000
Lube Oil	6,000	3,000
Sewage Treatment and Slops	5,000	5,000
Shore power (evening layup)	20,000	15,000
Maintenance Cost		
Preventative Maintenance	$50,000	$30,000
Annual Overhauls	400,000	280,000
Admin Overhead		
Shore personnel	$396,000	$396,000
Contractual	97,400	97,400
Insurance	60,000	60,000
Annual Total	**$2,340,700**	**$1,700,400**

FERRY SERVICE SCHEDULES

The day-boat, single-crew model has important scheduling and service frequency implications. The United States Coast Guard (USCG) has a 12-hour limit on the time a crew can work, which results in three possible weekly manning schedules:

- 5 days working 8 hours per day, followed by 2 days off = 40-hour work week
- 4 days working 10 hours per day, followed by 3 days off = 40-hour work week
- 7 days working 12 hour days, followed by 7 days off = 84-hour work week.

If it is assumed the crew requires six weeks of vacation and the vessel requires four weeks of overhaul, two of which can coincide with crew vacation, the number of weeks of total service can be determined for each manning system.

- 40-hour work week = 52 – 8 = 44 weeks service
- 84-hour work week = 26 – 4 = 22 weeks service.

With this basic work day and work week framework defined, it is possible to develop service schedules and annual service plans, including the number of port calls each community might see during the year. The number of potential schedules is virtually limitless depending on how many port calls are desired for each community. Further, the conventional day-boat and the landing craft have different scheduling possibilities because they operate at different service speeds. In general, a conventional day boat provides more port calls

because of its greater service speed (though of course it does not have the capacity to serve communities without docks). The landing craft must operate 84-hour work weeks to reach out ports, meaning a week-off and week-on schedule is not as convenient as weekly service and will impact revenue generation.

Detailed service schedule analysis is provided in the body of the report. For purposes of this summary, frequent service to Ouzinkie and Port Lions is possible with two to three stops per week for the day-boat. Service to Larsen Bay, Karluk and Old Harbor would be less due to the much longer travel times from Kodiak (perhaps with weekly or biweekly service). Akhiok would see the lowest level of service, due to its great distance from Kodiak. All of this presupposes suitable docking facilities are available.

The issue of ferry service parity among the communities is a point of discussion. Total parity (all communities receive the same number of ferry calls) is possible only with the 24-hour, 7-days a week ferry service. This is the most expensive service option and the option that would likely generate the least revenue. Finding that optimal point where revenues are maximized and costs are minimized means providing more service in larger communities located closer the Kodiak and less service to small communities more distant from Kodiak. In other words, optimal ferry system operation does not lend itself to service parity. That being said, public ferry systems are not operated to optimize revenues and costs. AMHS scheduling, for example, is based in part on perceived community need, which is subjective and prone to political influence. In any case, scheduling a dedicated Kodiak Island ferry system would be driven by operational constraints (12-hour work day, vessel speed limitations, etc.), revenue considerations, policy issues, and a number of other factors.

Roadway and Marine Terminal Cost Analysis

The economics of a ferry system serving the outlying communities of Kodiak Island could be enhanced by road connections between communities that could eliminate the need for costly dock development and/or reduce the length of ferry routes between communities. Further, docking facilities would be needed to accommodate ferry service to those communities that now lack such facilities. Several roadway and dock development projects were selected for cost analysis. These include:

- Akhiok/Alitak single-lane road connection
- Akhiok deepwater dock
- Karluk/Larsen Bay single-lane road connection
- Karluk deepwater dock
- Larsen Bay deepwater dock
- Old Harbor road extension and dock
- Anton Larsen Bay two-lane road extension and dock (two options)
- Anton Larsen Bay/Shakmanof Cove two-lane road and dock
- Monashka Bay/Shakmanof Cove two-lane road and dock

Road Segment Cost Analysis

For the various road segments analyzed in this study, total road construction costs ranged from a low of $750,000 per mile for a single unpaved road (Akhoik to Alitak) to a high of $1.2 million per mile for a two-

lane unpaved road (Anton Larsen to Shakmanof and Monashka Bay to Shakmanof). Total capital (construction) costs and annual maintenance cost are summarized in the following table.

Table 3: Road Segment Construction and Maintenance Cost Estimates

Description	Capital Cost	Annual Cost
Road Segments		
Akhiok/Alitak Road (7.3 miles)	$5.4 million	$55,000
Karluk/Larsen Bay Road (18.5 miles)	$17.9 million	$140,000
Old Harbor Extension (3.6 miles)	$4.2 million	$30,000
Anton Larsen Bay to Shakmanof (7.1 miles)	$7.6 million	$110,000
Monashka Bay to Shakmanof (10.6 miles)	$11.4 million	$160,000
Anton Larsen Extension – West Side (3.0 miles)	$3.0 million	$45,000
Anton Larsen Extension – East Side (9.6 miles)	$9.0 million	$145,000

Marine Terminal Cost Analysis

Akhiok, Karluk and Larsen Bay all lack docks suitable for conventional ferry service. For these communities, cost estimates were prepared for either a fixed-pier dock, a roll-on, roll-off floating (RO/RO) dock, or both. The fixed-pier dock would be suitable for the *Tustumena*, which has an on-board vehicle elevator. The RO/RO dock is similar to those employed in Prince William Sound and Southeast Alaska to serve AMHS vessels. (The conclusion from the analysis was the two types of docks are roughly equal in terms of construction cost.)

Cost estimates do not include wave barriers, uplands development of any kind, or the cost to install piping for fuel transfer or other utilities. These dock construction cost estimates are based on charts and aerial photographs; determining the optimal location for a deepwater dock in any of these communities would require additional, detailed site investigation.

Table 4: Outlying Community Dock Construction and Maintenance Cost Estimates

Description	Capital Cost	Annual Cost
Akhiok Fixed-Pier Dock	$6.6 million	$65,000
Akhiok RO/RO Dock	$6.4 million	$95,000
Karluk Fixed-Pier Dock	$13.8 million	$135,000
Larsen Bay Fixed-Pier Dock	$4.7 million	$50,000
Larsen Bay RO/RO Dock	$4.5 million	$65,000
Shakmanof Fixed-Pier Dock	$4.9 million	$50,000

The cost to construct docks in areas not explicitly studied, including the various Anton Larsen Bay marine terminal locations, are all estimated to be in the $5 million to $7 million range, plus the cost of breakwaters and uplands development, which have highly site-specific costs.

Dock construction or reconstruction projects in Ouzinkie and Old Harbor provide an indication of the cost to build docks in the outlying communities of Kodiak Island. Reconstruction of the Old Harbor dock has a total budget of $8.1 million. This includes the cost of piping for fuel transfer, electricity and lighting. Ouzinkie is replacing its old wooden dock with a rock and steel bulkhead facility that is slated to cost a total of $9.8

million. Planning is also underway for dock replacement at Port Lions, with a preliminary budget estimate of approximately $9 million to $10 million.

Funding Source Review

A wide variety of potential funding sources are available for surface transportation projects in Alaska. Several federal grant and loan scoring processes favor projects that serve geographically isolated areas, small communities, or achieve economic development goals. However, the majority of federal sources fund projects that are economically sustainable, assist the largest number of users, or are identified as state or national priorities. According to these criteria, applications for federal funding for surface transportation projects on Kodiak Island will likely need to justify construction costs in relation to the small population served. Projects supported through local or state matching funds are almost always more likely to receive federal funding.

In addition to design, planning, and construction funding, possible transportation improvements for Kodiak Island would require an outside source of operating capital. A limited amount of operating capital is available from federal sources. This funding is dependent upon annual, competitive processes. Thus, federal sources for annual operating capital would not necessarily offer dependable funding for successive years.

Aside from the Alaska Marine Highway System, two ferry systems in Alaska that have received public funding are the Inter-Island Ferry Authority and the Seldovia Bay (passenger-only) Ferry.

- **Inter-Island Ferry Authority**: Six Southeast Alaska communities formed the IFA. Initial funding for IFA ferries and infrastructure was obtained through Congressional earmarks ($12.6 million through the Federal Transit Administration (FTA)) and loans. Loans were provided by the supporting communities as well as through the Alaska Municipal Bond Bank Authority (AMBBA). A total of $2.1 million in loans was obtained including $1.45 million in revenue bonds to be paid back with revenue from ferry operations. The IFA has also obtained additional funding through a variety of sources including a U.S. Department of Agriculture – Rural Development (USDA-RD) Community Facilities Loan, a FTA Non-Urbanized Area Program grant for operating assistance and an Alaska legislative grant for debt retirement and assistance. In 2008 and 2009, approximately 25 percent of IFA's revenue came from grant assistance. Generating adequate operating funding continues to be a challenge for IFA.

- **Seldovia Bay Ferry**: This ferry provides passenger service between Homer and Seldovia. The project received approximately $8.5 million in federal appropriations for planning, design and construction of a ferry and infrastructure. The funding came from three sources: the Bureau of Indian Affairs, the Federal Highway Administration (FHWA) and the FHWA Ferry Boat Discretionary Fund. The project received a $1.5 million legislative grant in 2007 as a state match to the federal funding. Additional FTA American Recovery and Reinvestment Act funding in 2010 assisted with infrastructure improvements. A FTA Tribal Transit Program grant in 2010 assisted with operating funding.

Conclusions

It is evident from this analysis the communities of Kodiak Island do not provide a potential traffic base large enough to sustain a self-supporting ferry system. This study has profiled two ferry system concepts that come the closest to meeting the needs of the outlying communities, at the lowest cost possible, employing vessels most suitable for the service area. However, revenues generated by these vessels would not match the cost to operate them. Analysis of both concepts indicates substantial annual operating subsidies (over $1 million) would be required to provide any meaningful level of regular ferry service.

A variety of factors place significant limitations on a Kodiak Island ferry service's ability to be self-supporting. The most important factors are, in summary:

- The outlying communities of Kodiak Island represent a **very small market to support ferry operations**. Even with seasonal non-resident travel to and from these communities, the service area population and economic base for a dedicated ferry is very small, certainly smaller than any other dedicated ferry system in Alaska.

- **Long distances and travel times** increase vessel operating costs and limit the potential for frequent ferry service to some of the Island's outlying communities. Frequent service to Ouzinkie and Port Lions is possible, given those communities are in close proximity to Kodiak. However, the full day or more required to make a round-trip to each of the other four communities significantly reduces service opportunities to other communities.

- The outlying communities of Kodiak Island already enjoy a high-level of relatively **low-cost air taxi service**. Pricing and revenue potential from passenger travel on a Kodiak Island ferry service would be constrained by convenient and competitive air travel opportunities.

As described above, ferry services in Alaska are not self-supporting, and a Kodiak Island ferry service would be no exception. That fact alone does not necessarily preclude an effort to develop a dedicated Kodiak Island ferry service. However, securing necessary funding to acquire and, more importantly, operate a ferry is likely to present a major obstacle.

Each of the three "short-list" concepts has its advantages and disadvantages. In terms of meeting all the outlying communities marine transportation needs, development of a conventional hull day-boat ferry system is hampered by lack of docks in Akhiok, Karluk and Old Harbor. A landing craft ferry eliminates the need for docks in those communities, but is hampered by slow service speeds and poor sea keeping capacity. One clear course of action is to work with AMHS to secure some measure of service from the *Tustumena* to Old Harbor and Ouzinkie, along with Port Lions.

Though development of a self-sustaining Kodiak Island ferry service is unlikely under any circumstance, there are possibilities for improving the economics of the system. A variety of road extensions and connections would minimize ferry routes, shorten travel times, and reduce exposure to severe sea conditions. However, these improvements come at substantial cost. The total capital cost of full build-out of potential infrastructure improvements, including roads and docks is well over $50 million. This does not include the cost to purchase or build a suitable ferry.

One final consideration in assessing the economics of a Kodiak Island ferry is the potential household and community level economic benefits. The financial feasibility of a Kodiak Island ferry service is a critical issue, of course, in considering how to enhance the transportation infrastructure connecting the Island's outlying communities to the community of Kodiak. However, decision-makers must also consider community economic, socioeconomic and public safety benefits that could stem from enhanced access. While it is not possible to quantify all the benefits of regular, reliable ferry service, they would likely include:

- Lower cost for consumer goods, as the cost paid by consumers to ship goods is reduced.
- Lower cost of residential and commercial construction, as costs paid by builders for shipping building supplies is reduced.
- Enhanced business development opportunities as the cost of shipping goods into and out of communities is reduced.
- Increase visitor travel to outlying communities, enhancing development opportunities for businesses serving non-resident visitors.
- Greater social, educational, and recreational interaction among communities, as opportunities for safe travel are increased especially during the school year.

It is also important to note the community of Kodiak could benefit economically from development and operation of a dedicated ferry system. The local economy would benefit directly from the 10 or so new jobs created to operate the ferry service, including vessel crew and shore-side administrative jobs. Longer-term, to the extent that regular ferry service to outlying communities stabilizes those economies, or perhaps stimulates growth, Kodiak would benefit as the Island's service and supply hub.

Ideally, placing a dollar value on all present and future benefits would allow for objective comparison with the costs of building and maintaining necessary roads and docks, and operating a ferry system. However, while it is possible to predict the costs with a degree of certainty, it is not possible to measure all the potential future economic and social benefits.

The communities with the weakest existing surface transportation infrastructure, Akhiok and Karluk, may have the most to lose (like many other very small remote villages throughout Alaska) if the cost of moving goods into communities cannot be reduced. Some of these villages will continue a slow decline or at best exist precariously on the edge of sustainability. The slightly larger communities; Old Harbor, Larsen Bay, and Ouzinkie, all have a basic foundation for sustainability and may actually have the most to gain (in terms of economic development) from transportation enhancement. They are at or near a critical mass of government and business sustainability that can support a healthy community. Enhanced transportation infrastructure for these communities will strengthen that sustainability and could potentially result in real economic growth.

This is the conundrum of transportation development in rural Alaska. Clearly, enhanced transportation services and infrastructure can play a critical role in rural community sustainability and development (though that alone cannot ensure sustainability). However, the monetary cost of creating and providing that enhanced service can be very high.

Introduction and Scope of Work

The purpose of this study was to assess the feasibility of a Kodiak Island-wide transportation system connecting the Island's outlying communities to the city of Kodiak. This transportation system was initially conceived to include some combination of ferry links, road connections, road extensions, and new marine terminals (docks). This study considers the possible components of such a system, the cost to develop and maintain system components individually and together, the traffic demand for such a system, how much revenue it might generate, and what the economic benefits might be.

The *Island-Wide Transportation Feasibility Study* centers on the costs and benefits of an intra-island ferry service. Vessel construction, maintenance and operation costs, port/terminal construction and maintenance costs, and system management costs are measured. Ferry system revenues are estimated, including revenues related to diverted and induced traffic. Economic and qualitative benefits to communities, organizations/agencies, businesses, and households are considered.

This study was funded by the Denali Commission and administered by the Kodiak Island Borough. Transportation infrastructure and service challenges faced by Kodiak Island's small, outlying communities have been a priority issue for the Kodiak Archipelago Rural Regional Leadership (KARRL) Forum since its inception. The initial impetus for this study came from the KARRL Forum and as such the study team provided detailed study updates and the results of preliminary research and analyses to the Forum on three occasions, February 2010, September 2010 and most recently in February 2011.

The Challenge

Rural Kodiak Island's transportation infrastructure development challenge is to define a transportation system that links six widely dispersed, small communities in extreme marine environments, to the city of Kodiak, the island's population center as well as its service and supply hub. The six communities, Akhiok, Old Harbor, Karluk, Larsen Bay, Port Lions and Ouzinkie have a total year-round population of about 730 residents. These communities lie in one of the most challenging marine environments in the world, with routine exposure to sea conditions that keep even AMHS ships tied at the dock. The extremely rugged geography of Kodiak Island makes road connections between communities and the city of Kodiak completely impractical.

These communities, like many rural Alaska communities, are struggling with the high cost of transportation, especially the cost of moving heavy freight (vehicles, building supplies, etc.) and fuel. In fact, the long-term sustainability of the smallest communities is in question. Most communities have been experiencing declining population, including Port Lions (down 26 percent since 2000), Ouzinkie (also down 25 percent), Old Harbor (down 22 percent), Larsen Bay (down 42 percent), and Akhiok (down 40 percent). Improved transportation infrastructure and services alone cannot make communities economically sustainable, but it is a critically important part of the equation.

Each community in the study area has its own set of transportation challenges. Two communities (Akhiok and Karluk) have no dock at all and must rely on landing craft service for fuel and freight delivery. Old Harbor's deepwater dock is currently being replaced, as is Ouzinkie's. Detailed engineering and design work is

underway for replacement of Port Lion's aging dock (Port Lions is the only community of the six that receives AMHS service). Larsen Bay has no community owned dock, though a private seafood processing facility located in the community receives occasional freight service directly from Seattle.

A common challenge for all communities is the cost and availability of heavy freight transportation services. Heavy freight transportation is now provided primarily by a private firm, based in Kodiak, operating a 100-foot landing craft on an as-demand-warrants basis. The cost and infrequency of this service are viewed by many residents as a constraint on commerce, not adequately meeting the needs of households, and in general a major impediment to community sustainability and growth.

The villages of Kodiak Island enjoy comparatively well-developed air transportation infrastructure, and air service has come to play a vital role in moving passengers and light freight into and out of these communities.

The Costs

As in any feasibility study, a central question in transportation infrastructure development is the cost of building a new transportation system, and the cost to operate and maintain that system. For the communities of Kodiak Island, enhancing transportation of freight, fuel and people could include:

- Constructing roads from communities without docks to communities with docks
- Constructing roads to shorten marine links between communities
- Building deepwater docks or other marine terminals
- Acquiring and operating a ferry or ferries, capable of carrying vehicles as well as passengers

In terms of system costs, the challenge is to design, at the conceptual level, infrastructure and other assets that match most closely and appropriately the needs of the communities. For example, given expected traffic volumes, single-lane gravel roads (with pull-outs) would be sufficient in some cases where road extensions/connections might be warranted. In other instances, two-lane roads would be required. The issue of "right-sizing" assets is particularly important in the analysis of potential ferry service. While the expected demand for ferry service could be met by a relatively small vessel, safe and reasonably reliable service in the waters around Kodiak Island would require a much larger vessel.

Because multi-modal transportation systems are being considered, specialized expertise is required for cost analyses. Coastwise Corporation, an Alaska marine engineering and naval architecture firm, was retained to analyze a range of marine transportation service options, including capital and operating costs for a number of vessel types. PND Engineers, an Alaska-based civil engineering firm, prepared cost estimates for roads and marine terminals.

The Benefits

Any investment in transportation infrastructure must be weighed against the expected benefits. From a system feasibility perspective, revenues generated by user fees are a particularly important consideration. There are other potential benefits to consider as well; lower cost of living in outlying communities, for

example. Improved transportation could also lower costs to the various organizations and agencies that provide services to the residents of these outlying communities. Education, health, social services, and public safety, could all be enhanced with a more reliable, less costly transportation system. Another aspect of this concept is a more fully developed role for Kodiak as the island's service and supply hub. It plays that role now, but the community may have more to offer in this regard. If transportation economics permit, increasing Kodiak's role as a hub would benefit a range of local businesses and organizations, as well as local residents, with ties to the outlying communities.

Report Content

This report begins with an overview of socioeconomic conditions in the outlying communities of Kodiak Island. The existing transportation infrastructure and services are profiled in Chapter 2. Transportation demand and revenue potential are addressed in Chapter 3. This includes the results of a survey of Kodiak Island households. In Chapter 4, road and dock construction alternatives are identified and costs estimated. Chapter 5 describes some of the methodological issues considered in the marine services analysis. Chapter 6 summarizes the range of marine transportation service concepts considered. From this long-list of possible service concepts, a short-list of concepts was identified and carried forward for detailed analysis in Chapter 7. Chapter 8 discusses potential funding sources for transportation infrastructure development. Finally, Chapter 9 provides a summary of key study findings and conclusions.

Figure 3: Kodiak Island Map

Chapter 1. Regional and Community Profiles

Kodiak Island Borough

Kodiak Island Borough is a 2nd Class Borough encompassing Kodiak Island, Afognak Island, and dozens of smaller islands all located approximately 250 air miles south of Anchorage. The borough's population totaled 13,860 residents in 2009, according to Alaska Department of Labor and Workforce Development data. Approximately 80 percent of the Island's population resides on the road system in or around the City of Kodiak. Ten percent of the borough's population (1,321 residents) resides at Kodiak Station, a U.S. Coast Guard base, also on the road system. The remainder of the borough's population is scattered in small communities with populations ranging from a few dozen to several hundred.

Following are brief profiles of the study area communities that are the primary focus of this transportation feasibility study: Akhiok, Karluk, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions. There are other population centers in the borough, notably Chiniak and Aleneva. Chiniak is connected by road to the community of Kodiak, therefore is not specifically included in this analysis. Aleneva, with a population of 67 residents (in 2009), is located on Afognak Island. The community is a Russian Old Believer settlement, where Russian is the first language. Because of residents' desire for isolation, Aleneva was not treated as a community seeking stronger transportation connections with the community of Kodiak (though of course with appropriate marine terminal development, the community could be added as a ferry port-of-call, should ferry service be implemented). The population of Aleneva has been quite variable over the past ten years (according to ADOLWD data) ranging from a high of 96 in 2002 to a low of 44 in 2004.

The following community profiles provide data on population, income, the economy, and other information. For any business or infrastructure feasibility study it is important to understand the size of the market to be served and trends in that market. The purpose of these profiles is to summarize the size and character of the market potentially served by an intra-Island ferry service and related infrastructure.

Akhiok

Akhiok is located near the southern end of Kodiak Island at Alitak Bay. It is the southernmost and most remote village on Kodiak Island. A second-class city, Akhiok was incorporated in 1972. The site became a permanent settlement in the late 19th century, gaining populations from nearby Alutiiq otter hunting settlements and displaced residents from the tsunami of the 1964 earthquake. Akhiok has two federally-recognized tribal councils, Akhiok Traditional Tribal Council and Kaguyak Tribal Council.

Located 80 air miles southwest of Kodiak and 340 miles southwest of Anchorage, Akhiok is accessible only by air or water. There is a State-owned 3,120 foot gravel runway. Regular scheduled and chartered flights are available from Kodiak. Servant Air has one scheduled flight to Akhiok on Monday, Wednesday and Friday. In addition, they will extend any of three daily scheduled Old Harbor flights to Akhiok as long as two or more seat fares are purchased. Island Air has no scheduled flights to Akhiok, but will extend the Sunday Old Harbor flight if two or more seat fares are purchased. Chartered flights are available through several other operators. Freight service is provided by landing craft (M/V *Lazy Bay*) sporadically (two to three times a year) from Kodiak. Fuel also arrives by landing craft, the M/V *Polar Bear*, once a year.

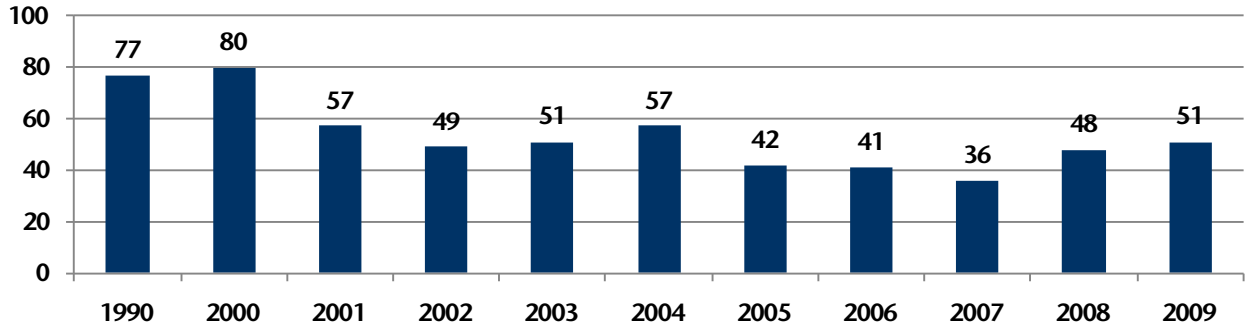
Figure 4: Aerial View of Akhiok

Near-by transportation infrastructure includes that at Alitak, located a few miles south of Akhiok (but only accessible by water). Alitak is an Ocean Beauty Seafoods-owned seasonal cannery operation first established in 1917. Alitak has deepwater docking facilities and receives fuel barge service (four to five deliveries during the operating season), and freight service through Northland Services and Coastal Transportation. Approximately 200 workers are employed at the Alitak facility at the peak season. There is also a seaplane dock located at a cannery site in Moser Bay, north of Akhiok. Akhiok residents travel by private boat to buy fuel and shop at the cannery store.

Demographics

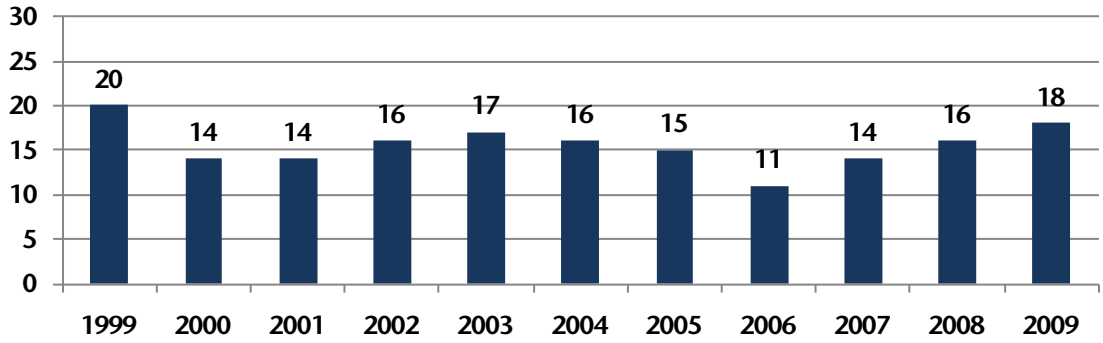
According to ADOLWD, the 2009 population of Akhiok was estimated to be 51 residents. The community's population declined 34 percent from 2000 to 2009, though it increased by 6.3 percent from 2008 to 2009. Approximately 86 percent of Akhiok residents identify themselves as being of American Indian or Alaska Native descent. Akhiok School had enrollment for fiscal year (FY) 2010 of 18 students. School enrollment has been trending up over the past several years.

Figure 5: Akhiok Population, 1990 and 2000-2009



Source: ADOLWD, 2009

Figure 6: Akhiok School Enrollment, 1999-2009



Source: ADEED, FY 1999 through FY 2010

Table 5: Akhiok Race by Count and Percentage, 2000

	Count	Percentage
Population of one race	74	92.5%
White alone	2	2.5
Alaska Native alone	69	86.3
Population of two or more races	6	7.5

Source: U.S. Census, 2000.

Economy

Nearly all Akhiok residents depend in some way on subsistence food sources from fishing and hunting. The median household income was $33,438 per year, with per capita income of $8.472, in 1999. In 1999, this was 35 percent below the state-wide average median household income of $51,571 per year.

Commercial fishing earnings have varied in recent years ranging from a low of $31,000 in 2007 to a high of $180,000 in 2004. The earnings mainly come from gillnetting.

Table 6: Akhiok Residents' Commercial Fishing Activity, 2000-2008

Year	Number of Permit Holders	Number of Fishermen Who Fished	Total Pounds Landed	Estimated Gross Earnings	Estimated Earnings Per Pound
2000	5	7	84,468	$67,739	$0.80
2001	5	5	58,972	$35,560	$0.60
2002	6	1	***	***	***
2003	7	7	99,187	$45,369	$0.46
2004	7	8	362,096	$179,700	$0.50
2005	5	5	207,995	$147,577	$0.71
2006	5	4	81,803	$40,240	$0.49
2007	5	4	42,179	$31,499	$0.75
2008	5	5	126,577	$129,810	$1.03

***Due to less than three permits fishing, by law data is kept confidential.
Source: CFEC, 2000 through 2008.

The number of crew member licenses have fluctuated from 2000 through 2008. In 2008, five licenses were issued to Akhiok residents. This was down from 12 in 2000, but above the low of two in 2007.

Table 7: Akhiok Residents' Crew Member Licenses, 2000-2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of crew member licenses	12	***	9	6	7	4	6	2	5

*** Due to problems with the data, crew member licenses are unavailable for 2001.
Source: CFEC, 2000 through 2008.

According to ADOLWD, there were two employers in Akhiok in 2007. The Kodiak Area Native Association was the largest employer with a peak monthly employment of seven and an average annual employment of five.

Table 8: Akhiok Local Employers, 2007

Employers	Peak Monthly Employment	Average Annual Employment
Kodiak Area Native Association	7	5
City of Akhiok	6	2
Total	**13**	**7**

Source: ADOLWD, unpublished data, 2007.

Karluk

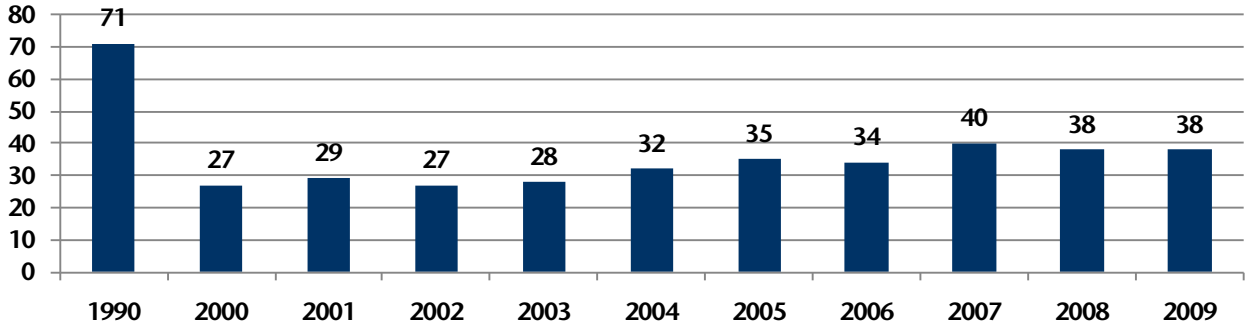
Located on the west coast of Kodiak Island near the mouth of the Karluk River, Karluk is an unincorporated city. The majority of the population is Alutiiq, who live a subsistence lifestyle. The physical site of the village of Karluk changed locations throughout the years. The present-day site of Karluk was established in 1978 after relocation was necessary due to flooding at the old location near the mouth of the river. Karluk has over 30 registered archaeological sites.

Located 88 air miles west of Kodiak and 301 miles southwest of Anchorage, Karluk is accessible only by small plane or water. There is a State-owned 2,000-foot gravel airstrip. Island Air Service offers one scheduled flight on Monday, Wednesday and Friday. Chartered flights are available through several other operators.

Demographics

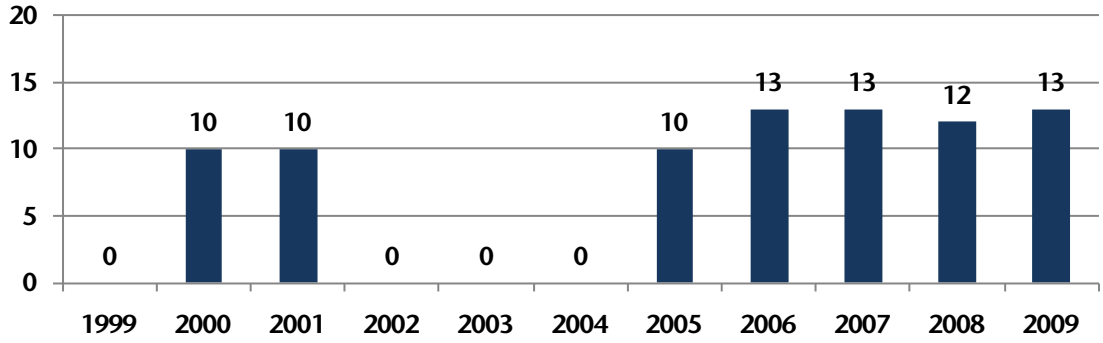
Karluk's population in 2009 was estimated at 38 residents. The community's population has increased since 2000, but is well below the 1990 population of 71 residents. As of 2000, nearly all of the population of Karluk identified itself as being of American Indian or Alaska Native descent. Karluk School has grades kindergarten through 12th grade with (FY) 2010 enrollment of 13 students. The school was closed for the 1999-2000 and 2002 through 2005 school years due to low enrollment.

Figure 7: Karluk Population, 1990 and 2000-2009



Source: ADOLWD, 2009

Figure 8: Karluk School Enrollment, 1999-2009



Source: ADEED, FY 1999 through FY 2010

Table 9: Karluk Race by Count and Percentage, 2000

	Count	Percentage
Population of one race	27	100.0%
Alaska Native alone	26	96.3
Asian alone	1	3.7

Source: U.S. Census, 2000.

Economy

Karluk's economy includes heavy dependence on subsistence, with cash income provided by tribal and other government employment. The median household income was $19,167 per year in 1999, with per capita income of $13,736. In 1999, this was 63 percent below the state-wide average median household income of $51,571 per year.

There is no data available for commercial fishing permits and participation for the years 2000 through 2008, except for one permit holder and one fisherman who fished in 2004. Crew member licenses have remained low from 2000 through 2008. In 2007 and 2008, zero licenses were issued. This was down from five in 2000.

Table 10: Karluk Residents' Crew Member Licenses, 2000-2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of crew member licenses	5	***	1	2	1	2	1	0	0

*** Due to problems with the data, crew member licenses are unavailable for 2001.
Source: CFEC, 2000 through 2008.

According to ADOLWD, there were four employers in Karluk in 2007. The Karluk IRA Tribal Council was the largest employer with a peak monthly employment of ten and an average annual employment of eight.

Table 11: Karluk Local Employers, 2007

Employers	Peak Monthly Employment	Average Annual Employment
Karluk IRA Tribal Council	10	8
Kodiak Area Native Association	2	1
US Postal Service	2	1
Karluk RPSU	2	0
Total	**16**	**10**

Source: ADOLWD, unpublished data, 2007.

Larsen Bay

Located on the northwest coast of Kodiak Island on Larsen Bay, the community of Larsen Bay was incorporated as a second-class city in 1974. The majority of the population is Alutiiq. Larsen Bay is within the boundaries of Kodiak Island Borough and Koniag Regional Corporation. The Alaska Natives of Larsen Bay Tribal Council is recognized by the Bureau of Indian Affairs as the official governing body for the Native Village of Larsen Bay.

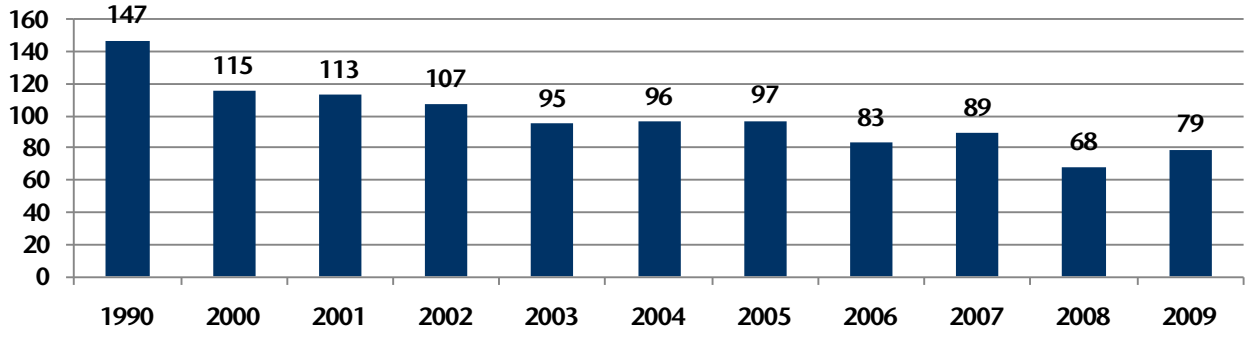
Figure 9: Aerial View of Larsen Bay

Located 60 air miles southwest of Kodiak and 283 miles southwest of Anchorage, Larsen Bay is accessible only by air or water. There is a State-owned 2,700 foot gravel airstrip (with plans for runway extension to 3,300 feet) and a seaplane base. Regular scheduled and chartered flights are available from Kodiak. During the summer, Island Air Service offers three flights daily Monday through Saturday, with an additional flight on Sunday. During the winter months, there are two flights daily Monday through Saturday. Servant Air does not offer scheduled service, but will stop there when two or more seat fares are purchased. Chartered flights are available through several other operators. Construction was completed in 2002 on the boat harbor, which has a breakwater and dock. The Icicle Seafood cannery has deepwater docking facilities and receives occasional freight and fuel barge service from Seattle.

Demographics

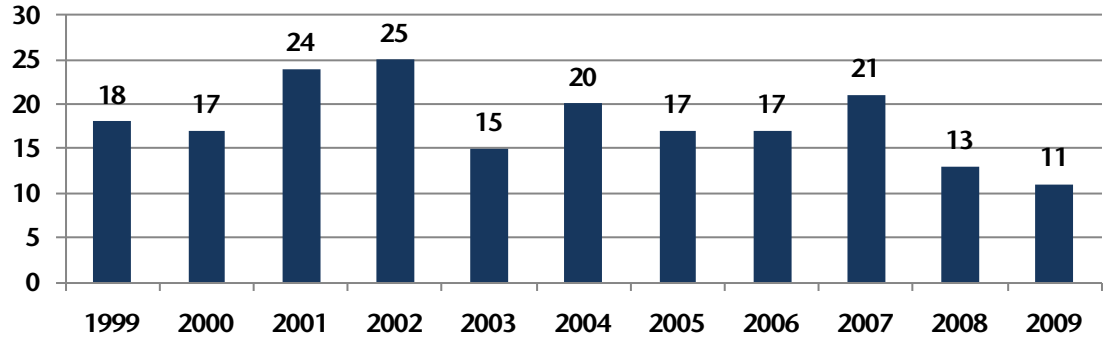
ADOLWD estimated the 2009 population of Larsen Bay to be 79 residents. The community's population declined 31 percent from 2000 to 2009, though it increased between 2008 and 2009. Over three-quarters of the population of Larsen Bay identifies itself as being of American Indian or Alaska Native descent. Just over 20 percent identifies itself as white. The Larsen Bay School had total K through 12 enrollment of 11 students in FY 2010. Enrollment has been variable in recent years, dropping sharply since 2007, when 21 students were enrolled.

Figure 10: Larsen Bay Population, 1990 and 2000-2009



Source: ADOLWD, 2009

Figure 11: Larsen Bay School Enrollment, 1999-2009



Source: ADEED, FY 1999 through FY 2010

Table 12: Larsen Bay Race by Count and Percentage, 2000

	Count	Percentage
Population of one race	114	99.1%
White alone	24	20.9
Alaska Native alone	90	78.3
Population of two or more races	1	0.9

Source: U.S. Census, 2000.

Of these households, 65 percent were family households, while 35 percent were nonfamily households. The average family size was 2.88 people.

Economy

The economy of Larsen Bay is based primarily on fishing, seafood processing and non-resident sportfishing and hunting. Most year-round residents depend in some way on subsistence food sources. The median household income was $48,833 per year with per capita income of $16,227. In 1999, this was 5 percent below the state-wide average median household income of $51,571 per year.

In commercial fishing, the number of permit holders decreased from 17 in 2000 to 10 in 2008, as has the number of fishermen who fished, slipping from 14 to 4. Gross earnings decreased from $692,000 in 2000 to $228,000 in 2008, though earnings have been reasonably stable over the past four years, and well above the low-point in 2002. Commercial fishing earnings come from seining and gillnetting.

Table 13: Larsen Bay Residents' Commercial Fishing Activity, 2000-2008

Year	Number of Permit Holders	Number of Fishermen Who Fished	Total Pounds Landed	Estimated Gross Earnings	Estimated Earnings Per Pound
2000	17	14	1,682,704	$691,972	$0.41
2001	12	10	1,175,283	333,200	$0.28
2002	11	7	315,012	82,955	$0.26
2003	11	6	375,356	149,041	$0.40
2004	12	9	551,380	168,166	$0.30
2005	9	7	480,599	211,964	$0.44
2006	10	7	851,448	241,779	$0.28
2007	10	7	404,342	215,469	$0.53
2008	10	4	351,146	228,346	$0.65

Source: CFEC, 2000 through 2008.

The number of crew member licenses declined from 2000 through 2008. In 2007 and 2008, eight licenses were issued. This was down from 24 in 2000. Due to problems with the data, crew-member was unavailable for 2001.

Table 14: Larsen Bay Residents' Crew Member Licenses, 2000-2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of crew member licenses	24	***	15	20	19	19	12	8	8

*** Due to problems with the data, crew member licenses are unavailable for 2001.
Source: CFEC, 2000 through 2008.

According to ADOLWD, there were ten employers in Larsen Bay in 2007. Icicle Seafoods was the largest employer with a peak monthly employment of 223 and an average annual employment of 52.

Table 15: Larsen Bay Local Employers, 2007

Employers	Peak Monthly Employment	Average Annual Employment
Icicle Seafoods Inc.	223	52
Larsen Bay City Council	15	10
Larsen Bay Tribal Council	11	8
Larsen Bay Lodge Inc.	16	7
Kodiak Area Native Association	13	7
Kodiak Lodge at Larsen Bay Ltd.	12	3
Larsen Bay Utility Company	4	2
US Postal Service	3	2
Uyak Bay Lodge	7	1
Shelikof Trading Company	3	1
Total	**307**	**93**

Source: ADOLWD, unpublished data, 2007.

There are five sportfishing lodges in the Larsen Bay area including the Larsen Bay Lodge, Uyak Bay Lodge, and the Kodiak Island Resort.

Old Harbor

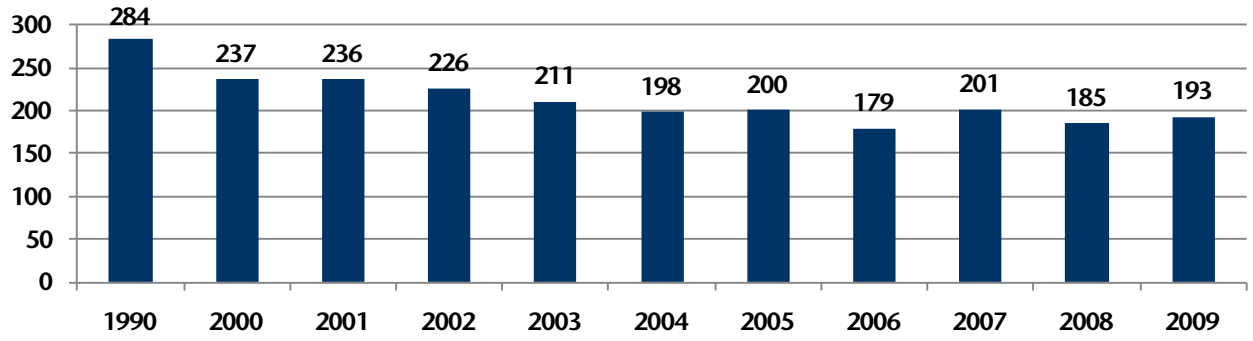
Located on the southeast coast of Kodiak Island, Old Harbor was incorporated as a second-class city in 1966. Old Harbor is the site of the first Russian colony in Alaska. Like many communities, Old Harbor was destroyed by the 1964 earthquake, but was rebuilt in the same location. The majority of the population is Alutiiq. The Old Harbor Tribal Council is the official governing body for the Native Village of Old Harbor.

Old Harbor is located 70 air miles southwest of Kodiak and 322 miles southwest of Anchorage. The community has a State-owned 2,750 foot gravel runway and a seaplane base. Regular scheduled and chartered flights are available from Kodiak. Island Air Service offers two flights per day Monday through Saturday, and an additional flight on Sunday during the summer months. Servant Air offers three scheduled flights per day Monday through Saturday, summer and winter. Chartered flights are available through several other operators.

Demographics

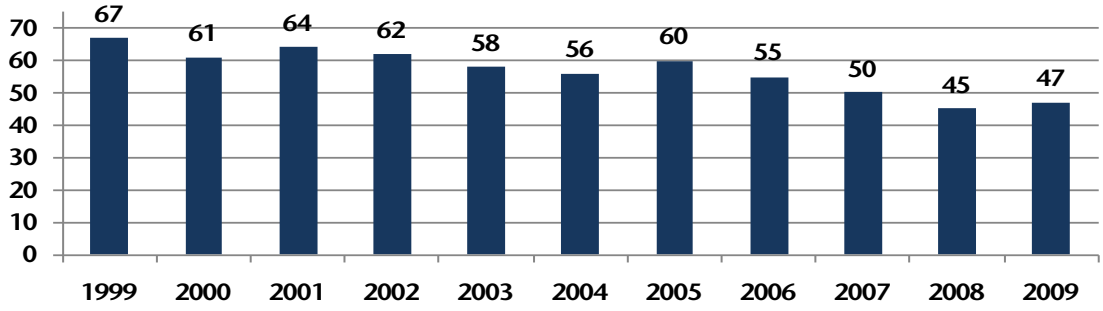
ADOLWD estimated the 2009 population of Old Harbor at 193 residents. The community's population declined 19 percent from 2000 to 2009, but has been reasonably steady over the past six years and increased slightly from 2008 to 2009. Nearly three-quarters of the population of Old Harbor identifies itself as being of American Indian or Alaska Native descent. Old Harbor School had enrollment in fiscal year (FY) 2010 of 47 students. This has been an enrollment drop of about 20 percent, or 13 students, since 2005.

Figure 12: Old Harbor Population, 1990 and 2000-2009



Source: ADOLWD, 2009

Figure 13: Old Harbor School Enrollment, 1999-2009



Source: ADEED, FY 1999 through FY 2010

Table 16: Old Harbor Race by Count and Percentage, 2000

	Count	Percentage
Population of one race	204	86.1%
White alone	31	13.1
Alaska Native alone	173	73.0
Population of two or more races	33	13.9

Source: U.S. Census, 2000.

Economy

The economy of Old Harbor is based primarily on commercial fishing, though non-resident sportfishing is also a source of income for local residents. Nearly all residents depend in some way on subsistence food sources. The median household income was $32,500 per year, with per capita income of $14,265. In 1999, this was 37 percent below the state-wide average median household income of $51,571 per year.

Income from commercial fishing has remained fairly steady in recent years, with ex-vessel income ranging between $1.5 million and $2.1 million annually. The number of permit holders declined from 32 in 2000 to 25 in 2008, as did the number of fishermen who fished, from 19 to 13.

Table 17: Old Harbor Residents' Commercial Fishing Activity, 2000-2008

Year	Number of Permit Holders	Number of Fishermen Who Fished	Total Pounds Landed	Estimated Gross Earnings	Estimated Earnings Per Pound
2000	32	19	4,570,688	$1,721,753	$0.38
2001	30	14	5,610,228	1,311,336	$0.23
2002	25	9	4,820,811	883,558	$0.18
2003	26	13	4,717,449	1,167,168	$0.25
2004	22	9	5,029,818	1,527,691	$0.30
2005	23	11	7,749,687	1,765,028	$0.23
2006	24	12	7,809,211	1,929,670	$0.25
2007	26	13	6,838,005	1,893,875	$0.28
2008	25	13	3,788,021	2,128,846	$0.56

Source: CFEC, 2000 through 2008.

The number of crew member licenses held by local residents declined from 2000 through 2008. In 2008, 39 licenses were issued. This was down from 52 in 2000, but above the low of 28 in 2005.

Table 18: Old Harbor Residents' Crew Member Licenses, 2000-2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of crew member licenses	52	***	40	45	43	28	37	34	39

*** Due to problems with the data, crew member licenses are unavailable for 2001.
Source: CFEC, 2000 through 2008.

According to ADOLWD, there were six employers in Old Harbor in 2007. The Old Harbor Tribal Council was the largest employer with a peak monthly employment of 25 and an average annual employment of 21. There are several wilderness and sportfishing lodges in the Old Harbor area including Kodiak Sportsman Lodge, Ocean View Lodge, and Sitkalidak Lodge.

Table 19: Old Harbor Local Employers, 2007

Employers	Peak Monthly Employment	Average Annual Employment
Old Harbor Tribal Council	25	21
City of Old Harbor	17	10
Kodiak Area Native Association	17	9
Kodiak Sportsman Lodge LLC	11	5
US Postal Service	3	3
Old Harbor Shuttle Service	3	1
Total	**76**	**48**

Source: ADOLWD, unpublished data, 2007.

Ouzinkie

On the west coast of Spruce Island, just north of Kodiak Island, lies the community of Ouzinkie. It was incorporated as a second-class city in 1967. Originally a retirement community for the Russian American Company, the site was also used over the years for cannery operations. The majority of the population is Alutiiq. The Ouzinkie Traditional Tribal Council is recognized by the Bureau of Indian Affairs as the community's official tribal governing body.

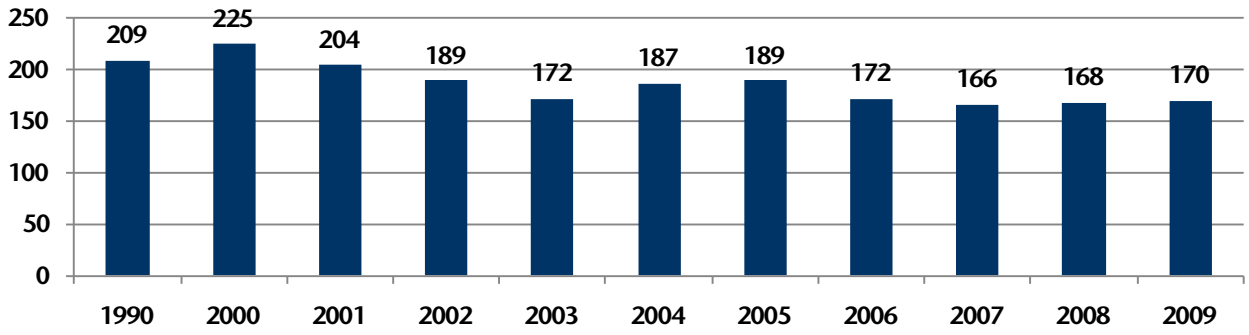
Figure 14: Aerial View of Ouzinkie

Ouzinkie is located approximately 12 miles northwest of Kodiak and 247 miles southwest of Anchorage. There is a new 3,300 foot state-owned airstrip. Seaplanes have access to a seaplane landing area in Ouzinkie Harbor. Regular scheduled and chartered flights are available from Kodiak. Island Air Service offers two scheduled flights per day Monday through Saturday, and an additional flight on Sunday during the summer months. Servant Air offers two scheduled flights per day Monday through Saturday, summer and winter. Chartered flights are available through several other operators.

Demographics

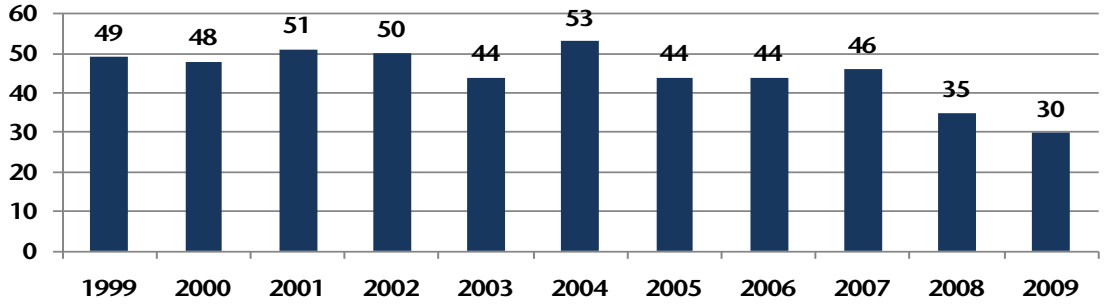
The 2009 population of Ouzinkie was estimated to be 170. The community's population in 2009 was 24 percent below the 2000 level, though it has increased slightly from 2007 to 2009. Eight in ten people in Ouzinkie identified themselves as being of American Indian or Alaska Native descent. One in ten people identified themselves as either white or two or more races. Ouzinkie's school had enrollment for fiscal year (FY) 2010 of 30 students. Enrollment has been declining over the past two years.

Figure 15: Ouzinkie Population, 1990 and 2000-2009



Source: ADOLWD, 2009

Figure 16: Ouzinkie School Enrollment, 1999-2009



Source: ADEED, FY 1999 through FY 2010

Table 20: Ouzinkie Race by Count and Percentage, 2000

	Count	Percentage
Population of one race	207	92.0%
White alone	25	11.1
Alaska Native alone	182	80.9
Population of two or more races	18	8.0

Source: U.S. Census, 2000.

Economy

Ouzinkie's economy is based primarily on commercial fishing and nearly all residents depend in some way on subsistence food sources. The median household income was $52,500 per year in 1999, which was 2 percent above the state-wide average median household income of $51,571 per year. Per capita income was $19,324.

The number of Ouzinkie resident commercial fishing permit holders declined slightly from 26 in 2000 to 22 in 2008, as did the number of fishermen who fished, from 19 to 12. However, gross earnings increased from $602,000 in 2000 to $802,000 in 2008.

Table 21: Ouzinkie Residents' Commercial Fishing Activity, 2000-2008

Year	Number of Permit Holders	Number of Fishermen Who Fished	Total Pounds Landed	Estimated Gross Earnings	Estimated Earnings Per Pound
2000	26	19	1,233,602	$602,479	$0.49
2001	27	15	2,033,367	582,638	$0.29
2002	26	19	1,452,030	464,710	$0.32
2003	25	18	1,052,850	464,535	$0.44
2004	24	14	1,297,077	582,586	$0.45
2005	23	15	1,746,405	597,757	$0.34
2006	23	13	956,275	600,985	$0.63
2007	23	12	1,648,241	793,570	$0.48
2008	22	12	943,893	802,180	$0.85

Source: CFEC, 2000 through 2008.

Crew member licenses issues to local residents remained fairly stable from 2000 through 2008. In 2008, 22 licenses were issued. This was down from 28 in 2000, but above the low of 20 in 2002 and 2003.

Table 22: Ouzinkie Residents' Crew Member Licenses, 2000-2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of crew member licenses	28	***	20	20	29	25	26	24	22

*** Due to problems with the data, crew member licenses are unavailable for 2001.
Source: CFEC, 2000 through 2008.

According to ADOLWD, there were eight employers in Ouzinkie in 2007. The Ouzinkie Tribal Council was the largest employer with a peak monthly employment of 20 and an average annual employment of 18.

Table 23: Ouzinkie Local Employers, 2007

Employers	Peak Monthly Employment	Average Annual Employment
Ouzinkie Tribal Council	20	18
City of Ouzinkie	23	15
Ouzinkie Native Corporation	14	9
Kodiak Area Native Association	15	7
Ouzinkie Water and Sewer	9	3
US Postal Service	2	2
Spruce Island Supply Inc.	3	2
Spruce Island Development Corporation (SIDCO)	1	1
Total	**87**	**57**

Source: ADOLWD, unpublished data, 2007.

Port Lions

Located on the north coast of Kodiak Island in Settler Cove, Port Lions was incorporated as a second-class city in 1966. Founded in 1964 by Afognak's displaced residents from the tsunami of the Good Friday Earthquake, the majority of the population is Alutiiq. The Native Village of Port Lions is the federally-recognized tribe for the community.

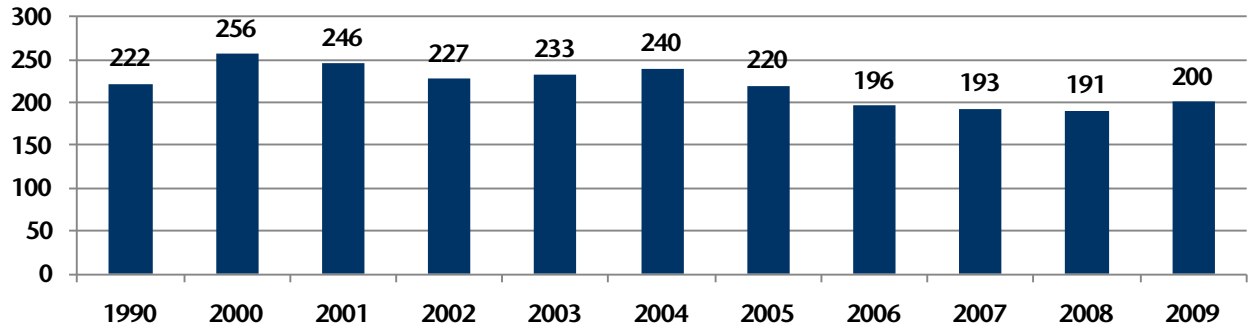
Figure 17: Aerial View of Port Lions

Port Lions is located 19 air miles west of Kodiak and 249 miles southwest of Anchorage. There is a State-owned 2,600 foot airstrip (with planning in place for extension to 3,300 feet). Seaplanes have access to the City-owned dock. Regular scheduled and chartered flights are available from Kodiak. Servant Air offers two scheduled flights per day Monday through Saturday, summer and winter. Island Air service offers the same schedule, though with an additional flight on Sunday during the summer months. Chartered flights are available through several other operators. The State Ferry, M/V *Tustumena*, operates twice weekly from Kodiak.

Demographics

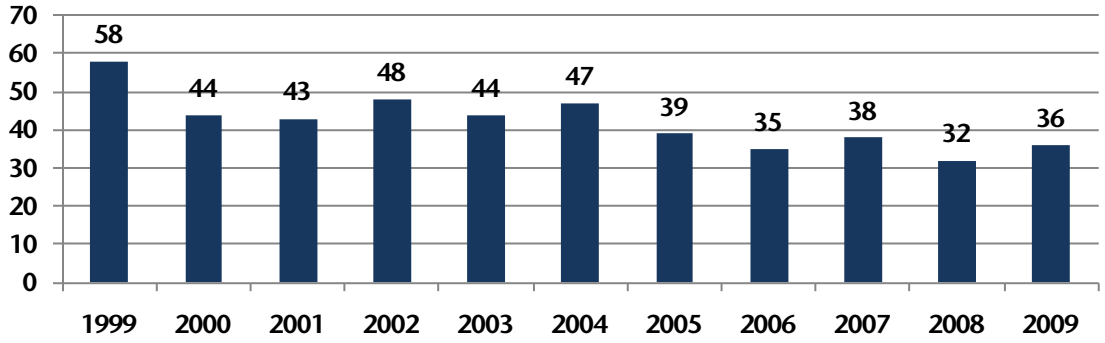
The population of Port Lions was estimated at 200 residents in 2009. The community's population declined 22 percent from 2000 to 2009, though it increased by about 5 percent from 2008 to 2009. Nearly two-thirds of the population of Port Lions identifies itself as being of American Indian or Alaska Native descent. Port Lions School had enrollment in fiscal year (FY) 2010 of 36 students. This is 38 percent, or 22 students, below the 1999 level.

Figure 18: Port Lions Population, 1990 and 2000-2009



Source: ADOLWD, 2009

Figure 19: Port Lions School Enrollment, 1999-2009



Source: ADEED, FY 1999 through FY 2010

Table 24: Port Lions Race by Count and Percentage, 2000

	Count	Percentage
Population of one race	251	98.0%
White alone	89	34.8
Alaska Native alone	162	63.3
Population of two or more races	5	2.0

Source: U.S. Census, 2000.

Economy

The Port Lions economy is based primarily on commercial fishing, tourism and local government. Many residents depend in some way on subsistence food sources. The median household income was $39,107 per year, with per capita income of $17,492, in 1999. This was 24 percent below the state-wide average median household income of $51,571 per year.

Commercial fishing income for local residents has remained fairly steady in recent years. The number of permit holders declined from 24 in 2000 to 17 in 2008, as has the number of fishermen who fished from 16 to 13. However, gross earnings have remained between $1.1 million and $1.3 million. The earnings come mainly from seining and halibut long-line.

Table 25: Port Lions Residents' Commercial Fishing Activity, 2000-2008

Year	Number of Permit Holders	Number of Fishermen Who Fished	Total Pounds Landed	Estimated Gross Earnings	Estimated Earnings Per Pound
2000	24	16	2,276,925	$1,027,875	$0.45
2001	20	11	3,842,795	868,191	$0.23
2002	19	11	4,976,294	740,018	$0.15
2003	19	13	4,070,465	812,785	$0.20
2004	18	12	4,984,141	987,560	$0.20
2005	18	12	6,304,024	1,301,196	$0.21
2006	16	11	3,898,233	1,079,263	$0.28
2007	17	12	4,287,550	1,297,515	$0.30
2008	17	13	1,866,772	1,098,399	$0.59

Source: CFEC, 2000 through 2008.

Crew member licenses have remained stable from 2000 through 2008. In 2008, 20 licenses were issued. This was down from 24 in 2000, but above the low of 16 in 2006.

Table 26: Port Lions Residents' Crew Member Licenses, 2000-2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of crew member licenses	24	***	24	23	20	20	16	20	20

*** Due to problems with the data, crew member licenses are unavailable for 2001.
Source: CFEC, 2000 through 2008.

According to ADOLWD, there were eleven employers in Port Lions in 2007. The Native Village of Port Lions was the largest employer with a peak monthly employment of 18 and an average annual employment of 14.

Table 27: Port Lions Local Employers, 2007

Employers	Peak Monthly Employment	Average Annual Employment
Native Village of Port Lions	18	14
City of Port Lions	10	8
Kodiak Area Native Association	6	5
US Postal Service	3	3
Kizhuyak Oil Sales	4	3
City of Port Lions Health Facility	6	2
Port Lions Clinic	6	2
Kodiak Electric Association	2	1
Kodiak Paradise Lodge LLC	8	1
Telalaska Inc.	1	1
Wilderness Lodge	5	1
Total	**69**	**40**

Source: ADOLWD, unpublished data, 2007.

There are several wilderness and sportfishing lodges in the Port Lions area including Kodiak Paradise Lodge, Whale Pass Lodge, Coho-Nook Lodge, Kodiak Wilderness Lodge, and Wilderness Beach Lodge.

Chapter 2. Existing Transportation Infrastructure and Services

The outlying communities of Kodiak Island depend on a range of transportation providers to meet their household, commercial and government transportation needs. Air taxis support most of the passenger travel to these communities with relatively frequent scheduled service with single and twin-engine aircraft. Private sector operators provide unscheduled marine freight transportation services. Port Lions is the only outlying community currently served by AMHS.

Freight Service and Traffic

Movement of freight is a particular challenge for the outlying communities of Kodiak Island. As recently as 2005, some of the small Kodiak Island communities enjoyed direct freight service from Seattle via Western Pioneer, Inc., which operated a fleet of four small freighters (ranging in length from 165 to 192 feet) between Seattle and numerous Alaska ports. This included regular or occasional stops in Port Lions, Larsen Bay, Ouzinkie and Old Harbor. Western Pioneer also served communities in Southeast Alaska and western Alaska. Western Pioneer hauled furniture and household freight, groceries, building materials, vehicles and other break-bulk freight north-bound and frozen fish southbound. However, Western Pioneer suspended shipping operations in June 2005 and sold its vessels shortly thereafter. While northbound freight volumes were good, declining volumes of south-bound fish was blamed for the demise of the operation.

Today, Coastal Transportation is the only shipping company offering freighter service to the smaller communities of western Alaska. Icicle Seafoods' plant in Larsen Bay and Ocean Beauty's plant in Alitak are among the ports served seasonally by Coastal Transportation. Coastal's fleet of six vessels range from 176 to 240 feet in length, with average hold capacity of 70,000 cubic feet.

According to a company representative, freight generating approximately $30,000 in revenue would be required for Coastal Transportation to make an unscheduled port call, perhaps somewhat more or less depending on the location of the port. Depending on the nature of the freight, this could be about 200,000 pounds of freight. For a community to secure regularly scheduled service, it would need to generate approximately that volume (value) of freight on a monthly or quarterly basis.

Coastal Transportation's rates for scheduled shipping from Seattle to its coastal Alaska customers include (as of December 6, 2010):

- Chill Fruits & Vegetables and Refrigerated Freight NOS: $34.12 cwt (per hundred-weight) for shipments less than 1,000 lbs. and $30.71 cwt for shipments greater than 1,000 lbs.
- Beverages and Foodstuffs: $17.50 cwt for shipments less than 5,000 lbs. and $14.50 for shipments greater than 5,000 lbs.
- Clothing and Household Goods: $5.50 per cubic foot.

- Appliances and Furniture: $4.80 per cubic foot.
- Lumber and Timbers: $16.00 cwt for shipments less than 5,000 lbs. and $14.48 cwt for shipments greater than 5,000 lbs.

If demand for freight service from Seattle to Kodiak Island communities were sufficient to support profitable freighter service, that service would be available today. It is worth noting re-initiation of direct freight service from Seattle to one of more Kodiak Island communities would come at the expense of Kodiak and other Alaska businesses that are now selling goods to customers in those communities.

Figure 20: M/V *Lazy Bay* Landing Craft Freight Service

Since the loss of Western Pioneer freight service directly from Seattle, Kodiak Island's outlying communities' heavy freight needs have been meet by a number of landing craft operators providing service from Kodiak. Some residents transport their own freight in private vessels ranging from small skiffs to large commercial fishing vessels. Island Provider Transportation Company operated the M/V *Lady Nina*. Currently M/V *Lazy Bay* LLC provides on-demand freight service with a 100-foot landing craft (87-foot on vessel doc data, built in 1968, 21 foot beam). It carries a forklift to load and unload none-mobile freight. The M/V *Polar Bear,* a 153-foot landing craft also provides freight and fuel service on demand.

Figure 21: M/V *Polar Bear* Landing Craft

Fuel is provided by barge or landing craft. Old Harbor, Ouzinkie and Port Lions have docks with fuel headers. In Larsen Bay the fuel barge lies at anchor while offloading fuel. The fuel supply transportation needs of Akhiok and Karluk are met by landing craft. Petro Marine Services delivers and Crowley provides fuel via tug and fuel barge.

There is very little useful published or available unpublished data concerning the volume of freight shipped into (or out of) the outlying communities of Kodiak Island. Data compiled by the U.S. Army Corps of Engineers Waterborne Commerce Statistics Center includes data for Old Harbor, which is summarized in the following table. The data is interesting in it shows the drop in non-petroleum freight volume to Old Harbor when Western Pioneer freighter service ceased mid-year 2005. This data indicates just over 425,000 pounds of non-fuel related freight was shipped into Old Harbor in 2004 from Seattle. Of course data after 2005 does not include freight delivered to the community via landing craft from Kodiak.

Table 28: Old Harbor In-Bound Freight, 2004-2008, Short Tons

	2004	2005	2006	2007	2008
All Commodities	753	613	404	443	494
Petroleum Products	539	523	404	443	494
All Other Goods	214	90	0	0	0

Source: U.S. Army Corps of Engineers Waterborne Commerce Statistics Center.

Freight data from other Alaska communities provides an indication of the total volume of freight likely moving into the outlying communities of Kodiak Island. In the following table, in-bound marine freight is presented for six communities of various sizes, ranging in population from about 800 (Hoonah) to nearly 9,000 (Sitka). Total freight is a measure of in-bound lumber, groceries, other food items, alcoholic beverages, paper products, manufactured products (furniture and appliances), vehicles, and boats shipped into these communities via barge in 2008. The data indicates in-bound freight in these categories ranges from about 1,700 pounds per person in the smallest community to about 5,800 pounds per person in the largest community. In these same categories, freight shipped into Old Harbor in 2004 was about 1,500 pounds, per capita. Higher per capita volumes of freight into larger communities are to be expected. Larger communities typically have higher per capita personal income, with greater per capita spending on durable and non-durable consumer goods. Further, in Alaska, small rural communities have a much higher level of dependence on subsistence resources (meaning lower per capita purchases of groceries).

Table 29: Freight Volumes to Selected Alaska Communities, 2008

	2008 Population	Total Freight (lbs)	Freight Per Capita (lbs)
Cordova	2,155	9,728,000	4,514
Metlakatla	1,370	3,152,000	2,301
Hoonah	819	1,366,000	1,668
Nome	3,565	11,534,000	3,235
Sitka	8,641	50,568,000	5,852
Wrangell	1,939	5,484,000	2,828
Total/Average	**18,489**	**81,832,000**	**4,426**

Source: U.S. Army Corps of Engineers Waterborne Commerce Statistics Center.
Compiled by McDowell Group.

Based on this data, the volume of freight moving in to the six outlying communities of Kodiak Island is likely in the range of 1,500 to 2,000 pounds per person annually. For the communities' total population (in 2009) of 730 residents, in bound freight is likely in the range of 1.1 million to 1.5 million pounds (550 to 750 short tons).

This freight is currently moving into Kodiak Island communities in several ways, including small plane, the *Lazy Bay*, private boat, and, for Port Lions residents, in personal vehicles carried aboard the *Tustumena*. (Much of this freight would have been carried by Western Pioneer prior to that company's departure from the Alaska market).

It is important to note not all freight is included in these figures. Of course fuel is not included. COE data also records a variety of one-time or infrequent freight shipments, such as concrete, paints, explosives, chemical products, etc, which are not included in the figures in the preceding table.

Other Traffic Trends and Volumes

Air Traffic (Passenger and Freight)

Air traffic data provides an indication of transportation market size and trends. Data from the federal Bureau of Transportation Statistics (BTS) indicates passenger and freight volumes. Data for 2007, 2008 and 2009 are reported here. Old Harbor is the largest air taxi market among the six communities, with total in-bound and out-bound traffic of 6,638 passengers in 2009. Ouzinkie and Larsen Bay are a close second and third, with 6,375 and 6,124 passengers respectively in 2009. Karluk, the smallest of the communities, had total in-bound and out-bound traffic of 733 passengers in 2009 (which is significantly below the 2008 level of more than 1,100 passengers).

On a per capita equivalent basis, Larsen Bay generates the highest level of air passenger traffic. Per capita equivalent traffic ranges from a low of about 10 round-trips in Karluk to a high of about 39 round-trips in Larsen Bay. Larsen Bay traffic is high due to the relatively large numbers of non-resident visitors to the community (mostly related to the large fish processing facility located in Larsen Bay, as well as guided non-resident fishermen and hunters). Akhiok traffic is also influence by travel to and from the Alitak cannery. Port Lions is at the low end of the range because it enjoys frequent AMHS ferry service.

Table 30: Kodiak Island Outlying Community Air Passenger Statistics, 2007-2009

	2007	2008	2009	2009 Per Capita
Passenger Volume				
Kodiak-Akhiok	895	1,015	1,198	23
Akhiok-Kodiak	962	1,026	1,180	23
Kodiak-Larsen Bay	3,133	3,086	2,996	38
Larsen Bay-Kodiak	2,995	2,882	3,128	40
Kodiak-Old Harbor	3,136	3,294	3,202	17
Old Harbor-Kodiak	2,921	3,170	3,436	18
Kodiak-Karluk	658	604	332	9
Karluk-Kodiak	587	547	401	11
Kodiak-Ouzinkie	2,288	2,487	2,920	17
Ouzinkie-Kodiak	1,835	2,072	3,455	20
Kodiak-Port Lions	2,165	2,184	3,056	15
Port Lions-Kodiak	2,334	2,563	2,591	13

Source: Bureau of Transportation Statistics

Federal Aviation Administration (FAA) data measuring total embarkations for each community is generally consistent with the BTS data. Data back to 2005 shows a general increase in passenger traffic at all the communities, with the exception of Karluk.

Table 31: Kodiak Island Outlying Community Air Passenger Boarding Statistics, 2005-2009

	2005	2006	2007	2008	2009
Akhiok	1,153	1,190	1,054	1,220	1,356
Karluk	666	586	697	505	376
Larsen Bay	2,581	2,699	2,944	2,933	3,009
Old Harbor	2,266	2,620	2,946	3,282	3,226
Ouzinkie	1,684	1,695	1,914	2,071	2,999
Port Lions	1,907	2,162	2,311	2,386	2,666

Source: FAA

Airfreight statistics show (not surprisingly) disproportionate volumes of in-bound freight. BTS data indicates the highest level of air freight volume at Old Harbor, with 523,000 pounds, including 462,000 pounds of in-bound freight. Karluk has the lowest volume, totaling 54,000 pounds in 2009, including 52,000 pounds of in-bound freight.

On a per-capita equivalent basis, Akhiok is highest, with over 2,800 pounds of in-bound freight per capita. Port Lions is lowest in terms of per capita in-bound freight at 860 pounds, which reflects the availability of AMHS service to the community.

Table 32: Kodiak Island Outlying Community Airfreight Statistics, 2007-2009

	2007	2008	2009	2009
Freight Volume (lbs)				**Per Capita**
Kodiak-Akhiok	73,974	107,153	145,542	2,854
Akhiok-Kodiak	8,465	20,141	23,737	465
Kodiak-Larsen Bay	264,315	221,812	191,236	2,421
Larsen Bay-Kodiak	15,400	17,628	25,394	321
Kodiak-Old Harbor	354,343	416,523	461,772	2,393
Old Harbor-Kodiak	35,287	52,715	61,581	319
Kodiak-Karluk	80,281	73,221	52,080	1,371
Karluk-Kodiak	2,221	5,510	2,069	54
Kodiak-Ouzinkie	186,711	189,838	292,789	1,722
Ouzinkie-Kodiak	6,672	14,104	24,470	144
Kodiak-Port Lions	160,584	168,292	171,976	860
Port Lions-Kodiak	9,344	8,943	18,650	93

Source: Bureau of Transportation Statistics

Typical seat fares for scheduled air travel from Kodiak to the outlying communities are presented in the following table. Freight rates are also presented (on Island Air passengers can take 50 pounds of freight free of charge).

Table 33: Typical Kodiak Island Seat Fare and Airfreight Rates, 2010

Kodiak to:	Air Miles	Seat Fare	Freight ($/lb)
Port Lions	19	$50	0.44
Ouzinkie	11	$50	0.44
Larsen Bay	64	$99	0.65
Karluk	79	$127	0.79
Old Harbor	70	$90	0.65
Akhiok	90	$133	0.83

Source: Island Air.

AMHS Service and Traffic

Port Lions is the only outlying community on Kodiak Island served by the AMHS. The M/V *Tustumena* provides ferry service year around (the other AMHS vessel serving Kodiak and southwest Alaska, the M/V *Kennicott*, is too large to call on Port Lions). Departures vary, but are often twice weekly. Passenger and vehicle traffic remained fairly constant 2000 through 2005, then increased sharply (more than doubling) when an increase in port calls in 2006 resulted and the loss of Western Pioneer freight service to Port Lions. Passenger traffic peaked in 2007 then declined slightly in 2008 and 2009. Vehicle traffic has been somewhat more stable since 2007.

Table 34: Port Lions AMHS Passenger Traffic, 2000-2009

Year	Embarking	Disembarking
2000	417	503
2001	420	571
2002	433	415
2003	326	399
2004	423	460
2005	418	520
2006	1,020	1,178
2007	1,471	1,525
2008	1,405	1,430
2009	1,357	1,355

Source: AMHS Annual Traffic Report, 2000-2009.

Table 35: Port Lions AMHS Vehicle Traffic, 2000-2009

Year	Embarking	Disembarking
2000	182	202
2001	207	245
2002	155	162
2003	141	167
2004	173	225
2005	187	219
2006	419	482
2007	566	634
2008	598	615
2009	572	613

Source: AMHS Annual Traffic Report, 2000-2009.

Chapter 3. Transportation Demand and Revenue Potential Analysis

In Chapter 2, information concerning current movement of passengers and freight to and from the outlying communities of Kodiak Island was presented. This, however, does not necessarily represent the total demand for transportation services or the number of passengers and volume of freight that would move on an enhanced transportation system serving some or all of these communities. The purpose of this chapter is to assess potential traffic and revenue from enhanced surface transportation infrastructure, including regularly scheduled marine transportation service.

This chapter begins with a summary of the results of a telephone survey conducted with a randomly selected sample of Kodiak Island Borough households. The primary purpose of the survey was to gauge anticipated use, among Kodiak Island Borough residents, of a regularly scheduled ferry service connecting the community of Kodiak with the Island's outlying communities. This chapter also includes an overview of ferry system case studies, which describes the basic economics of operating ferry systems in Alaska. The chapter concludes with an analysis of revenue potential for a dedicated Kodiak Island ferry system.

Household Survey Results

A total of 419 randomly-selected Kodiak Island Borough households were surveyed in April 2010. The sample included 301 households from the community of Kodiak and 118 households from the six study area communities in the outlying areas of the borough.

While most of the demand for ferry service to outlying communities would come from the residents of those communities, the borough's population center around the community of Kodiak represents a potentially significant source of passenger travel, as residents seek recreational opportunities and travel to visit with friends and relatives. Strong cultural ties exist between residents of the city and residents of outlying communities, and enhanced transportation infrastructure and service could spur additional personal travel as transportation cost and convenience barriers are reduced.

Community of Kodiak Resident Survey Results

Just over three quarters of the adult residents of the community of Kodiak had not visited any of the outlying communities in the preceding 12 months. Visitation to Port Lions, Ouzinkie, Larsen Bay and Old Harbor was approximately equal, with about one in ten Kodiak residents visiting each of these communities, either for personal or business reasons.

Among residents traveling to the outlying communities, some made just one trip during the past 12 months while others made numerous trips to one or more communities. For example, residents that traveled to Port Lions made an average of 3.6 trips. Kodiak residents that traveled to Ouzinkie, the community geographically closest to Kodiak, made an average of 6.5 trips.

Table 36: In the last 12 months, have you traveled to any of the following communities on Kodiak Island?
Base: Kodiak residents

	% of Kodiak n=301
Port Lions	11%
Ouzinkie	11
Larsen Bay	10
Old Harbor	9
Akhiok	5
Karluk	4
None	76

Table 37: Number of Trips from Kodiak to Other Communities
Base: Traveled to community

	1 trip	2 trips	3-10 trips	11+ trips	Average
Port Lions (n=33)	58%	21%	15%	6%	3.6
Ouzinkie (n=33)	39	24	24	12	6.5
Larsen Bay (n=28)	46	18	18	18	6.3
Old Harbor (n=26)	65	8	15	12	4.4
Akhiok (n=15)	53	7	33	7	5.3
Karluk (n=11)	36	18	27	18	5.0

Among all Kodiak residents, there was generally equal interest in visiting the larger outlying communities if ferry service were available. Potential ferry service was described to survey respondents as such: "One option for improved transportation to these [Kodiak Island] communities is a passenger and vehicle ferry that would travel between Kodiak and each community twice a week between May and September, and less frequently during the winter months." Residents were asked "Which of the following communities, if any, would you be likely to visit using the proposed ferry service?" Residents expressed about equal interest in visiting Old Harbor (28 percent would be likely to visit), Larsen Bay (26 percent), and Ouzinkie (25 percent). Of course, Kodiak residents can already visit Port Lions via ferry.

Table 38: Which of the following communities, if any, would you be likely to visit using the proposed ferry service?
Base: Kodiak residents

	% of Kodiak n=301
Old Harbor	28%
Larsen Bay	26
Ouzinkie	25
Karluk	15
Akhiok	15
None	41
Don't know/refused	7

While most travelers to outlying communities would make just one trip, others would expect to make multiple trips to one or more outlying communities using the proposed ferry service. Most trips would be for recreation ("vacation/pleasure"); however, business travel, visiting friends and relatives and fishing/hunting combined would be expected to account for a quarter to a third of the ferry travel to outlying communities, among Kodiak residents.

Table 39: Number of Likely Trips from Kodiak to Other Communities Using Proposed Ferry Service, May-September
Base: Kodiak residents

	0 trips	1 trip	2 trips	3-10 trips	11+ trips
Ouzinkie (n=81)	75%	11%	8%	5%	1%
Larsen Bay (n=87)	74	15	7	4	-
Old Harbor (n=89)	72	19	7	3	-
Akhiok (n=49)	85	10	3	2	<1
Karluk (n=52)	85	10	3	2	-

Table 40: Primary Purpose of Trips from Kodiak to Other Communities Using Proposed Ferry Service, May-September
Base: Likely to travel to community

	Vacation/ Pleasure	Business	Visit Friends/ Family	Fish/Hunt
Ouzinkie (n=72)	69%	14%	11%	6%
Larsen Bay (n=73)	70	11	11	8
Old Harbor (n=80)	68	6	14	13
Akhiok (n=45)	71	13	7	9
Karluk (n=46)	74	7	4	15

Outlying Community Resident Survey Results

Residents of the six outlying communities of Kodiak Island make frequent trips to the community of Kodiak. As Kodiak Island's service, supply, government and transportation hub, residents travel to Kodiak for a broad range of trip purposes.

Table 41: Travel Mode for Trips from Outlying Communities to Kodiak

	Average # trips by air	Average # trips by private vessel	Average # trips by state ferry	Average Total Trips	Median Total Trips
Port Lions (n=38)	10.8	4.0	8.6	23.4	20.0
Ouzinkie (n=21)	16.5	11.1	n/a	27.6	24.0
Larsen Bay (n=9)	10.9	0.0	n/a	10.9	8.0
Old Harbor (n=31)	10.9	0.3	n/a	11.2	6.0
Akhiok (n=13)	8.8	0.0	n/a	8.8	6.0
Karluk (n=5)	12.4	0.0	n/a	12.4	9.0

Residents would continue to rely heavily on air service for their travel to Kodiak, but a substantial amount of travel would occur on a new intra-island ferry service. Residents would expect to make an average of between

seven (among Old Harbor residents) and 13 (among Ouzinkie residents) trips to Kodiak on the ferry. With the small sample sizes from these communities, average values have high error margins. Median values (the most frequent values) are considered a better representation of typical household travel. Median values range from five trips (Larsen Bay and Old Harbor residents) to 10 trips (Ouzinkie residents). These are measures of predicted summer travel (May through September).

While surveys measuring anticipated travel typically indicate greater travel frequency than would actually be the case, these survey results (which gauge seasonal travel) appear to be reasonably consistent with AMHS ferry travel frequencies for Port Lions residents. AMHS data indicates about 70 percent of the AMHS passenger embarkations and disembarkations at Port Lions are Port Lions residents, which is the equivalent of about five AMHS round-trips per year per resident.

Table 42: Number of Likely Trips from Other Communities to Kodiak Using Proposed Ferry Service, May-September
Base: Village residents, not including Port Lions

	0 trips	1-2 trips	3-10 trips	11-20 trips	21+ trips	Average	Median
Ouzinkie (n=21)	5	10	52	19	14	13.2	10.0
Larsen Bay (n=9)	-	-	89	11	-	8.2	5.0
Old Harbor (n=31)	10	12	65	6	3	6.7	5.0
Akhiok (n=13)	8	-	69	23	-	8.0	6.0
Karluk (n=5)	-	25	50	25	-	9.0	7.0

One of the challenges associated with assessing traffic on new transportation services is predicting induced travel. This is travel that would not occur in the absence of the new transportation service. One component of induced travel is that travel related to population growth that might occur in the outlying communities if it were easier to travel to the community. It is not possible to predict with any degree of certainty if and by how much the population might grow in communities enjoying new ferry service. However, 30 percent of the residents of the outlying communities have family or friends currently living in Kodiak that might choose to live in one of the smaller communities if ferry service existed.

Table 43: Do you have family or friends currently living in the community of Kodiak that might choose to live in your community if such a ferry service existed?
Base: Village residents, not including Port Lions

	% of Villages n=79
Yes	30%
No	49
Maybe	11
Don't know/refused	9

Residents of the outlying communities were asked about their support for regular ferry service between Kodiak and their community. This can be an important question. Some small, remote communities in Alaska, while interested in better access for local residents, would prefer to not see an increase in non-resident traffic to and through their communities. Competition for local fish and game resources is one reason why some residents might rather not see an increase in traffic to their community. Loss of privacy is another potential

concern. Of course the flip-side of that are the potential economic benefits associated with increased non-resident travel to the outlying communities.

In any case, the residents of all of the outlying communities expressed support for regular ferry service. Overall, two-thirds of residents are "very supportive" and one-third "supportive". Virtually no one surveyed expressed opposition to the concept of regular ferry service to their community.

Figure 22: Residents "Supportive" and "Very Supportive" of Ferry Service

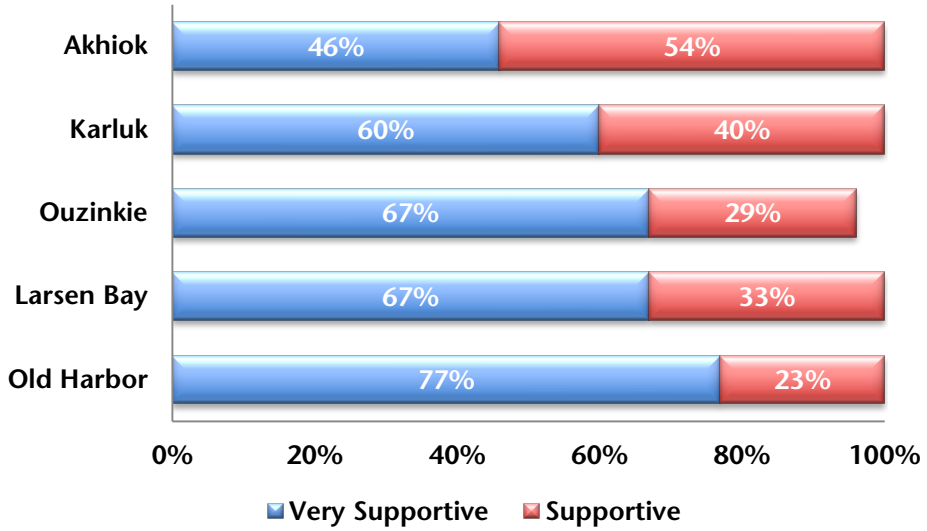


Table 44: Are you very supportive, supportive, opposed, or very opposed to regular ferry service between Kodiak and your community?
Base: Village residents, not including Port Lions

	% of Villages n=79
Very supportive	67%
Supportive	32
Opposed	-
Very opposed	-
Don't know/refused	1

Heavy Freight Transportation

The survey of Kodiak Island residents provides measures of ferry passenger travel demand for personal and business reasons. At least as important from a community economics perspective is the need for marine transportation of materials, equipment, and other freight that cannot be moved cost-effectively (or at all) by aircraft. This includes building materials, construction equipment and other vehicles, and fuel, among other things. The cost to transport this freight has important implications for the cost of doing business in a community, and the cost of living overall.

The largest government users of ferry service would include the various local governments that occasionally need to transport equipment for road maintenance, building materials and parts for maintenance of public

facilities ,and other heavy freight. Similarly, organizations such as the Kodiak Island School District and Kodiak Island Housing Authority (KIHA) also have heavy freight transportation needs. (KIHA has expended an average of about $80,000 a year on shipping charges for freight to outlying communities over the past several years.)

As indicated previously in the report, there is no data available on the volume of heavy freight moving into the outlying communities on Kodiak Island (volume and value of freight hauled by the M/V *Lazy Bay* to and from the outlying communities is proprietary information). However, as described in Chapter 3, modeling based on freight data for other Alaska communities suggests the volume of freight that would move into the six outlying communities of Kodiak Island (on a regularly schedule marine freight service) is likely in the range of 1,500 to 2,000 pounds per person annually. For the communities' total population (in 2009) of 730 residents, in bound freight is likely in the range of 1.1 million to 1.5 million pounds (550 to 750 short tons). The volume of freight represents a significant amount of revenue to the businesses that now transport it, perhaps half a million to three-quarters of a million dollars annually (depending on many different factors).

A dedicated ferry serving Kodiak Island communities would play a significant role in meeting the freight transportation needs of households, businesses and government organizations. However, it would meet those needs indirectly. Ferries are generally not equipped to deal with break bulk cargo. Freight that is moved is in personal vehicles, in container vans, on flat-bed trucks, and the like. Therefore with respect to revenues, the key measure for a proposed ferry system is not pounds of freight moved but number of vehicles carried on the ferry. This is discussed further in a following section of this report.

Travel Demand and Revenue Modeling

The actual number of passengers and vehicles transported on any particular ferry system is the result of a complex blend of market size and characteristics, ferry service frequency, fare structure and travel time, and the cost of alternative modes of transportation. Logically, lower-cost, higher-frequency service will stimulate more travel than higher-cost, lower-frequency service. The ferry service planning and operations challenge is to find the fare structure and service frequency that maximizes revenue while minimizing ferry system operating costs. This is a particularly challenging task for ferry systems serving coastal Alaska, where markets are small (sometimes very small), distances between ports sometimes great, and sea conditions such that vessel sizing is driven by sea keeping requirements (passenger comfort and safety) rather than expected passenger and vehicle traffic.

A number of important factors frame the analysis of revenue potential for a Kodiak Island ferry system. Most important is the size of the market. The six study area communities have a combined total population of about 700 residents. Some additional travel demand would come from residents of the city of Kodiak, as well as from non-Kodiak Island residents, but nevertheless the primary market for a dedicated Kodiak ferry service is small, far smaller than any other dedicated ferry service in Alaska.

Understanding the potential for dedicated Kodiak Island ferry service to generate revenue, regardless of actual fares or service frequency, can be framed by examination of revenue generated by ferry service to other small communities in coastal Alaska. Following are case study profiles of ferry service to Port Lions, Metlakatla, and Prince of Wales Island, with a focus on revenue-generating implications of ferry service to these communities

and regions. These case studies also provide an indication of costs associated with ferry operations in Alaska, which are discussed in more detail in following chapters.

Ferry Service Case Studies

Case Study: Port Lions AMHS Service

Port Lions, a community of about 200 residents, enjoys regular AMHS service. In 2009, the M/V *Tustumena* made a total 117 sailings between Port Lions and Kodiak, a 48 nautical mile trip, including 55 trips from Kodiak to Port Lions and 62 trips from Port Lions to Kodiak. AMHS service frequency between Port Lions and Kodiak in 2009 was slightly lower than in 2008, when a total of 133 trips were made, including 63 trips from Kodiak to Port Lions and 70 trips from Port Lions to Kodiak.

Traffic between the two communities included a total of 929 passengers boarding in Port Lions and disembarking in Kodiak and a similar number (925) of passengers boarding in Kodiak and disembarking in Port Lions. Port Lions passenger traffic also included 427 passengers boarding in Port Lions and disembarking in Homer and 429 passengers doing the reverse. The following table presents this traffic data and similar vehicle traffic data for 2008 and 2009

Table 45: Port Lions AMHS Traffic Volume, 2008 and 2009

	On/Off Port Lions - Kodiak	On/Off Port Lions - Homer	On/Off Kodiak - Port Lions	On/Off Homer - Port Lions
2008				
Passengers	1,074	331	1,076	351
Vehicles	437	160	441	172
2009				
Passengers	929	427	925	429
Vehicles	384	188	385	228

AMHS passengers and vehicle traffic between Port Lions and Kodiak in 2009 generated a total $81,345 in revenue, including $30,080 in passenger fare revenue and $51,265 in car deck revenue. The passenger fare structure for ferry service between Port Lions and Kodiak includes discounted rates for children under 12 and seniors, but is typified by the adult fare of $33. Vehicle fares depend on the length of the vehicle, typified by the $68 rate for vehicles longer than 15 feet and up to 19 feet.

Table 46: Port Lions/Kodiak AMHS Revenue, 2008 and 2009

	Passengers	Car Deck	Total
2008			
Kodiak - Port Lions	$16,598	$31,560	$46,158
Port Lions - Kodiak	$16,543	$30,020	$46,563
Total	$33,141	$61,580	$92,721
2009			
Kodiak - Port Lions	$14,563	$25,532	$40,095
Port Lions - Kodiak	$15,517	$25,733	$41,250
Total	$30,080	$51,265	$81,345

Source: AMHS.

These figures provide a partial measure of revenue-generation potential of a dedicated Kodiak Island ferry service, providing regular service to Port Lions (as well as other outlying communities). This data does not include any revenue generated by passengers and vehicles traveling between Port Lions and Homer. If all the Port Lions/Homer traffic moved through Kodiak, one direction of the other, another $42,000 in annual revenue would be generated, based on average per passenger and per vehicle rates for travel between Port Lions and Kodiak in 2009. There was a lower volume of Port Lions/Homer traffic in 2008, with $34,000 in revenue if all of that year's Port Lion's traffic moved through Kodiak.

In total, based on recent AMHS traffic and revenue related to Port Lions, the upper-end revenue potential of a dedicated ferry service linking Port Lions and Kodiak, along with other communities and Kodiak, is approximately $125,000 annually, perhaps as high as $150,000 if it is assumed that fares on a dedicated ferry service would be somewhat higher. This should be considered to be at the upper-end of revenue potential for Port Lions, as AMHS service has been very good (133 and 117 trips, bidirectional, in 2008 and 2009, respectively), including opportunities for same-day, round-trip travel. At an annual revenue total of $150,000, the per capita equivalent rate is about $750. It should also be noted $150,000 in annual revenue from Port Lions service would only result if direct *Tustumena* service to the community were discontinued, a prospect that would likely not be popular among Port Lions residents.

CASE STUDY: METLAKATLA M/V *LITUYA* SERVICE

Metlakatla is a community of approximately 1,385 residents located in southern Southeast Alaska. Metlakatla is served by the M/V *Lituya*, a 181-foot AMHS ferry with capacity of 149 passengers and 18 vehicles. The *Lituya* provides dedicated twice-daily round-trip service between Metlakatla and Ketchikan, over a one-way route of about 16 nautical miles.

In 2009, the *Lituya* made a total of 940 one-way sailings between Metlakatla and Ketchikan, carrying a total of 30,357 passengers and 10,637 vehicles. Traffic in 2008 included 1,038 one-way trips (519 each way), with a total of 32,030 passengers and 9,185 vehicles.

In Fiscal Year 2009, the *Lituya* generated total operating revenues of $639,000. In terms of per capita revenue (for Metlakatla's population of 1,385 residents), the *Lituya's* FY09 operating revenues were the equivalent of about $460 per person. It should be noted that Metlakatla receives regular barge service, therefore the community's per capita expenditure rate for ferry service is lower than would be the case for a community without barge service.

Ferry system operating costs are discussed in detail in the following chapters of this report. However, it is important to note that M/V *Lituya* annual operating expenditures totaled $1,189,000 in FY09. This does not include reservations, shore operations, administration or marine engineering costs associated with *Lituya* service between Metlakatla and Ketchikan. The *Lituya's* operating revenue and expenditure performance in FY09 indicates a net operating subsidy of $550,000 was required.

CASE STUDY: PRINCE OF WALES ISLAND M/V *PRINCE OF WALES SERVICE*

The Inter-Island Ferry Authority (IFA) operates the M/V *Prince of Wales*, a 198-foot ferry with capacity for 160 passengers and 30 vehicles. The *Prince of Wales* provides daily service between Hollis (on Prince of Wales Island) and Ketchikan, a 45 nautical mile voyage requiring about 3 hours.

The IFA serves the residents of Prince of Wales Island (2009 population of 3,920), plus residents of Ketchikan traveling to Prince of Wales Island for business or recreation, as well as non-Alaskan visitors.

IFA also operated a second vessel (M/V *Stikine*, sister ship of the *Prince of Wales*) on a northern Prince of Wales Island route, between Coffman Cove, Wrangell and Mitkof Island (connected by road to Petersburg). The *Stikine* operated from Summer 2006 through January 2008, when the service was suspended due to low traffic volumes.

In 2009 the *Prince of Wales* carried 51,700 passengers and 11,400 vehicles. The ferry service generated service revenues of $3.68 million. IFA revenues are the equivalent of about $940 per capita for the Island's 3,920 residents. Expenses included $3.2 million in vessel operations, $361,000 in shore-side operations, and $1.2 million in depreciation expense.

IFA administration expenses for this one-vessel, two-port ferry service totaled $745,000 in 2009, including $498,000 in personnel services, $83,000 in professional fees, $64,000 in office expense, $15,000 in travel, $20,000 in insurance, and $66,000 in "other" expenses.

OVERVIEW OF ALASKA FERRY OPERATIONS ECONOMICS

As described previously in this report, ferry system operations in Alaska are challenged by small markets, long routes, and difficult sea conditions. Vessels are sized to ensure passenger safety and comfort, and a high level of scheduled service reliability. Smaller ships could generally meet passenger and vehicle demand, and would be somewhat less expensive to acquire and operate. But vessels sized to meet market demand would not provide adequate sea keeping characteristics.

Experience has shown that public ferry systems in Alaska do not generate revenues sufficient to cover operating costs. The case studies described above illustrate that point, as does other AMHS data. For example, in FY09, the *Tustumena* generated $2,992,000 in total revenues, while costing $6,642,000 to operate, indicating an annual operating subsidy of $3,650,000. The AMHS overall generated $46.2 million in operating revenues in FY09, compared to expenditures of $124.5 million.

Travel Demand Modeling Assumptions

As described above, the potential for a new transportation system to generate traffic and revenues depends on a variety of factors. With respect to ferry service, the cost, frequency and convenience of the service dictates how often travelers will use the service. These factors, coupled with the size of the market being served, determine the number of travelers and the revenue generated by that travel.

Four key factors place important limitations on the traffic and revenue potential from a Kodiak Island ferry service. These include:

- **Long distances and travel times** limit the potential for frequent ferry service to some of the Island's outlying communities. Very frequent service (daily or better) to Ouzinkie and Port Lions would be possible, given those communities close proximity to Kodiak, if that service were to those communities exclusively (or nearly so). However, the full day or more required to make a round-trip to each of the other four communities indicates that weekly trips would be about the highest level of service frequency possible, if all communities were to receive equal levels of ferry service. In reality, given the geography and demographics of the Kodiak Island communities, equal service is likely not a realistic goal, nor would it generate the highest possible revenue from this market.

- The outlying communities of Kodiak Island represent a **very small market to support ferry operations**. With populations ranging between 50 and 200 residents, the total number of primary ferry system users (residents in the outlying communities) is about 700. Even adding seasonal non-resident travel to and from these communities, the service area population and economic base for a dedicated ferry is very small, certainly smaller than any other dedicated ferry system in Alaska.

- Given the small market and limited revenue generating potential of the service area, ferry system operating costs must be minimized. Crew is the largest source of operating costs. Controlling crew costs would be critical to **lowest-possible operating costs** in a small-market service area. That means limiting service to day-boat operations, to the maximum extent possible.

- The outlying communities of Kodiak Island already enjoy a high-level of relatively **low-cost air taxi service**. Pricing and revenue potential from passenger travel on a Kodiak Island ferry service would be constrained by convenient and competitive air travel opportunities.

Passenger and Vehicle Fares

It is assumed that fares for passenger and vehicle on a dedicated Kodiak Island ferry would generally be consistent with or slightly higher than fares charged for ferry service elsewhere in Alaska. The following table provides passenger and vehicle fares for a variety of routes served by AMHS, plus IFA's Ketchikan-Hollis route.

Table 47: Passenger and Vehicle Fares for Selected Alaska Routes, 2010

	Nautical Miles	Passenger Fare (Adult)	Vehicle Fare (15-19 ft)	Passenger Cost per Mile	Vehicle Cost per Mile
Metlakatla-Ketchikan	16	$25	$40	$1.56	$2.50
Homer-Seldovia	17	$33	$54	$1.94	$3.18
Ketchikan-Hollis	40	$37	$85	$0.93	$2.13
Port Lions-Kodiak	48	$33	$68	$0.69	$1.42
Juneau-Hoonah	48	$33	$68	$0.69	$1.42
Angoon-Sitka	67	$35	$75	$0.52	$1.12
Chenega-Whittier	67	$89	$190	$1.33	$2.84
Juneau-Kake	114	$66	$167	$0.58	$1.46
Port Lions-Homer	134	$74	$179	$0.55	$1.34
Chignik-Sand Pt.	138	$66	$157	$0.48	$1.14
Juneau-Wrangell	164	$87	$214	$0.53	$1.30
Kodiak-Chignik	249	$111	$295	$0.45	$1.18

Notes: The Kodiak/Port Lions route is 27nm if inside Spruce Island.

This fare information is reasonably consistent in illustrating that per mile costs decrease with route distance. A notable exception is AMHS service between Chenega and Whittier, which is priced substantially higher on a per-mile basis than routes of equal distance. In any case, these prices guide the discussion about pricing for a dedicated Kodiak Island ferry service. Due to the small traffic base over which to spread operating and administrative costs, per-mile pricing for a dedicated Kodiak Island service would necessarily be higher than for routes served by AMHS or the IFA. Still, pricing could not be established at a level that would provide for self-sustaining ferry operations.

For purposes of this study, the following basic rate structure is used to predict revenue potential for a Kodiak Island ferry. These fares should of course be viewed as approximate only. Route distances may vary depending on the location of terminals. For example, a terminal in Anton Larsen would reduce the route distance to Port Lions from Kodiak. Similarly, road extensions/connections in other communities would serve to reduce ferry route distances.

Table 48: Kodiak Island Ferry Fare Assumptions

From Kodiak to:	Route Distance (nm)	Adult Passenger Fare	Avg. Vehicle Fare
Akhiok	134	$90	$200
Karluk	88	$70	$150
Larsen Bay	85	$70	$150
Old Harbor	95	$70	$150
Ouzinkie	14	$30	$70
Port Lions	27	$35	$80

Based on these fare assumptions and the results of the household survey it possible to develop an estimate of annual revenue for a dedicated ferry system. In the following table the results of a revenue modeling exercise are presented. The model blends predicted travel frequency (based in part on survey results), and the fare assumptions described above. Other important assumptions made in this revenue modeling exercise include the following:

- Average fares would be about 60 percent of the adult fare. (Average passenger fares are lower than adult passenger fares, as children and seniors would likely be offered discounted rates.)
- Non-resident travelers would account for 30 percent of passenger revenues.
- The number of vehicles carried would equal approximately 40 percent of the number of passengers and total revenues from vehicles would equal about twice total passenger fares.

This analysis indicates that potential annual revenues could range from approximately $500,000 to about $750,000. The Low Case figures presented in the following table are resident travel frequencies approximately 20 percent below the Mid-Case, while the High-Case is based on resident travel frequencies about 20 percent above the Mid-Case.

Table 49: Kodiak Island Ferry Revenue Forecast (Travel Frequency and Average Fare Basis)

	Passenger Revenue	Car Deck Revenue	Total Revenue
Low Case			
Akhiok	$11,200	$23,200	$34,400
Karluk	9,600	20,000	29,600
Larsen Bay	20,800	41,600	62,400
Old Harbor	50,400	100,800	151,200
Ouzinkie	32,000	64,000	96,000
Port Lions	44,000	87,200	131,200
Total	**$168,000**	**$336,800**	**$504,800**
Mid Case			
Akhiok	$14,000	$29,000	$43,000
Karluk	12,000	25,000	37,000
Larsen Bay	26,000	52,000	78,000
Old Harbor	63,000	126,000	189,000
Ouzinkie	40,000	80,000	120,000
Port Lions	55,000	109,000	164,000
Total	**$210,000**	**$421,000**	**$631,000**
High Case			
Akhiok	16,800	34,800	51,600
Karluk	14,400	30,000	44,400
Larsen Bay	31,200	62,400	93,600
Old Harbor	75,600	151,200	226,800
Ouzinkie	48,000	96,000	144,000
Port Lions	66,000	130,800	196,800
Total	**$252,000**	**$505,200**	**$757,200**

It is important to recognize the uncertainty in this analysis, particularly at the community level. Each community in the study area has a unique socioeconomic and geographic profile, with different propensity to utilize ferry service. Nevertheless, the modeling assumptions made here are considered reasonable for gauging Island-wide revenue.

Per Capita Revenues

Another revenue modeling approach is to consider per capita-equivalent expenditures on ferry travel. Per capita revenue is a proxy measure intended to capture all personal, government and commercial traffic associated with ferry service to an individual community. Total population is an excellent indicator of the relative size of an economy; local, regional, or otherwise. The two figures together can provide a measure of total community-level ferry revenue.

An important modeling assumption is that per capita expenditures will be, in general, approximately equal among the outlying communities. In other words, more frequent lower cost travel to and from communities closer to Kodiak will be matched by higher cost less frequent travel from the more distant communities. An additional modeling assumption is that car deck revenues will be about twice the amount of passenger

revenues. Both these assumptions are derived from analysis of revenue generation from ferry service to other communities in Alaska.

Predicting traffic for an entirely new transportation service is subject to considerable uncertainty. Given that uncertainty, per capita revenue estimates ranging from $600 (Low-Case), to $750 (Mid-Case) to $900 (High-Case) are assumed to generate low-case, mid-case and high-case revenues estimates. This modeling exercise produces a range of annual revenues of between $440,000 and $657,000.

Table 50: Kodiak Island Ferry Annual Revenue Estimates (Per Capita Revenue Basis)

	Passenger Revenue	Car Deck Revenue	Total Revenue
Low Case			
Akhiok	$10,000	$21,000	$31,000
Karluk	8,000	15,000	23,000
Larsen Bay	16,000	32,000	48,000
Old Harbor	38,000	78,000	116,000
Ouzinkie	34,000	68,000	102,000
Port Lions	40,000	80,000	120,000
Total	**$146,000**	**$294,000**	**$440,000**
Mid Case			
Akhiok	13,000	26,000	39,000
Karluk	9,000	19,000	28,000
Larsen Bay	20,000	40,000	60,000
Old Harbor	48,000	97,000	145,000
Ouzinkie	42,000	85,000	127,000
Port Lions	50,000	101,000	151,000
Total	**$182,000**	**$368,000**	**$550,000**
High Case			
Akhiok	15,000	31,000	46,000
Karluk	11,000	23,000	34,000
Larsen Bay	23,000	48,000	71,000
Old Harbor	57,000	116,000	173,000
Ouzinkie	50,000	103,000	153,000
Port Lions	59,000	121,000	180,000
Total	**$215,000**	**$442,000**	**$657,000**

Chapter 4: Transportation Infrastructure Cost Analysis

The economics of a ferry system serving the outlying communities of Kodiak Island could be substantially enhanced by road connections between communities that could eliminate the need for costly dock development and/or reduce the length of ferry routes between communities. Also docking facilities would be needed to accommodate a ferry in those communities that now lack such facilities.

A variety of roadway and dock development projects were selected for cost analysis. These are described below.

- **Akhiok/Alitak Road Connection**: Akhiok has no deepwater or barge docking facilities of any kind. Alitak is an Ocean Beauty Seafoods-owned cannery operation located about seven miles south of Akhiok. Alitak has deepwater docking facilities and receives fuel barge service, and freight service through Northland Services and Coastal Transportation. Residents of Akhiok now purchase, and transport in small boats, small volumes of fuel from Alitak. A road connection between Akhiok and Alitak has the potential to give Akhiok access to lower-cost fuel and regular barge service from Seattle.

- **Akhiok Deepwater Dock**: In the absence of road access to Alitak, a newly constructed deepwater dock would be required at Akhiok to accommodate ferry or conventional barge service (Akhiok's heavy freight and fuel supply is now provided by landing craft).

- **Karluk/Larsen Bay Road Connection**: Karluk also lacks deepwater or barge docking facilities of any kind. Further, the exposed shoreline near Karluk would make construction of a dock in the area very expensive. A 20-mile road up the Karluk River drainage and along the shore of Larsen Bay would connect Karluk to the community of Larsen Bay. While the community of Larsen Bay lacks a deepwater dock, it does have fuel barge service. A local cannery receives freight barge service. Fuel and freight could be trucked from Larsen Bay to Karluk, precluding the need for a dock in Karluk.

- **Karluk Deepwater Dock:** Like Akhiok, Karluk's heavy freight and fuel is currently supplied via landing craft. Though the coastal environment in the Karluk area is challenging, deepwater dock construction is technically possible. An alternative to a road connection with Larsen Bay is construction of such a dock.

- **Larsen Bay Deepwater Dock:** While the cannery at Larsen Bay has barge service from Seattle, the community itself lacks a barge dock or deepwater dock of any kind. Fuel is pumped to storage tanks from a barge at anchor. A deepwater dock is at the top of the community's capital improvement priorities list, and such a dock would be required to serve a ferry calling on the community.

- **Old Harbor Road Extension and Dock**: The community of Old Harbor has a deepwater dock that is now being reconstructed. As such Old Harbor will have the infrastructure to serve ferries calling on the community. However, a road extension to the northeast to the Bush Point area, and construction

of a marine terminal, would significantly shorten the very exposed ferry route between Old Harbor and Kodiak by eliminating the run around Sitkalidak Island.

- **Anton Larsen Bay Road Extension and Dock (two options)**: A ferry terminal somewhere in the vicinity of Anton Larsen Bay connecting the Kodiak road system would substantially reduce ferry travel times to communities on the north and western side of Kodiak Island (Karluk, Larsen Bay, Port Lions and Ouzinkie). Winter icing conditions within Anton Larsen Bay prohibit ferry terminal construction within the bay. Therefore road extensions would be required, either along the eastern side of Anton Larsen Bay, or to the northwest along the eastern side of the bay, to a suitable deepwater dock location.

- **Anton Larsen Bay/Shakmanof Cove Road and Dock:** Another option for a west-side ferry terminal is at Shakmanof Cove, where Koniag Inc. is developing a commercial rock quarry. Though the sheet pile dock planned for development in Shakmanof Cove to support the quarry will not be suitable for a ferry landing, this location could offer construction efficiencies and cost savings associated with access to rock fill and infrastructure at the quarry.

- **Monashka Bay/Shakmanof Cove Road and Dock:** A fourth option for access to a west-side ferry terminal is a road from the existing road terminus at Monashka Bay extending about 11 miles to Shakmanof Cove.

Roadway Cost Analysis

PND Engineers was retained to prepare cost estimates for potential roadway and dock improvements. Unit costs used in the development of road construction cost estimates are provided in the following table. In summary, a single-lane, unpaved roadway, with pullouts, costs approximately half a million dollars per mile to construct. Two-lane unpaved roadways cost about twice that amount to construct. The full cost of any particular road segment also depends on the number of bridges, culverts, pull-outs and other factors. Cost estimates include a 10 percent mobilization/demobilization cost factor, plus 30 percent contingency factor.

Table 51: Road Segment Cost Estimates

Description	Units	Unit Cost
One-Lane Road	Mile	$346,000 to $435,000
Two-Lane Road	Mile	$518,000
Culverts	Each	$4,000 – $4,200
One-Lane Bridge	Lineal Feet	$6,000
Pullouts	Each	$2,300 – $3,000
Clearing and Grubbing	Acre	$21,500
Mobilization/Demobilization	--	10%
Contingency	--	30%

Source: PND Engineers

For the various road segments analyzed in the study, total road construction costs ranged from a low of $750,000 per mile for a single unpaved road (Akhiok to Alitak) to a high of $1.2 million per mile for a two-lane unpaved road (Anton Larsen to Shakmanof and Monashka Bay to Shakmanof).

The 7.3-mile single lane Akhiok/Alitak road would have an estimated total construction cost of $5.4 million. It should be noted that this road would traverse Akhiok-Kaguyak Inc. land and therefore would presumably be available for development for this purpose. (Concerns about access to the immediate Alitak cannery property are discussed later in this report.) Maintenance of this road would cost approximately $110,000 annually, based on an average cost of $7,500 per lane-mile per year. Annual maintenance costs would be reduced if the road were only maintained seasonally.

An 18.5-mile single-lane gravel road connection between Karluk and Larsen Bay would cost approximately $17.9 million, with annual maintenance costs of about $140,000. There is a somewhat higher level of uncertainty associated with this cost estimate, as great care would be required to minimize any potential adverse effects on the Karluk River, a very rich salmon rearing area. This road would traverse land owned by Koniag, Inc.

The Old Harbor road extension would be approximately 3.6 miles in length, with a construction cost of $4.2 million. Annual maintenance would cost approximately $30,000. There is uncertainty in this estimate associated with optimal location of a marine terminal in the vicinity of Bush Point. More detailed investigation could result in a somewhat longer roadway, necessary to reach suitably deep water.

Table 52: Road Segment Cost Estimates

Description	Capital Cost	Annual Cost
Road Segments		
Akhiok/Alitak Road (7.3 miles)	$5.4 million	$55,000
Karluk/Larsen Bay Road (18.5 miles)	$17.9 million	$140,000
Old Harbor Extension (3.6 miles)	$4.2 million	$30,000
Anton Larsen Bay to Shakmanof (7.1 miles)	$7.6 million	$110,000
Monashka Bay to Shakmanof (10.6 miles)	$11.4 million	$160,000
Anton Larsen Extension – West Side (3.0 miles)	$3.0 million	$45,000
Anton Larsen Extension – East Side (9.6 miles)	$9.0 million	$145,000

Source: Capital costs from PND Engineers. Maintenance costs are McDowell Group estimates.

There are several options for extending a roadway from the existing Kodiak road system to a west-side location suitable for development of a marine terminal to support ferry operations. A small-vessel float and gangway already exists in Anton Larson Bay, located near the end of the Anton Larsen Bay road. However, because the bay typically freezes during the winter this location is not suitable for a ferry terminal. As such the road would need to be developed to the nearest best-suited location for a year-round dock. This new roadway could either be an extension of the existing road to a location on the west side of Anton Larsen Bay (or thereabouts), or a spur road from the head of Anton Larsen Bay to a location on the east side of the Bay, or to the north in Shakmanof Cove.

Construction costs for the options range from $3 million (West Side option) to $9 million (East Side option). These costs are based on construction of a two-lane unpaved roadway. Unlike the very isolated roadways in Akhiok and Karluk, these Anton Larsen options all extend the existing Kodiak area road system and therefore would experience much higher traffic volumes. Therefore two-lane roads would be required rather than the one-lane roads that would be adequate for the small remote communities.

An additional option for access to a west-side ferry terminal is extension of the highway that now terminates at Monashka Bay. The roadway extension would be approximately 10.6 miles to a marine terminal location in Shakmanof Cove. This two-lane option has an estimated cost of $19.7 million.

The cost to construct docks, suitable for ferry and barge traffic, was also estimated for several locations. PND Engineers estimated dock construction costs for locations, including Akhiok, Karluk, Larsen Bay, and Shakmanof. PND prepared two cost estimates for Akhiok and Larsen Bay, one for a fixed-pier dock, the other for a roll-on, roll-off floating (RO/RO) dock. The fixed-pier dock would be suitable for the *Tustumena*, which has an on-board vehicle elevator. The RO/RO dock is similar to those employed in Prince William Sound and Southeast Alaska to serve AMHS vessels. The conclusion from the analysis was that the two types of docks are roughly equal in terms of construction cost.

Construction of a dock at Karluk would be the most costly, at approximately $13.8 million. This estimate does not include uplands development of any kind, or the cost to install piping for fuel transfer. A comparatively long trestle would be required to reach sufficiently deep water. This cost estimate does not include installation of any form of breakwater or other wave barrier to shelter the face of the dock. Without such protection the dock would likely frequently be unavailable for use, due to its exposure to weather from the north. One conclusion from this analysis is that the cost to construct a dock at Karluk, coupled with the cost to install a breakwater, develop necessary uplands staging areas, and install fuel transfer facilities, would equal or exceed the cost to build a road to Larsen Bay.

Constructing a fixed-pier dock in Akhiok, in the vicinity of Prior Point, would cost approximately $6.6 million. While the Prior Point area appears to be a reasonable location for a dock, based on charts and aerial photographs, determining the optimal location for a deepwater dock in the Akhiok area would require additional detailed site investigation. Again, uplands development and fuel transfer facilities would increase the cost of dock development in Akhiok. These total costs would also exceed the cost to construct a road to Alitak.

A Larsen Bay fixed-pier dock would cost approximately $4.7 million. The preliminary dock location is inside Larsen Bay in the general area of the existing fuel headers. The total cost to fully develop a dock in Larsen Bay, including uplands staging areas, fuel transfer facilities, and lighting would likely approach the cost of the Old Harbor dock.

A Shakmanof fixed-pier dock has an estimated construction cost of $4.9 million. If constructed after development of the Koniag's Shakmanof quarry, the cost to develop a ferry dock in Shakmanof would be lower than would otherwise be the case.

The cost to construct docks in areas not explicitly studied by PND, including the various Anton Larsen Bay marine terminal locations, are all estimated to be in the $5 million to $7 million range. These estimates do not include wave barriers or uplands development, which have highly site-specific costs.

Table 53: Dock Construction and Maintenance Cost Estimates

Description	Capital Cost	Annual Cost
Akhiok Fixed-Pier Dock	$6.6 million	$65,000
Akhiok RO/RO Dock	$6.4 million	$95,000
Karluk Fixed-Pier Dock	$13.8 million	$135,000
Larsen Bay Fixed-Pier Dock	$4.7 million	$50,000
Larsen Bay RO/RO Dock	$4.5 million	$65,000
Shakmanof Fixed-Pier Dock	$4.9 million	$50,000

Source: PND Engineers and McDowell Group.

PND's detailed roadway and dock construction documentation is provided in the appendices.

Dock construction or reconstruction projects in Ouzinkie and Old Harbor provide a good indication of the cost to build docks in the outlying communities of Kodiak Island. Planning is also underway for a new dock in Port Lions.

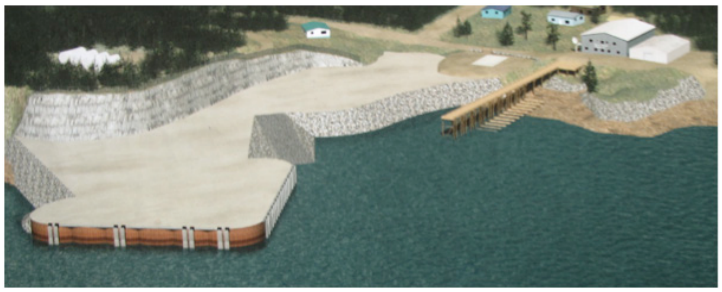
Old Harbor Dock: Reconstruction of the Old Harbor dock has a total budget of $8.1 million. This includes the cost of piping for fuel transfer, electricity and lighting. The new dock will be 56 feet wide and 102 feet long with three fenders along the dock face and three mooring dolphins connected to the dock by catwalks. The dock will be accessed by an 18-foot wide by 280-foot long pile supported trestle connected to shore by a 50 foot by 70-foot gravel abutment. Utilities include 600 linear feet of power line for general lighting and navigation lights, and 825 linear feet of fuel pipe and a fuel header to allow fuel barges to offload fuel to the fuel tank farm.[1]

Figure 23: Old Harbor Dock

[1] https://www.denali.gov, see project database.

Ouzinkie is replacing its old wooden dock with a rock and steel bulkhead facility that is slated to cost a total of $9.8 million. Phase I of that project was launched in 2010.

Figure 24: Conceptual Rendering of Ouzinkie's Dock



Port Lions Dock Replacement: Port Lions' deepwater dock is in a state of serious disrepair and in need of replacement. Engineering and design work for a replacement dock is underway. Several options were identified in a 2009 U.S. Army Corps of Engineers planning-level study.[2] Alternatives considered included:

- Steel pipe pile and concrete multipurpose dock with mooring and breasting dolphins, and an access trestle, with an estimated 2008 cost of $8.8 million. This dock would provide 9,400 square feet of dock space and a 100-foot mooring face.
- A modified diaphragm sheet pile dock with fenders for the M/V *Tustumena* and an armored gravel access causeway, with an estimated 2008 cost of $10 million
- A steel pipe pile and concrete deck trestle with mooring and breasting dolphins designed for the M/V *Tustumena* with an estimated 2008 cost of $6.4 million.

The Corps also estimated the cost to construct a concrete launch ramp located at the site of the existing launch ramp at approximately $540,000. The Corps estimates that engineering and project administration will add about 20 percent to all of this cost estimates.

The Corps is now engaged in a more detailed "preliminary design up to 20%" for a dock that will accommodate freight and fuel barges and the *Tustumena* via a trestle. This work will produce a more precise construction cost estimate.

Figure 25: Port Lions' Dock

[2] City Dock and Ferry Terminal Repairs Technical Report, Port Lions, Alaska October 2009.

Chapter 5: Marine Service Analysis Methodology

Improving transportation to the outlying communities of Kodiak Island is a challenging technical problem due to the severe wind and wave environment, the long distances between communities, and the limited infrastructure development at each port. In Chapter 6, a long list of possible transportation solutions, or concepts, is presented and described briefly in terms of service potential and costs. Then, each concept on the long list is evaluated against the goals of this study and its basic practicality. Only those concepts that are fully consistent with the goals of this study and are reasonably practicable are carried forward to a short list analysis, where each is subject to additional, more detailed study.

First, however, it is important to consider the factors that are relevant in developing marine transportation service solutions. With respect to vessels, critical factors include route characteristics, weather and sea keeping requirements.

Routes

To begin the investigation of marine transportation around Kodiak Island, vessel routes between communities were identified and approximate vessel courses placed on charts. The vessel routes were discussed with AMHS vessel captains and other local vessel operators. The captains made it clear that vessel courses are approximate and depend on size of vessel, tides, and weather. However, it was generally agreed that these courses are a good representation of how actual vessels would operate.

After the courses were laid down, route distances were calculated. Representative time between ports was calculated for two vessel speeds: 9 knots and 13.5 knots. These speeds were chosen to account for the effect of wind, waves, and current. It is important to note that times between ports in this table cannot be used as vessel sailing times because they do not contain time for maneuvering, mooring, or loading/unloading.

The route data have been organized into two general groups: a) a Round Island scenario based on a continuous counter-clockwise loop proceeding from one community to the next; and b) a Hub scenario in which individual community routes originate at a terminal hub near the city of Kodiak. Hub routes are "direct" routes between the hub and each community. The Hub group is further divided into three subgroups. The first Hub alternative uses the existing central Kodiak terminal as an origin point. The second and third Hub alternatives are each based on potential new terminals located at Anton Larsen Bay and Pasagshak Bay, with new or improved road access. An Anton Larsen Bay terminal would potentially serve northern routes, whereas the Pasagshak Bay terminal would potentially serve routes along the south coast of Kodiak Island.

An overview map and associated Route Length Summary table for the Round Island, Kodiak Direct, Anton Larsen Bay Direct and Pasagshak Bay Direct groups are given in the following figures. Additional supporting route information is provided in the appendices to this report.

Figure 26: Round-Island Route Overview

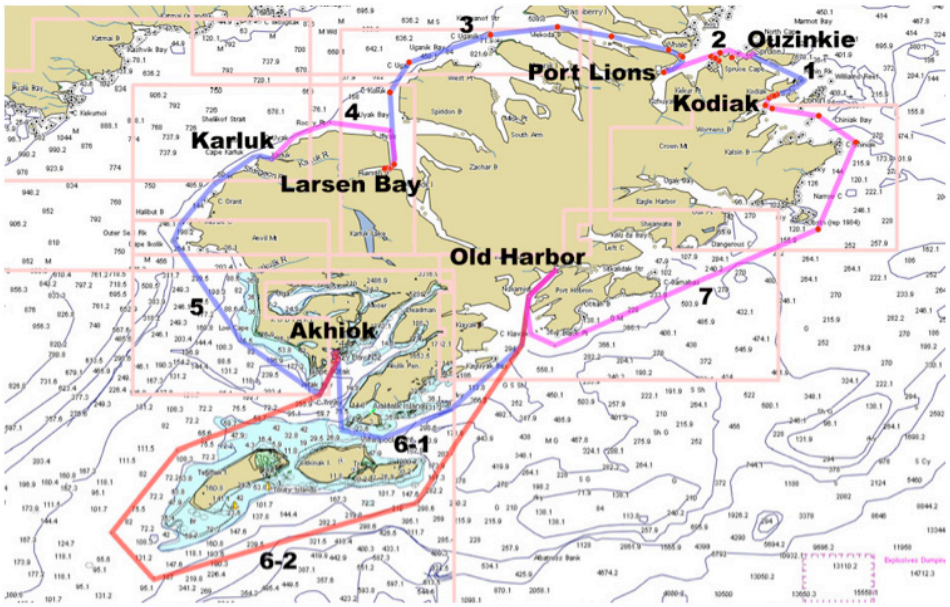


Table 54: Round-Island Route Length Summary

Routes	Distance (nm)	Time at 9 knots	Time at 13.5 knots
1. Kodiak to Ouzinkie	13.4	1:29	0:59
2. Ouzinkie to Port Lions	13.2	1:28	0:58
3. Port Lions to Larsen Bay	65.3	7:15	4:50
4. Larsen Bay to Karluk	27.8	3:05	2:03
5 Karluk to Akhiok	69.5	7:43	5:08
6-1. Akhiok to Old Harbor	64.9	7:12	4:48
6-2. Akhiok Outside Route to Old Harbor	151.0	16:46	11:11
7. Old Harbor to Kodiak	95.4	10:36	7:04

Required vessel speeds are greater than speeds indicated, due to the effects of wind, current and waves.

Figure 27: Kodiak Direct Route Overview

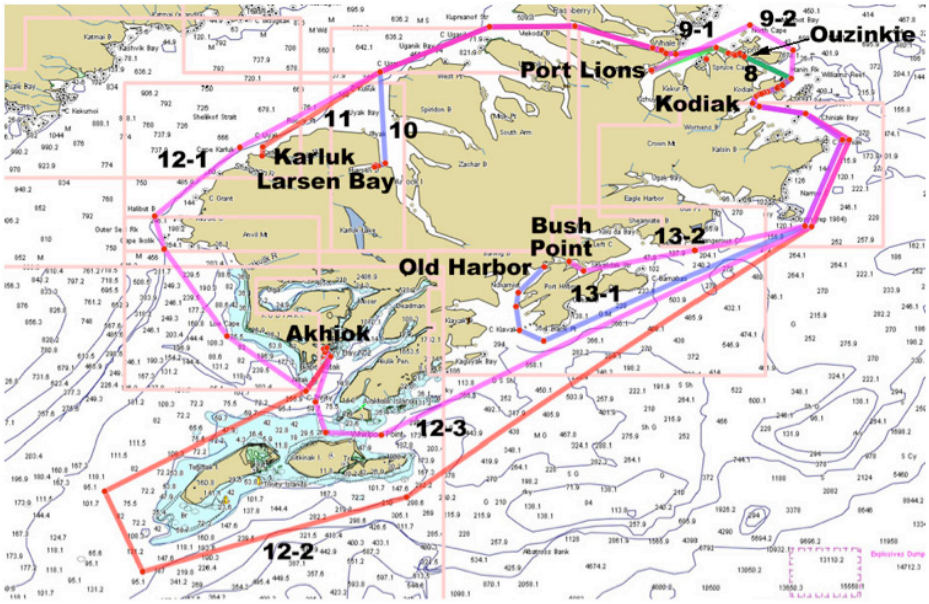


Table 55: Kodiak Direct Route Length Summary

Routes	Distance (nm)	Time at 9 knots	Time at 13.5 knots
8. Kodiak to Ouzinkie	13.4	1:29	0:59
9-1. Kodiak to Port Lions	26.5	2:56	1:57
9-2. Kodiak to Port Lions (around Spruce Island)	34.0	3:46	2:31
10. Kodiak to Larsen Bay	85.1	9:27	6:18
11. Kodiak to Karluk	88.3	9:48	6:32
12-1. Kodiak to Akhiok (North route)	159.0	17:40	11:46
12-2. Kodiak to Akhiok (South route via Tugidak Island)	214.0	23:46	15:51
12-3. Kodiak to Akhiok (South route via Sitkinak Strait)	134.0	14:53	9:55
13-1. Kodiak to Old Harbor	95.4	10:36	7:04
13-2. Kodiak to Old Harbor (Bush Point)	69.2	7:41	5:07

Required vessel speeds are greater than speeds indicated, due to the effects of wind, current and waves.

Figure 28: Pasagshak Bay Direct Route Overview

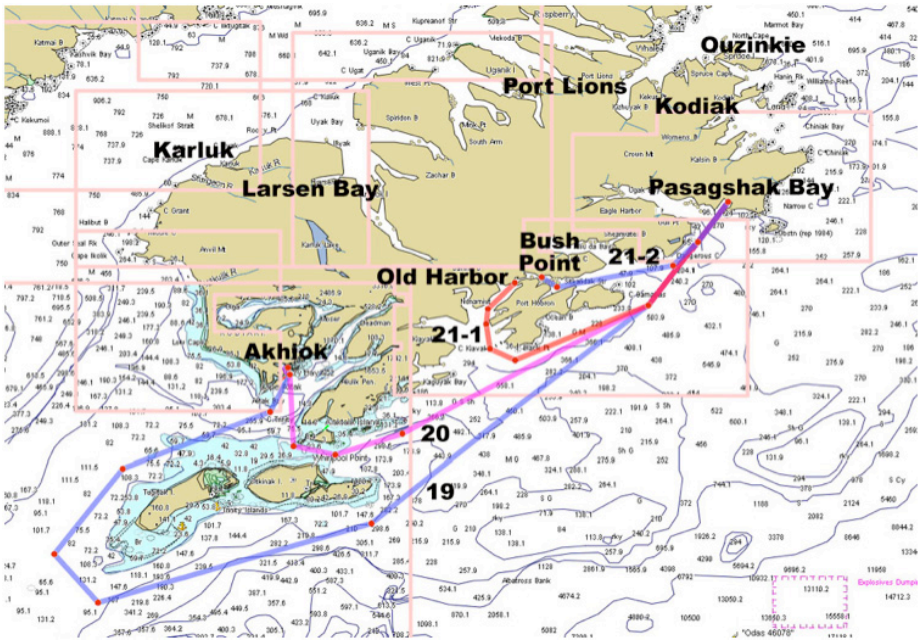


Table 56: Pasagshak Bay Direct Route Length Summary

Routes	Distance (nm)	Time at 9 knots	Time at 13.5 knots
19. Pasagshak Bay to Akhiok (via Tugidak Island)	178.0	19:46	13:11
20. Pasagshak Bay to Akhiok (via Sitkinak Str.)	93.8	10:25	6:56
21-1. Pasagshak Bay to Old Harbor	60.5	6:43	4:28
21-2. Pasagshak Bay to Old Harbor (Bush Point)	32.4	3:36	2:24

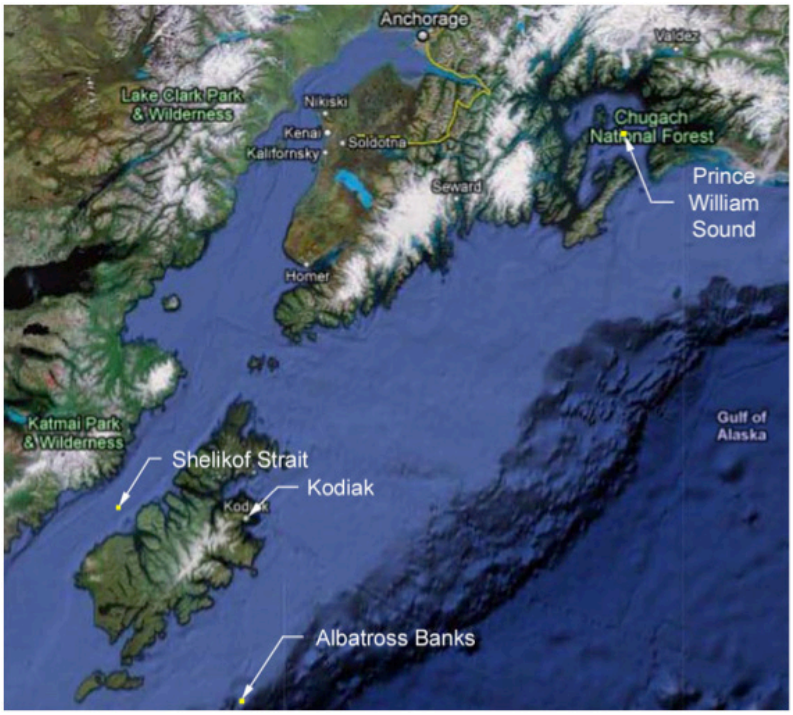
Required vessel speeds are greater than speeds indicated, due to the effects of wind, current and waves.

The route length information yielded some very important information. Distances between outlying communities and Kodiak vary greatly, but many routes are very long in terms of passenger ferry operation. Another finding is obvious: most Kodiak Island routes contain portions of full North Pacific Ocean exposure. The hub routes provide a substantial improvement in system efficiency by reducing route length and ocean exposure.

Weather

Kodiak weather is notoriously difficult from a vessel operations perspective. In their description of the Kodiak Airport weather station, the NOAA National Climate Data Center says, "Although the prevailing wind direction is northwesterly every month except May, June, and July, and the average speed is about 10 knots, these data may be misleading because of the extreme variability in both direction and speed. Maximum gusts of over 90 knots have been recorded. Coast Guard Cutters docked in Womens Bay have reported williwaw winds off Old Womens Mountain in excess of 120 knots. Gusts of over 50 knots have occurred during each month of the year, but are most likely to occur in the winter months."

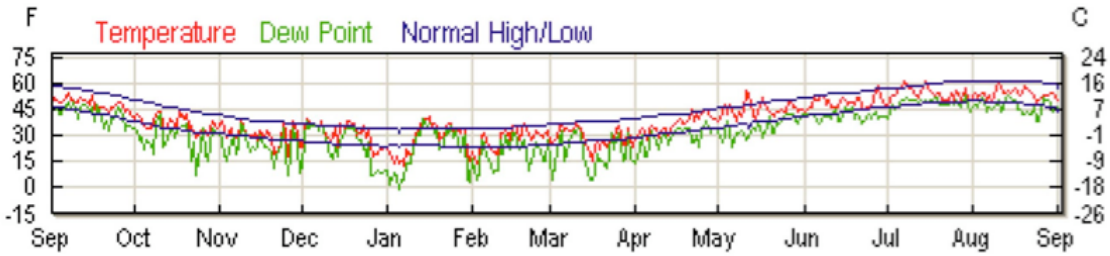
Figure 29: North Pacific/Gulf of Alaska Area Image



Kodiak is located southwest of Anchorage in the Gulf of Alaska, at latitude 57 degrees north. Good weather data is available from nearby airports and weather buoys. See Figure 29.

Kodiak ambient temperatures range from a summer average of about 55 degrees F. to a winter average of about 28 degrees F. Temperatures vary considerably according to marine weather patterns in the Gulf of Alaska and Bering Sea. Figure 30 shows typical annual temperatures for Kodiak airport. Any marine vessel working in the Kodiak vicinity year-round should be prepared to operate in a temperature range from 80 degrees F to 0 degrees F, with freezing spray.

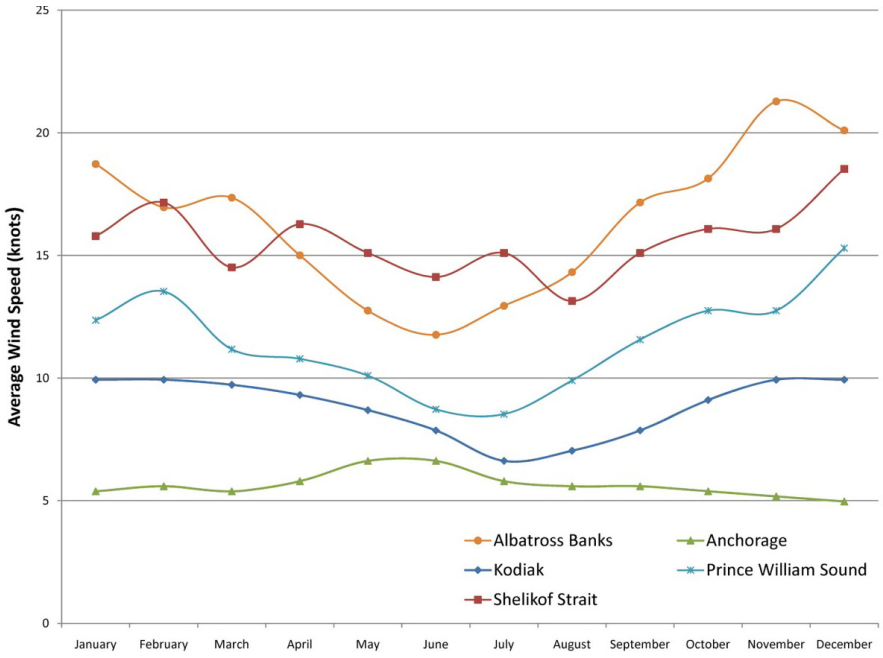
Figure 30: Kodiak Area Weather Indicators



Kodiak 2008_2009 air temperatures. (Weather Underground based on Kodiak airport readings.)

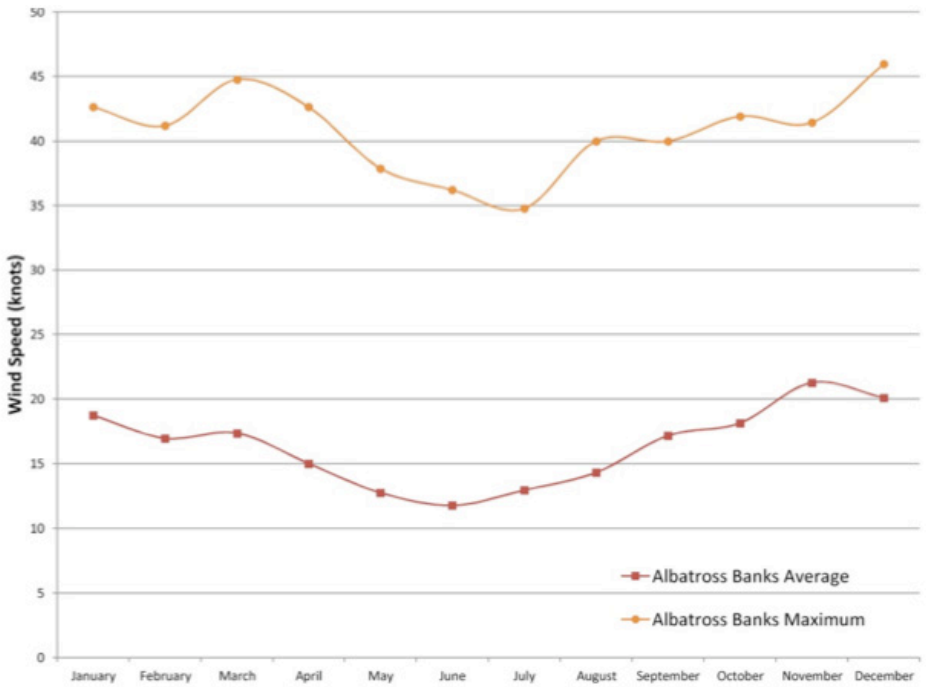
Kodiak wind speeds vary considerably according to location. Figure 31 indicates average winds in Kodiak and also in nearby waters. Figure 32 demonstrates the difference between an average wind speed reading and a maximum wind speed, which is greater than a factor of two. This means that a vessel working year-round near Kodiak Island would be subject to winds of 50 to 60 knots, and as noted previously, local weather phenomenon could realistically generate gusts greater than 60 knots.

Figure 31: Average Wind Speed, Various Locations, by Month



Source: National Data Buoy Center and Alaska Climate Research Center.

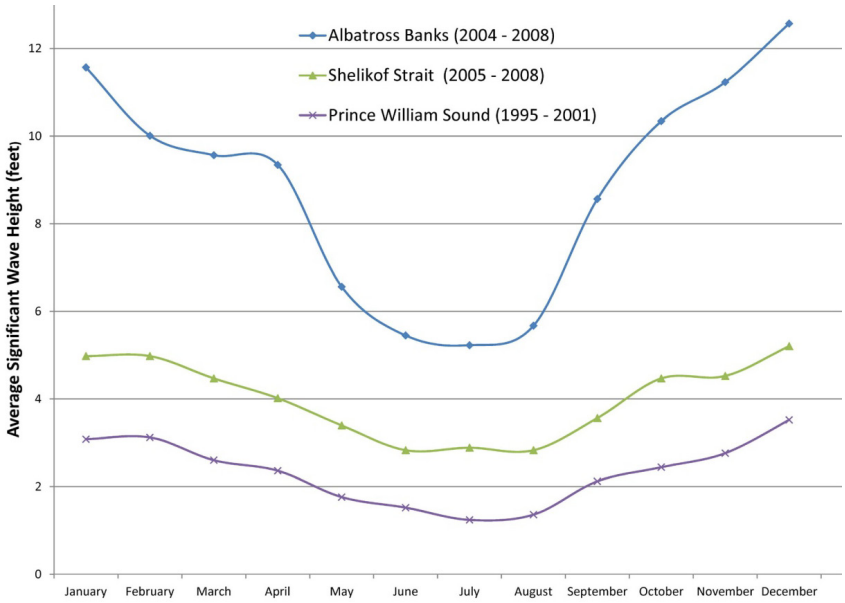
Figure 32: Albatross Banks Average and Maximum Wind Speed, by Month



Sea Keeping

As discussed in the route section, many of the vessel routes around Kodiak Island are exposed to long stretches of open water, strong currents, and ocean capes. This type of environment, coupled with high winds and cold temperatures can result in severe marine operating conditions. Sea keeping, the ability of a vessel to transit rough water safely and with minimal discomfort to passengers, is a substantial challenge for many Kodiak Island vessel routes.

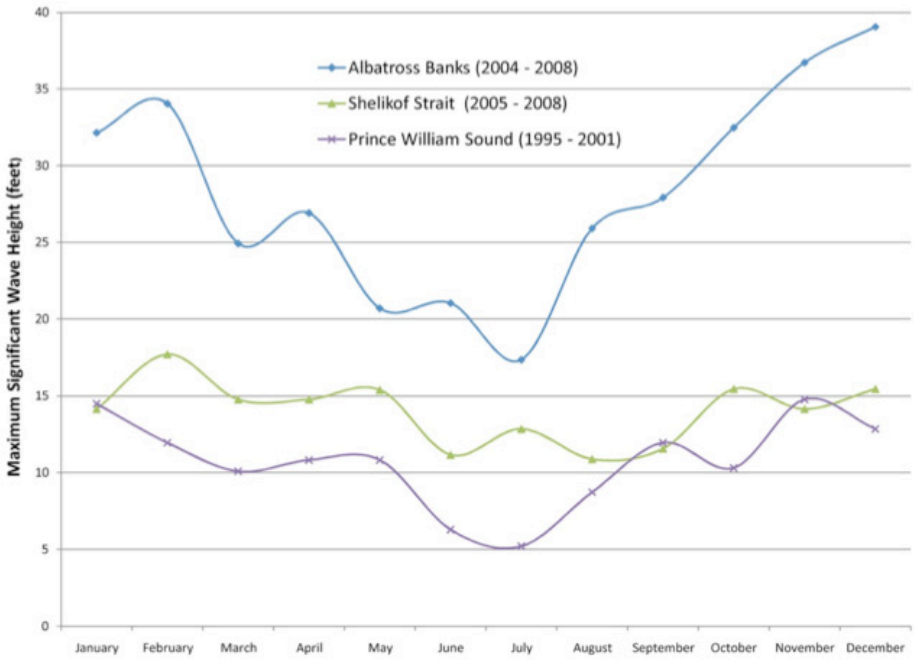
Figure 33: Average Significant Wave Heights, Shelikof Strait and Other Locations



A limited amount of historical wave data is available for Shelikof Strait and the west side of Kodiak Island (Albatross Banks). Since ocean waves consist of a random combination of wave trains, wave information is usually provided statistically. For example "Significant Wave Height" is a measure of the average height (from trough to crest) of the one-third highest waves. This is not the height of the largest wave seen during the measurement interval. If a sample of waves has a significant wave height of H_s of 12 ft, then 1 in 100 waves in that sample would be greater than 18.12 ft. Average significant wave heights for Shelikof Strait and Albatross Banks are shown in Figure 33. Prince William Sound wave data is included for comparison.

Data that averages significant wave height over a long period of time does not indicate wave heights from storm events. Figure 34 indicates maximum significant wave height for the same locations. The two graphs provided in this study do not address the numerous complexities associated with measuring waves and wave direction. However, they do give a good indication of the severity of winter wave environment around Kodiak Island. For operation on the southeast side of the island, winter significant wave height exceeds 30 feet, meaning some waves would be above 40 feet in height. For winter operation in Shelikof Strait, significant wave height exceeds 15 feet, with some waves being above 20 feet.

Figure 34: Maximum Significant Wave Heights, Shelikof Strait and Other Locations



The implications of this wave data on vessel sea keeping are complicated. Generally, the type of vessel is the first consideration of sea keeping. If a vessel is carrying only cargo and crew, it can be designed to have larger motions. If a vessel is carrying passengers, including children and elders, it must be designed to keep motions to a minimum. This difference is important. Vessel motions that are acceptable for a young crew of crab fishermen would cause acute sickness and injuries if allowed to occur on a typical passenger vessel.

Vessel size is another primary sea keeping indicator. Larger vessels generally provide much better sea keeping. For Kodiak Island routes, the size of a vessel will likely be based on sea keeping ability, rather than payload requirements, which will result in a payload much larger than is required.

The selection of vessel size for the long list of alternatives is based on the characteristics of existing successful vessels. For example, the *Tustumena* has many years of successful service around Kodiak Island. Later in the study, a more rigorous examination of vessel size and sea keeping is presented.

Chapter 6: Transportation Service Improvement Concept Preliminary Analysis

The process of identifying optimal solutions for enhancing transportation infrastructure on Kodiak Island – especially marine transportation infrastructure – began with identification of a variety of potential solutions. The "long-list" of potential solutions (characterized here as "concepts") were subject to a screening process, where concepts that appear to be impractical are set aside and concepts worthy of further consideration are carried forward for more detailed analysis. The long-list of transportation concepts included the following:

- Concept 1: Enhanced *Tustumena* Service
- Concept 2: Dedicated 24-Hour Ferry
- Concept 3: Dedicated Passenger/Cargo Vessel
- Concept 4: Dedicated "Day-Boat" Ferry
- Concept 5: Dedicated Landing Craft Ferry, Conventional Hull
- Concept 6: Dedicated Landing Craft Ferry, Catamaran
- Concept 7: Cargo-Only Landing Craft
- Concept 8: Tug and Barge or Other Cargo-Only Vessel Service
- Concept 9: Passenger Only Ferry
- Concept 10: Enhanced Airfreight Transportation Service

This long list of concepts, developed through input from stakeholders, community meetings, and by the study team, includes a broad number and variety of possible transportation improvements for Kodiak Island. This list of alternatives is intended to encompass a full range of potential transportation improvements, regardless of perceived likelihood of viability. Each concept summary includes a description of the vessel, proposed system service, concept advantages and disadvantaged, cost implications, and possible variations.

Concept 1: Enhanced *Tustumena* Service

Description: This concept includes passenger and vehicle ferry service to Kodiak Island communities through rescheduling of the M/V *Tustumena*. The *Tustumena* is the AMHS ferry dedicated to Gulf of Alaska service and has a vehicle elevator which allows it to service piers.

Figure 35: Rendering of the *Tustumena*

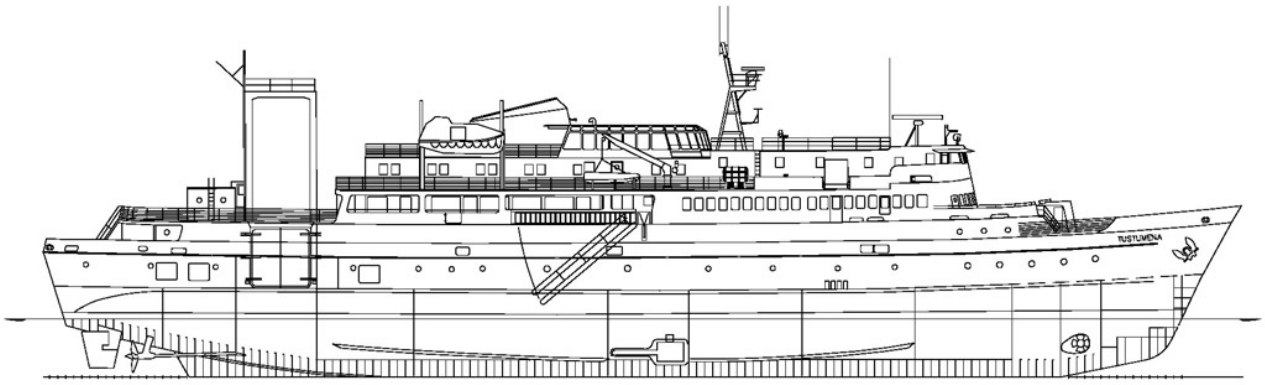


Table 57: Enhanced *Tustumena* Service System Components

Vessel			
Length	295 feet	**Speed**	13.8 knots
Passenger capacity	174	**Passenger cabins**	26 cabins
Crew capacity	37	**Crew cabins**	34 cabins
Cargo capacity	36 vehicles	**Cargo gear**	Vehicle elevator
Service			
Operation	24 hours per day with 2-3 visits per summer		
Ports of call	Kodiak, Port Lions, Ouzinkie, Old Harbor		
Infrastructure needs	Piers required at Larsen Bay, Akhiok, Karluk		
Sea keeping	Summer: Good, Winter: Acceptable		

Discussion: Among the outlying communities, only Port Lions is currently served by the *Tustumena.* Port Lions received 62 port calls in 2009. During the summer of 2011, the AMHS plans to increase the *Tustumena*'s number of Aleutian trips to twice per month, and supplement Homer- Kodiak service with the *Kennicott*.

Concept advantages: This concept is advantageous for residents of KIB because it would come at no cost to them, other than user fees (fares), as the *Tustumena* is a state-operated ferry. A dedicated ferry serving only Kodiak Island communities would come only at substantial capital and operating cost. Another advantage is the *Tustumena's* proven sea keeping capacity for the service area. Finally, with new dock construction at Old Harbor and Ouzinkie, the *Tustumena* would be capable of serving the three largest outlying communities.

Concept disadvantages: Requires redeployment/rescheduling of an already fully-utilized AMHS asset. Adding communities to the *Tustumena* itinerary would result in some decline in service frequency to communities

now being served by the *Tustumena* (or additional vessel resources be provided). This trade-off is usually resolved politically. Additional *Tustumena* service to Kodiak Island communities would likely be limited to several times per summer. In the absence of suitable dock facilities, the *Tustumena* cannot serve Larsen Bay, Akhiok, and Karluk.

Concept variations: Since the *Tustumena* is large enough to withstand ocean conditions, it could be used to provide service to outlying communities on the more exposed and demanding southern routes. This service could be provided in conjunction with a smaller day-boat service for the communities on the more sheltered northern side of the island. This plan would maximize the utilization of the *Tustumena's* capabilities and use a more cost efficient vessel for the communities with shorter and more sheltered marine routes.

The AMHS vessel *Kennicott* is also equipped with a vehicle elevator and could provide service from the mainland to Kodiak, while the *Tustumena* could focus primarily on Southwest service. The *Kennicott* is too large to dock at most of the outlying Kodiak Island communities.

Concept 2: Dedicated 24-Hour Ferry

Concept Description: This concept would provide a dedicated 24-hour/day passenger and vehicle ferry to service Kodiak Island communities with deepwater piers. This service would be similar to the *Tustumena*, but dedicated primarily to Kodiak Island. The vessel would include/require on-board overnight accommodations for passengers and crew. This ferry could operate on a round-island circuit basis (rather than hub and spoke basis).

Figure 36: Rendering of the 24-Hour Ferry

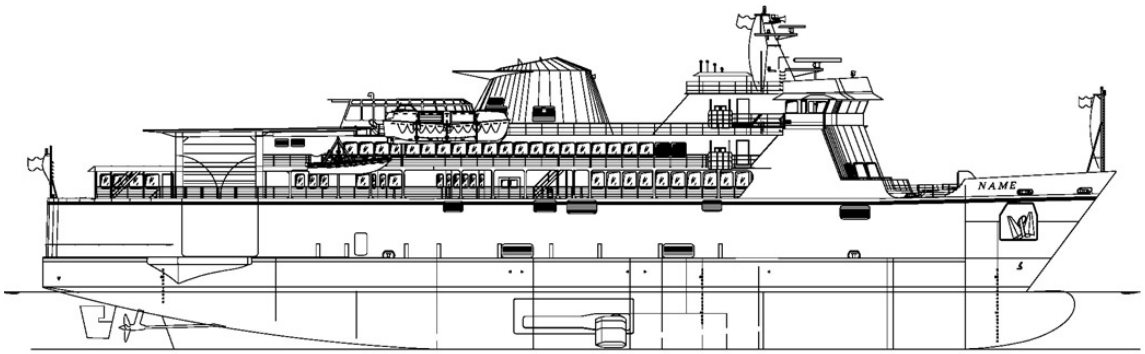


Table 58: Dedicated 24-Hour Ferry System Components

Vessel			
Length	195 feet	**Speed**	14.5 knots
Passenger capacity	174	**Passenger cabins**	26 cabins
Crew capacity	37	**Crew cabins**	34 cabins
Cargo capacity	36 vehicles	**Cargo gear**	Vehicle elevator
Service			
Operation	24 hours per day with 2-3 visits per summer		
Ports of call	Kodiak, Port Lions, Ouzinkie, Old Harbor		
Infrastructure needs	Piers required at Larsen Bay, Akhiok, Karluk		
Sea keeping	Summer: Good, Winter: Acceptable		

Cost: Construction of a new *Tustumena*-class vessel would cost over $100 million. Annual operating costs would be approximately $7 million.

Concept advantages: This alternative would provide frequent and reliable year-round ferry service to Kodiak Island communities. Similar to the *Tustumena*, this vessel would have good speed, sea keeping, and excess payload capacity. As a vessel crewed for 24–hour operations, this vessel could serve all communities (with suitable piers) on Kodiak Island. This type of service could generate some additional seasonal revenue from the non-resident visitor market. A service connection to Homer could enhance the economics of this concept.

Concept disadvantages: This service concept requires a very large capital investment for the vessel and is very expensive to operate. A large annual subsidy (approximately $6 million) would be required. Before this service could be provided to Larsen Bay, Akhiok, and Karluk, construction of deepwater piers would be required.

Variations: This transportation alternative could also serve Southwest Alaska. This variation would substantially improve transportation to both regions, but would not significantly change the magnitude of the required annual operating subsidy.

Concept 3: Dedicated Passenger/Cargo Vessel

Concept Description: This concept would provide a passenger-carrying cargo vessel for Kodiak Island. This system would provide 24-hour passenger and containerized cargo service to communities with deepwater piers.

Figure 37: Rendering of Passenger/Cargo Vessel

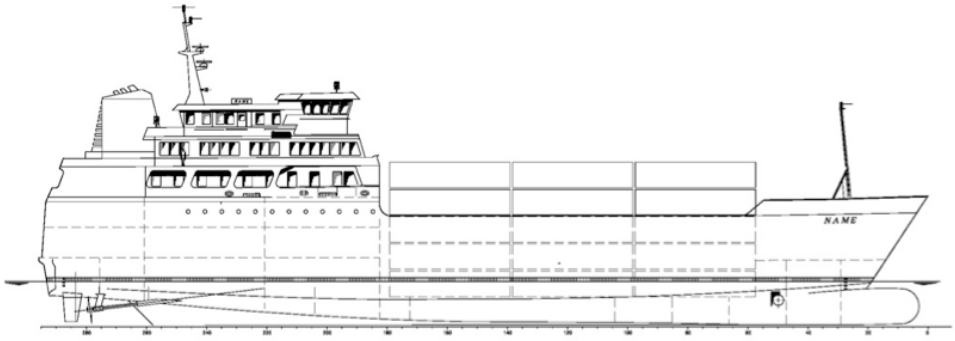


Table 59: Dedicated Passenger/Cargo Vessel System Components

Vessel			
Length	295 feet	**Speed**	14.5 knots
Passenger capacity	150	**Passenger cabins**	22 cabins
Crew capacity	35	**Crew cabins**	30 cabins
Cargo capacity	90 vehicles	**Cargo gear**	Open Hatch
Service			
Operation	24 hours per day with 2-3 visits per week		
Ports of call	Kodiak, Port Lions, Ouzinkie, Old Harbor		
Infrastructure needs	Piers required at Larsen Bay, Akhiok, Karluk		
Sea keeping	Summer: Good, Winter: Acceptable		

Discussion: This alternative would provide service similar to existing regional cargo vessels, but also provide passenger service. For efficiency purposes, a modern cargo vessel usually carries containers, instead of loose ("break-bulk") cargo. The vessel required for this service is a combination passenger cargo vessel. These vessels were commonplace in the past, however they are now rarely built due to the high level of regulatory complexity required to safely support both cargo and passenger missions. The resulting vessel cannot usually be employed in a cost effective manner and is much less efficient than a dedicated cargo or dedicated passenger vessel.

Cost: Construction of a new passenger-carrying cargo vessel would cost about $120 million. Annual operating costs would be approximately $7 million.

Concept advantages: This concept would provide regular, reliable year-round passenger and cargo transportation. Vehicles could be transported inside containers. The concept vessel has good speed, sea keeping, and excess payload capacity. As a vessel crewed for 24–hour operations, this vessel could serve all

communities on Kodiak Island. For communities without piers, this vessel could provide lightering service with small landing craft barges.

Concept disadvantages: This service concept requires a very large capital investment for the vessel and would require large operating subsidies.

Variations: The proposed vessel could also be employed in a transportation alternative that includes service out the Aleutian Chain and up the coast of Southwest Alaska. This service would be similar to the route of the old "North Star" cargo vessels. Expanding the range of the vessel would decrease the frequency of service to Kodiak Island communities but improve system revenue generation.

Concept 4: Dedicated "Day-Boat" Ferry

Description: This concept provides passenger and vehicle ferry service to Kodiak communities that are within one day's sailing from Kodiak. This concept would provide daily, or every other day, service on a 2 or 3 week schedule. A Kodiak Island day-boat ferry would have to alternately operate on the south side of the Kodiak Island, then reposition and operate on the north side of the Island.

Figure 38: Rendering of Day Boat Ferry

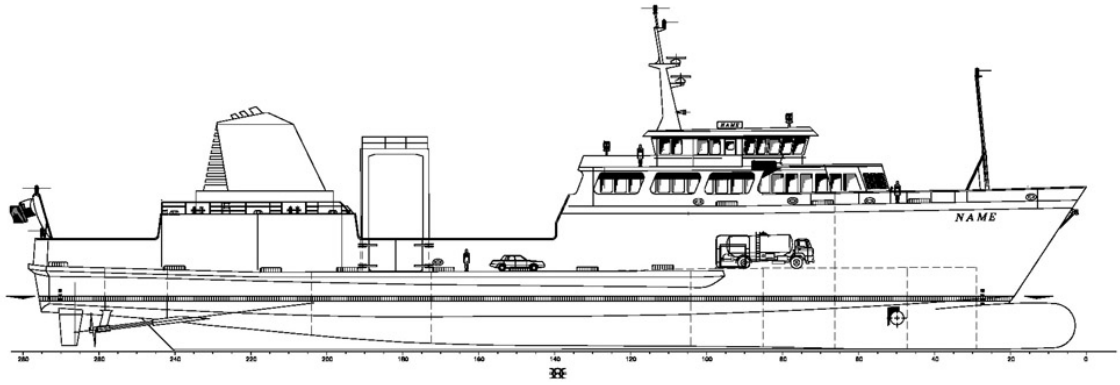


Table 60: Dedicated Day-Boat Ferry System Components

Vessel			
Length	263 feet	**Speed**	14.5 knots
Passenger capacity	150	**Passenger cabins**	0 cabins
Crew capacity	7	**Crew cabins**	4 cabins
Cargo capacity	28 vehicles	**Cargo gear**	Vehicle Elevator
Service			
Operation	12 hours per day, 1 town per day		
Ports of call	Kodiak, Port Lions, Ouzinkie, Old Harbor		
Infrastructure needs	Piers required at Larsen Bay, Akhiok, Karluk		
Sea keeping	Summer: Good, Winter: Acceptable		

Discussion: This service concept takes advantage of USCG manning regulations (for passenger vessels that operate less than 12 hours per day) to greatly reduce crew size. Because crew members are not on a two-watch system and not living on the vessel, additional crew positions such as cooks and stewards are eliminated and crew and passenger accommodations are not needed. The challenge of a day-boat is to find routes that can be serviced in less than 12 hours.

Since day-boats do not require accommodations they are less expensive than overnight ferries. In the case of a Kodiak Island day-boat, vessel length would need to be increased for sea keeping, but the cost of this increase could be mitigated by using an open or partially open car deck.

Cost: Construction of a new day-boat ferry would cost about $50 million. Annual operating costs would be approximately $3 million.

Concept advantages: The benefits of a day-boat are greatly reduced operating costs and service is provided only during daytime hours (when people usually prefer to travel.) A day-boat can be smaller than a 24-hour ferry, allowing for slightly more appropriate sizing relative the market demand. Vessel construction costs are significantly lower than the cost of a larger 24-hour vessel.

Concept disadvantages: Since distances between Kodiak Island communities are large, the challenge is finding routes that are acceptable for day-boat service. The Route study indicates there are three possible day-boat routes: 1) Kodiak – Old Harbor, 2) Kodiak – Port Lions/Ouzinkie, 3) Kodiak – Larsen Bay/Karluk. Akhiok might be reached on a calm day with minimum current. Until improvements can be made to reduce route distances, operation to Old Harbor (and perhaps Larsen Bay) will require the vessel and crew to overnight at the outlying port. Normally, a day-boat returns its crew to the original sailing port and the vessel is moored overnight at an unattended, floating, dock which provides vessel support services. It may require special dispensation from the USCG to allow the crew to live aboard a day-boat at night and then provide 12-hour passenger service the next day.

Concept Variations: Since route lengths are at the maximum allowed for one-way travel, roadway improvements and new terminal construction are required to deliver the optimum day-boat benefits. A road connection between Karluk and Larsen Bay, a road east from Old Harbor to a new terminal location, and terminals at Anton Larsen, Pasagshak all have important implications for day-boat scheduling and frequency of service.

The improvement with the largest benefit would be a floating terminal at Anton-Larsen Bay. A terminal in this location would reduce the distance to all north side communities, increase sailing frequency, eliminate ocean exposure, and provide for overnight mooring. New floating terminals at the east side of Old Harbor and at Pasagshak would also improve this concept.

A marine terminal to the east of Old Harbor and one located at Pasagshak would significantly reduce route length and reduce ocean exposure. These terminals would allow for very efficient day-boat operation to Old Harbor. However, terminal and road costs are high and there is concern that a road to Bush Point may impact subsistence fishing.

Concept 5: Dedicated Landing Craft Ferry, Conventional Hull

Concept Description: This concept would provide passenger vehicle ferry service to Kodiak Island communities using a conventional (slow speed) landing craft ferry.

Figure 39: Rendering of Landing Craft with Conventional Hull

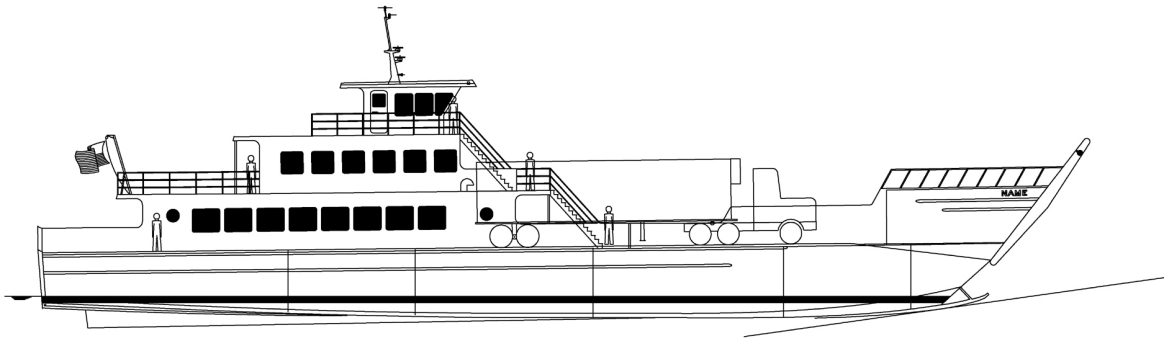


Table 61: Dedicated Landing Craft, Conventional Hull System Components

Vessel			
Length	150 feet	**Speed**	9.5 knots
Passenger capacity	150	**Passenger cabins**	0 cabins
Crew capacity	5	**Crew cabins**	4 cabins
Cargo capacity	14 vehicles	**Cargo gear**	Forward Ramp
Service			
Operation	12 hours per day, 1-2 per week		
Ports of call	Kodiak, Port Lions, Ouzinkie, Old Harbor, Larsen Bay, Karluk, Akhiok (limited)		
Sea keeping	Summer: Acceptable, Winter: Marginal		

Discussion: While versatile, a conventional landing craft is slow and not a good sea keeping vessel, even at 150 feet in length. It is not possible to get to Akhiok in a 12-hour operational day with this vessel.

Cost: Construction of a new conventional style landing craft would cost about $15 million. Annual operating costs would be approximately $2 million.

Concept advantages: A conventional style landing craft can provide service to all Kodiak Island communities, including those without piers. The vessel requires very minimal investment in dock/landing facilities. This concept involves relatively low vessel acquisition costs. The vessel could also generate revenue by providing one-time or occasional service to other areas of Kodiak Island (resource development camps, lodges, fish processing facilities, etc.)

Concept disadvantages: Poor sea keeping characteristics result in comparatively unreliable service schedule and passenger discomfort while underway. This vessel provides very versatile service though at the cost of long, rough trips. It will be difficult to control this vessel on the beach in wind and current and bow loading will require vehicles to back down the beach and go up the ramp in reverse. This type of service may not be attractive to visitors or economical for time-sensitive cargo.

Concept Variations: It may be possible to have the crew live aboard this vessel so it can overnight at any port, but still provide day-boat (12 hour) service with passengers. It may also be possible to have the vessel run to Akhiok (in excess of 12 hours) if it were only carrying cargo. A variation of freight-only landing craft service would be subsidizing private landing craft operators to provide scheduled service, through a competitive contracting arrangement.

Concept 6: Dedicated Landing Craft Ferry, Catamaran

Description: This alternative provides passenger vehicle ferry service to Kodiak Island communities using a catamaran (medium speed) landing craft ferry. This alternative is similar to the conventional landing craft, except it uses a twin hull vessel to increase vessel speed to 15 knots.

Figure 40: Rendering of Landing Craft Ferry, Catamaran

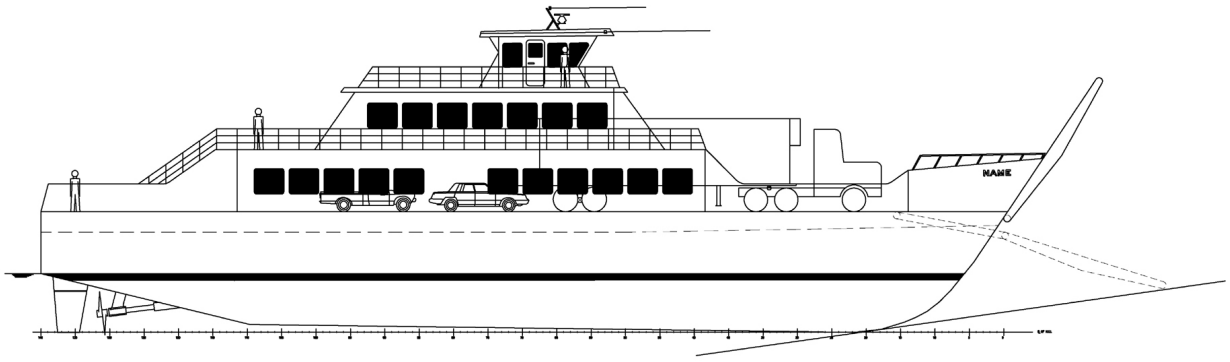


Table 62: Dedicated Landing Craft Ferry Catamaran System Components

Vessel			
Length	140 feet	**Speed**	14.5 knots
Passenger capacity	150	**Passenger cabins**	0 cabins
Crew capacity	5	**Crew cabins**	4 cabins
Cargo capacity	14 vehicles	**Cargo gear**	Forward Ramp
Service			
Operation	12 hours per day, 2-3 per week		
Ports of call	Kodiak, Port Lions, Ouzinkie, Old Harbor, Larsen Bay, Karluk, Akhiok (limited)		
Sea keeping	Summer: Good, Winter: Poor		

Cost: Construction of a new catamaran style landing craft would cost about $25 million. Annual operating costs would be approximately $3 million.

Concept advantages: A catamaran style landing craft can provide service to all Kodiak Island communities, including those without piers. The vessel's faster speed (15 knots) would allow day-boat service to all ports except Akhiok.

Concept disadvantages: The tall height of a catamaran makes beach landing more difficult and the vessel will need to slow substantially when waves begin hitting the wet deck. It will be difficult to control this vessel on the beach in wind and current. It has an extremely wide bow area, which will not fit on conventional boat ramps. Bow loading will require vehicles to back down the beach and go up the ramp in reverse. This vessel will not be reliable in the winter as sea keeping limitations will force trip cancelations.

Variations: It may be possible to have the crew live aboard this vessel so it can overnight at any port, but still provide day-boat (12 hour) service with passengers. One-way trips to Akhiok might be possible in reasonably calm seas with minimal current.

Discussion: This vessel has some major draw backs due to the height of the main deck above the water. The main deck needs to be as high as possible to facilitate clearance between the water and the underside of the hull connecting structure (wetdeck), because catamaran speed and sea keeping ability deteriorate rapidly once water hits the wetdeck. But beach landing operations require the main deck to be as low as possible to the water so that ramp lengths are minimal and ramp angles do not cause vehicles to bottom out. In Kodiak waters, sea keeping requirements will drive the wetdeck of a catamaran up too high to be a viable landing craft. There is an experimental vessel that attempts to resolve this trade-off using a large movable wetdeck and hydraulic lifting systems, but this type of vessel is very expensive to build and has not yet been proven in service. Therefore the catamaran landing craft is not a recommended concept.

Concept 7: Cargo-Only Landing Craft

Description: This concept consists of a conventional landing craft cargo vessel that provides cargo service (no passengers) to Kodiak Island communities. This concept is similar to several existing marine cargo operations around Kodiak Island and Southcentral Alaska.

Figure 41: Rendering of Cargo-Only Landing Craft

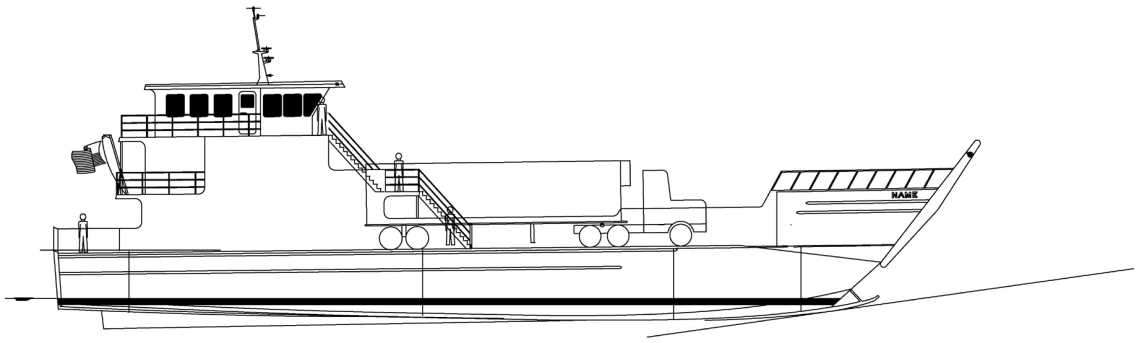


Table 63: Cargo-Only Landing Craft System Components

Vessel			
Length	130 feet	**Speed**	9.5 knots
Passenger capacity	0	**Passenger cabins**	0 cabins
Crew capacity	5	**Crew cabins**	4 cabins
Cargo capacity	14 containers	**Cargo gear**	Forward Ramp
Service			
Operation	24 hours per day, 2-3 per month		
Ports of call	Kodiak, Port Lions, Ouzinkie, Old Harbor, Larsen Bay, Karluk, Akhiok		
Sea keeping	Summer: Good, Winter: Marginal		

Cost: Construction of a new cargo-only landing craft would cost about $12 million. Annual operating costs would be approximately $1 million.

Concept advantages: This is a low cost concept with the same advantages of other landing craft options, including the capacity to serve communities without piers. This alternative would provide more reliable freight service than is now provided by the private sector. To the extent that service could be subsidized, the communities might enjoy lower freight costs.

Concept disadvantages: While costs to the outlying communities might be lower (if the service is subsidized) the total cost of moving freight would not be substantially different assuming a publicly funded freight service could not be as efficient as a private sector effort. This concept would be contentious as the vessel would be in direct competition with private sector operators. Because of this, public funding would be difficult to obtain. Finally, this concept fails to meet a key purpose and need for ferry service to outlying communities, passenger transportation.

Concept 8: Tug and Barge or Other Cargo-Only Vessel Service

Description: This concept includes using a tug and barge or some other type of cargo vessel to provide cargo service to Kodiak Island communities.

Figure 42: Rendering of Tug and Barge Service

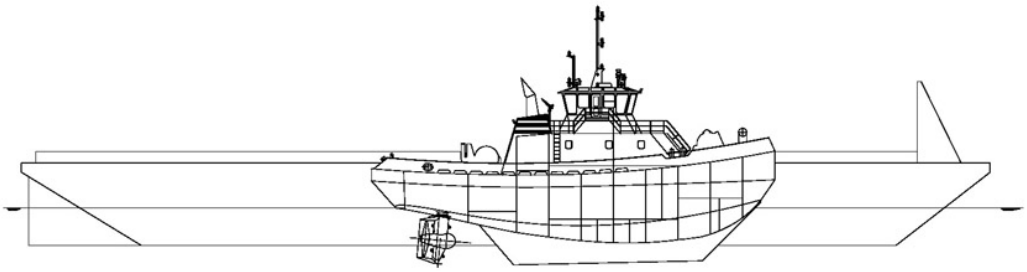
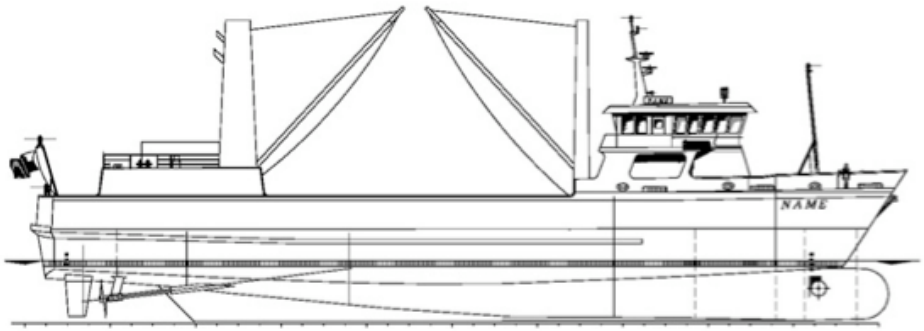


Figure 43: Rendering of Alternative Freight-Only Concept



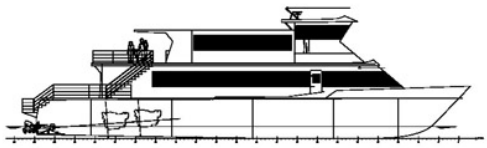
Discussion: This concept is similar to several existing marine cargo operations around Kodiak Island and Southcentral Alaska. Since it would be dedicated to Kodiak Island, service frequency and reliability would increase. This alternative would provide more reliable freight service than is now available but at a much higher overall cost (due to low cargo volumes and the inefficiencies of public operation). This concept would

be in direct competition with private sector freight carriers. Public funding would be difficult to obtain. This concept also fails to meet a key purpose for ferry service to outlying communities, passenger transportation

Concept 9: Passenger-Only Ferry

Description: This concept includes providing passenger-only service to communities around Kodiak Island. This alternative would use a high-speed vessel to carry passengers on day-boat routes. Very limited freight would be carried. This concept does not provide needed vehicle or cargo service.

Figure 44: Conceptual Rendering of Passenger Ferry



Discussion: The high speed (30 knots) of the vessel would greatly reduce transit times, but the vessel's small size would make it impossible to operate in even moderate sea states. If vessel size were greatly increased to improve for sea keeping, fuel costs would rise sharply. This type and size of vessel would see frequent weather-related trip cancelations and would not be able to provide service during the winter and shoulder seasons. It would compete with existing air taxi operators, which currently provide a high level of service. Because a passenger-only ferry could not carry vehicles and other heavy freight, it fails to satisfy a key purpose and need for ferry service to outlying communities.

Concept 10: Enhanced Airfreight Transportation Service

Description: This concept involves expanding the facilities and services necessary to support delivery of fuel and larger freight items by air. This could include runway expansions and contracted (subsidized) scheduled or on-demand airfreight service. This concept does not include provisions to enhance passenger service.

A variety of aircraft are used to fly freight in Alaska, ranging from small single engine aircraft to jets. Aircraft capable of hauling large volumes of fuel or heavy freight have runway requirements that often preclude their use in many small communities. Runway length is a constraining factor for Kodiak Island's outlying communities. The runways of the six communities vary in length from 2,000 feet to 3,300 feet.

Table 64: Selected Aircraft Employed in Alaska's Airfreight Transportation Sector

Aircraft	Average Payload (lbs)	Minimum Runway Length (ft)
DC-6*	28,000	3,500
L382 Hercules*	48,000	3,900
C-46*	12,000	3,500
DHC-8-100	7,500	3,200
DC-3	7,500	2,600
Britten-Norman Islander	3,000	1,115
EMB 120	7,000	4,500
Beech 1900	7,150	3,000
Cessna Caravan	2,800	2,500
DC-9	32,000	5,900
737-200	30,000	5,000

*Lynden Air Cargo can carry 6,400 gallons of fuel on its C130 Hercules aircraft. Everts Air Fuel can carry 5,000 gallons on a DC-6 tanker and 2,000 gallons on a C-46. Other aircraft can carry fuel in barrels.

While it may be technically possible to extend runways to suitable lengths, the basic economics of flying fuel and heavy freight to communities that have marine access preclude any serious consideration of flying fuel into the outlying communities of Kodiak Island. In fact, elsewhere in rural Alaska, fuel is flown in only in emergency situations where no other option is available (truck or barge). Costs vary with volume and distance to destination, but flying can easily add five dollars to the cost of a gallon of fuel, significantly more than any marine or other service option.

Figure 45: Everts Air Cargo DC – 6

The cost to transport heavy airfreight in general is high relative to land or marine transport. For example, to transport a vehicle from Anchorage to Dillingham (roughly the same distance as Anchorage to Kodiak) Everts Air Cargo charges approximately $225 per foot for vehicles up to 18 feet and $3,600 for a 16-foot vehicle, plus fuel surcharges (17%) and Federal Transportation tax (6.25%). Ace Air Cargo, which flies Raytheon Beech 1900C aircraft and serves communities throughout Alaska from its Anchorage hub, charges about 65 cents a pound for shipment from Anchorage to Kodiak. Everts rates for airfreight from Anchorage to

Dillingham (for example) range from 60 cents per pound to 70 cents per pound. These rates are for regularly scheduled service. Charter rates are higher.

Kodiak Island is fortunate to have the Britten-Norman Islander aircraft as part of the fleet of aircraft that serves the outlying communities. These versatile twin-engine aircraft have good freight hauling capacity. As of 2010, airfreight rates ranged from 44 cents per pound for Kodiak/Port Lions and Kodiak/Ouzinkie service, up to 83 cents per pound for Kodiak/Akhiok service. (Island Air's published rates also included 65 cents per pound for Kodiak/Old Harbor and Kodiak/Larsen Bay service, and 79 cents per pound for Kodiak/Karluk service.)

Chapter 7: Detailed Analysis of Select Transportation Improvement Concepts

Introduction

In the previous chapter, this study examined a wide variety of transportation concepts for improvement of transportation on Kodiak Island. After considering challenges related to severe environment, long distances, and limited infrastructure, three ferry concepts were selected for further study: 1) enhanced *Tustumena* service, 2) day-boat ferry, and 3) conventional landing craft ferry.

This chapter provides a brief discussion of additional *Tustumena* service. The new concept ferry systems are examined more closely. Each new vessel concept will be examined with regard to its ability to meet system requirements such as payload, speed, and sea keeping. Analysis of each system included generating possible operating schedules so that total annual service can be compared. After comparison of possible ferry system schedules, the capital cost for each vessel and the operational cost for each concept ferry system were calculated.

In Chapter 3, it was indicated that the revenue generation potential of a Kodiak Island Ferry System is very limited, even when compared to other small Alaska ferry systems. This means any Kodiak Island ferry system will require an operational subsidy. Because of the difficulty of obtaining this subsidy, it is imperative that any Kodiak Island System be designed to operate with a minimum of operational funds. Thus, the primary focus of system design must be on minimizing operational cost.

Enhanced *Tustumena* Service

Enhanced service by the AMHS ferry M/V *Tustumena* is an option for improving ferry service to Kodiak Island. The vessel has proven successful over the course of almost 50 years of service to Kodiak Island and will be the benchmark for any future ferry service. Since the *Tustumena* is operated by the State of Alaska, it operates at essentially no cost to Kodiak Island (other than fares paid by travelers). From a Kodiak Island economic benefit perspective, the *Tustumena* would be dedicated to Kodiak to the greatest extent possible.

However, additional *Tustumena* service would not be easy to obtain because the vessel is already fully scheduled. To add service to a new Kodiak port means decreased service elsewhere. This effect can be somewhat mitigated by deploying AMHS's second ocean-going vessel, the *Kennicott*. For example, during the summer of 2011, the AMHS will be providing two trips out the Aleutian Chain per month. In this case, the *Kennicott* is helping provide some of the service to Kodiak that is lost to provide the Aleutian Chain trips. The *Kennicott* is limited in this role because it is too large to get into many of the smaller Kodiak Island ports.

The *Tustumena* and the *Kennicott* are very valuable marine transportation assets. It is extremely costly and difficult to provide USCG approved ocean-going passenger and vehicle service to unimproved ports, so *Tustumena* and *Kennicott* ferry service is important and very difficult to replace. The scheduling of the *Tustumena* and *Kennicott* is a complicated matter, because the AMHS is under pressure to keep operating

costs at a minimum, something that is difficult on long ocean routes which are not great revenue generators. Any requests for additional *Tustumena* service should be made with an emphasis on efficiency.

The *Tustumena*'s effectiveness could be enhanced by the addition of a new Kodiak Island Ferry System. If a small regional system could handle the majority of ferry service around Kodiak Island, the *Tustumena* could be freed-up to provide more main land, Kodiak and Aleutian Chain service. The goal of this concept would be to provide more service to the smaller communities using a much less costly ferry, saving *Tustumena* service for the long ocean routes (including perhaps Old Harbor service) where it is most capable. This division of service allows each vessel and ferry system to operate at higher efficiencies. From a long-term perspective, a small regional Kodiak ferry might even be viewed as beneficial to the AMHS, if such a system would increase regional service and not greatly increase operating subsidies.

New Vessel Configuration

The configuration of any new Kodiak Island ferry vessel needs to be optimized for safety and least cost. Both of the vessels brought forward for additional study are day-boats, meaning ferries that operate for less than 12 hours daily with one crew. In this case, vessel configuration is fairly simple because there are no passenger staterooms, galleys, bars, or cafeterias.

Since USCG manning requirements require a crew member for each passenger deck, these vessels have been arranged for only one main passenger deck, in addition to the main car deck. Since this space will be above the 15'-6" car deck, it will need to be serviced by a small elevator. Main passenger space will consist of theater and booth seating, restroom facilities, and food services by vending machine/microwave oven.

A small amount of crew accommodations are planned for each vessel. These accommodations are intended to serve as sleeping quarters for the crew when the vessel is secured for the night at out ports, not as a system for having two crews aboard the vessel. Crew food service is not planned for a normal 8, 10, or 12 hour work day. In the case of overnights at out ports, food service would need to be catered with items that can be warmed without a galley. There is no plan for the day-boats to have cooks, stewards, or pursers. Any night watch will occur in the wheelhouse.

The proposed vessels share many characteristics; however they differ greatly in vehicle handling methods. The landing craft would land on beaches with minimal improvements (such as a boat launch ramp) and cars and people would move off the vessel using the forward ramp. The day-boat would moor at piers and use a vehicle elevator, similar to the *Tustumena* to unload, although floating docks would allow much faster turnaround. The versatility of a landing craft is offset by the challenges posed by beach landing: ramp angles frequently exceed regulation, vehicle traffic must back down the ramp in one direction, and controlling a large vessel on the beach can be very difficult in wind or current and as cargo load varies.

Vessel Size

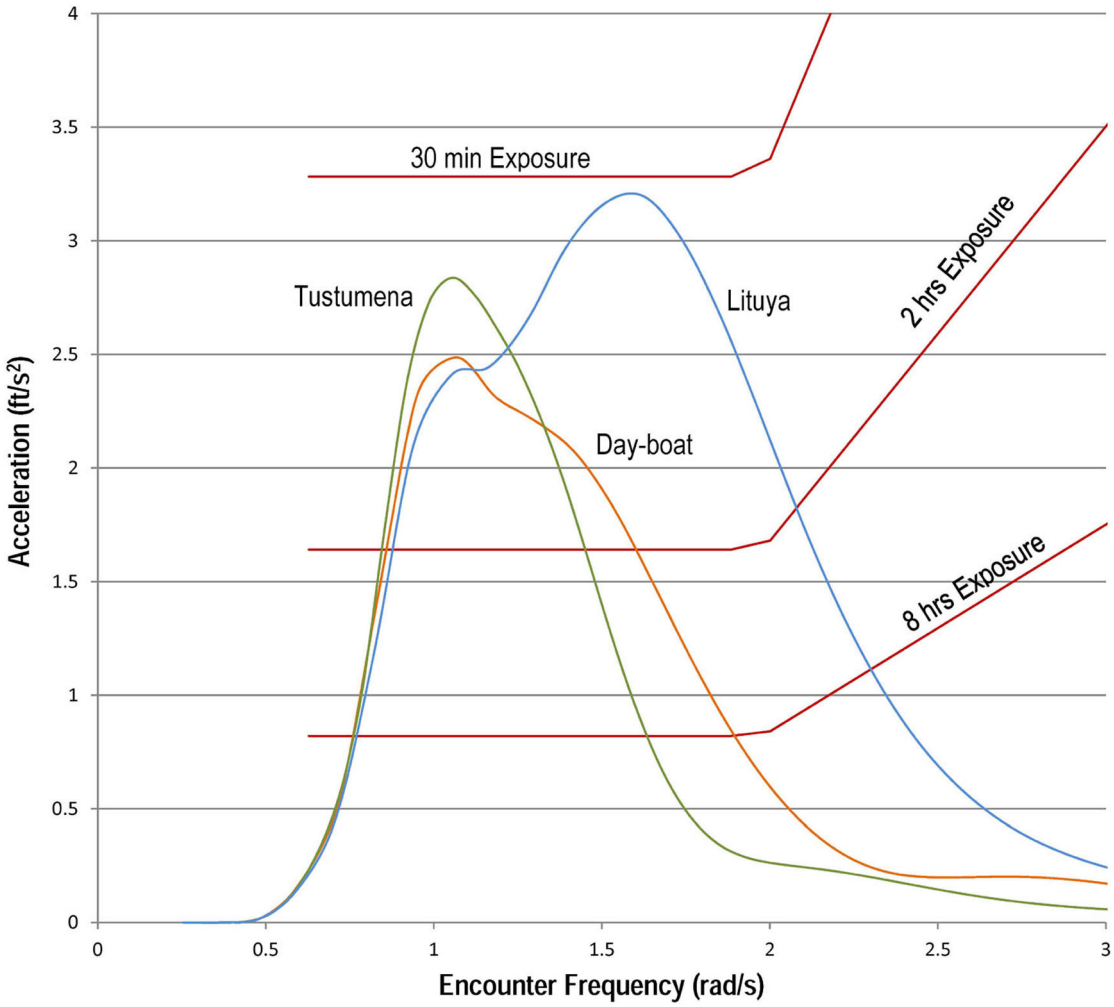
Usually, the size of a ferry vessel is determined by the expected payload of passengers and vehicles. Since Kodiak Island ferry payloads would be small, a least-cost ferry designed for this system would be relatively short in length, for example less than 100 feet long. However, this type of vessel design solution is not

acceptable for Kodiak Island, because the resulting vessel would be too small to meet the sea keeping requirements of year-round Kodiak Island service.

Previously, the severity of Kodiak Island weather was discussed. This type of marine environment is not just an inconvenience; but is a serious threat to vessel survivability. One of the first missions of a Kodiak Island ferry must be the ability to survive a typical storm and be able to seek shelter safely. Secondly, passenger comfort must be within reasonable and safe limits. The amount of vessel motion and time of exposure that causes sea sickness is reasonably well defined. However, there are often public misconceptions about this topic due to the widespread familiarity with televised commercial fishing programs. These programs depict vessel crew members subject to extreme vessel accelerations and wave force. This type of sea keeping is unrealistic for a public ferry system. If even half of the motions depicted on those programs were allowed to occur in a passenger vessel, there would be very serious sickness and passenger injury. A Kodiak Island ferry must be designed to safely transport children and elders on a year-round basis.

Because sea keeping and vessel motions in a large seaway are extremely complicated, it is difficult to exactly determine the correct length of a Kodiak Island ferry. A detailed sea keeping analysis of multiple vessels is beyond the scope of this report. However, due to almost 50 years of successful service, the sea keeping ability of the *Tustumena* is a very good benchmark from which to compare possible Kodiak Island vessels. Using a relatively simple form of sea keeping software, it is possible to compare ship motions for different vessels that are on a single heading, at the same speed, in a similar wave environment. Three vessels were analyzed: the 295-foot *Tustumena*, the 263-foot day-boat ferry, and the 180-foot ferry *Lituya*. Assuming a wave field similar to a large storm (10.66 foot significant wave height, 0.7 second period, JONSWAP sea spectrum) calculations were made for crew/passenger motion sickness incidence and are shown in Figure 46.

Figure 46: Ship Motions for Different Vessels



Compared to the *Tustumena*, the graph of motion sickness incidence indicates that the day-boat has a similar, but moderate increase in the chance of severe discomfort. When the *Tustumena* is compared to the much smaller *Lituya*, the analysis indicates a significantly larger chance of severe discomfort with the smaller vessel. Another measure of motion sickness was calculated called "subjective magnitude." On a scale of moderate to intolerable, the *Tustumena* and the day-boat were rated "serious" and the *Lituya* was rated "severe: necessary to hang on". This study did not attempt to model other measures of severe vessel motions such as bow slamming or propeller emergence. However it is likely that these measures would also be much worse for the smaller vessel.

It is reasonable to conclude that a vessel in the size range of the day-boat (265 ft) or the *Tustumena* (292 ft) is required to provide a prudent level of sea keeping ability, at 13.5 knots, for a year-round Kodiak Island ferry. If a Kodiak Island ferry were intended to operate only on the north side of the island, its size could be reduced.

A similar sea keeping analysis was conducted on the landing craft but was not conclusive, because the vessel operates at significantly slower speed (9 knots) and has a shape that necessitates additional bow slamming and propeller emergence analysis. For planning purposes, it is prudent to continue to assume that a Kodiak

Island landing craft ferry will need to be around 150 feet in length, based on existing successful landing crafts operating in the Gulf of Alaska. Further analysis of all sea keeping issues is warranted during any future stage of vessel or system design.

Vessel Capital Cost

Acquiring a Kodiak Island ferry will most likely require new construction, because it is very unlikely that a vessel suitable for the specific mission of Kodiak ferry service will exist on the used vessel market. Cargo and fishing vessels generally cannot be converted to passenger vessels because passenger vessels require specific watertight subdivision.

Using the size and characteristics of the Kodiak Island concept ferries, a price to construct each vessel can be estimated. For this study, a new vessel construction price analysis was undertaken using a proprietary vessel construction cost model. This model uses vessel size, volume of spaces, type of spaces, propulsion horsepower, electrical power, and list of specialized equipment as input. Then this model uses typical construction costs per unit to calculate construction cost. The results of this analysis and the projected construction cost of each vessel are shown below.

Table 65: Vessel Capital Costs

Vessel Capital Costs

	Kodiak Island Ferry	Kodiak Island Passenger / Cargo Vessel	Day-boat	Landing Craft Ferry (Conventional)	Landing Craft Ferry (Catamaran)	Cargo Landing Craft
A) Hull Structure (Below M Dk)	16,793,145	15,578,583	11,969,990	3,100,893	7,263,373	2,501,308
B) Superstructure (Above M Dk)						
1 Superstructure	6,549,777	7,131,158	2,802,962	1,275,743	1,287,480	422,432
2 Enclosed car deck	7,386,332	8,012,817	2,135,319			
C) Accommodation Outfit						
1 Low density Spaces	3,206,995	5,550,243	4,239,477	1,511,730	1,263,476	823,500
2 High density Spaces	31,179,715	32,664,804	4,043,398	5,044,197	5,606,356	1,647,652
3 Car Deck	6,324,933	3,873,989	1,775,479	729,502	729,502	
D) Machinery						
1 Engines, propulsion, etc	8,214,450	12,321,674	4,978,454	2,489,227	4,978,454	2,489,227
2 Elevator / Crane	8,000,000	8,000,000	6,000,000	1,000,000	1,500,000	1,500,000
3 Electrical	7,223,532	14,447,063	3,224,791	2,149,861	2,149,861	1,289,916
Subtotal	**94,878,878**	**107,580,331**	**41,169,870**	**17,301,152**	**24,778,502**	**10,674,036**
E) Eng./ Testing/ Delivery Cost	9,013,493	10,220,131	3,911,138	1,643,609	2,353,958	1,014,033
Total Vessel Capital Cost ($)	**103,900,000**	**117,800,000**	**45,100,000**	**18,900,000**	**27,100,000**	**11,700,000**

VESSEL SPEED AND SCHEDULES

In a traditional ferry system, the speed of each vessel can be optimized for primary routes. In the case of a Kodiak Island ferry, distances are large and there would be no incentive to pay for the fuel consumed to provide extra speed. The approach used on the Kodiak Island vessels was to establish maximum efficient vessel speed, commonly called "hull speed", then determine the maximum service that could be provided. Given that the two hull types in consideration are taken from variations of existing vessels, speed can be reliably predicted. A speed of about 14.5 knots is possible for the day-boat and a speed of 9.5 for the conventional landing craft. Scheduled speeds are slightly lower, 13.5 and 9 knots respectively, to account for the effects of wind, waves, and current.

WEEKLY MANNING PLANS

With speed known, schedules for a landing craft and day-boat alternative can be determined. This process is extremely complicated for Kodiak Island because the system requires a least cost approach. This means that the schedules have to reflect only one crew operating the vessel. Many different schemes can be concocted for scheduling crews, but the bottom line is that a full-time employee cannot work much more than 40 hours per week on a consistent basis. Since the USCG has a 12-hour limit on the time a crew can work, this results in three possible weekly manning schedules:

1. 5 days working 8 hours per day, followed by 2 days off = 40 hour work week
2. 4 days working 10 hours per day, followed by 3 days off = 40 hour work week
3. 7 days working 12 hour days, followed by 7 days off = 84 hour work week.

SERVICE WEEKS PER YEAR

If it is assumed that the crew requires six weeks of vacation and the vessel requires four weeks of overhaul, two of which can coincide with crew vacation, it is possible to determine the number of weeks of total service each manning system can provide.

1. 40 hour work week = 55 –8 = 44 weeks service
2. 84 hour work week = 26 – 4 = 22 weeks service.

Note that using an 84 hour work week results in a week-on week-off service, which cuts in half the number of weeks of vessel service.

POSSIBLE WEEKLY SCHEDULES:

Using vessel schedule speed and the route information in the appendices, weekly vessel schedules were created. Each schedule used a ½ hour loading time and a ½ hour unloading time and included 0.5 nautical mile reduced speed (for maneuvering) at each port. There are an almost unlimited number of weekly schedules that could be created for Kodiak Island. Based on the premise of maximum efficiency, many schedules were generated and abandoned, if the schedule did not efficiently use one week of crew service. After much iteration, the following schedules are provided for possible Kodiak Island ferry service.

Table 66: Landing Craft Weekly Schedules

Landing Craft: Weekly Schedules

Sample Week	Home Port	Hours per week	Weekly schedule Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
A Kodiak-Ouzinkie	Kodiak	40 (4 - 10's)		Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar KOD 16:12	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar KOD 16:12	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar KOD 16:12	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar KOD 16:12		
	Vessel Hrs/day *Ports Served*			*9.20* *2 Ports*	*9.20* *2 Ports*	*9.20* *2 Ports*	*9.20* *2 Ports*		
			Ports Served *Calls Per Port*	*OUZ* *4.00*	*PRL* *4.00*	*LRB* *0.00*	*OHR* *0.00*	*KAR* *0.00*	*AKH* *0.00*
B Kodiak-Larsen Bay	Kodiak	84	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20	Dp KOD 8:00 Ar LRB 17:33	Dp LRB 8:00 Ar KOD 17:33	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20	Dp KOD 8:00 Ar LRB 17:33	Dp LRB 8:00 Ar KOD 17:33
	Vessel Hrs/day *Ports Served*		*10.33* *3 Ports*	*10.55* *1/2 Port*	*10.55* *1/2 Port*	*10.33* *3 Ports*	*10.33* *3 Ports*	*10.55* *1/2 Port*	*10.55* *1/2 Port*
			Ports Served *Calls Per Port*	*OUZ* *6.00*	*PRL* *3.00*	*LRB* *2.00*	*OHR* *0.00*	*KAR* *0.00*	*AKH* *0.00*
C Kodiak-Old Harbor	Kodiak	84	Dp KOD 8:00 Ar OHR 18:42	Dp OHR 8:00 Ar KOD 18:42	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20	Dp KOD 8:00 Ar OHR 18:42	Dp OHR 8:00 Ar KOD 18:42	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20
	Vessel Hrs/day *Ports Served*		*11.70* *1/2 Port*	*11.70* *1/2 Port*	*10.33* *3 Ports*	*10.33* *3 Ports*	*11.70* *1/2 Port*	*11.70* *1/2 Port*	*10.33* *3 Ports*
			Ports Served *Calls Per Port*	*OUZ* *6.00*	*PRL* *3.00*	*LRB* *0.00*	*OHR* *2.00*	*KAR* *0.00*	*AKH* *0.00*

Landing Craft: Weekly Schedules

Sample Week	Home Port	Hours per week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
D[1] Kodiak - Akhiok	Kodiak	84 (1)	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20	Dp KOD 8:00 Ar OHR 18:42	Dp OHR 8:00 Ar AKH 15:19	Dp AKH 8;00 Ar OHR 15:19	Dp OHR 8:00 Ar KOD 18:42	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20	Dp KOD 8:00 Ar OUZ 9:36 DP OUZ 10:36 Ar PRL 12:10 Dp PRL 13:10 Ar OUZ 14:44 DP OUZ 15:44 Ar KOD 17:20
	Vessel Hrs/day		*10.33*	*11.70*	*8.32*	*8.32*	*11.70*	*10.33*	*10.33*
	Ports Served		*3 Ports*		*1/2 Ports*	*1/2 Ports*		*3 Ports*	*3 Ports*
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*6.00*	*3.00*	*0.00*	*0.00*	*0.00*	*1.00*
E Anton Larsen Bay-Ouzinkie	Anton Larsen Bay	40 (5 - 8's)		Dp ANT 8:00 Ar OUZ 8:52 Dp OUZ 9:52 Ar PRL 11:26 Dp PRL 12:26 Ar ANT 13:27	Dp ANT 8:00 Ar OUZ 8:52 Dp OUZ 9:52 Ar PRL 11:26 Dp PRL 12:26 Ar ANT 13:27	Dp ANT 8:00 Ar OUZ 8:52 Dp OUZ 9:52 Ar PRL 11:26 Dp PRL 12:26 Ar ANT 13:27	Dp ANT 8:00 Ar OUZ 8:52 Dp OUZ 9:52 Ar PRL 11:26 Dp PRL 12:26 Ar ANT 13:27	Dp ANT 8:00 Ar OUZ 8:52 Dp OUZ 9:52 Ar PRL 11:26 Dp PRL 12:26 Ar ANT 13:27	
	Vessel Hrs/day			*6.45*	*6.45*	*6.45*	*6.45*	*6.45*	
	Ports Served			*2 Ports*	*2 Ports*	*2 Ports*	*2 Ports*	*2 Ports*	
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*5.00*	*5.00*	*0.00*	*0.00*	*0.00*	*0.00*
F Anton Larsen - Larsen	Anton Larsen Bay	40 (4 - 10's)		Dp ANT 8:00 Ar LRB 15:34	Dp LRB 8:00 Ar ANT 15:34	Dp ANT 8:00 Ar LRB 15:34	Dp LRB 8:00 Ar ANT 15:34		
	Vessel Hrs/day			*8.57*	*8.57*	*8.57*	*8.57*		
	Ports Served			*1/2 Port*	*1/2 Port*	*1/2 Port*	*1/2 Port*		
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*0.00*	*0.00*	*2.00*	*0.00*	*0.00*	*0.00*
G Pasagshak - Old Harbor	Pasagshak Bay	40 (4 - 10's)		Dp PAS 8:00 Ar OHR 14:49	Dp OHR 8:00 Ar PAS 14:49	Dp PAS 8:00 Ar OHR 14:49	Dp OHR 8:00 Ar PAS 14:49		
	Vessel Hrs/day			*7.82*	*7.82*	*7.82*	*7.82*		
	Ports Served			*1/2 Port*	*1/2 Port*	*1/2 Port*	*1/2 Port*		
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*0.00*	*0.00*	*0.00*	*2.00*	*0.00*	*0.00*
H[2] Kodiak - Akhiok	Kodiak	40		Dp KOD 8:00 Ar AHK 22:49	Dp AHK 8:00 Ar KOD 22:49				
	Vessel Hrs/day			*15.98*	*15.98*				
	Ports Served			*1/2 Port*	*1/2 Port*				
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*

Landing Craft: Weekly Schedules

Sample Week	Home Port	Hours per week	Weekly schedule						
			Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
I Anton Larsen - Ouzinkie	Anton Larsen Bay	84	Dp ANT 8:00	Dp ANT 8:00	Dp ANT 8:00	Dp ANT 8:00	Dp ANT 8:00	Dp ANT 8:00	Dp ANT 8:00
			Ar OUZ 8:52	Ar PRL 9:01	Ar OUZ 8:52	Ar PRL 9:01	Ar OUZ 8:52	Ar PRL 9:01	Ar OUZ 8:52
			Dp OUZ 9:52	Dp PRL 10:01	Dp OUZ 9:52	Dp PRL 10:01	Dp OUZ 9:52	Dp PRL 10:01	Dp OUZ 9:52
			Ar ANT 10:44	Ar ANT 11:02	Ar ANT 10:44	Ar ANT 11:02	Ar ANT 10:44	Ar ANT 11:02	Ar ANT 10:44
			Dp ANT 11:44	Dp ANT 12:02	Dp ANT 11:44	Dp ANT 12:02	Dp ANT 11:44	Dp ANT 12:02	Dp ANT 11:44
			Ar PRL 12:45	Ar OUZ 12:54	Ar PRL 12:45	Ar OUZ 12:54	Ar PRL 12:45	Ar OUZ 12:54	Ar PRL 12:45
			Dp PRL 13:45	Dp OUZ 13:54	Dp PRL 13:45	Dp OUZ 13:54	Dp PRL 13:45	Dp OUZ 13:54	Dp PRL 13:45
			Ar ANT 14:46	Ar ANT 14:46	Ar ANT 14:46	Ar ANT 14:46	Ar ANT 14:46	Ar ANT 14:46	Ar ANT 14:46
			Dp ANT 15:46	Dp ANT 15:46	Dp ANT 15:46	Dp ANT 15:46	Dp ANT 15:46	Dp ANT 15:46	Dp ANT 15:46
			Ar OUZ 16:38	Ar PRL 16:47	Ar OUZ 16:38	Ar PRL 16:47	Ar OUZ 16:38	Ar PRL 16:47	Ar OUZ 16:38
			Dp OUZ 17:38	Dp PRL 17:47	Dp OUZ 17:38	Dp PRL 17:47	Dp OUZ 17:38	Dp PRL 17:47	Dp OUZ 17:38
			Ar ANT 18:30	Ar ANT 18:48	Ar ANT 18:30	Ar ANT 18:48	Ar ANT 18:30	Ar ANT 18:48	Ar ANT 18:30
	Vessel Hrs/day		*11.50*	*11.80*	*11.50*	*11.80*	*11.50*	*11.80*	*11.50*
	Ports Served		*3 Ports*	*3 Ports*	*3 Ports*	*3 Ports*	*3 Ports*	*3 Ports*	*3 Ports*
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*11.00*	*10.00*	*0.00*	*0.00*	*0.00*	*0.00*

1) Stop in Old Harbor is an overnight only. Vessel is not considered to be unloaded. Old Harbor is considered to have no port calls in this schedule
2) Schedule H requires significant overtime and may require an additional crew memeber. For a 40 hour week equivalent, only one trip to Akhiok can be completed. This schedule is for cargo only.

Table 67: Day Boat Weekly Schedules

Day-boat: Weekly Schedules

Sample Week	Home Port	Hours per week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
A Kodiak-Larsen Bay	Kodiak	40 (5 - 8's)		Dp KOD 8:00 Ar LRB 14:22	Dp LRB 8:00 Ar KOD 14:22	Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	Dp KOD 8:00 Ar LRB 14:22	Dp LRB 8:00 Ar KOD 14:22	
	Vessel Hrs/day *Ports Served*			*7.37* *1/2 port*	*7.37* *1/2 port*	*7.10* *2 ports*	*7.37* *1/2 port*	*7.37* *1/2 port*	
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*1.00*	*1.00*	*2.00*	*0.00*	*0.00*	*0.00*
B Kodiak - Old Harbor	Kodiak	40 (5 - 8's)		Dp KOD 8:00 Ar OHR 15:07	Dp OHR 8:00 Ar KOD 15:07	Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	Dp KOD 8:00 Ar OHR 15:07	Dp OHR 8:00 Ar KOD 15:07	
	Vessel Hrs/day *Ports Served*			*8.12* *1/2 port*	*8.12* *1/2 port*	*7.10* *2 ports*	*8.12* *1/2 port*	*8.12* *1/2 port*	
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*1.00*	*1.00*	*0.00*	*2.00*	*0.00*	*0.00*
C Kodiak - Ouzinkie	Kodiak	40 (5 - 8's)		Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	
	Vessel Hrs/day *Ports Served*			*7.10* *2 ports*	*7.10* *2 ports*	*7.10* *2 ports*	*7.10* *2 ports*	*7.10* *2 ports*	
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*5.00*	*5.00*	*0.00*	*0.00*	*0.00*	*0.00*
D Kodiak - Ahiok	Kodiak	40 (4 - 10's)		Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06	Dp KOD 8:00 Ar AKH 17:59	Dp AKH 8:00 Ar KOD 17:59	Dp KOD 8:00 Ar OUZ 9:03 DP OUZ 10:03 Ar PRL 11:05 Dp PRL 12:05 Ar KOD 14:06		
	Vessel Hrs/day *Ports Served*			*7.10* *2 ports*	*10.98* *1/2 port*	*10.98* *1/2 port*	*7.10* *2 ports*		
			Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
			Calls Per Port	*2.00*	*2.00*	*0.00*	*0.00*	*0.00*	*1.00*

Day-boat: Weekly Schedules

Sample Week		Home Port	Hours per week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
E	Anton Larsen Bay - Larsen Bay	Anton Larsen Bay	40 (5 - 8's)		Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16	Dp ANT 8:00 Ar LRB 13:02	Dp ALRB 8:00 Ar Ant 13:02	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16	
		Vessel Hrs/day			*5.27*	*6.03*	*6.03*	*5.27*	*5.27*	
		Ports Served			*2 ports*	*1/2 port*	*1/2 port*	*2 ports*	*2 ports*	
				Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
				Calls Per Port	*3.00*	*3.00*	*1.00*	*0.00*	*0.00*	*0.00*
F	Anton Larsen Bay - Ouzinkie	Anton Larsen Bay	40 (4 - 10's)		Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar ANT 10:08 Dp ANT 11:08 Ar PRL 11:48 Dp PRL 12:48 Ar ANT 13:28 Dp ANT 14:28 Ar OUZ 15:02 Dp OUZ 16:02 Ar ANT 16:36	Dp ANT 8:00 Ar PLR 8:40 Dp PLR 9:40 Ar ANT 10:20 Dp ANT 11:20 Ar OUZ 11:54 Dp OUZ 12:54 Ar ANT 13:28 Dp ANT 14:28 Ar PLR 15:08 Dp PLR 16:08 Ar ANT 16:48	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar ANT 10:08 Dp ANT 11:08 Ar PRL 11:48 Dp PRL 12:48 Ar ANT 13:28 Dp ANT 14:28 Ar OUZ 15:02 Dp OUZ 16:02 Ar ANT 16:36	Dp ANT 8:00 Ar PLR 8:40 Dp PLR 9:40 Ar ANT 10:20 Dp ANT 11:20 Ar OUZ 11:54 Dp OUZ 12:54 Ar ANT 13:28 Dp ANT 14:28 Ar PLR 15:08 Dp PLR 16:08 Ar ANT 16:48		
		Vessel Hrs/day			*9.60*	*9.80*	*9.60*	*9.80*		
		Ports Served			*3 Ports*	*3 Ports*	*3 Ports*	*3 Ports*		
				Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
				Calls Per Port	*6.00*	*6.00*	*0.00*	*0.00*	*0.00*	*0.00*
G	West Island	Anton Larsen Bay	84	Dp ANT 8:00 Ar LRB 13:02 Dp LRB 14:02 Ar ANT 19:04	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16 Dp ANT 13:16 Ar OUZ 13:50 Dp OUZ 14:50 Ar PRL 15:52 Dp PRL 16:52 Ar ANT 17:32	Dp ANT 8:00 Ar LRB 13:02 Dp LRB 14:02 Ar ANT 19:04	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16 Dp ANT 13:16 Ar OUZ 13:50 Dp OUZ 14:50 Ar PRL 15:52 Dp PRL 16:52 Ar ANT 17:32	Dp ANT 8:00 Ar LRB 13:02 Dp LRB 14:02 Ar ANT 19:04	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16 Dp ANT 13:16 Ar OUZ 13:50 Dp OUZ 14:50 Ar PRL 15:52 Dp PRL 16:52 Ar ANT 17:32	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16 Dp ANT 13:16 Ar OUZ 13:50 Dp OUZ 14:50 Ar PRL 15:52 Dp PRL 16:52 Ar ANT 17:32
		Vessel Hrs/day		*12.07*	*10.53*	*12.07*	*10.53*	*12.07*	*10.53*	*10.53*
		Ports Served		*1 port*	*4 ports*	*1 port*	*4 ports*	*1 port*	*4 ports*	*4 ports*
				Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
				Calls Per Port	*8.00*	*8.00*	*3.00*	*0.00*	*0.00*	*0.00*

Day-boat: Weekly Schedules

Sample Week		Home Port	Hours per week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				Weekly schedule						
H	Pasagshak Bay - Old Harbor	Pasagshak Bay	84	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06
		Vessel Hrs/day		*11.10*	*11.10*	*11.10*	*11.10*	*11.10*	*11.10*	*11.10*
		Ports Served		*1 port*	*1 port*	*1 port*	*1 port*	*1 port*	*1 port*	*1 port*
				Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
				Calls Per Port	*0.00*	*0.00*	*0.00*	*7.00*	*0.00*	*0.00*
I	Kodiak - Akhiok	Kodiak	84		Dp KOD 8:00 Ar AKH 17:59	Dp AKH 8:00 Ar KOD 17:59	Dp KOD 8:00 Ar AKH 17:59	Dp AKH 8:00 Ar KOD 17:59	Dp KOD 8:00 Ar AKH 17:59	Dp AKH 8:00 Ar KOD 17:59
		Vessel Hrs/day			*10.98*	*10.98*	*10.98*	*10.98*	*10.98*	*10.98*
		Ports Served			*1/2 ports*	*1/2 ports*	*1/2 ports*	*1/2 ports*	*1/2 ports*	*1/2 ports*
				Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
				Calls Per Port	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*3.00*
J	Anton - Akhiok	Anton Larsen Bay	84	Dp ANT 8:00 Ar LRB 13:02 Dp LRB 14:02 Ar ANT 19:04	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16 Dp ANT 13:16 Ar OUZ 13:50 Dp OUZ 14:50 Ar PRL 15:52 Dp PRL 16:52 Ar ANT 17:32	Dp ANT 8:00 Ar LRB 13:02 Dp LRB 14:02 Ar ANT 19:04	Dp ANT 8:00 Ar OUZ 8:34 Dp OUZ 9:34 Ar PRL 10:36 Dp PRL 11:36 Ar ANT 12:16 Dp ANT 13:16 Ar OUZ 13:50 Dp OUZ 14:50 Ar PRL 15:52 Dp PRL 16:52 Ar ANT 17:32	Dp ANT 8:00 Ar LRB 13:02 Dp LRB 14:02 Ar ANT 19:04	Dp ANT 8:00 Ar AKH 18:30	Dp AKH 8:00 Ar ANT 18:30
		Vessel Hrs/day		*12.07*	*10.53*	*12.07*	*10.53*	*12.07*	*11.50*	*11.50*
		Ports Served		*1 port*	*4 ports*	*1 port*	*4 ports*	*1 port*	*1/2 ports*	*1/2 ports*
				Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
				Calls Per Port	*4.00*	*4.00*	*3.00*	*0.00*	*0.00*	*1.00*
K	North Round Island	Anton Larsen Bay	84	Dp ANT 8:00 Ar AKH 18:30	Dp AKH 8:00 Ar PAS 15:00	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar OHR 12:33 Dp OHR 13:33 Ar PAS 18:06	Dp PAS 8:00 Ar AKH 15:00	Dp AKH 8:00 Ar ANT 18:30
		Vessel Hrs/day		*11.50*	*8.00*	*11.10*	*11.10*	*11.10*	*8.00*	*11.50*
		Ports Served		*1/2 ports*	*1/2 ports*	*1 port*	*1 port*	*1 port*	*1/2 ports*	*1/2 ports*
				Ports Served	*OUZ*	*PRL*	*LRB*	*OHR*	*KAR*	*AKH*
				Calls Per Port	*0.00*	*0.00*	*0.00*	*3.00*	*0.00*	*2.00*

SUMMARY OF SYSTEM PORT CALLS:

Based on the schedule information presented in the previous section, it was possible to select different weekly schedules and create one year-long service plan for a Kodiak Island ferry system. In the case of this analysis, each system must consist of only 40-hour work week schedules, or only 84-hour work week schedules. It is theoretically possible to mix the work week schedules, but it is very complicated, difficult on system personnel, and makes for a confusing operation schedule.

Once an annual service plan is determined, it is possible to calculate the number of port calls that each community would see during the year. This analysis was conducted for several Kodiak Island ferry service plans, assuming 44 service weeks for 40-hour work week systems and 22 service weeks for 84-hour work week systems, and is shown in the following figures.

Table 68: Landing Craft Annual Port Calls

Landing Craft: Annual Port Calls

Home Port	Hours Per Week	Sample Week Schedule	No. Of Weeks	Ports Served					
				OUZ	*PRL*	*LRB*	*OHR*	*KAR* [1]	*AKH*
System 1: Kodiak homeport,Tustumena Serves Old Harbor									
Kodiak	40 (4 - 10's)	A	44	4	4	0	0	0	0
44 service week total			*44*	176	176	0	0	0	0
System 2: Kodiak homeport, 84 hour operation									
Kodiak	84	B	14	6	3	2	0	0	0
		C	8	6	3	0	2	0	0
22 service week total			*22*	132	66	28	16	0	0
System 3: Kodiak homeport, Service to Akhiok									
Kodiak	84	B	10	6	3	2	0	0	0
		C	8	6	3	0	2	0	0
		D	4	6	3	0	0	0	1
22 service week total			*22*	132	66	20	16	0	4
System 4: Anton Larsen Bay homeport, Tustumena serves Old Harbor									
Anton Larsen Bay	40 (F is 4 - 10's)	E	30	5	5	0	0	0	0
		F	14	0	0	2	0	0	0
44 service week total			*44*	150	150	28	0	0	0

1) Distance to Karluk is similar to distance to Larsen Bay. A trip to Larsen Bay can be replaced with a trip to Karluk. For simplicity, only trips to Larsen Bay are shown

Table 69: Day-Boat Annual Port Calls

Day-boat: Annual Port Calls

Home Port	Hours Per Week	Sample Week Schedule	No. Of Weeks	Ports Served					
				OUZ	*PRL*	*LRB*	*OHR*	*KAR* [1]	*AKH*
System 1: Kodiak Homeport, Service to Larsen Bay and Old Harbor, no service to Akhiok									
Kodiak	40	A	11	1	1	2	0	0	0
		B	11	1	1	0	2	0	0
		C	22	5	5	0	0	0	0
		44 service week total	*44*	132	132	22	22	0	0
System 2: Kodiak Homeport, Service to Akhiok, Old Harbor and Larsen Bay									
Kodiak	40 (D is 4 10's)	A	11	1	1	2	0	0	0
		B	11	1	1	0	2	0	0
		C	18	5	5	0	0	0	0
		D	4	2	2	0	0	0	1
		44 service week total	*44*	120	120	22	22	0	4
System 3: Anton Larsen Bay, Pasagshak Split									
Anton Larsen Bay - Pasagshak Split	84	G	15	8	8	3	0	0	0
		K	7	0	0	0	3	0	2
		22 service week total	*22*	120	120	45	21	0	14
System 4: Anton Larsen Bay Homeport, Larsen Bay Service, Tustumena serves Old Harbor, No Akhiok Service									
Anton Larsen Bay	40 (F is 4-10's)	E	22	3	3	1	0	0	0
		F	22	6	6	0	0	0	0
		44 service week total	*44*	198	198	22	0	0	0
System 5: Anton Larsen Bay 84hr week, Service to Larsen bay and Akhiok, Tustumena services Old Harbor									
Anton Larsen Bay	84	G	18	8	8	3	0	0	0
		J	4	4	4	3	0	0	1
		22 service week total	*22*	160	160	66	0	0	4

1) Distance to Karluk is similar to distance to Larsen Bay. A trip to Larsen Bay can be replaced with a trip to Karluk. For simplicity, only trips to Larsen Bay are shown

SCHEDULE DISCUSSION

The above schedule analysis demonstrates the complexity of a Kodiak Island ferry system. Even assuming relatively simple weekly schedules, there are an almost unlimited number of ways to configure a Kodiak Island ferry system, each with its own positive and negative impacts on each community. By necessity, a Kodiak Island ferry schedule will need to maximize revenue and this type of scheduling will not provide equitable service to each community. Smaller communities, further from Kodiak, will not receive as many port calls.

Another lesson learned from the scheduling exercise is that the day-boat concept (rather than the landing craft) provides significantly more port calls, due to vessel speed. For systems serving the same number of communities the day-boat provides 42 more port calls to Ouzinkie and Port Lions and 8 more trips to Larsen Bay or Old Harbor than the landing craft. The day-boat can get to Akhiok in one day and it reduces the number of overnights at out ports, which saves system cost. However, the day-boat concept assumes that a pier will be built at Larsen Bay and at other communities, before service can commence.

The schedules also demonstrate that the landing craft must operate 84-hour work weeks to reach out ports. An 84-hour work week necessitates a week-off and week-on service schedule that is not as convenient as weekly service and will reduce revenue generation. Landing craft beach operation (unloading and loading) is conservatively scheduled for one hour total, however beach landing is likely to be less efficient, subject to weather delays, and cause increased system operational costs.

All of the options assume overnight terminal/dock space can be found in Kodiak harbor.

Schedules were also completed for terminals at Anton Larsen and Pasagshak. These schedules demonstrate the effectiveness of using road segments to reduce marine route lengths. The terminal at Anton Larsen is particularly effective for communities on the north side of the island because it allows multiple trips to Port Lions and Ouzinkie during one day of service and it eliminates an ocean cape.

System Operating Cost

Previous sections of this chapter identified two possible Kodiak Island ferry vessels, a landing craft and a day-boat, and determined the acquisition cost of these vessels. Subsequently, the most cost efficient vessel operating systems were discussed. Using the operating parameters of each system it was possible to calculate the cost to operate each ferry system.

PERSONNEL

The number of crew on a passenger vessel is determined by the USCG based on the number of passengers, number of decks, lifesaving needs, and hours of operation. Based on these rules, the number of crew required for each vessel was determined.

Previously, the concept of a maximum 12-hour operating day (day-boat) was introduced as a means to limit the number of crews on a vessel. Since a Kodiak Island system needs to operate at minimum cost, this analysis assumes that only one full-time crew will be used. This means that the vessel will not operate when its crew needs to take vacation or if the crew requires compensation time as a result of an unusual sailing. Sick

days will be addressed by using cross-trained crew, licensed for alternate positions, and temporally hiring non-skilled workers, such as deck hands.

Using wage comparisons for similar full-time maritime employment, salaries were determined for each crew position. These salaries are comparable with current Alaska coastal marine transportation employees, but are somewhat less than open ocean sailing rates, for example those established on the AMHS. A burden rate of 40% was added to each salary for benefits.

CONSUMABLES

Vessel consumables were estimated by volume and cost per unit volume. Fuel is the largest single consumable. Fuel consumption was estimated based on the size of vessel engines using a 12 hour operating day, reduced for port time and maneuvering. Fuel cost was estimated to be $3.14 per gallon, based on the 2010 Kodiak marine fuel price. Since the vessel will not be used during the night, a cost is included for minimal shore power.

MAINTENANCE

Maintenance costs were calculated in two parts: preventative maintenance and annual overhauls. Preventive maintenance, such as oil change out, was calculated based on engine hours. Annual overhaul, such as shipyard haul-out and painting, were based on a single annual event using prices from similar shipyard contracts.

OVERHEAD

The minimum number of operating personnel for typical small ferry system shore-side operations was established and typical salaries estimated for these positions. A cost for part-time terminal agents was included as were typical contractual costs such as rent, utilities, and marketing.

Using this methodology, described above, day-boat and landing craft system operating costs were calculated.

Table 70: Vessel Operating Costs

Vessel Operating Costs

		Day-boat		Landing Craft	
A) Crew Cost					
Captain	$ 75,000	0.4	$ 105,000	0.4	$ 105,000
Mate	$ 65,000	0.4	$ 91,000	0.4	$ 91,000
Engineer	$ 60,000	0.4	$ 84,000	0.4	$ 84,000
Sr. Deckhand	$ 50,000	0.4	$ 70,000	0.4	$ 70,000
Deckhand	$ 40,000	0.4	$ 56,000	0.4	$ 56,000
Total Crew Cost		***$***	***406,000***	***$***	***406,000***
B) Vessel Consumables					
Installed Hp		4000		2000	
Vessel operating hours		1800		1800	
1) Fuel Oil					
Fuel Oil Consumption Rate (gal/hr)		187.4		96.2	
Operating Profile		0.85		0.75	
Fuel Consumption (gal)		*286722*		*129870*	
Annual Fuel cost		3.14	*$900,307*	3.14	*$ 407,792*
2) Lube Oil					
Lube Oil Consumption Rate (gal/Hp-hr)		0.0002		0.0002	
Lube Oil Consumption (gal)		*1332*		*666*	
Annual Lube oil cost		4.50	$ 5,993	4.50	$ 2,997
3) Sewage Treatment and Slops			$ 5,000		$ 5,000
4) Shore power (evening layup)			$ 20,000		$ 15,000
Total operating Cost		***$***	***931,300***	***$***	***430,788***
D) Maintenance Cost					
1) Preventative Maintenance			$ 50,000		$ 30,000
2) Annual Overhauls			$ 400,000		$ 280,000
Total Maintenance cost		***$***	***450,000***	***$***	***310,000***
E) Overhead					
1) Shore personal					
Manager	$ 85,000	0.4	$ 119,000	0.4	$ 119,000
Bookkeeper/accountant	$ 65,000	0.4	$ 91,000	0.4	$ 91,000
Sales/Procurement	$ 50,000	0.4	$ 70,000	0.4	$ 70,000
Night Watchman	$ 40,000	0.4	$ 56,000	0.4	$ 56,000
2) Ticket/Terminal Agents	$ 10,000	6	$ 60,000	6	$ 60,000
3) Contractual					
Rent			$ 30,000		$ 30,000
Utilities			$ 2,400		$ 2,400
Supplies			$ 5,000		$ 5,000
Technical			$ 40,000		$ 40,000
Marketing			$ 20,000		$ 20,000
4) Insurance			$ 60,000		$ 60,000
Total Overhead Cost		***$***	***553,400***	***$***	***553,400***
Vessel Annual Cost		***$***	***2,340,700***	***$***	***1,700,188***

Summary

A Kodiak Island ferry system will need to operate in severe environments, over long distances, with limited infrastructure, at a minimum operating cost. In this context, three transportation concepts were examined in this chapter: 1) enhanced *Tustumena* service, 2) day-boat ferry, and 3) conventional landing craft. Each of these alternatives has qualities that meet the above system criteria.

The *Tustumena* has a long history of providing consistent Gulf of Alaska service and is an excellent resource for Kodiak Island. Any additional *Tustumena* service to Kodiak Island communities would be beneficial and could occur in the near future to communities with a deep water pier. *Tustumena* service to Kodiak Island could be supplemented by a small regional ferry system. The *Tustumena* would use it ocean going attributes to reach Old Harbor, allowing the smaller regional ferry to work on the north side of the island. The *Tustumena* service would reduce the size of the Kodiak Island ferry service, allowing the smaller regional vessel to operate more efficiently and with greater frequency. However, any change to the *Tustumena* schedule is going impact other areas of the state and will require political support as well as the support of AMHS managers.

The day-boat ferry would be a reasonable choice for Kodiak Island. This vessel provides more port stops on the schedule due to greater vessel speed and, since a single crew is used, manning costs are less expensive than for a ferry like the *Tustumena*. The sea keeping ability of a day-boat ferry will provide comfort and winter trip cancelations similar to the *Tustumena*. However, the day-boat requires each community to have a pier for loading and unloading. Significant system efficiencies could be gained by having a floating terminal in Anton-Larsen Bay, giving this concept greater value. A new day-boat would require a $45 million capital investment and $2.3 million in annual operating funds. If service to Old Harbor was not required, the day-boat vessel could be designed significantly smaller.

The landing craft ferry is the least expensive ferry option, including capital and operation costs. It also has the added benefit of being able to land and discharge cargo at any community. However, its low speed limits distance traveled, resulting in longer trips, lower port of call frequency, and decreased efficiency. The sea keeping of a landing craft will result in more canceled trips during the winter. A new landing craft would require a $19 million capital investment and $1.7 million in annual operating funds.

Each of the options presented above has its merits and requires discussion on the part of Kodiak Island community stakeholders to determine which attributes are the most important and advantageous for a regional ferry system. However, even the very smallest Kodiak Island ferry system will cost significantly more to operate than it will earn in revenue.

Chapter 8: Surface Transportation Funding

A wide variety of potential funding sources are available for surface transportation projects in Alaska. Direct state or federal appropriations provide substantial support for Alaska projects. Most other funding for planning, design and construction is available through federal grants and loans. Several federal grant and loan scoring processes favor projects that serve geographically isolated areas, small communities, or achieve economic development goals. The majority of federal sources fund projects that are economically sustainable, assist the largest number of users, or are identified as state or national priorities. According to these criteria, applications for federal funding of surface transportation projects on Kodiak Island will likely need to justify construction costs in relation to the small population served. Also, in almost all cases, federal funding sources require projects be included in the State Transportation Improvement Program (STIP) or other long-range transportation planning documents. Projects supported through local or state matching funds are almost always more likely to receive federal funding.

In addition to design, planning and construction funding, projected transportation improvements for Kodiak Island will require an outside source of operating capital. Projected revenue from ferry operations will not cover annual operating costs. A limited amount of operating capital is available from federal sources. This funding is dependent upon annual, competitive processes. Thus, federal sources for annual operating capital will not necessarily offer dependable funding for successive years.

Aside from the Alaska Marine Highway System, two ferry systems in Alaska that have received public funding are the Inter-Island Ferry Authority and the Seldovia Bay (passenger-only) Ferry. The Inter-Island Ferry Authority (IFA) provides service between Ketchikan and Prince of Wales Island. Six Southeast Alaska communities formed the IFA. Initial funding for IFA ferries and infrastructure was obtained through Congressional earmarks ($12.6 million through the Federal Transit Administration (FTA)) and loans. Loans were provided by the supporting communities as well as through the Alaska Municipal Bond Bank Authority (AMBBA). In total, $2.1 million in loans were obtained. The loans included $1.45 million in revenue bonds to be paid back with revenue from the ferry service (vehicle and passenger fees). After start-up, the IFA has obtained additional funding through a variety of sources including a U.S. Department of Agriculture – Rural Development (USDA-RD) Community Facilities Loan, a FTA Non-Urbanized Area Program grant for operating assistance, and an Alaska legislative grant for debt retirement and assistance. In 2008 and 2009, approximately 25% of IFA's revenue came from grant assistance.

The Seldovia Bay Ferry provides passenger service between Homer and Seldovia. The project received approximately $8.5 million in federal appropriations for planning, design and construction of a ferry and infrastructure. The funding came from three sources: the Bureau of Indian Affairs, the Federal Highway Administration (FHWA) and the FHWA Ferry Boat Discretionary Fund. The project received a $1.5 million legislative grant in 2007 as a state match to the federal funding. Additional FTA American Recovery and Reinvestment Act funding in 2010 assisted with infrastructure improvements. A FTA Tribal Transit Program grant in 2010 assisted with operating funding.

As the IFA and Seldovia examples suggest, project funding may be achieved through a mix of local, state and federal sources. A summary of potential funding sources is provided below.

Table 71: Summary of Alaska Surface Transportation Funding Options

Source	Projects Funded	Allocation	Funds to Alaska	Funds to Kodiak
Bureau of Indian Affairs (BIA)				
Indian Reservation Roads Program	Road construction, maintenance, planning, ferries, docks	Annual tribal shares	Approximately $45 million annually	Under $1 million annually
Indian Reservation Roads High Priority Project Program	Transportation design and construction	Grants - $1 million at a time, national competitive program	Varies ($4-12 million annually in 2009-2010)	None recently
Denali Commission				
Transportation Program	Road, waterfront development, community connections, economic development	Grants - Alaska annual competitive program	Approximately $20 million annually	$3.4 million between 2007 and 2010
Economic Development Administration (EDA)				
Public Works and Economic Development Program	Public infrastructure, facilities that promote economic development	Grants - National competitive program	Varies ($2 –16 million annually FY06-FY10) - all EDA programs	$4 million over the last decade
Federal Highway Administration (FHWA)				
Surface Transportation Program	Surface transportation projects	Allocated by AK DOT through the State Transportation Improvement Program (STIP)	$400-$410 million annually	Varies
Ferry Boat Discretionary Fund	Construction or improvement of ferry boats and ferry terminals	Grants - National competitive program. An additional $10 million set aside annually for the Alaska Marine Highway System	Varies ($750,000-$11.8 million annually FY02-FY10).	None recently
Federal Transit Administration (FTA)				
Non-Urbanized Area Formula Program	Planning, capital and operating assistance for public transportation	Grants – According to a state formula to communities with populations under 200,000	Approximately $4.5 million annually	Varies ($0-$114,000 in FY08-FY11)
Tribal Transit Program	Capital, operating, planning and administration of public transportation projects	Grants - Competitive program for federally recognized tribes	$800,000 to $1.5 million annually 2007-2009	None recently
Department of Agriculture – Rural Development (USDA-RD)				
Community Facilities Grants and Loans	Purchase, construction or renovation of community facilities including roads, docks and ferries	Loans, grants (usually under $50,000) often tied to loans	Approximately $20 million annually	Varies
Federal Credit Programs				
Transportation Infrastructure Finance and Innovation Act (TIFIA)	Surface transportation projects	Projects of national or regional importance: direct loans, loan guarantees, lines of credit	Not available	Not available
Grant Anticipation Revenue Vehicles Bonds (GARVEE)	Surface transportation projects	For projects hard to fund through traditional methods	Not available	Not available
Advanced Construction	Surface transportation projects	Projects use state funds until federal funds available	Not available	Not available
Direct Appropriations				
State or Federal	Any project	Through the budget processes	Not available	Not available

Local Option Gasoline Tax	Any project	Through local government after public vote	Not available	None recently
Public Financing	Any project	A variety of financing options through local governments. The Alaska Municipal Bond Bank Authority is one source.	Not available	Not available

Federal Funding Opportunities

Most Alaska surface transportation projects are funded through federal grants and loans. Significant sources of funds include the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA) and funds earmarked by Congress for particular projects. To receive federal funding, projects must be included in the State Transportation Improvement Program (STIP). Congress authorized federal highway funding discussed in this report in the 2005 SAFETEA-LU. The act expired in 2009, and a continuing resolution provided funding for 2010. Future funding depends on reauthorization of the act or further continuing resolutions until Congress passes a new surface transportation act.

Bureau of Indian Affairs

INDIAN RESERVATION ROADS PROGRAM

Program Overview

The Federal Highway Administration's Federals Lands Highway Office and the Bureau of Indian Affairs (BIA) jointly administer the Indian Reservation Roads Program (IRR). The stated purpose of the IRR program is to "provide safe and adequate transportation services and public access to and within Indian reservations, Indian lands and communities for Indians and Alaska Natives (including visitors, recreational users, resource users and others), while contributing to Tribal economic development, self-determination and employment." The IRR program funds road construction, maintenance and planning. Ferries and docks are eligible for funding through this program. Indian Reservation Roads Program funds are allocated through annual tribal shares. Additional IRR program funds are available through the High Priority Projects Program (IRRHPP). All IRR funds may only be expended on projects included in a tribe's long-range transportation plan and in the IRR road inventory approved by BIA.

Tribal Shares

Indian Reservation Roads program funding is distributed through annual tribal shares to each federally recognized tribal government. While a small portion of these funds are set aside for planning purposes, the majority of funds from this program can be used for design and construction of transportation facilities. Eligible facilities include roads, ferries and docks. Up to 25% of these funds can also be used for maintenance. Funds may be used for the state or local matching share required for federal highway funds.

IRR High Priority Projects Program

Any projects that require funding beyond the annual IRR tribal shares distribution may be funded through the IRRHPP program. The IRRHPP program is a national competitive program that awards $1 million in funding to

transportation design and construction projects. Each tribe can typically receive one allocation from the IRRHPP program at a time. In the case of emergency and disaster funding requests, two allocations from the IRRHPP program can be made at one time.

Program Funds to Alaska

Tribal Shares

In FY09, $45 million was budgeted to the Alaska IRR program. The 2010 program allocated $47.7 million in tribal shares (source: UAF Alaska Tribal Technical Assistance Program and AK Dept. of Commerce, Community and Economic Development).

High Priority Project Funding

IRR HPP funding for Alaska in 2009 totaled $4,449,791 and in 2010, $12,041,000 (Source: BIA).

Program Funds to Kodiak Island

Tribal Shares

Tribal shares are approximately constant from year to year unless a community's road inventory changes.

Table 72: 2010 Indian Reservation Roads Program Tribal Shares
Kodiak Island Communities

Community	2009 Tribal Share	2010 Tribal Share
Akhiok	$84,824	$78,386
Larsen Bay	$38,170	$63,129
Karluk	$234,261	$229,227
Old Harbor	$44,236	$43,591
Ouzinkie	$213,012	$194,652
Port Lions	$119,693	$111,035
Total	**$734,196**	**$720,020**

Source: UAF Alaska Tribal Technical Assistance Program

High Priority Project Funding

According to the Bureau of Indian Affairs, no IRRHPP program funding has been awarded in Kodiak for the past three years.

Applying for IRRHPP Program Funds

A tribe may apply for IRRHPP funds by submitting an application to the BIA Alaska Regional Office in Anchorage. The Anchorage office forwards applications to the national BIA office. The application process for

2011 funds opened in October 2010. Applications were due to the Anchorage BIA office on December 1, 2010.

Proposed projects for IRRHPP funding must meet the definition of an IRR facility and be on the IRR inventory. Grants are awarded according to scoring criteria that give priority to projects that:

- Resolve safety hazards;
- Have not received IRRHPP program funding recently;
- Are ready to begin;
- Have a match available from non-IRR program funds;
- Are less expensive than other applicants;
- Are geographically isolated; and
- Provide all weather access to employment, commerce, health, safety, educational resources and housing.

More information on the IRRHPP program process can be found through the Alaska Tribal Technical Assistance program at the University of Alaska Fairbanks.

Denali Commission

TRANSPORTATION PROGRAM

Program Overview

The Commission's Transportation Program supports rural road improvements, waterfront development and rural economic development in Alaska. The program also focuses on opportunities to connect rural communities to one another and the state highway system. The program partners with other agencies and governments on development projects. These entities include regional, local and tribal governments, the Federal Highway Administration (FHWA), Western Federal Lands Highway Division, Alaska Department of Transportation and Public Facilities and the U.S. Army Corps of Engineers.

Program Funds to Alaska

In 2009, the Commission distributed $22.3 million through the transportation program and $24.1 million in 2008.

Program Funds to Kodiak Island

The Denali Commission project database lists $3,420,925 in awards for projects on Kodiak Island between 2007 and 2010.

Applying for Denali Commission Transportation Program Funds

Applications for 2011 program funds were due November 3, 2010. Information on grants and program details can be accessed through the Denali Commission website. The Denali Commission manages their grant application process through GrantSolutions.gov.

Economic Development Administration

PUBLIC WORKS AND ECONOMIC DEVELOPMENT PROGRAM

Program Overview

This Economic Development Administration (EDA) program provides grants for public infrastructure and facilities that promote economic development. Funded projects will help retain or generate private sector jobs and investment. Funding is also focused on projects that increase regional competitiveness. Funds can cover costs of construction, expansion and upgrades of public infrastructure and facilities.

Program Funds to Alaska

The EDA invests in Alaska through a number of focus areas: investment in public infrastructure, regional planning partnerships, technical assistance grants and assistance to public bodies. The combined investment of all EDA programs in Alaska over the past five years is summarized in Figure 3.

Table 73: Economic Development Administration Investment in Alaska FY06-FY10

Fiscal Year	Investment (millions)
FY10	$2.1
FY09	$12.6
FY08	$10.1
FY07	$16.3
FY06	$15.6

Source: EDA.

Program Funds to Kodiak Island

Over the past decade, the EDA has invested $ 3.8 million in construction projects on Kodiak Island. An additional $223,500 in non-construction EDA funding has also been awarded to Kodiak Island communities over the last ten years.

Applying for Economic Development Administration Funds

Application for EDA funds can be made online through grants.gov or by paper submission to the Anchorage EDA office. Early communication with an EDA representative at the Anchorage EDA office is highly recommended. The Anchorage staff helps applicants refine their proposal in accordance with EDA's investment criteria.

The EDA requires all proposals be included in a current Comprehensive Economic Development Strategy for the region from which the application is submitted. According to EDA, other criteria used to evaluate applications include:

1. **National Strategic Priorities** (30% of score) Applications that encourage job growth and business expansion as well as promoting technology- led economic development, support small and medium

size business, global competitiveness and innovation, response to economic dislocation, commercialization of research and or environmentally sustainable development;

2. Economically Distressed and Underserved Communities (25% of score) Applications that strengthen diverse communities and/or rebuild to become more competitive in the global economy;

3. Return on Investment (25% of score) Applications that demonstrate a high return on EDA's investment in creation and/or retention particularly high wage jobs and private sector investment;

4. Collaborative Regional Innovation (10% of score) Applications that support the development and growth of innovation clusters based on existing regional competitive strengths; and.

5. Public / Private Partnerships (10% of score) Applications that use both public & private sector resources and/or leverage complementary investments by other government/public entities and/or nonprofits. (Source: EDA)

Federal Highway Administration

SURFACE TRANSPORTATION PROGRAM

Program Overview

This FWHA Surface Transportation Program provides funding for surface transportation projects. Surface Transportation Program funds are distributed in Alaska through the AK Department of Transportation. Alaska can use these funds for any public road in the state. Funds are only awarded to projects included in the State Transportation Improvement Program (STIP). Department of Transportation regional transportation planners in Alaska work with project applicants to include projects in the STIP. Projects that are partially funded through a substantial local or state match are much more likely to receive federal funding.

Program Funds to Alaska

Average $400-410 million annually (Source: AKDOT)

Program Funds to Kodiak Island

According to the federal consolidated funds report, projects in the Kodiak Island Borough totaled approximately $17 million in 2007, $7.8 million in 2008 and $7.6 million in 2009.

FERRY BOAT DISCRETIONARY FUND

Program Overview

The Ferry Boat Discretionary (FBD) Fund supports construction or improvement of ferryboats and ferry terminals on National Highway System routes. A certain portion of funds are set aside for the Alaska Marine Highway System. Alaska may also apply for additional funds through a nationwide competitive process.

To be eligible for FBD funds, a project is usually required to be publicly owned and controlled by a public entity. The project must occur where it is not feasible to substitute a bridge, tunnel or highway structure for

the proposed ferry system. The ferry must be on a route classified as public within the state but not as a route in the Interstate System. The FBD fund provides an 80% federal match.

Program Funds to Alaska

The Alaska Ferry Boat Discretionary Fund set-aside is $10 million annually for Alaska. This funding has been used for the existing Alaska Marine Highway System.

Additional funds have been awarded to other Alaska ferry projects through the nationwide competitive process. Funds awarded through the competitive process are listed below.

Table 74: Ferry Boat Discretionary Fund Awards in Alaska FY02-FY10 (Excluding AK Set-Aside)

	Award	Project
FY10	$2,560,000	Pelican Ferry Terminal Renovation
FY09	$950,000	Gustavus Public Dock and Floats – Breakwater Construction
2009 Recovery Act	$3,000,000	Hoonah Ferry Terminal Marine Structures
FY06	$787,757	Kachemak Bay Ferry Project
FY04	$880,773	Akutan Ferry Planning and Design
FY03 & FY02	$11,800,000	Coffman Cove/Wrangel/Petersburg Ferries & Ferry Facility

Source: Federal Highway Administration.

Program Funds to Kodiak Island

No FBD competitive funds have been awarded within the Kodiak Island Borough from FY00-FY10. Some of the FBD Alaska set-aside has been spent on Kodiak Island for the Alaska Marine Highway System.

Applying for Ferry Boat Discretionary Funds

The FHWA requests submission of project proposals and identified priorities from the Alaska State Department of Transportation. Once an application is submitted, statutory selection criteria apply. A project is given priority if it provides critical access to areas "not well-served by other modes of surface transportation" and will carry the greatest number of passengers and vehicles (or passengers in passenger-only service). The FHWA also favors projects that, among other criteria, are identified as state priorities, leverage private or additional public funding and for which FBD funds will expedite completion of the project.

Federal Transit Administration

NON-URBANIZED AREA FORMULA PROGRAM

Program Overview

The Federal Transit Administration (FTA) Non-Urbanized Area Formula Program provides capital, planning and operating assistance for public transportation in small, urbanized areas with populations under 200,000. Grant applications are solicited annually from public transportation providers. Funds are managed by the

State Department of Transportation. Funding is determined according to a state formula based on population of areas to be served and projected service miles and rides.

Table 75: Non-Urbanized Area Program Funding
Alaska and Kodiak Island FY08-FY11

	Alaska	Kodiak Island
FY08	$4.3 million	$113,980
FY09	$4.6 million	$73,009
FY10	$4.7 million	$77,326
FY11	$4.4 million	$0

Source: AKDOT

PUBLIC TRANSPORTATION ON INDIAN RESERVATIONS, TRIBAL TRANSIT PROGRAM

Program Overview

The Public Transportation on Indian Reservations Program (Tribal Transit Program) provides a total of $45 million nationwide to federally recognized tribes. Tribes may use the funding for capital, operating, planning and administrative expenses associated with public transit projects. This program does not require a match but scoring criteria support applications that can demonstrate community support.

Table 76: Tribal Transit Program Funding
Alaska and Kodiak Island 2007-2010

	Alaska	Kodiak Island
2007	$824,000	$0
2008	$1,000,000	$0
2009	$1,500,000	$0
2010	Not yet released	

Source: FTA Region X.

Federal Loans

DEPARTMENT OF AGRICULTURE – RURAL DEVELOPMENT (USDA-RD)

Community Facilities Grants and Loans

Program Overview

Under the community facilities program, the USDA-RD operates two loan programs: the Guaranteed and Direct Loan Programs. A limited number of small grants are also offered through this program. Funds are used to assist rural communities with populations of 20,000 or less to purchase, construct or renovate community facilities. Roads, docks and ferry purchases may be funded under this program. Communities may use funds from either of the guaranteed or direct loan programs as a required match for other federal programs.

USDA Rural Development Guaranteed Community Facilities Loan

The guaranteed loan program provides a guarantee to a lender who may not otherwise be willing to lend on a project. The applicant works directly with the lender. The lender obtains the guarantee from USDA Rural Development.

Direct Loan Program

The direct loan program offers low rates and long term financing. Financing may be provided for up to 40 years or the economic life of the funded facility, whichever is less. A down payment is not required under this program, and USDA can loan up to 100% of the loan value.

Grants

Grants from the USDA–RD community facilities program are usually under $50,000. Grants are often paired with loans. A non-federal match is required.

Program Funds to Alaska

According to the USDA Rural Development office in Palmer, this program awards an estimated $20 million annually in Alaska.

Program Funds to Kodiak Island

While some funds have been awarded to Kodiak over the years, data on these funds was not currently available.

FEDERAL CREDIT PROGRAMS

Federal law provides states with several options for financing or borrowing money to pay for surface transportation projects. Federal credit and financing programs include the Transportation Infrastructure Finance and Innovation Act (TIFIA), Grant Anticipation Revenue Vehicles bonds (GARVEE) and Advanced Construction.

Transportation Infrastructure Finance and Innovation Act (TIFIA)

The TIFIA program provides direct loans, loan guarantees, and standby lines of credit to finance up to thirty-three percent of the cost of a surface transportation project. Projects must be of national and regional importance. They also must be included in the STIP. This program also requires that projects be at least partially supported by user charges or other non-federal dedicated funding sources.

Grant Anticipation Revenue Vehicles (GARVEEs)

The GARVEE bonds are intended to provide financing for projects that are hard to fund through traditional methods. GARVEE bonds are issued by states and backed by anticipated federal funding. Once federal funds are secured, they can be used to make interest payments, retire principal and pay any other costs associated with the bond issue. Voter or legislative approval often is required in order to issue these bonds.

Advanced Construction

With approval from the FHWA, this program allows the state to begin a project using state funds before federal funds become available.

U.S. Army Corps of Engineers

Like previous acts of the same name, the Water Resources Development Act of 2010 would authorize the U.S. Army Corps of Engineers to assist with local and regional water resource projects. The Corps plans, constructs and operates water resources facilities as part of its civil works program. The Corps focuses on flood damage reduction, navigation, and environmental concerns. Congressional representatives submit ports and harbor projects for direct appropriations under this bill. The 2010 version of the Water Resources Development Act has not yet passed Congress.

State and Local Funding Opportunities

State and local funding has supported a portion of many surface transportation projects in Alaska. The funding has originated from state, borough, and city governments and Alaska Native corporations.

State Appropriations

State funds for surface transportation projects are appropriated annually in the state capital budget. Project coordinators work with local legislative representatives to include their project in the legislature's budget. Coordinators can also work with the governor's office to include the project in the governor's capital budget. State monies can fund all or part of a project. They can also serve as a project match in order to acquire federal funding.

Local Option Gasoline Tax

This funding option allows communities to address local transportation needs by raising the local gasoline tax.

Public Financing

A variety of public financing options are available to fund surface transportation projects. These options often allow states or local governments to move on a project more quickly than the time it takes to obtain outside sources of funds. Some of the most applicable financing options are listed below. The Alaska Municipal Bond Bank Authority (AMBBA) is one source for direct loans to Alaska communities.

ANTICIPATION NOTES

Anticipation notes are public securities issued when money is expected from a specific source. States can issue anticipation notes that can be paid off with future bond issues (bond anticipation notes—BANs) or through future tax revenue (tax anticipation notes—TANs).

GENERAL OBLIGATION BONDS

These public bonds are issued for projects that do not generate revenue. The state or local jurisdiction that issues general obligation bonds backs them.

REVENUE BONDS

Revenue bonds are public bonds issued to finance projects that generate revenue, such as toll roads or fares collected from transit projects. The revenue from the project is used to make principal and interest payments to bond holders.

TAX-EXEMPT LEASING

Tax-exempt leases, or lease to purchase agreements, are available to local or state government entities. These leases may be used to purchase equipment such as ferries.

Chapter 9: Summary Analysis and Conclusions

It is evident from this analysis that the communities of Kodiak Island do not represent a population base large enough to sustain a self-supporting ferry system. This study has profiled two ferry system concepts that come the closest to meeting the needs of the outlying communities, at the lowest cost possible, employing vessels most suitable for the service area. However, revenues generated by these vessels would not match the cost to operate the ferries. Analysis of both concepts indicates annual operating subsidies of approximately $1 million or more would be required to provide any meaningful level of regular ferry service.

The review of potential sources for construction and operating funding, conducted for purposes of this study, illustrates the challenges associated with securing funding. Various sources are potentially available for capital (construction) funding, however, funding to support on-going ferry system operations would be especially difficult to secure.

There are obvious and very significant challenges associated with building and operating a dedicated ferry system serving the outlying communities of Kodiak Island. The total capital cost of full build-out of potential infrastructure improvements, including roads, docks and a ferry is roughly $100 million. Annual maintenance and operating costs at full build-out would total several million dollars. Nevertheless, steps can be taken to enhance surface transportation on Kodiak Island.

Table 77: Kodiak Island Transportation Improvements

Description	Capital Cost	Annual Cost
Road Segments		
Akhiok/Alitak Road (7.3 miles)	$5.4 million	$55,000
Karluk/Larsen Bay Road (18.5 miles)	$17.9 million	$140,000
Old Harbor Extension (3.6 miles)	$4.2 million	$30,000
Anton Larsen Bay to Shakmanof (7.1 miles)	$7.6 million	$110,000
Monashka Bay to Shakmanof (10.6 miles)	$11.4 million	$160,000
Anton Larsen Extension – West (3.0 miles)	$3.0 million	$45,000
Anton Larsen Extension – East (9.6 miles)	$9.0 million	$145,000
Docks		
Akhiok Fixed-Pier Dock	$6.6 million	$65,000
Akhiok RO/RO Dock	$6.4 million	$95,000
Karluk Fixed-Pier Dock	$13.8 million	$135,000
Larsen Bay Fixed-Pier Dock	$4.7 million	$50,000
Larsen Bay RO/RO Dock	$4.5 million	$65,000
Shakmanof Fixed-Pier Dock	$4.9 million	$50,000
Vessels		
Dedicated Conventional Hull Day-Boat	$40 million	$2.4 million
Dedicated Landing Craft Day-Boat	$19 million	$1.7 million

While this study is not intended to serve as a formal planning document, a long-term transportation infrastructure development plan might consider the following issues, by community.

Akhiok

Akhiok faces a number of serious challenges as it seeks to enhance its transportation infrastructure and reduce costs in the community. In addition to limited, irregular and costly freight service, Akhiok has a tenuous fuel supply situation, requiring permitting exemptions to allow fuel transfer from a vessel at anchor (or beached) via a floating fuel line. Fueling via this means is expensive and risky from an environmental perspective.

Road connection between Akhiok and Alitak (construction cost of $5.4 million) is a seemingly logical solution. However, there are significant obstacles. The OBS–Alitak facility manager has indicated that while OBS is able to sell small quantities of fuel to Akhiok residents, it would not be able to sell larger quantities of fuel to generate power in Akhiok due to regulatory issues, liability, and cost of pollution control preparedness. Ocean Beauty's facility manager expressed concern about the food safety and security aspects of such a road connection to the private seafood processing facility. Further, facilities at Alitak do not appear suitable for moving vehicles or other heavy freight over the dock to an Akhiok road. As such, even with a road connection to Akhiok, significant additional investment in dock construction would be required at Alitak to adequately serve the needs of Akhiok.

Dock construction at Akhiok, while certainly desirable from a local perspective, would be difficult to justify from a cost/benefit perspective. At about $6.6 million (for a fixed-pier) plus the cost of ancillary facilities (such as fuel headers and piping), the cost to build a dock would be quite high relative to the population it would serve. Further, while a deepwater dock would offer significant advantages for fuel handling, the presence of a deepwater dock does not ensure any form of regular freight service.

Regarding ferry service, Akhiok would be best served by some form of regular landing craft service. Few passengers would choose to make the 12-hour one-way trip to Kodiak, but it would serve the community's needs in terms of heavy freight movement. Further, landing craft service would require minimal marine landing facilities. However, ferry service to Akhiok is problematic due to its distance from Kodiak. Located over 12 hours of running time from Kodiak, Akhiok service does not fit the day-boat model that appears to be the only reasonably practicable ferry solution for the Island overall.

One solution for reducing energy costs not investigated in the study is a power line connection between Akhiok and Alitak. While not addressing the community's heavy freight shipping challenges, such an intertie could substantially reduce the cost of electricity in the community.

Karluk

Karluk's surface transportation challenges are as daunting as Akhiok's. The nearby coastline presents very poor opportunities for deepwater dock construction. The $13.8 million dock construction cost, plus the cost of necessary uplands and ancillary facilities development would push total costs to above the estimated cost of a Karluk/Larsen Bay Road connection ($18 million). In either case, a very high level of per capita investment would be required to enhance Karluk's physical transportation infrastructure, nearly half a million dollars for each resident of the community, either for a dock or a road.

As with Akhiok, landing craft ferry service appears to be the best (if not only) solution, requiring minimal investment in marine terminal development. Landing craft ferry service would not ease Karluk's fuel supply challenges, however.

Larsen Bay

Larsen Bay's top capital improvement priority is funding for engineering and design of a deepwater dock. Estimates developed for this study suggest such a dock could cost about $4.7 million, plus cost of related uplands and ancillary facilities. Cannery operations coupled with a reasonably well-developed guided fishing and hunting industry provide the foundation for a sustainable, largely seasonal economy. Community sustainability and development is hampered by limited options for moving heavy freight. A deepwater dock capable of serving freight barges, fuel barges and ferries could have substantial positive impacts on the community.

There are location-related challenges associated with dock construction in Larsen Bay. A logical location for a new dock is inside the bay near the existing fuel headers. However, it is unclear if the *Tustumena* could routinely navigate the narrow pass into the bay. Conversations with vessel captains were inconclusive in this regard.

Old Harbor

Reconstruction of the Old Harbor dock is underway, with a total budget of $8.1 million. The new dock will be 56 feet wide and 102 feet long with three fenders along the dock face and three mooring dolphins connected to the dock by catwalks. The project includes piping for fuel transfer, electricity and lighting. Once dock reconstruction is completed, Old Harbor will have the infrastructure needed for *Tustumena* service.

Occasional *Tustumena* service is a reasonable short-term and long-term goal for Old Harbor. Should a dedicated Kodiak Island ferry system be developed, the long open-ocean route from Kodiak will place some constraints on possible service options. Development of a terminal at Pasagshak as well as a road connection and terminal in the Bush Point area would significantly enhance the frequency, reliability, and cost of ferry operations to Old Harbor. Of course those transportation infrastructure improvements have significant cost implications.

Ouzinkie

Redevelopment of Ouzinkie's deepwater dock places that community in a relatively strong position with regard to its surface transportation infrastructure. (Recent construction of a new airstrip has also substantially enhanced its air transportation infrastructure.) With the new dock Ouzinkie will have the capacity to accommodate occasional or regular *Tustumena* service. Further, the community's comparatively close proximity to Kodiak and Anton Larson Bay would make the community a prime beneficiary of a new dedicated Kodiak Island ferry service, should such a service be initiated.

Port Lions

Port Lions has and is expected to continue enjoying regular and convenient AMHS service. However, its dock is in a state of serious disrepair and in need of replacement. The U.S. Army Corps of Engineers is now

engaged in a more detailed design study for a dock that will accommodate freight and fuel barges and the *Tustumena* via a trestle. This work will produce a more precise construction cost estimate, which in preliminary documents was estimated at between S6 million and $9 million. Securing necessary funding to replace the dock will be a priority for the community.

Development of a dedicated Kodiak Island ferry system could have mixed implications for Port Lions. Such a ferry system might mean reduction or elimination of *Tustumena* service to the community, with the resulting loss of direct service to Homer. Depending on the vessel employed to serve Kodiak Island's outlying communities, Port Lions could see some overall reduction in ferry service (though along with Ouzinkie it would likely receive the most frequent service among all the communities served). To maintain *Tustumena* service to Port Lions while also operating a dedicated ferry would have significant negative consequences on traffic and revenue generation for that dedicated ferry service.

Local Economic Benefits

The financial feasibility of a Kodiak Island ferry service is a critical issue in considering how to enhance the transportation infrastructure around Kodiak Island. However, other factors are relevant, such as community economic development, socioeconomic, and public safety benefits that could result from better surface transportation access. After all, the AMHS is operated with substantial subsidy because it provides essential surface transportation service to many coastal Alaska communities.

While it is not possible to identify, and especially quantify, all of the potential benefits of a regular, reliable ferry service, they would likely include:

- Lower cost of consumer goods, as the cost paid by consumers to ship goods is reduced.
- Lower cost of residential and commercial construction, as costs paid by builders for shipping building supplies is reduced.
- Enhanced business development opportunities as the cost of shipping goods in to and out of communities is reduced.
- Increase visitor travel to outlying communities, enhancing development opportunities for businesses serving non-resident visitors.
- Greater social, educational, and recreational interaction among communities, as opportunities for safe travel are increased, especially during the school year.

The community of Kodiak could benefit economically from development and operation of a dedicated ferry system. The local economy would benefit directly from the 10 or so new jobs created to operate the ferry service, including vessel crew and shore-side administrative jobs. In the long-term, Kodiak would benefit as the Island's service and supply hub – to the extent that regular ferry service to outlying communities stabilizes those economies, or even stimulates growth.

Ideally, placing a dollar value on all present and future benefits would allow for objective comparison with the costs of building and maintaining necessary roads and docks, and operating a ferry system. However, while it is possible to predict the costs with a degree of certainty, it is not possible to measure all the potential future economic and social benefits.

The communities with the weakest existing surface transportation infrastructure, Akhiok and Karluk, may have the most to lose (like many other very small remote villages throughout Alaska) if the cost of moving goods into communities cannot be reduced. Some of these villages could continue a slow decline or at best exist precariously on the edge of sustainability. The slightly larger communities, including Old Harbor, Larsen Bay, and Ouzinkie, all have a basic foundation for economic sustainability and may in fact have the most to gain (in terms of economic development) from surface transportation enhancement. They may possess a critical mass of government and private business sustainability that can support a reasonably healthy community. Enhanced transportation infrastructure for these communities will strengthen that sustainability and could potentially result in economic growth.

This is the challenge of transportation development in rural Alaska. Enhanced transportation services and infrastructure can play a critical role in rural community sustainability and development (though that alone cannot ensure sustainability). However, the monetary cost of creating and providing enhanced transportation infrastructure service can be very high, especially on a per capita basis.

A next step for the communities of Kodiak Island might be to take the results of this study and identify the components of, and priorities within, a transportation infrastructure development plan. Options include setting aside the concept of a dedicated Kodiak Island ferry (due the high subsidy required) and focusing on building the infrastructure and the political support (and especially ferry system management support) needed for gaining as much *Tustumena* service as possible. Alternatively, stakeholders could continue to pursue the idea of a dedicated ferry system, beginning with the development of comprehensive fund-raising plan and strategy.

Appendix 1

Marine Route Information

Introduction

The Route Overviews and Route Length Summaries in this Appendix illustrate a series of potential ferry routes connecting communities on Kodiak Island. They are presented for use in regional transportation planning. The Appendix data includes route maps and corresponding tabular distances and transit times. The routes shown here are considered realistic in terms of the distances and times indicated, but are representational and should not be interpreted as navigational guidance, particularly in terms of harbor entrances and clearances to shorelines and headlands.

The route data have been organized into two general groups: a) a Round Island scenario based on a continuous counter-clockwise loop proceeding from one community to the next; and b) a Hub scenario in which individual community routes originate at a terminal hub near the city of Kodiak. Hub routes are "direct" routes between the hub and each community.

The Hub group is further divided into three subgroups, based on three potential terminal locations in the Kodiak area. The first Hub alternative uses the existing central Kodiak terminal as an origin point. The second and third Hub alternatives are each based on potential new terminals located at Anton Larsen Bay and Pasagshak Bay, with new or improved road access between central Kodiak and the new terminals. The Anton Larsen Bay terminal would potentially serve Northern routes using Shelikof Strait and adjacent coastal passages as far as Akhiok, whereas the Pasagshak Bay terminal would potentially serve Southern routes as far as Akhiok along the South coast of Kodiak Island.

An overview map and associated Route Length Summary table for the Round Island, Kodiak Direct, Anton Larsen Bay Direct and Pasagshak Bay Direct groups are given below. These tables provide overall distances and transit times for their respective routes. Following the four summaries, each route is presented individually, showing distances and transit times between the waypoints which comprise each route.

In order to clearly identify routes, a discreet number is assigned to each route between any two communities. For example, in the Round Island group, Kodiak to Ouzinkie is numbered Route 1, Ouzinkie to Port Lions is numbered Route 2, etc. In some cases, two communities are shown with alternative routes between them, and such routes are distinguished by a dash and second number. For example, in the Round Island group, Akhiok to Old Harbor routes include an inside route through Sitkinak Strait designated Route 6-1 and an outside route around Tugidak Island designated Route 6-2.

Where a particular route is duplicated between the Round Island group and Hub group, the route is identified by a separate number in each group. For example, Kodiak to Ouzinkie in the Round Island group is numbered 1 and the same route in the Kodiak Direct hub route is numbered 8.

Figure 47: Round-Island Route Overview

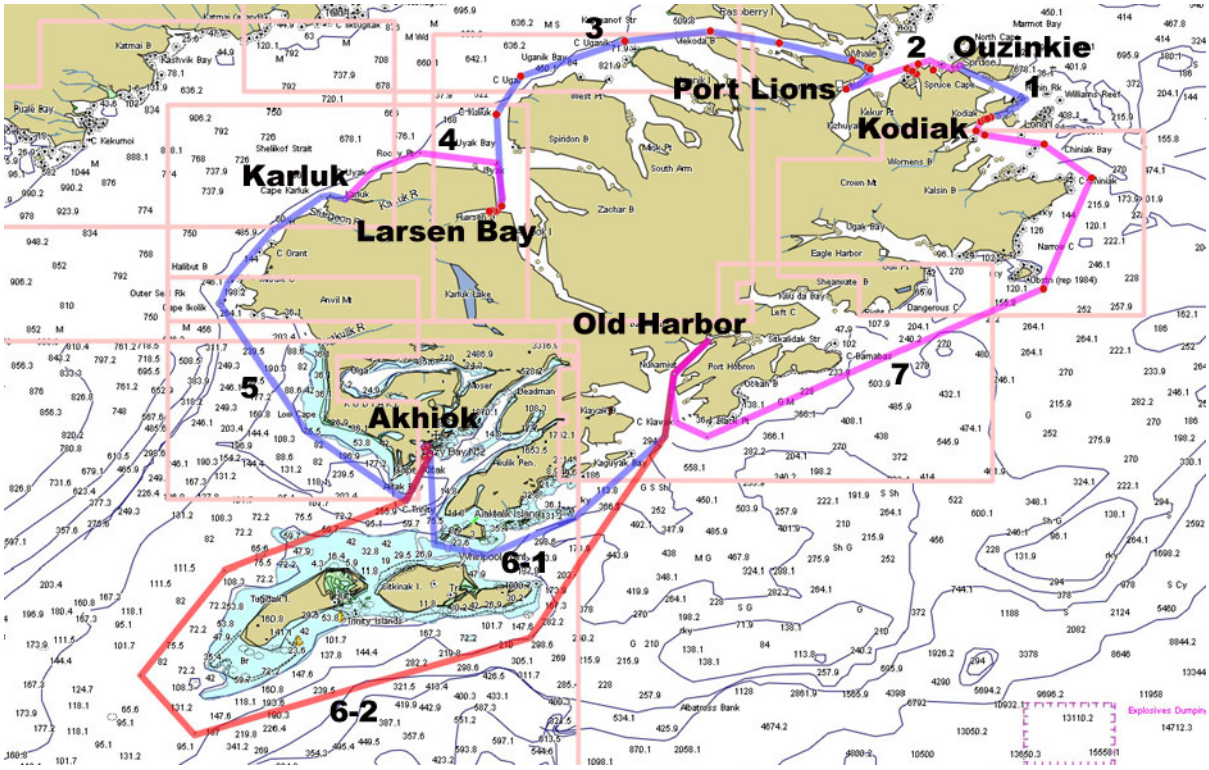


Table 78: Round-Island Route Length Summary

Routes	Distance (nm)	Time at 9 knots	Time at 13.5 knots
1. Kodiak to Ouzinkie	13.4	1:29	0:59
2. Ouzinkie to Port Lions	13.2	1:28	0:58
3. Port Lions to Larsen Bay	65.3	7:15	4:50
4. Larsen Bay to Karluk	27.8	3:05	2:03
5 Karluk to Akhiok	69.5	7:43	5:08
6-1. Akhiok to Old Harbor	64.9	7:12	4:48
6-2. Akhiok Outside Route to Old Harbor	151.0	16:46	11:11
7. Old Harbor to Kodiak	95.4	10:36	7:04

Required vessel speeds are greater than speeds indicated, due to the effects of wind, current and waves.

Figure 48: Kodiak Direct Route Overview

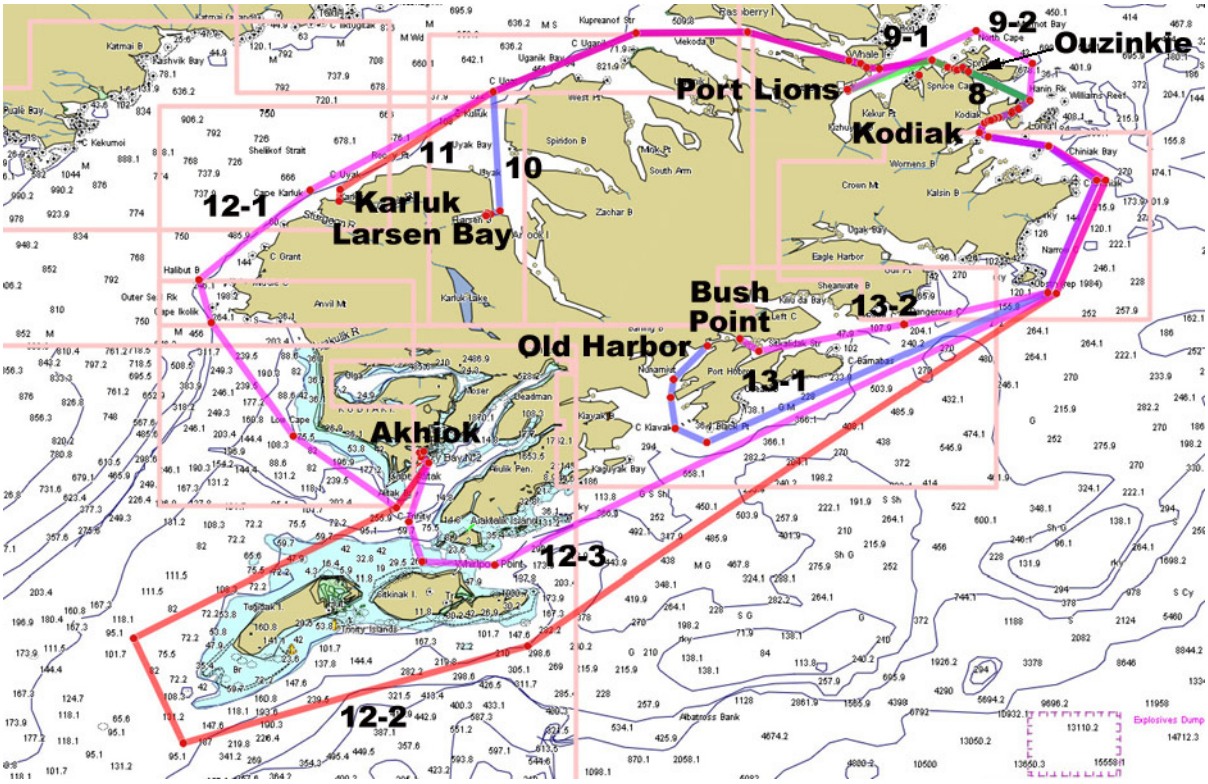


Table 79: Kodiak Direct Route Length Summary

Routes	Distance (nm)	Time at 9 knots	Time at 13.5 knots
8. Kodiak to Ouzinkie	13.4	1:29	0:59
9-1. Kodiak to Port Lions	26.5	2:56	1:57
9-2. Kodiak to Port Lions (around Spruce Island)	34.0	3:46	2:31
10. Kodiak to Larsen Bay	85.1	9:27	6:18
11. Kodiak to Karluk	88.3	9:48	6:32
12-1. Kodiak to Akhiok (North route)	159.0	17:40	11:46
12-2. Kodiak to Akhiok (South route via Tugidak Island)	214.0	23:46	15:51
12-3. Kodiak to Akhiok (South route via Sitkinak Strait)	134.0	14:53	9:55
13-1. Kodiak to Old Harbor	95.4	10:36	7:04
13-2. Kodiak to Old Harbor (Bush Point)	69.2	7:41	5:07

Required vessel speeds are greater than speeds indicated, due to the effects of wind, current and waves.

Figure 49: Anton Larsen Bay Direct Route Overview

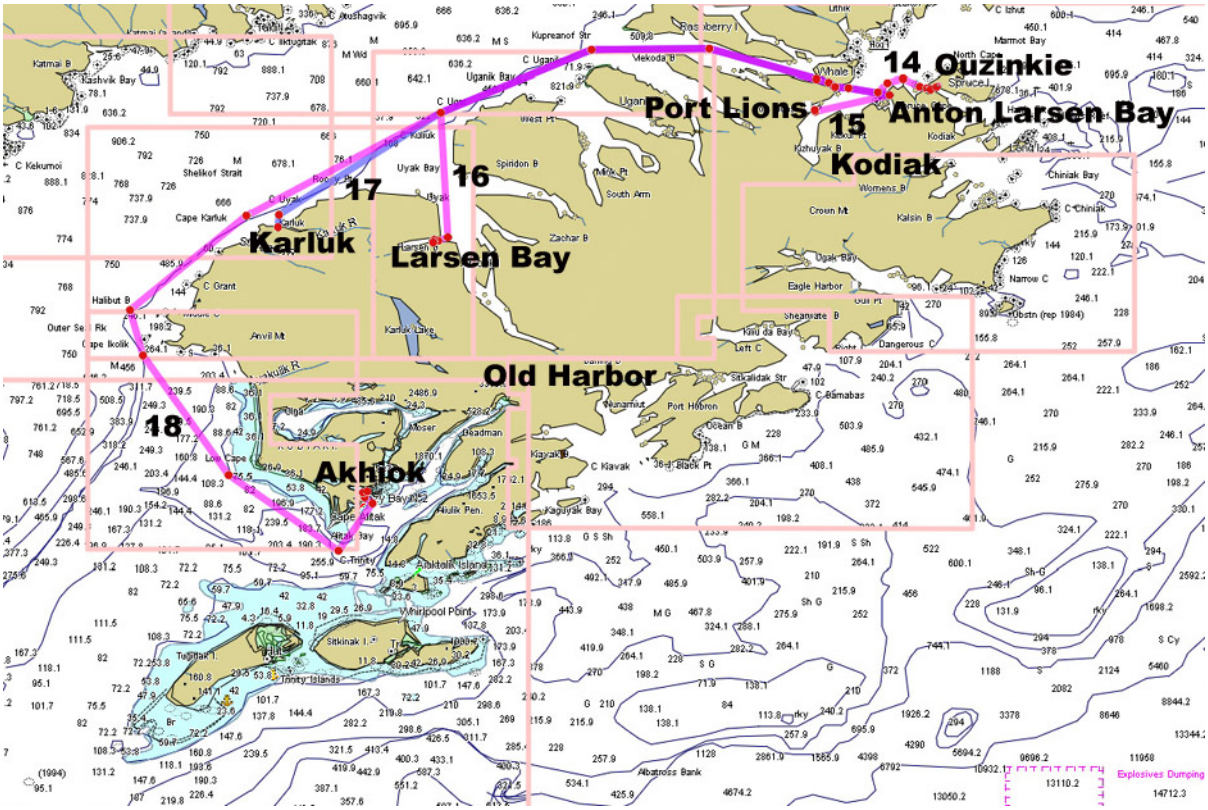


Table 80: Anton Larsen Bay Direct Route Length Summary

Routes	Distance (nm)	Time at 9 knots	Time at 13.5 knots
14. Anton Larsen Bay to Ouzinkie	6.9	0:46	0:30
15. Anton Larsen Bay to Port Lions	8.2	0:54	0:36
16. Anton Larsen Bay to Larsen Bay	67.2	7:28	4:58
17. Anton Larsen Bay to Karluk	70.3	7:48	5:12
18. Anton Larsen Bay to Akhiok	141.0	15:40	10:26

Required vessel speeds are greater than speeds indicated, due to the effects of wind, current and waves.

Figure 50: Pasagshak Bay Direct Route Overview

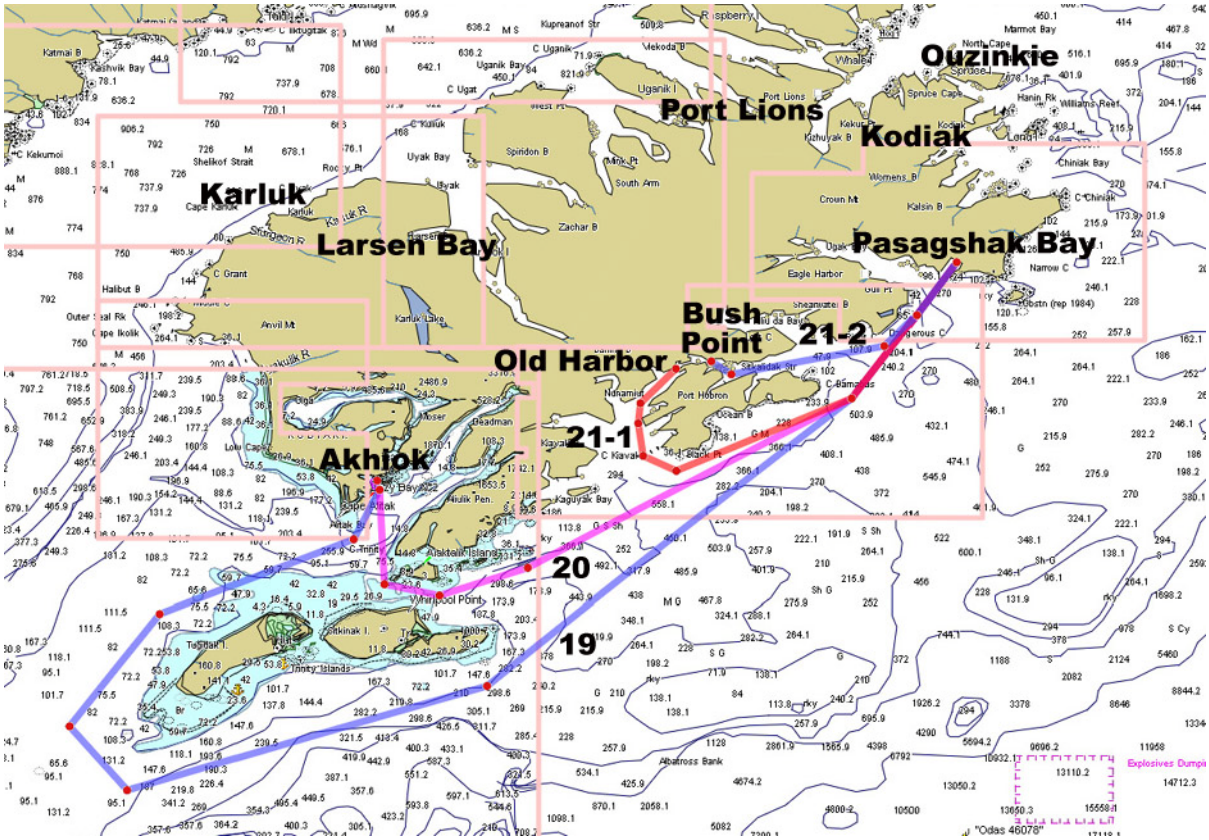


Table 81: Pasagshak Bay Direct Route Length Summary

Routes	Distance (nm)	Time at 9 knots	Time at 13.5 knots
19. Pasagshak Bay to Akhiok (via Tugidak Island)	178.0	19:46	13:11
20. Pasagshak Bay to Akhiok (via Sitkinak Str.)	93.8	10:25	6:56
21-1. Pasagshak Bay to Old Harbor	60.5	6:43	4:28
21-2. Pasagshak Bay to Old Harbor (Bush Point)	32.4	3:36	2:24

Required vessel speeds are greater than speeds indicated, due to the effects of wind, current and waves.

Figure 51: Kodiak to Ouzinkie

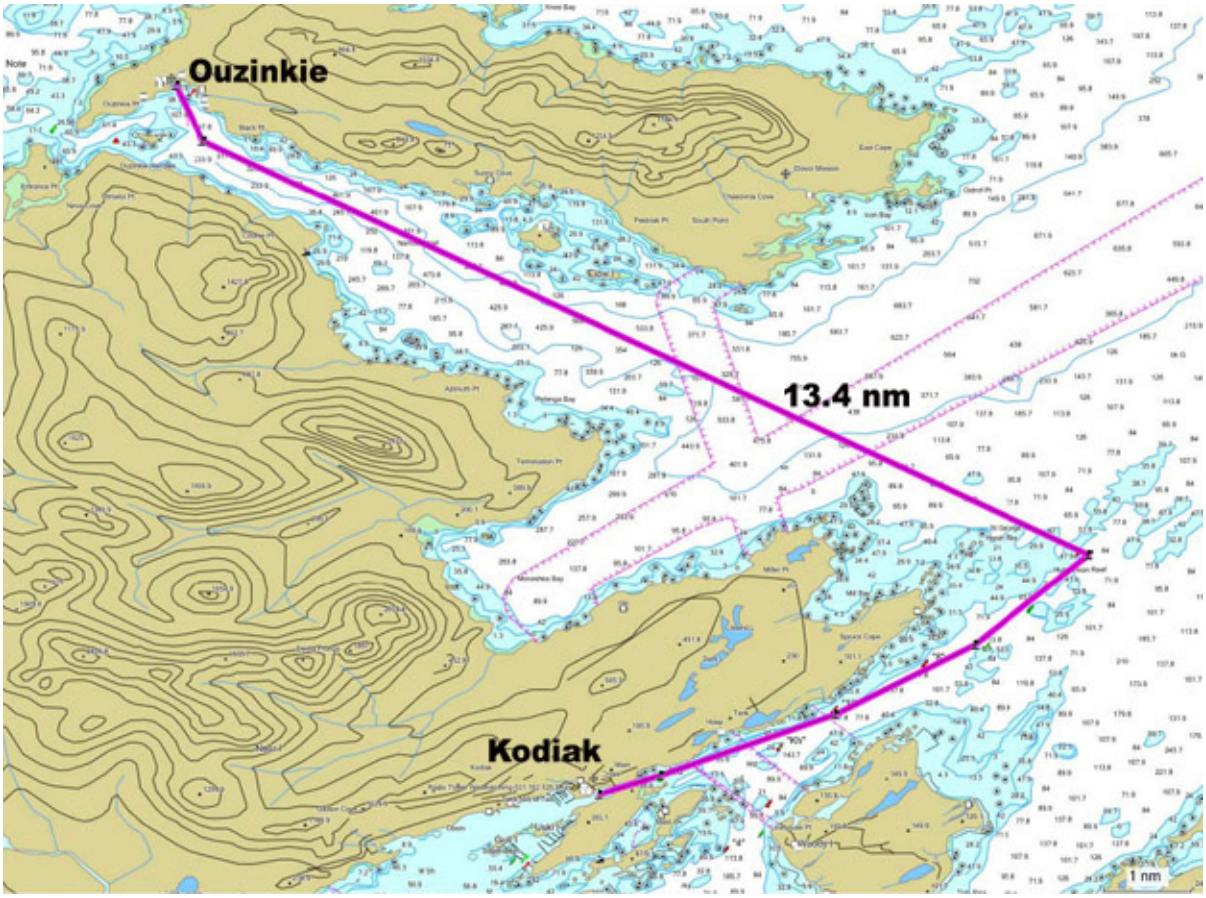


Table 82: Kodiak to Ouzinkie – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.5 nm	0.5 nm	0:03	0:02
Waypoint 3	2.0 nm	1.5 nm	0:13	0:08
Spruce Cape	3.3 nm	1.3 nm	0:22	0:14
Hutchinson Reef	4.6 nm	1.3 nm	0:30	0:20
Black Point	12.7 nm	8.1 nm	1:24	0:56
Ouzinkie Harbor	13.4 nm	0.7 nm	1:29	0:59

Figure 52: Ouzinkie to Port Lions

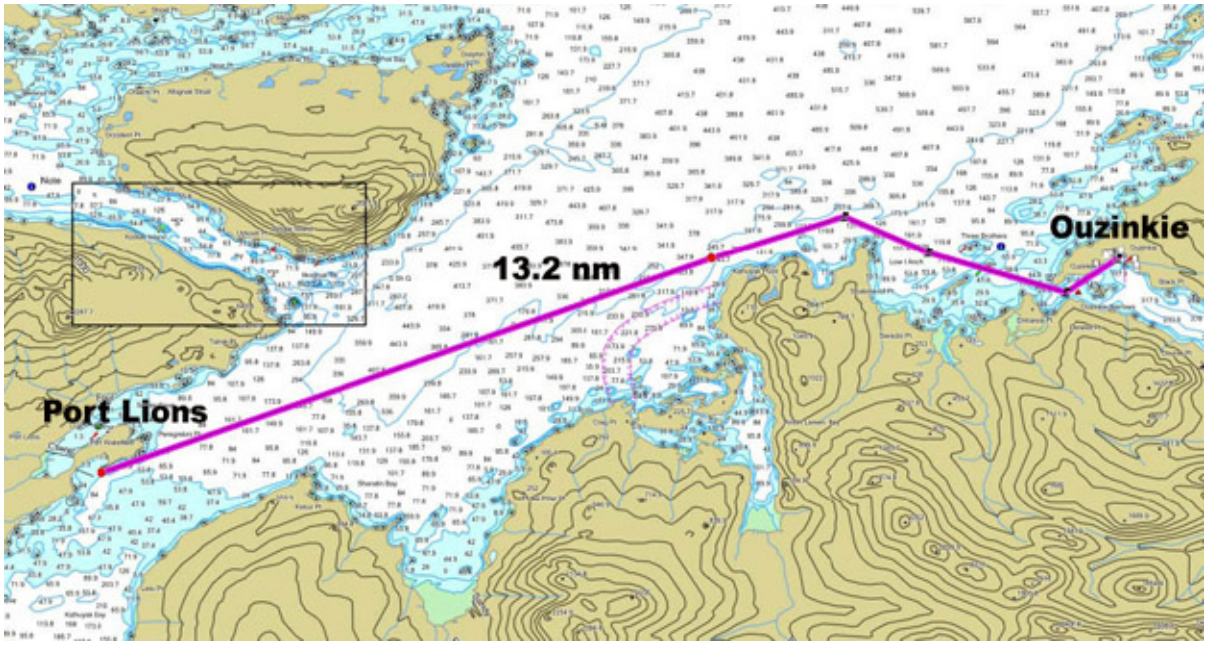


Table 83: Ouzinkie to Port Lions – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Ouzinkie Harbor (start)				
Ouzinkie Point	0.8 nm	0.8 nm	0:05	0:03
Three Brothers Rocks	2.5 nm	1.7 nm	0:16	0:11
Waypoint 4	3.7 nm	1.1 nm	0:24	0:16
Kizhuyak Point	5.4 nm	1.7 nm	0:36	0:24
Port Lions	13.2 nm	7.9 nm	1:28	0:58

Figure 53: Port Lions to Larsen Bay

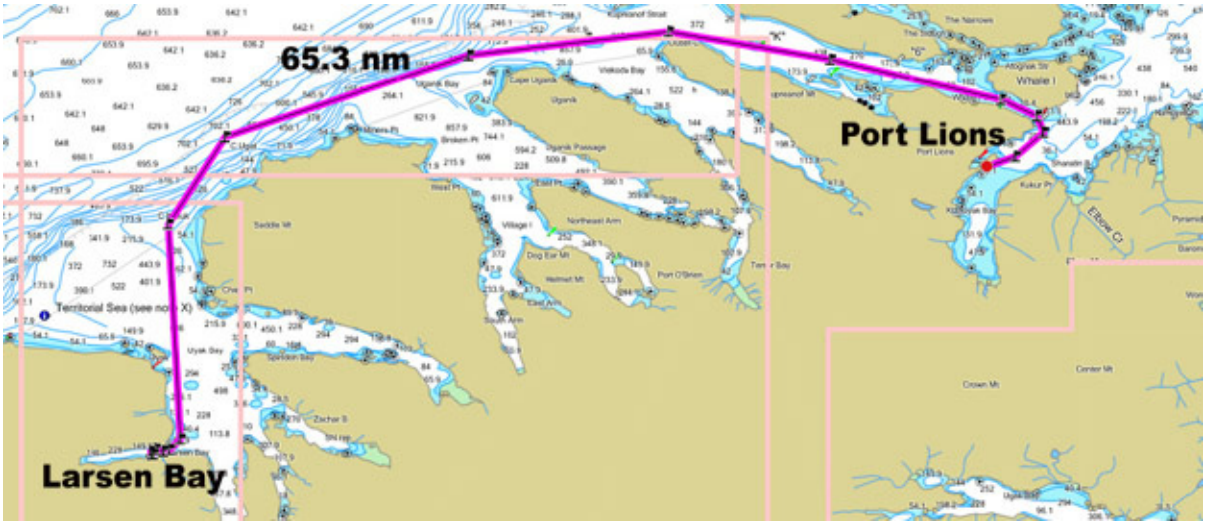


Table 84: Port Lions to Larsen Bay – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Port Lions (start)				
Waypoint 2	1.4 nm	1.4 nm	0:09	0:06
Inner Point	3.4 nm	2.0 nm	0:22	0:15
Ilkognak Rock	4.6 nm	1.1 nm	0:30	0:20
Waypoint 5	6.5 nm	1.9 nm	0:43	0:28
Waypoint 6	14.4 nm	7.9 nm	1:36	1:04
Outlet Cape	21.7 nm	7.3 nm	2:24	1:36
Cape Uganik	30.5 nm	8.9 nm	3:23	2:15
Cape Ugak	42.5 nm	12.0 nm	4:43	3:08
Cape Kuliuk	48.8 nm	6.3 nm	5:25	3:36
Larsen Bay Entrance	63.3 nm	14.4 nm	7:02	4:41
Waypoint 12	64.1 nm	0.9 nm	7:07	4:44
Waypoint 13	64.4 nm	0.3 nm	7:09	4:46
Waypoint 14	64.8 nm	0.4 nm	7:12	4:48
Waypoint 15	65.1 nm	0.3 nm	7:14	4:49
Larsen Bay Dock	65.3 nm	0.2 nm	7:15	4:50

Figure 54: Larsen Bay to Karluk

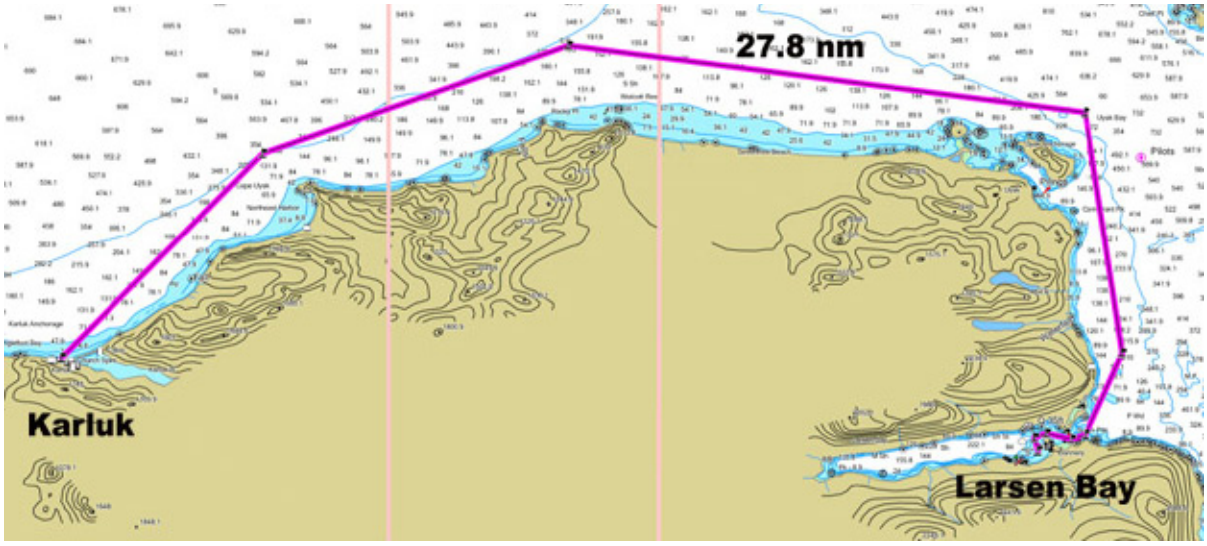


Table 85: Larsen Bay to Karkuk – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Larsen Bay (start)				
Waypoint 2	0.3 nm	0.3 nm	0:02	0:01
Waypoint 3	0.5 nm	0.2 nm	0:03	0:02
Waypoint 4	0.9 nm	0.4 nm	0:06	0:04
Larsen Bay Entrance	1.2 nm	0.2 nm	0:08	0:05
Waypoint 6	3.1 nm	2.0 nm	0:20	0:13
Harvester Island	8.8 nm	5.6 nm	0:58	0:39
Rocky Point	16.8 nm	8.0 nm	1:52	1:14
Cape Uyak	22.1 nm	5.3 nm	2:27	1:38
Karluk River Mouth	27.8 nm	5.7 nm	3:05	2:03

Figure 55: Karkuk to Akhiok

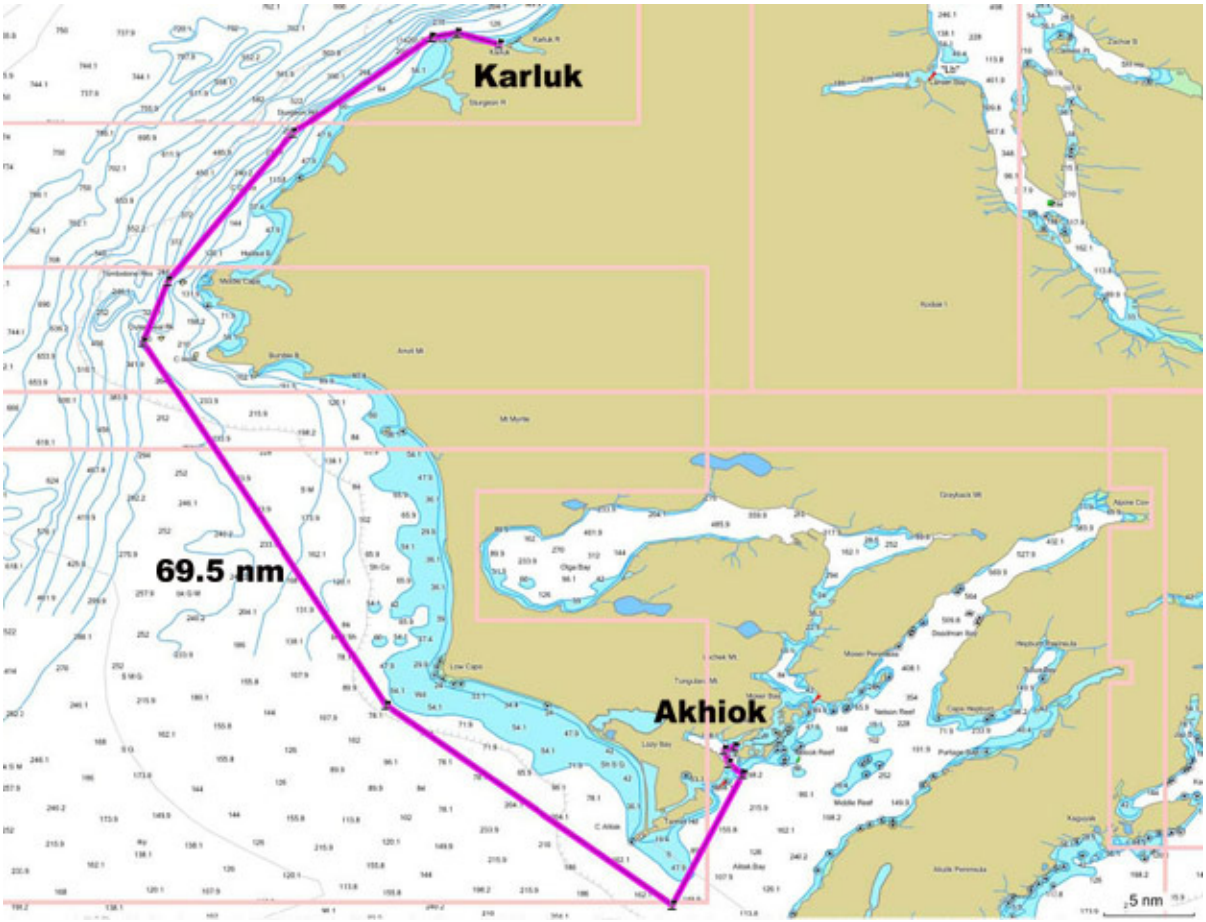


Table 86: Karluk to Akhiok – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Karluk River (start)				
Cape Karluk	1.6 nm	1.6 nm	0:10	0:07
Waypoint 3	2.6 nm	1.0 nm	0:17	0:11
Waypoint 4	9.9 nm	7.3 nm	1:06	0:44
Middle Cape	19.2 nm	9.3 nm	2:08	1:25
Outer Seal Rock	22.7 nm	3.5 nm	2:31	1:40
Low Cape	44.6 nm	22.0 nm	4:57	3:18
Cape Alitak	59.9 nm	15.2 nm	6:39	4:26
Kempff Bay Entrance	67.5 nm	7.6 nm	7:30	5:00
Waypoint 10	68.3 nm	0.8 nm	7:35	5:03
Waypoint 11	69.0 nm	0.8 nm	7:40	5:06
Pryor Point	69.5 nm	0.4 nm	7:43	5:08

Figure 56: Akhiok to Old Harbor

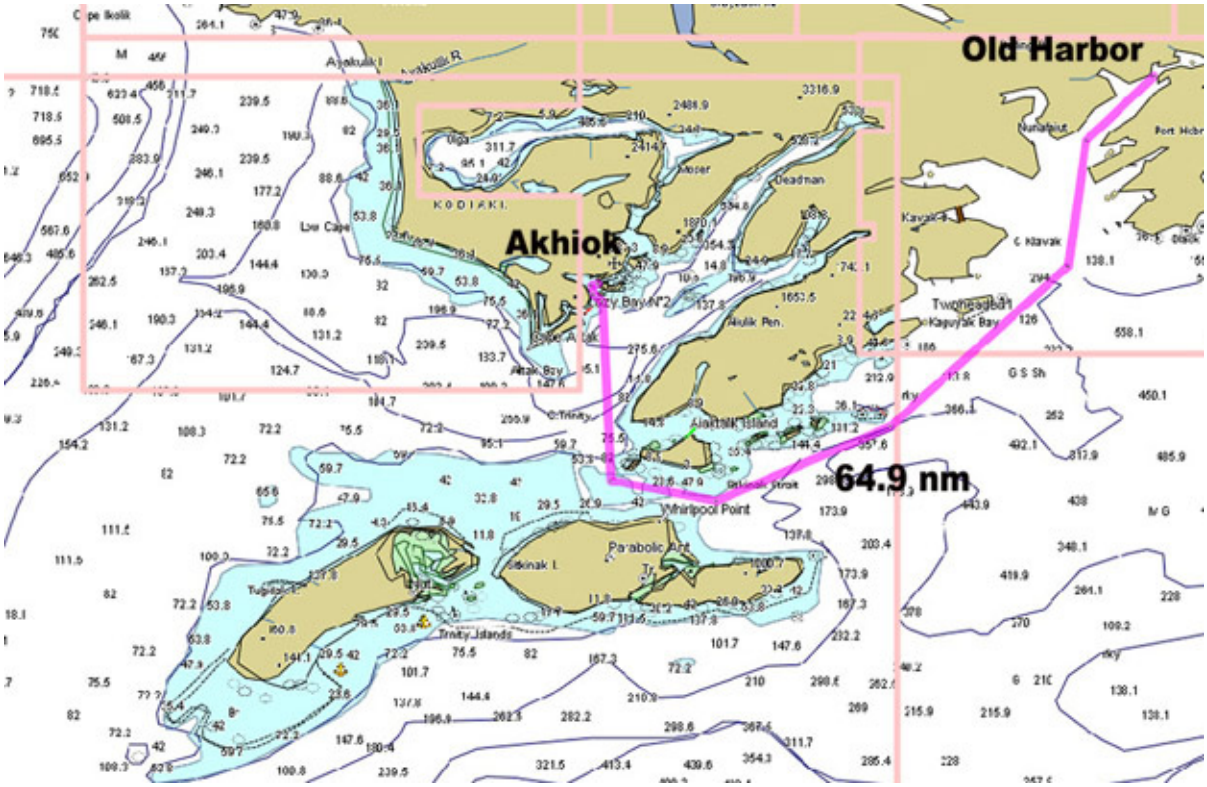


Table 87: Akhiok to Old Harbor – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Pryor Point (Start)				
Waypoint 2	0.4 nm	0.4 nm	0:02	0:01
Waypoint 3	1.1 nm	0.7 nm	0:07	0:04
Kempff Bay Entrance	1.8 nm	0.7 nm	0:12	0:08
Sundstrom Island	16.0 nm	14.2 nm	1:46	1:11
Sitkinak Strait Entrance	21.9 nm	5.9 nm	2:26	1:37
Waypoint 7	32.9 nm	11.0 nm	3:39	2:26
Cape Kiavak	48.7 nm	15.9 nm	5:24	3:36
Sitkalidak Strait Entrance	58.7 nm	10.0 nm	6:31	4:20
Old Harbor	64.9 nm	6.2 nm	7:12	4:48

Figure 57: Akhiok Outside Route to Old Harbor

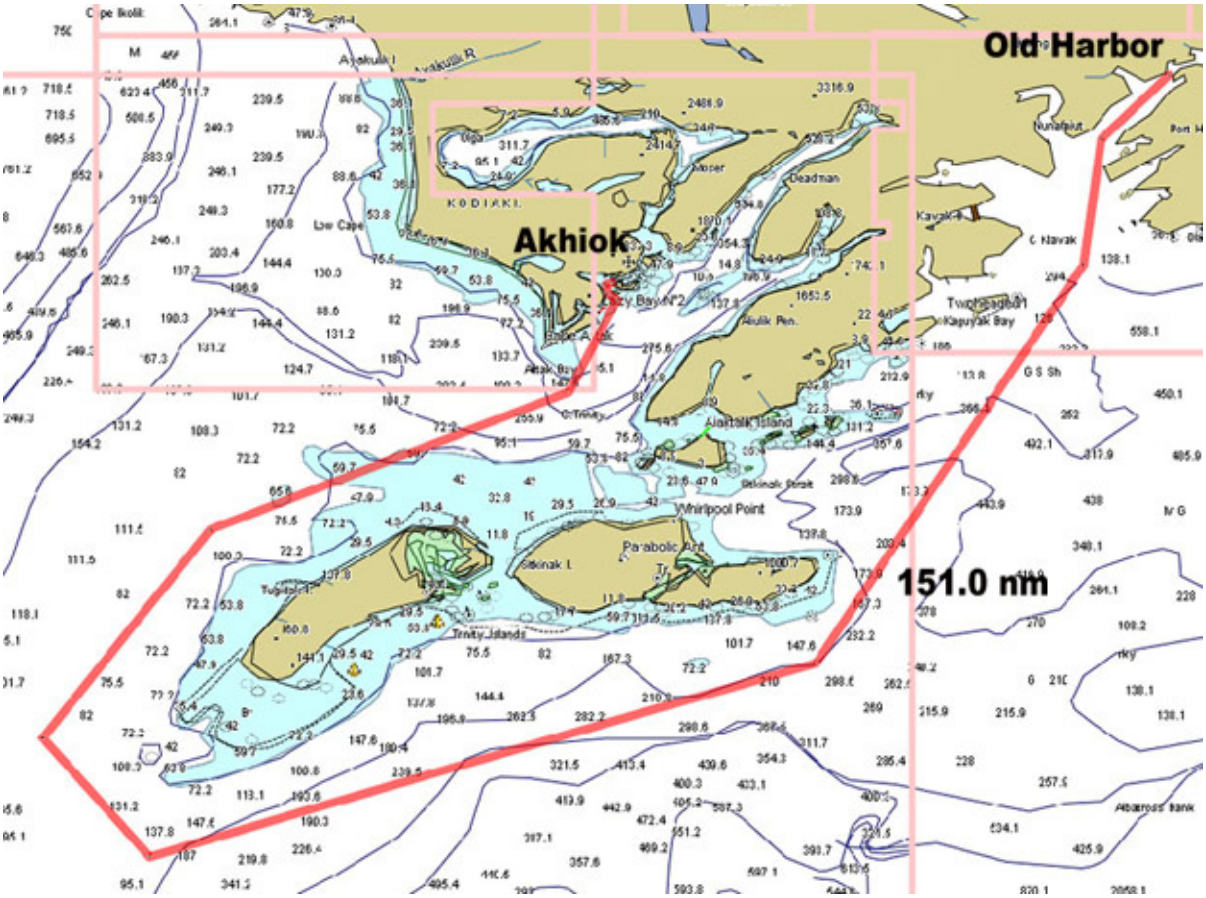


Table 88: Akhiok Outside Route to Old Harbor – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Prior Point (Start)				
Waypoint 2	0.4 nm	0.4 nm	0:02	0:01
Waypoint 3	1.1 nm	0.7 nm	0:07	0:04
Kempff Bay Entrance	1.8 nm	0.7 nm	0:12	0:08
Cape Alitak	9.5 nm	7.7 nm	1:03	0:42
Waypoint 6	31.5 nm	21.9 nm	3:30	2:20
Waypoint 7	50.2 nm	18.8 nm	5:34	3:43
Cape Sitkinak	61.2 nm	11.0 nm	6:48	4:32
Black Point	100 nm	39.0 nm	11:06	7:24
Waypoint 10	135 nm	34.6 nm	15:00	10:00
Waypoint 11	145 nm	10.0 nm	16:06	10:44
Old Harbor	151 nm	6.2 nm	16:46	11:11

Figure 58: Old Harbor to Kodiak

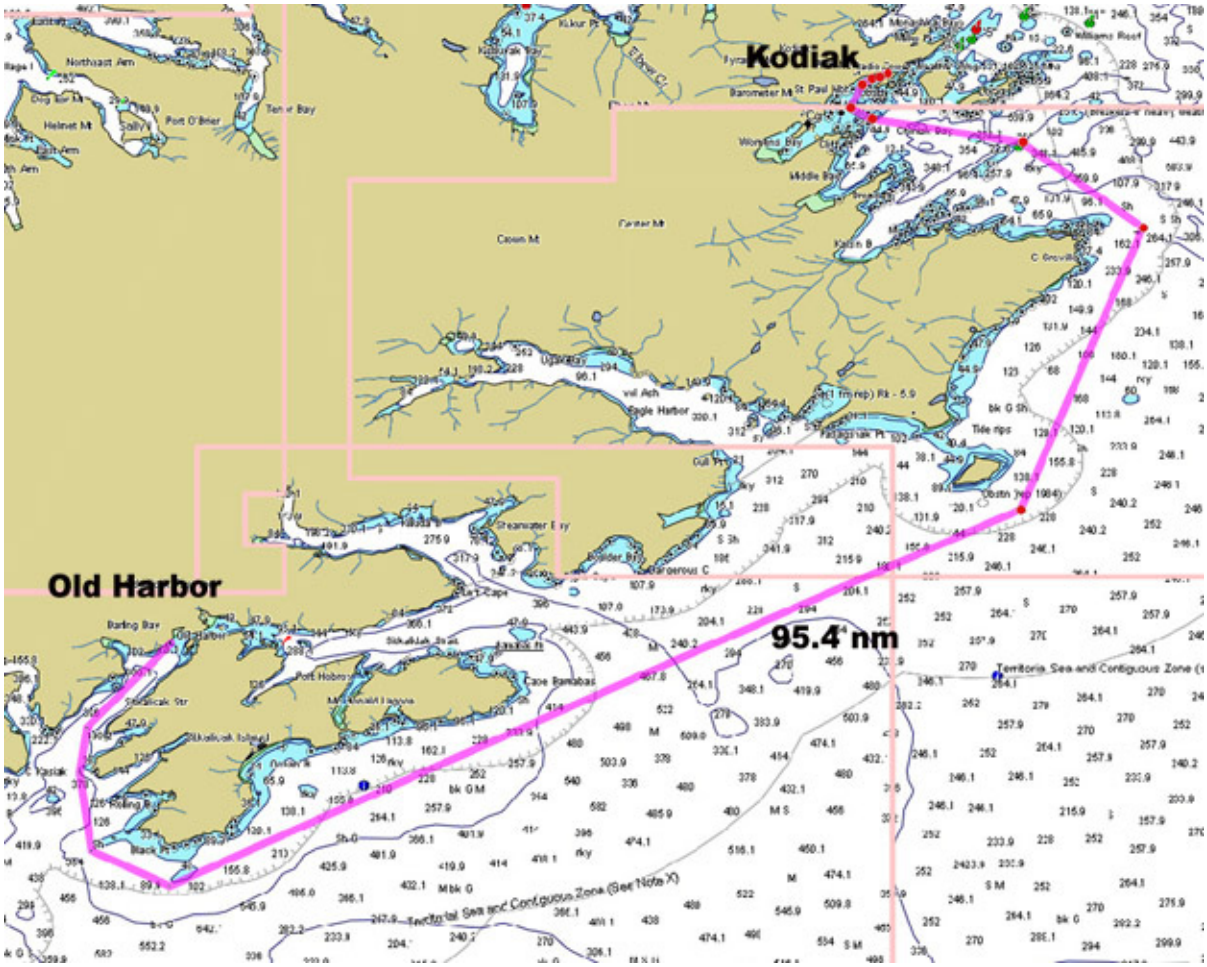


Table 89: Old Harbor to Kodiak – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Old Harbor (start)				
Sitkalidak Strait Entrance	6.2 nm	6.2 nm	0:41	0:27
Waypoint 3	9.1 nm	2.8 nm	1:00	0:40
Ship Rock	13.9 nm	4.8 nm	1:32	1:01
Black Point	17.8 nm	3.9 nm	1:58	1:19
Ugak Island	59.9 nm	42.1 nm	6:39	4:26
Cape Chiniak	78.1 nm	18.2 nm	8:40	5:47
Waypoint 8	85.2 nm	7.2 nm	9:28	6:18
Kodiak Harbor Entrance	91.5 nm	6.2 nm	10:10	6:46
Waypoint 10	92.6 nm	1.1 nm	10:17	6:51
Gull Island	94.1 nm	1.6 nm	10:27	6:58
Round Island	94.7 nm	0.5 nm	10:31	7:00
Waypoint 13	95.0 nm	0.3 nm	10:33	7:02
Kodiak Terminal	95.4 nm	0.4 nm	10:36	7:04

Figure 59: Kodiak to Ouzinkie

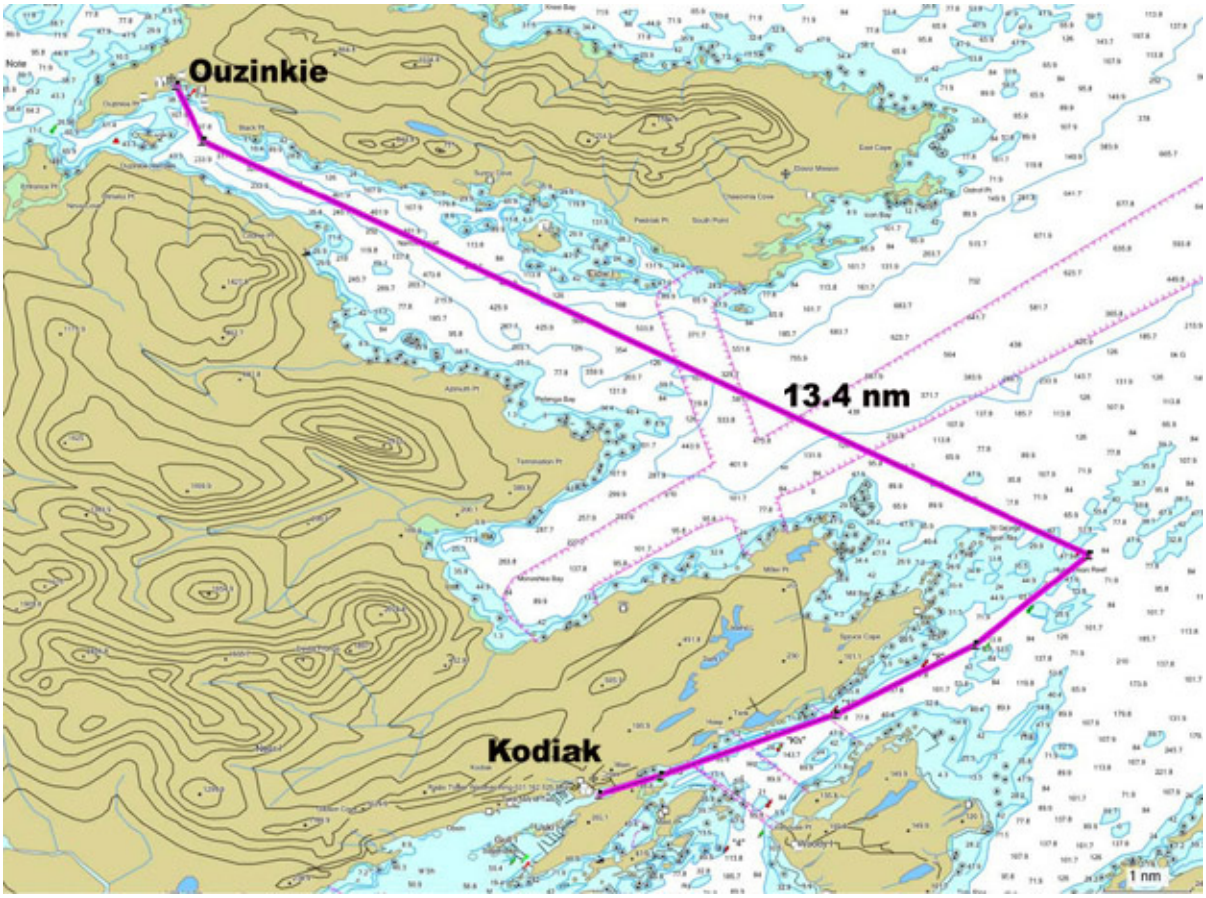


Table 90: Kodiak to Ouzinkie – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.5 nm	0.5 nm	0:03	0:02
Waypoint 3	2.0 nm	1.5 nm	0:13	0:08
Spruce Cape	3.3 nm	1.3 nm	0:22	0:14
Hutchinson Reef	4.6 nm	1.3 nm	0:30	0:20
Black Point	12.7 nm	8.1 nm	1:24	0:56
Ouzinkie Harbor	13.4 nm	0.7 nm	1:29	0:59

Figure 60: Kodiak to Port Lions

Table 91: Kodiak to Port Lions – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.5 nm	0.5 nm	0:03	0:02
Waypoint 3	2.0 nm	1.5 nm	0:13	0:08
Channel Rock	2.8 nm	0.9 nm	0:18	0:12
Hutchenson Reef	4.5 nm	1.7 nm	0:30	0:20
Black Point	12.2 nm	7.6 nm	1:21	0:54
Prokoda Island	13.0 nm	0.9 nm	1:26	0:57
Ouzinkie Narrows	13.7 nm	0.7 nm	1:31	1:00
Ouzinkie Point	14.0 nm	0.3 nm	1:33	1:02
Low Island	14.7 nm	0.7 nm	1:38	1:05
Shakmanof Point	16.7 nm	1.9 nm	1:51	1:14
Port Wakefield Entrance	26.3 nm	9.6 nm	2:55	1:56
Port Lions Terminal	26.5 nm	0.2 nm	2:56	1:57

Figure 61: Kodiak to Port Lions (around Spruce Island)

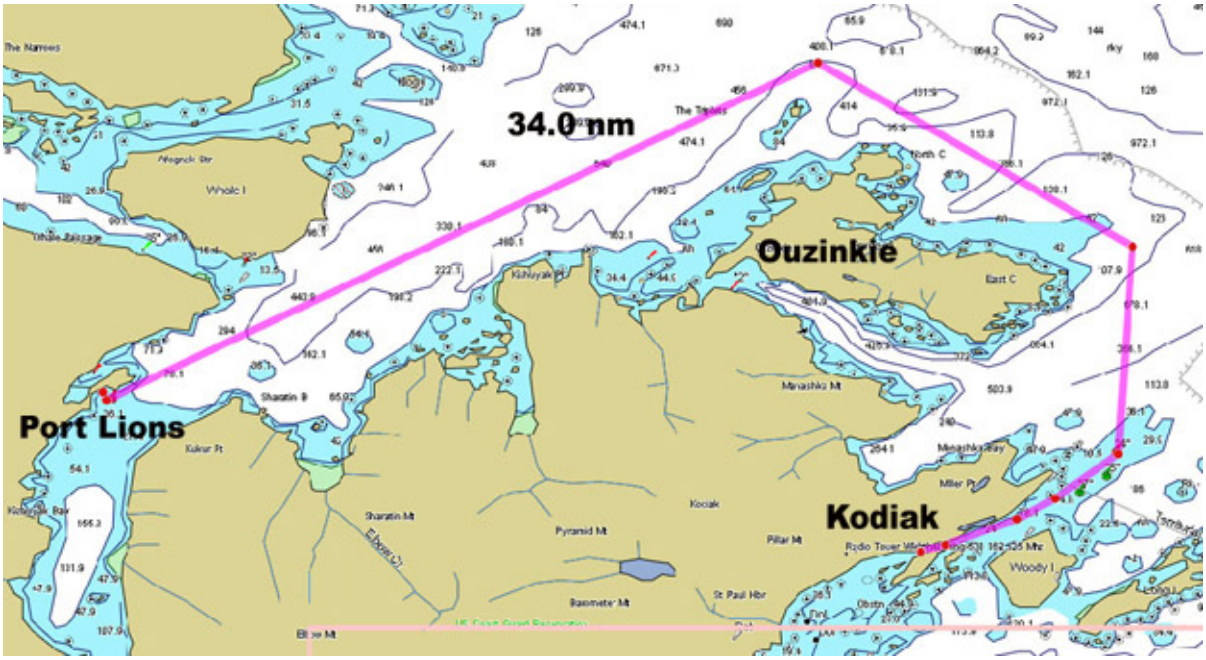


Table 92: Kodiak to Port Lions (around Spruce Island) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.5 nm	0.5 nm	0:03	0:02
Waypoint 3	2.0 nm	1.5 nm	0:13	0:08
Channel Rock	2.8 nm	0.9 nm	0:18	0:12
Hutchenson Reef	4.5 nm	1.7 nm	0:30	0:20
Spruce Island East Cape	10.3 nm	5.7 nm	1:08	0:45
Taliudek Island	17.9 nm	7.6 nm	1:59	1:19
Port Wakefield Entrance	33.7 nm	15.9 nm	3:44	2:29
Port Lions Terminal	34.0 nm	0.2 nm	3:46	2:31

Figure 62: Kodiak to Larsen Bay

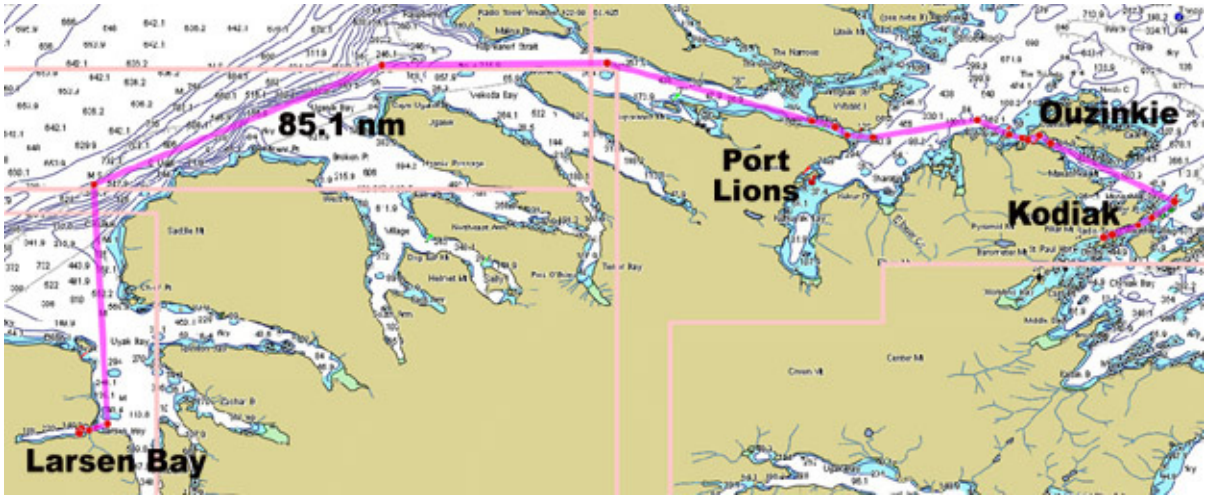


Table 93: Kodiak to Larsen Bay – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.5 nm	0.5 nm	0:03	0:02
Waypoint 3	2.0 nm	1.5 nm	0:13	0:08
Channel Rock	2.8 nm	0.9 nm	0:18	0:12
Hutchenson Reef	4.5 nm	1.7 nm	0:30	0:20
Black Point	12.2 nm	7.6 nm	1:21	0:54
Prokoda Island	13.0 nm	0.9 nm	1:26	0:57
Ouzinkie Narrows	13.7 nm	0.7 nm	1:31	1:00
Ouzinkie Point	14.0 nm	0.3 nm	1:33	1:02
Low Island	14.7 nm	0.7 nm	1:38	1:05
Shakmanof Point	16.7 nm	1.9 nm	1:51	1:14
Whale Passage East End	22.0 nm	5.4 nm	2:26	1:37
Bird Point	23.3 nm	1.3 nm	2:35	1:43
Uzkosti Point	24.2 nm	0.9 nm	2:41	1:47
Pokati Point	25.5 nm	1.3 nm	2:50	1:53
Whale Passage West End	36.6 nm	11.1 nm	4:04	2:42
Cape Uganik	47.8 nm	11.2 nm	5:18	3:32
Cape Kuliuk	64.9 nm	17.1 nm	7:12	4:48
Larsen Bay Approach	83.2 nm	18.4 nm	9:14	6:09
Larsen Bay Entrance	84.3 nm	1.0 nm	9:22	6:14
Waypoint 11	84.7 nm	0.4 nm	9:24	6:16
Waypoint 12	85.0 nm	0.3 nm	9:26	6:17
Larsen Bay Terminal	85.1 nm	0.1 nm	9:27	6:18

Figure 63: Kodiak to Karluk

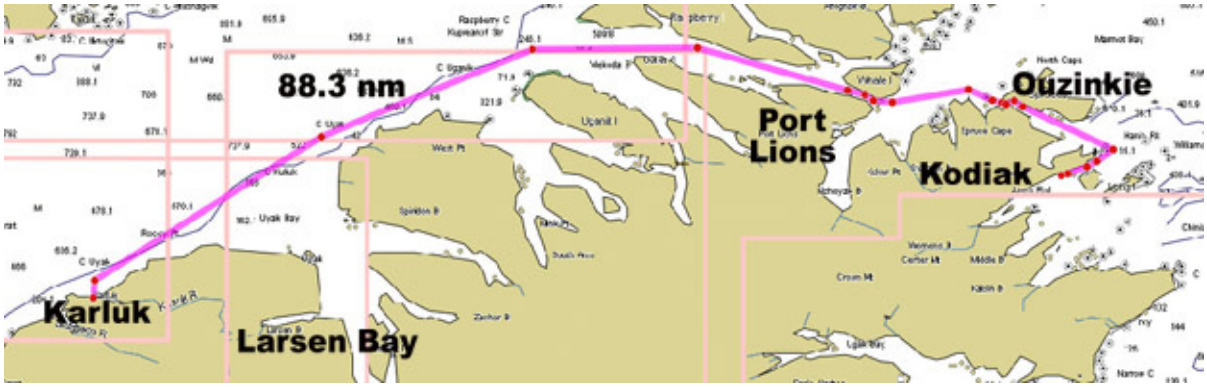


Table 94: Kodiak to Karluk – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.5 nm	0.5 nm	0:03	0:02
Waypoint 3	2.0 nm	1.5 nm	0:13	0:08
Channel Rock	2.8 nm	0.9 nm	0:18	0:12
Hutchenson Reef	4.5 nm	1.7 nm	0:30	0:20
Black Point	12.2 nm	7.6 nm	1:21	0:54
Prokoda Island	13.0 nm	0.9 nm	1:26	0:57
Ouzinkie Narrows	13.7 nm	0.7 nm	1:31	1:00
Ouzinkie Point	14.0 nm	0.3 nm	1:33	1:02
Low Island	14.7 nm	0.7 nm	1:38	1:05
Shakmanof Point	16.7 nm	1.9 nm	1:51	1:14
Whale Passage East End	22.0 nm	5.4 nm	2:26	1:37
Bird Point	23.3 nm	1.3 nm	2:35	1:43
Uzkosti Point	24.2 nm	0.9 nm	2:41	1:47
Pokati Point	25.5 nm	1.3 nm	2:50	1:53
Whale Passage West End	36.6 nm	11.1 nm	4:04	2:42
Cape Uganik	47.8 nm	11.2 nm	5:18	3:32
Cape Kuliuk	64.9 nm	17.1 nm	7:12	4:48
Waypoint 19	86.5 nm	21.6 nm	9:36	6:24
Karluk River Mouth	88.3 nm	1.8 nm	9:48	6:32

Figure 64: Kodiak to Akhiok (North route)

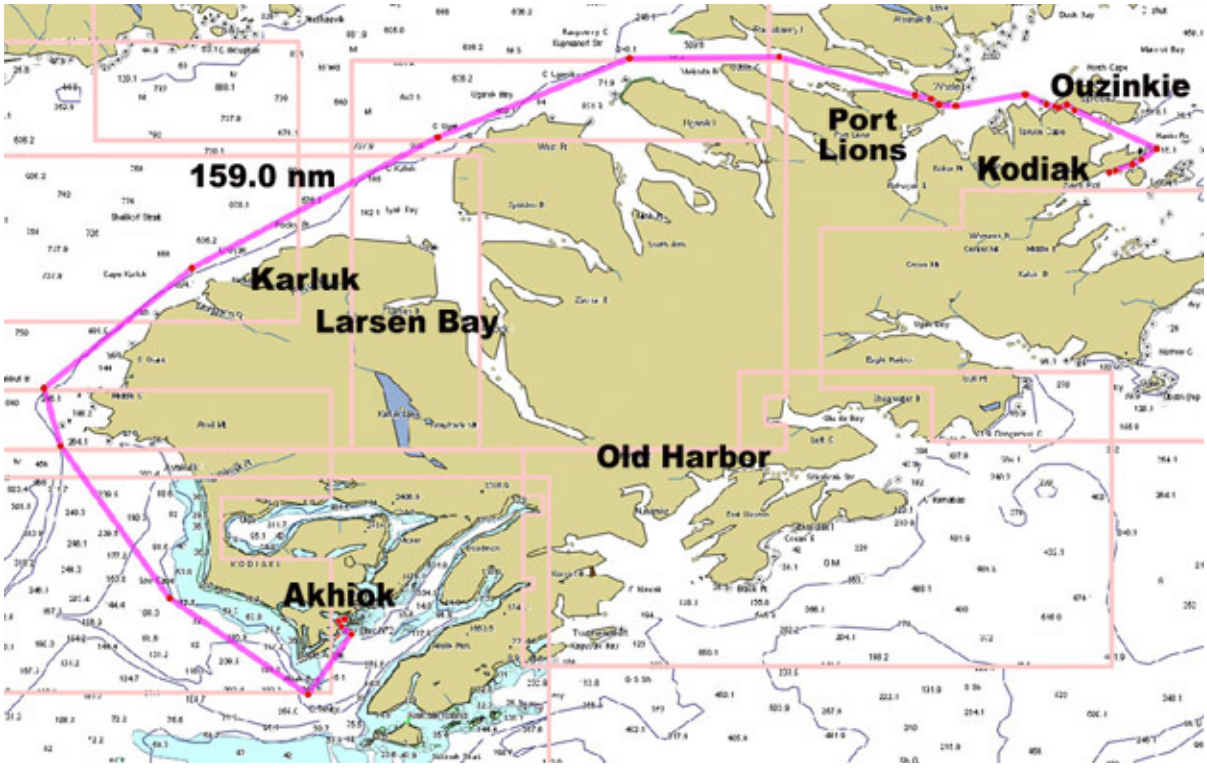


Table 95: Kodiak to Akhiok (North route) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.5 nm	0.5 nm	0:03	0:02
Waypoint 3	2.0 nm	1.5 nm	0:13	0:08
Channel Rock	2.8 nm	0.9 nm	0:18	0:12
Hutchenson Reef	4.5 nm	1.7 nm	0:30	0:20
Black Point	12.2 nm	7.6 nm	1:21	0:54
Prokoda Island	13.0 nm	0.9 nm	1:26	0:57
Ouzinkie Narrows	13.7 nm	0.7 nm	1:31	1:00
Ouzinkie Point	14.0 nm	0.3 nm	1:33	1:02
Low Island	14.7 nm	0.7 nm	1:38	1:05
Shakmanof Point	16.7 nm	1.9 nm	1:51	1:14
Whale Passage East End	22.0 nm	5.4 nm	2:26	1:37
Bird Point	23.3 nm	1.3 nm	2:35	1:43
Uzkosti Point	24.2 nm	0.9 nm	2:41	1:47
Pokati Point	25.5 nm	1.3 nm	2:50	1:53
Whale Passage West End	36.6 nm	11.1 nm	4:04	2:42
Cape Uganik	47.8 nm	11.2 nm	5:18	3:32
Cape Kuliuk	64.9 nm	17.1 nm	7:12	4:48
Cape Karluk	88.9 nm	24.0 nm	9:52	6:35
Middle Cape	107 nm	17.9 nm	11:53	7:55
Cape Ikolik	114 nm	6.8 nm	12:40	8:26

Low Cape	133 nm	19.5 nm	14:46	9:51
Cape Alitak	148 nm	15.4 nm	16:26	10:57
White Rock	156 nm	7.7 nm	17:20	11:33
Kempff Bay Entrance	157 nm	1.2 nm	17:26	11:37
Akhiok Is. West End	158 nm	0.7 nm	17:33	11:42
Akhiok (Prior Point)	159 nm	0.4 nm	17:40	11:46

Figure 65: Kodiak to Akhiok (South route via Tugidak Island)

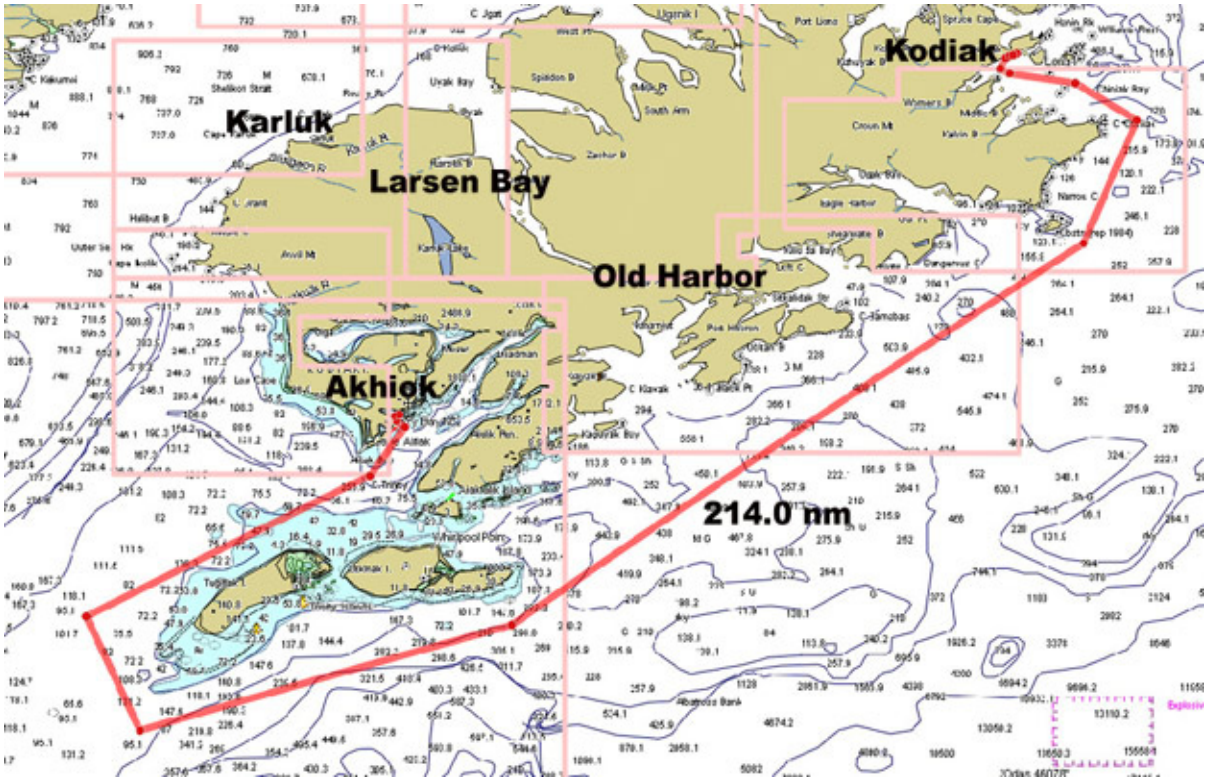


Table 96: Kodiak to Akhiok (South route via Tugidak Island) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (start)				
Waypoint 2	0.3 nm	0.3 nm	0:02	0:01
Round Island	0.7 nm	0.4 nm	0:04	0:03
Gull Island West End	1.2 nm	0.5 nm	0:08	0:05
Puffin Island	2.8 nm	1.6 nm	0:18	0:12
Kodiak Harbor Entrance	4.0 nm	1.1 nm	0:26	0:17
Humpback Rock	10.3 nm	6.4 nm	1:08	0:45
Cape Chiniak	18.2 nm	7.8 nm	2:01	1:20
Ugak Island	36.4 nm	18.3 nm	4:02	2:41
Cape Sitkinak	114 nm	77.4 nm	12:40	8:26
Tugidak Island South Side	153 nm	39.2 nm	17:00	11:20
Tugidak Island West End	170 nm	17.1 nm	18:53	12:35
Cape Alitak	204 nm	34.0 nm	22:40	15:06
White Rock	212 nm	7.7 nm	23:33	15:42
Kempff Bay Entrance	213 nm	1.2 nm	23:40	15:46
Akhiok Is. West End	214 nm	0.7 nm	23:46	15:51
Akhiok (Prior Point)	214 nm	0.4 nm	23:46	15:51

Figure 66: Kodiak to Akhiok (South route via Sitkinak Strait)

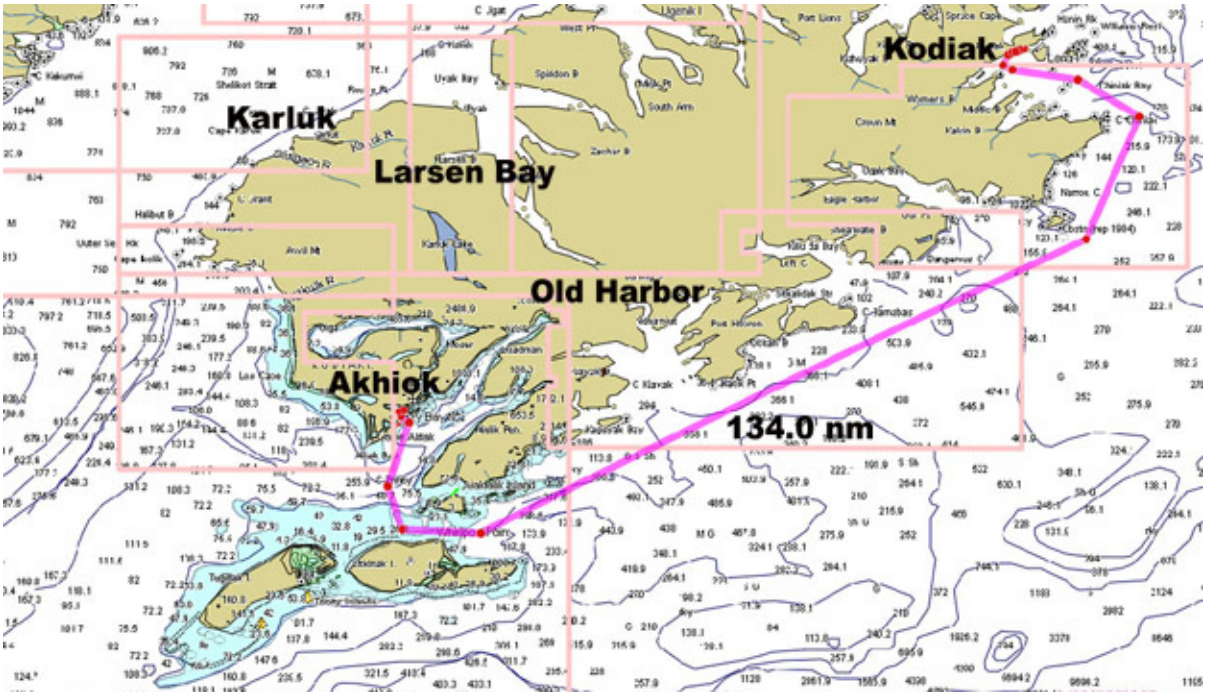


Table 97: Kodiak to Akhiok (South route via Sitkinak Strait) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (Start)				
Waypoint 2	0.3 nm	0.3 nm	0:02	0:01
Round Island	0.7 nm	0.4 nm	0:04	0:03
Gull Island West End	1.2 nm	0.5 nm	0:08	0:05
Puffin Island	2.8 nm	1.6 nm	0:18	0:12
Kodiak Harbor Entrance	4.0 nm	1.1 nm	0:26	0:17
Humpback Rock	10.3 nm	6.4 nm	1:08	0:45
Cape Chiniak	18.2 nm	7.8 nm	2:01	1:20
Ugak Island	36.4 nm	18.3 nm	4:02	2:41
Aiaktalik Island	108 nm	71.8 nm	12:00	8:00
Sundstrum Island	116 nm	7.6 nm	12:53	8:35
Cape Trinity	122 nm	6.4 nm	13:33	9:02
White Rock	132 nm	9.4 nm	14:40	9:46
Kempff Bay Entrance	133 nm	1.2 nm	14:46	9:51
Akhiok Is. West End	133 nm	0.7 nm	14:46	9:51
Akhiok (Prior Point)	134 nm	0.4 nm	14:53	9:55

Figure 67: Kodiak to Old Harbor

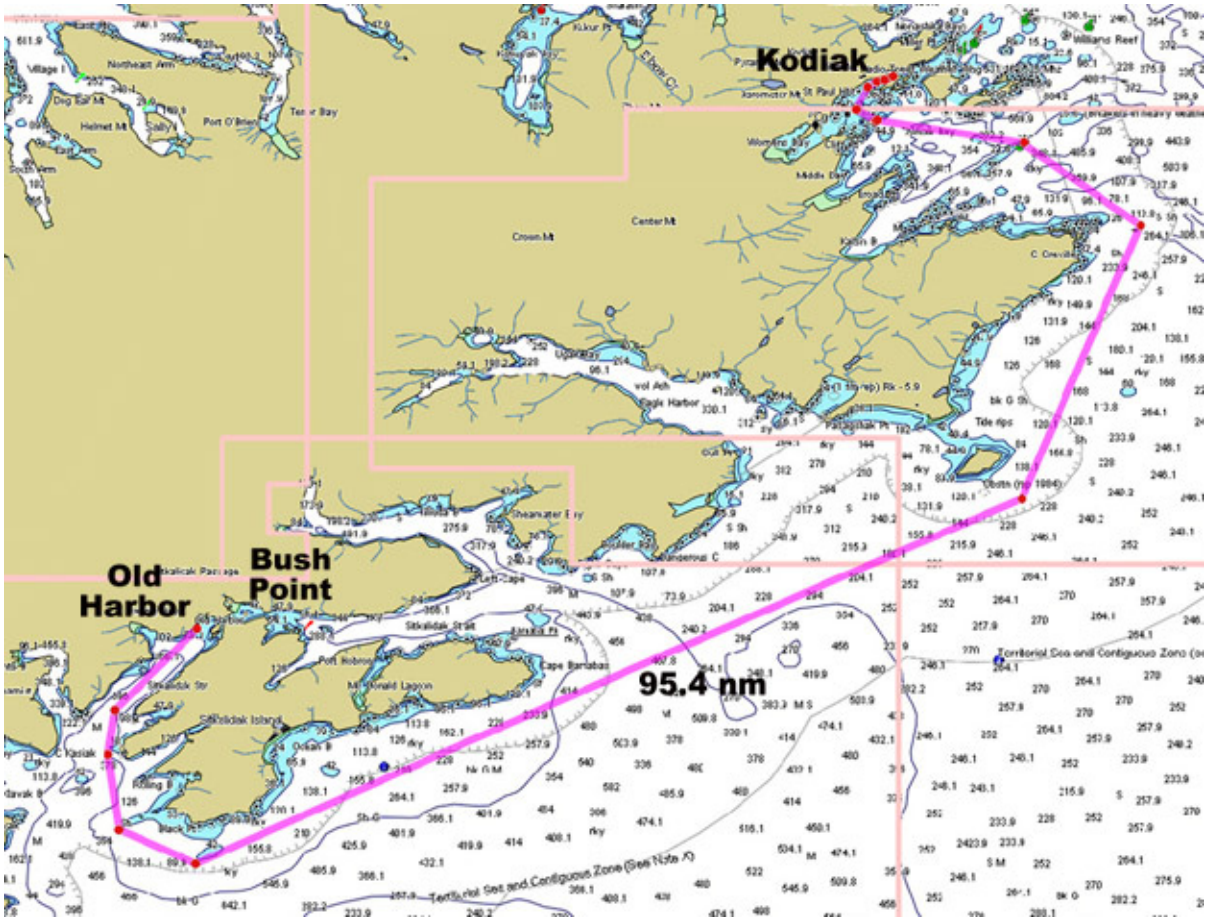


Table 98: Kodiak to Old Harbor – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (Start)				
Waypoint 2	0.4 nm	0.4 nm	0:02	0:01
Round Island	0.7 nm	0.3 nm	0:04	0:03
Gull Island West End	1.2 nm	0.5 nm	0:08	0:05
Puffin Island	2.8 nm	1.6 nm	0:18	0:12
Kodiak Harbor Entrance	3.9 nm	1.1 nm	0:26	0:17
Humpback Rock	10.1 nm	6.2 nm	1:07	0:44
Cape Chiniak	17.3 nm	7.2 nm	1:55	1:16
Ugak Island	35.5 nm	18.2 nm	3:56	2:37
Black Point	77.6 nm	42.1 nm	8:37	5:44
Ship Rock	81.5 nm	3.9 nm	9:03	6:02
Natalia Point	86.3 nm	4.8 nm	9:35	6:23
Newman Bay	89.1 nm	2.8 nm	9:54	6:36
Old Harbor	95.4 nm	6.2 nm	10:36	7:04

Figure 68: Kodiak to Old Harbor (Bush Point)

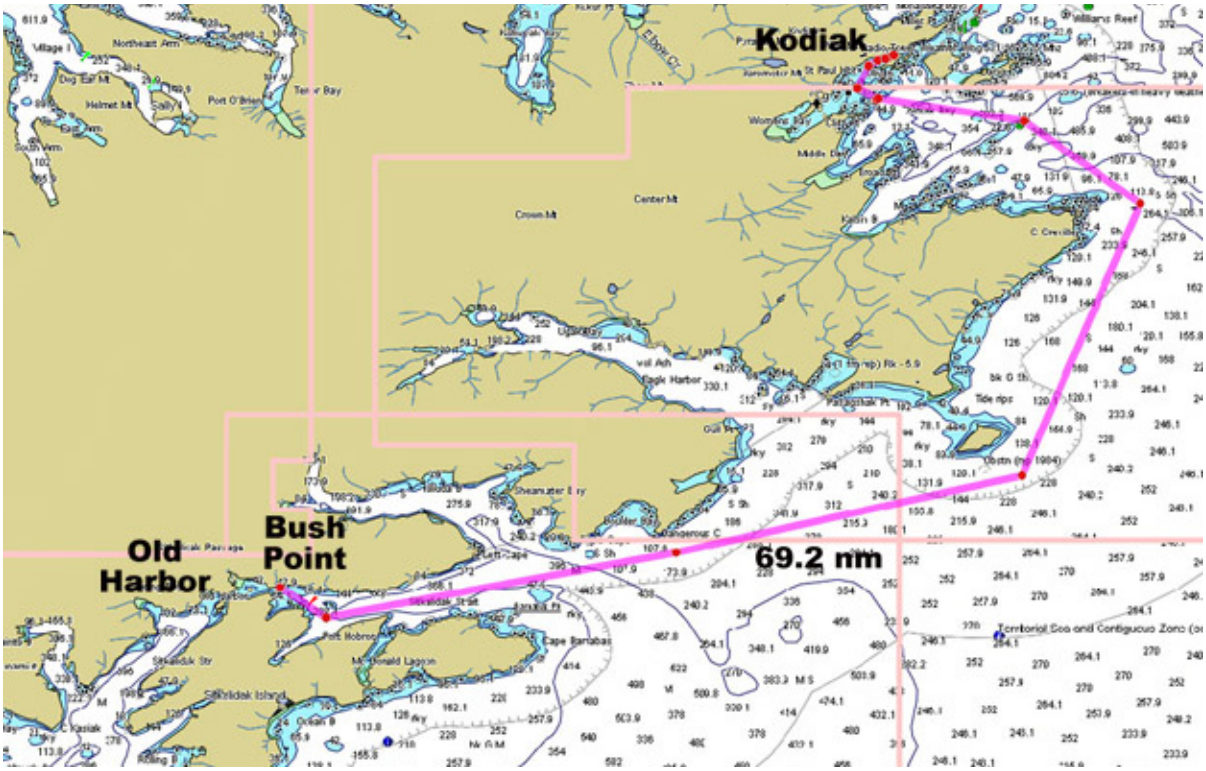


Table 99: Kodiak to Old Harbor (Bush Point) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Kodiak Terminal (Start)				
Waypoint 2	0.4 nm	0.4 nm	0:02	0:01
Round Island	0.7 nm	0.3 nm	0:04	0:03
Gull Island West End	1.2 nm	0.5 nm	0:08	0:05
Puffin Island	2.8 nm	1.5 nm	0:18	0:12
Kodiak Harbor Entrance	3.9 nm	1.1 nm	0:26	0:17
Humpback Rock	10.2 nm	6.3 nm	1:08	0:45
Cape Chiniak	17.4 nm	7.2 nm	1:56	1:17
Ugak Island	35.5 nm	18.2 nm	3:56	2:37
Dangerous Cape	51.0 nm	15.5 nm	5:40	3:46
Cathedral Island	66.5 nm	15.5 nm	7:23	4:55
Old Harbor (Bush Point)	69.2 nm	2.7 nm	7:41	5:07

Figure 69: Anton Larsen Bay to Ouzinkie

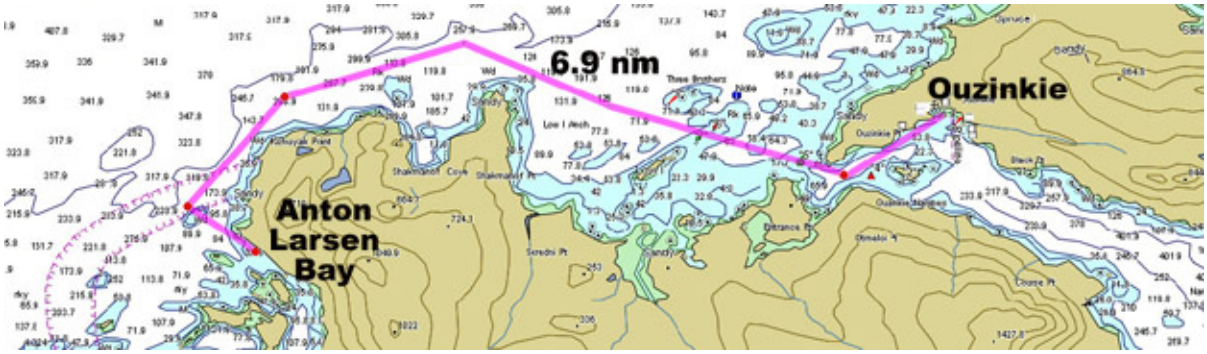


Table 100: Anton Larsen Bay to Ouzinkie – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Anton Larsen Bay Terminal (start)				
Kizhuyak Point Entrance	0.6 nm	0.6 nm	0:04	0:02
Kizhuyak Point	1.9 nm	1.3 nm	0:12	0:08
Shakmanof Point	3.2 nm	1.3 nm	0:21	0:14
Three Brothers Rocks	4.3 nm	1.1 nm	0:28	0:19
Ouzinkie Narrows	6.1 nm	1.7 nm	0:40	0:27
Ouzinkie Terminal	6.9 nm	0.8 nm	0:46	0:30

Figure 70: Anton Larsen Bay to Port Lions

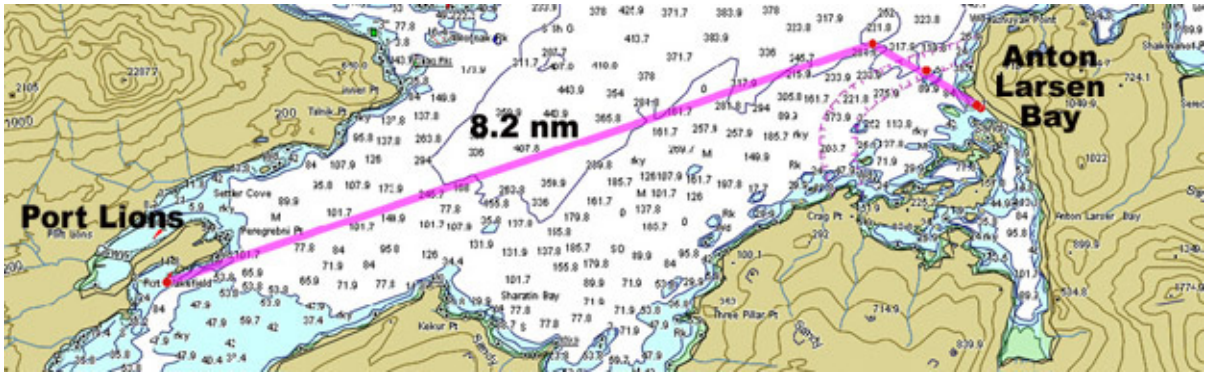


Table 101: Anton Larsen Bay to Port Lions – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Anton Larsen Bay Terminal (start)				
Kizhuyak Point Entrance	1.2 nm	1.2 nm	0:08	0:05
Port Lions	8.2 nm	6.9 nm	0:54	0:36

Figure 71: Anton Larsen Bay to Larsen Bay

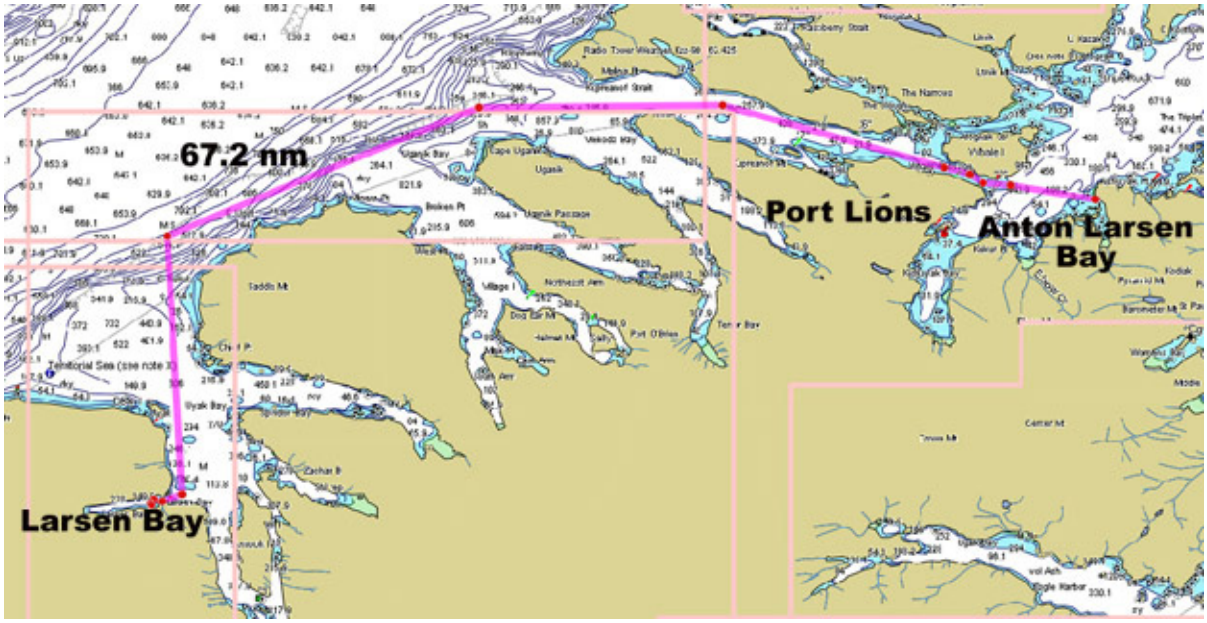


Table 102: Anton Larsen Bay to Larsen Bay – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Anton Larsen Bay Terminal (start)				
Whale Passage East End	4.0 nm	4.0 nm	0:26	0:17
Bird Point	5.3 nm	1.3 nm	0:35	0:23
Uzkosti Point	6.2 nm	0.9 nm	0:41	0:27
Pokati Point	7.5 nm	1.3 nm	0:50	0:33
Whale Passage West End	18.6 nm	11.1 nm	2:04	1:22
Cape Uganik	29.8 nm	11.2 nm	3:18	2:12
Cape Kuliuk	46.9 nm	17.1 nm	5:12	3:28
Larsen Bay Approach	65.3 nm	18.4 nm	7:15	4:50
Larsen Bay Entrance	66.3 nm	1.0 nm	7:22	4:54
Waypoint 11	66.7 nm	0.4 nm	7:24	4:56
Waypoint 12	67.0 nm	0.3 nm	7:26	4:57
Larsen Bay Terminal	67.2 nm	0.1 nm	7:28	4:58

Figure 72: Anton Larsen Bay to Karluk

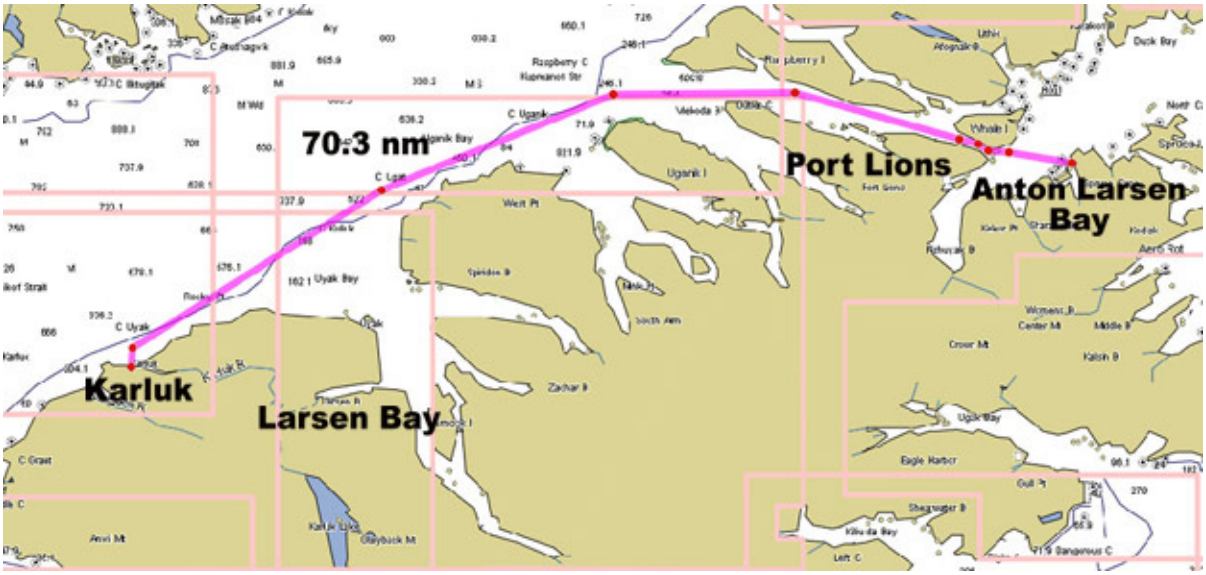


Table 103: Anton Larsen Bay to Karluk – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Anton Larsen Bay Terminal (start)				
Whale Passage East End	4.0 nm	4.0 nm	0:26	0:17
Bird Point	5.3 nm	1.3 nm	0:35	0:23
Uzkosti Point	6.2 nm	0.9 nm	0:41	0:27
Pokati Point	7.5 nm	1.3 nm	0:50	0:33
Whale Passage West End	18.6 nm	11.1 nm	2:04	1:22
Cape Uganik	29.8 nm	11.2 nm	3:18	2:12
Cape Kuliuk	46.9 nm	17.1 nm	5:12	3:28
Karluk Approach	68.5 nm	21.6 nm	7:36	5:04
Karluk	70.3 nm	1.8 nm	7:48	5:12

Figure 73: Anton Larsen Bay to Akhiok

Table 104: Anton Larsen Bay to Akhiok – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Anton Larsen Bay Terminal (start)				
Whale Passage East End	4.0 nm	4.0 nm	0:26	0:17
Bird Point	5.3 nm	1.3 nm	0:35	0:23
Uzkosti Point	6.2 nm	0.9 nm	0:41	0:27
Pokati Point	7.5 nm	1.3 nm	0:50	0:33
Whale Passage West End	18.6 nm	11.1 nm	2:04	1:22
Cape Uganik	29.8 nm	11.2 nm	3:18	2:12
Cape Kuliuk	46.9 nm	17.1 nm	5:12	3:28
Cape Karluk	70.9 nm	24.0 nm	7:52	5:15
Middle Cape	88.8 nm	17.9 nm	9:52	6:34
Cape Ikolik	95.5 nm	6.8 nm	10:36	7:04
Low Cape	115 nm	19.5 nm	12:46	8:31
Cape Alitak	130 nm	15.4 nm	14:26	9:37
White Rock	138 nm	7.7 nm	15:20	10:13
Kempff Bay Entrance	139 nm	1.2 nm	15:26	10:17
Akhiok Is. West End	140 nm	0.7 nm	15:33	10:22
Akhiok (Prior Point)	141 nm	0.4 nm	15:40	10:26

Figure 74: Pasagshak Bay to Akhiok (via Tugidak Island)

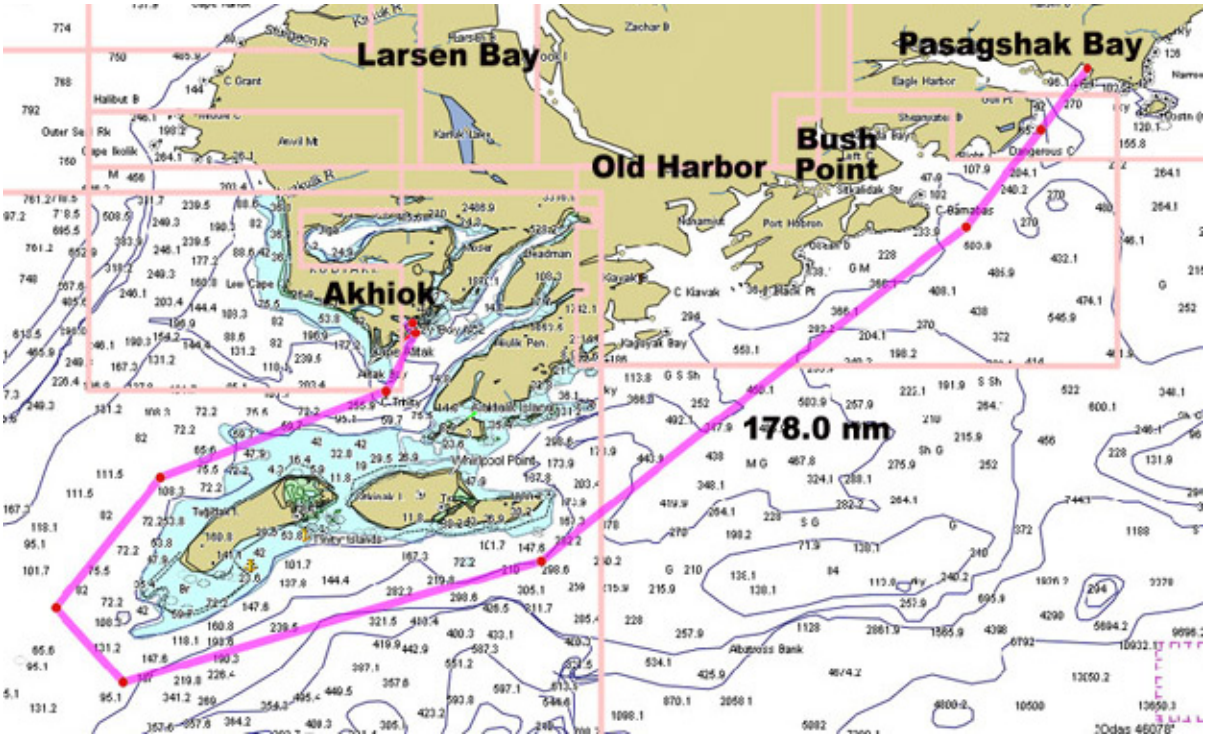


Table 105: Pasagshak Bay to Akhiok (via Tugidak Island) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Pasagshak Bay Terminal (start)				
Gull Point	8.7 nm	8.7 nm	0:58	0:38
Cape Barnabas	22.4 nm	13.8 nm	2:29	1:39
Cape Sitkinak	77.8 nm	55.4 nm	8:38	5:45
Tugidak Island South Side	117 nm	39.0 nm	13:00	8:40
Tugidak Island West End	128 nm	11.0 nm	14:13	9:28
Tugidak Island North Side	147 nm	18.8 nm	16:20	10:53
Cape Alitak	169 nm	21.9 nm	18:46	12:31
White Rock	176 nm	7.7 nm	19:33	13:02
Kempff Bay Entrance	177 nm	0.7 nm	19:40	13:06
Akhiok Is. West End	178 nm	0.7 nm	19:46	13:11
Akhiok (Prior Point)	178 nm	0.4 nm	19:46	13:11

Figure 75: Pasagshak Bay to Akhiok (via Sitkinak Strait)

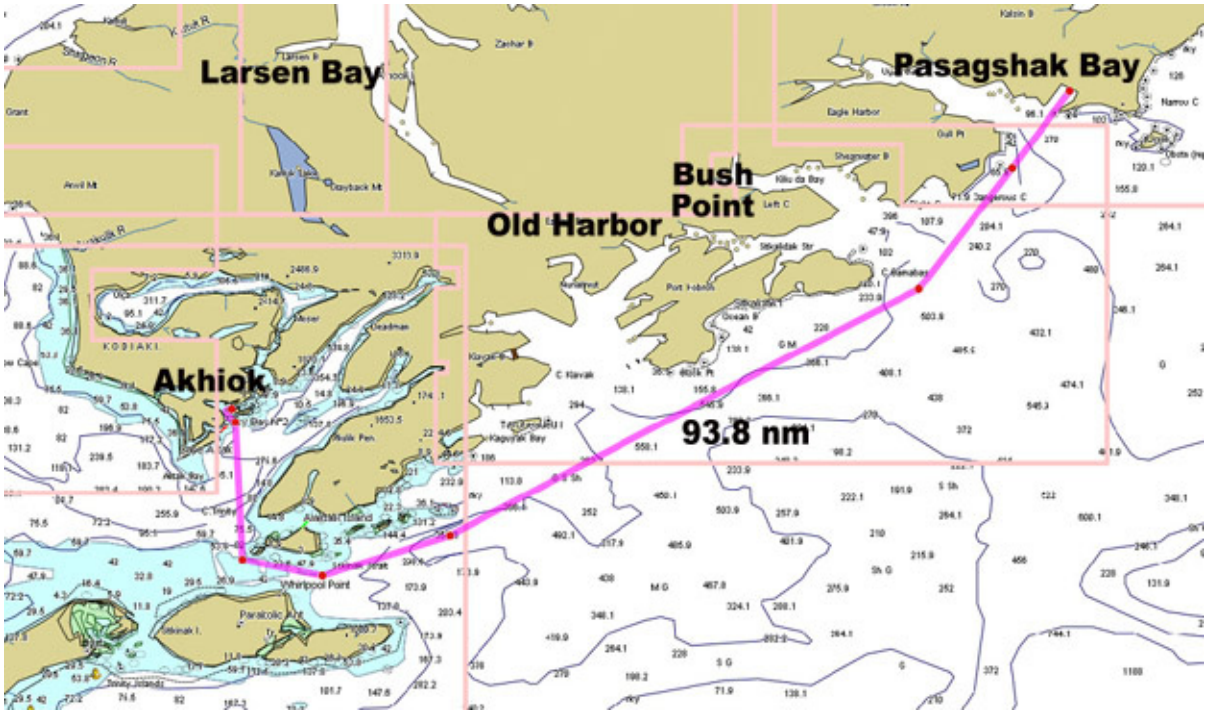


Table 106: Pasagshak Bay to Akhiok (via Sitkinak Strait) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Pasagshak Bay Terminal (start)				
Gull Point	8.7 nm	8.7 nm	0:58	0:38
Cape Barnabas	22.4 nm	13.8 nm	2:29	1:39
Geese Islands	62.8 nm	40.4 nm	6:58	4:39
Aiaktalik Island	72.5 nm	9.6 nm	8:03	5:22
Sundstrum Island	78.1 nm	5.7 nm	8:40	5:47
White Rock	92.0 nm	13.9 nm	10:13	6:48
Kempff Bay Entrance	92.7 nm	0.7 nm	10:18	6:52
Akhiok Is. West End	93.4 nm	0.7 nm	10:22	6:55
Akhiok (Prior Point)	93.8 nm	0.4 nm	10:25	6:56

Figure 76: Pasagshak Bay to Old Harbor

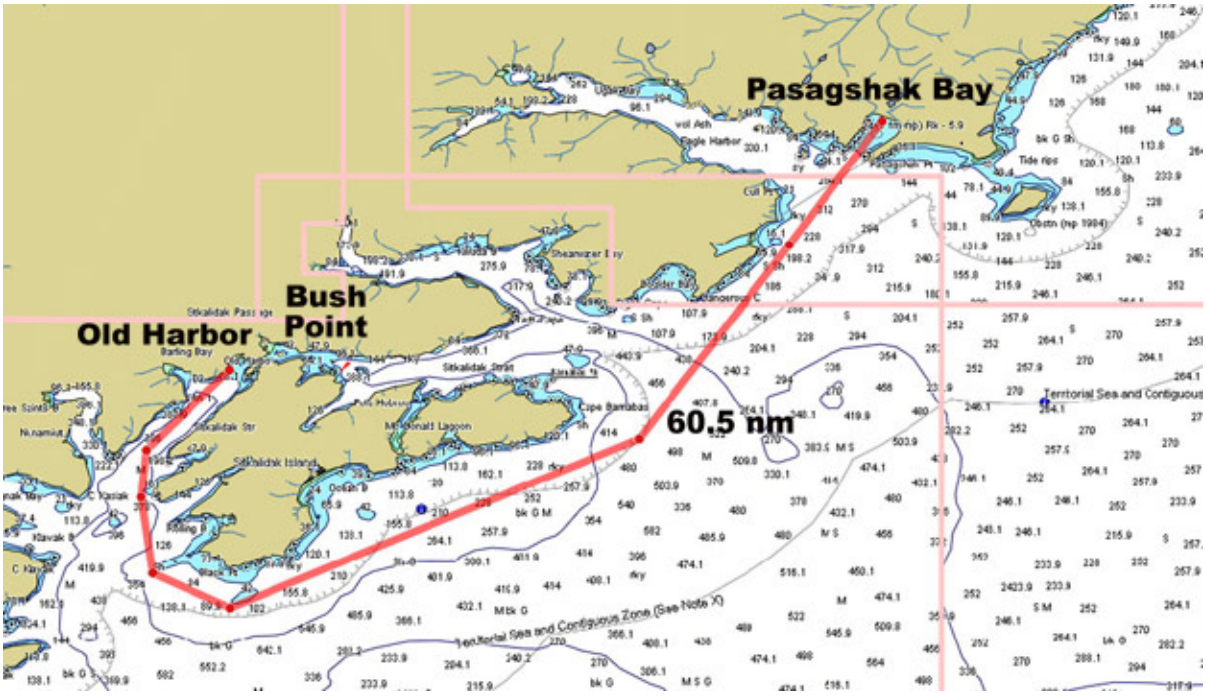


Table 107: Pasagshak Bay to Old Harbor – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Pasagshak Bay Terminal (start)				
Gull Point	8.7 nm	8.7 nm	0:58	0:38
Cape Barnabas	22.4 nm	13.8 nm	2:29	1:39
Black Point	42.6 nm	20.2 nm	4:44	3:09
Ship Rock	46.6 nm	3.9 nm	5:10	3:27
Natalia Point	51.4 nm	4.8 nm	5:42	3:48
Newman Bay	54.3 nm	3.0 nm	6:02	4:01
Old Harbor	60.5 nm	6.1 nm	6:43	4:28

Figure 77: Pasagshak Bay to Old Harbor (Bush Point)

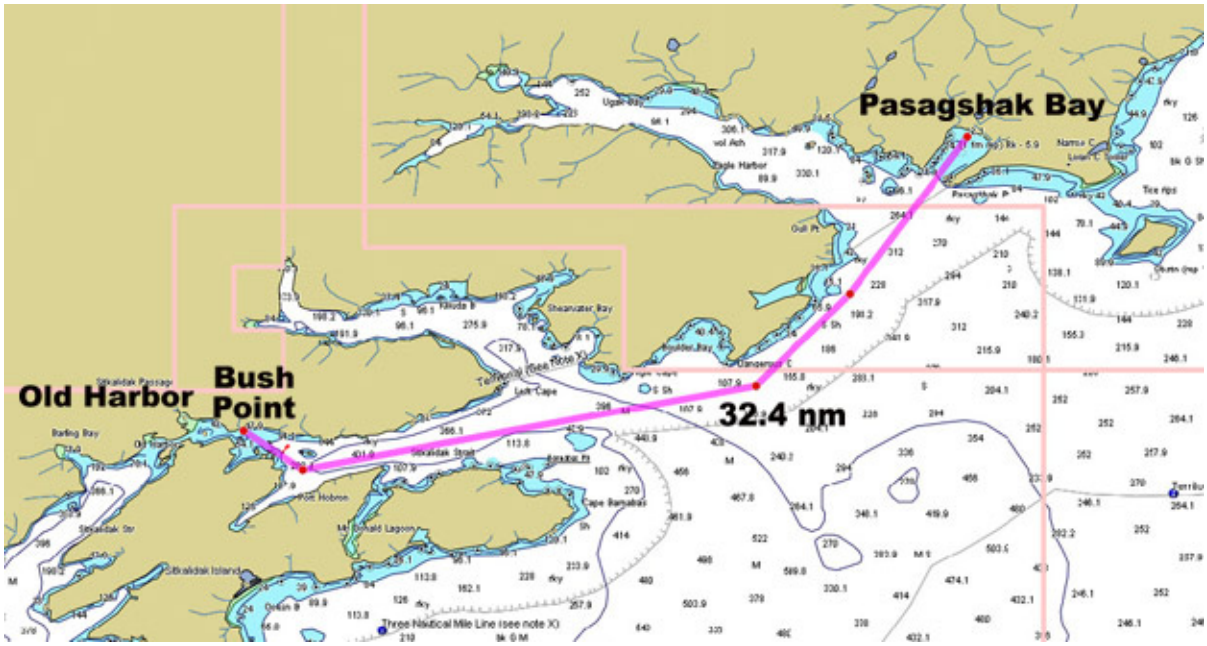
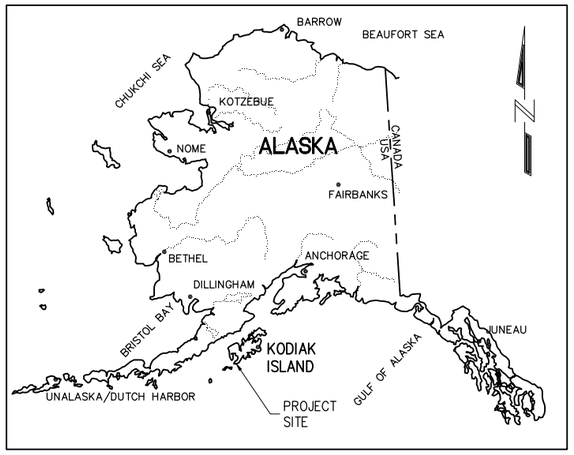


Table 108: Pasagshak Bay to Old Harbor (Bush Point) – Route Segments, Distances & Times

Routes	Total Distance (nm)	Distance (leg)	Time at 9 knots	Time at 13.5 knots
Pasagshak Bay Terminal (start)				
Gull Point	8.7 nm	8.7 nm	0:58	0:38
Dangerous Cape	14.2 nm	5.5 nm	1:34	1:03
Cathedral Island	29.6 nm	15.5 nm	3:17	2:11
Old Harbor (Bush Point)	32.4 nm	2.7 nm	3:36	2:24

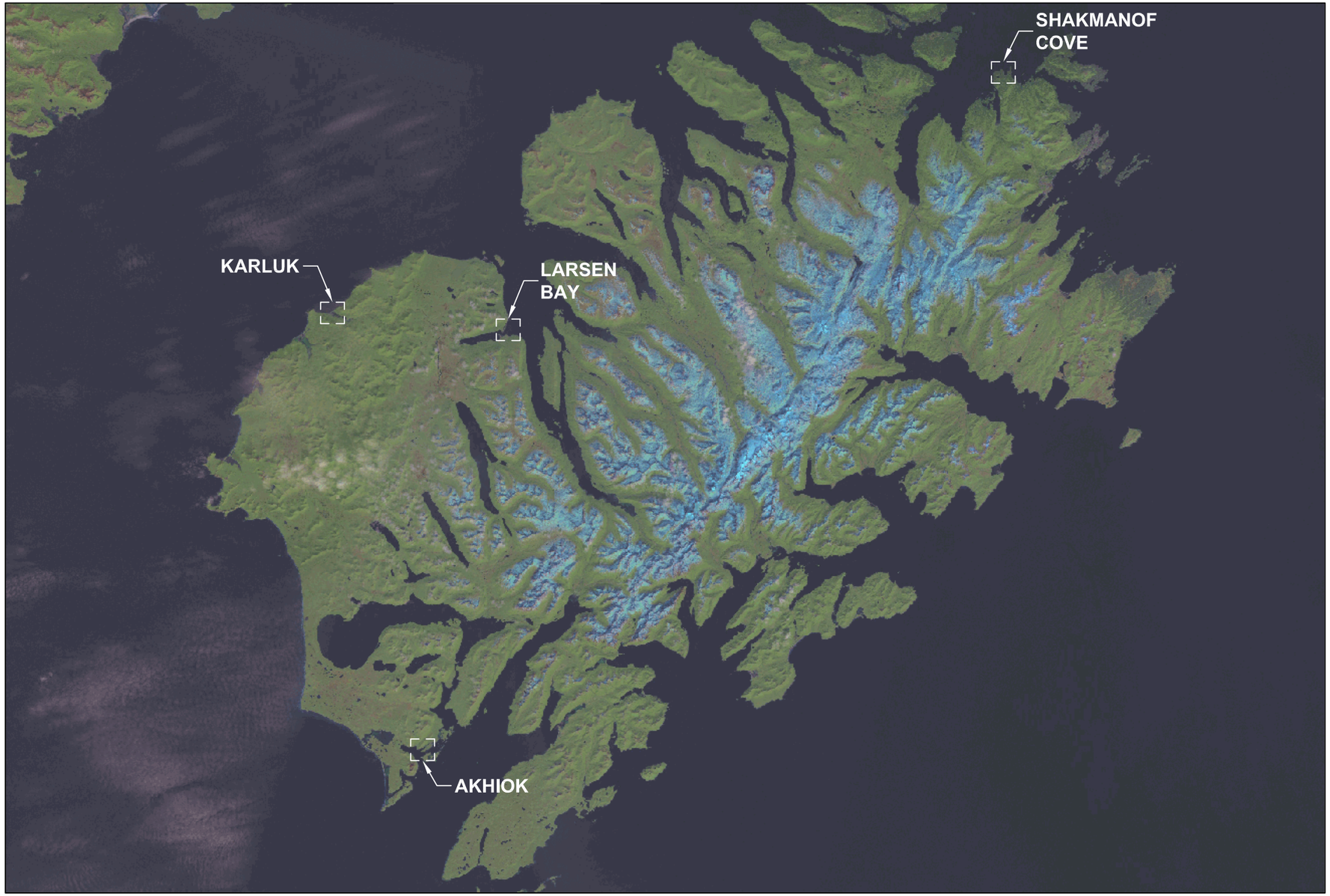
Appendix 2

Kodiak Island Transportation Road Concept by PND Engineers, Inc.



VICINITY MAP

NOT TO SCALE



SITE MAP

NOT TO SCALE

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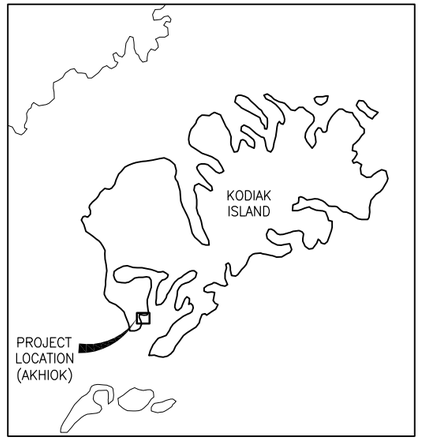
P N D
ENGINEERS, INC.

PROJECT:
KODIAK ISLAND TRANSPORTATION ROAD CONCEPT

TITLE:
SITE MAP

DESIGNED BY: TG	DATE: JANUARY 2011	SHEET NO: 1 OF 8
CHECKED BY: DK	PROJECT NO: 101070	



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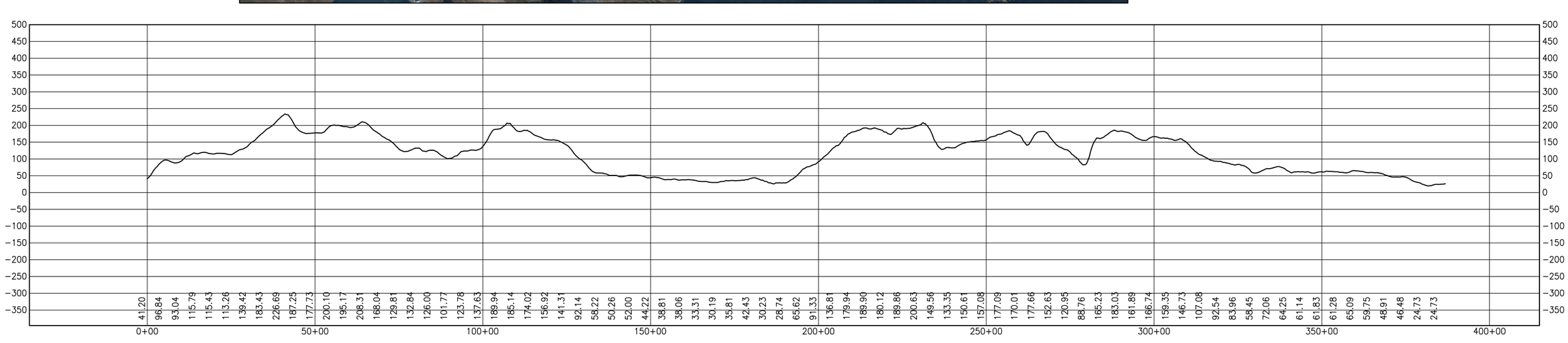

LAZY BAY TO AKHIOK (PIONEER ACCESS ROAD)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	CONCEPT ASSUMPTIONS	
1	SINGLE LANE ROAD	MILE	7.3	$346,000	$2,526,000	HAUL DISTANCE	1.0 MILES
2	CULVERTS	EA	51	$2,800	$143,000	ROADWAY SURFACE WIDTH	14 FEET
3	SINGLE LANE BRIDGE	LF	25	$6,000	$150,000	ROADWAY SECTION THICKNESS	3 FEET
4	PULLOUTS	EA	10	$2,300	$23,000	MAXIMUM GRADE	10%
5	CLEARING AND GRUBBING	ACRE	45	$21,500	$968,000	PULLOUT 12'x80'x3't	
				10% MOB/DEMOB:	$381,000	YEAR ROUND ACCESS	
				30% CONTINGENCY:	$1,258,000		
TOTAL CONSTRUCTION COST:	$5,449,000			COST PER MILE:	$747,000		

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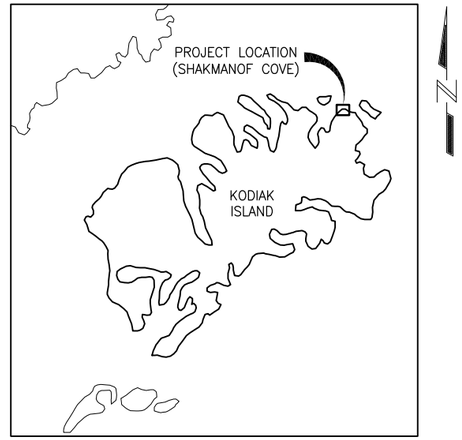
PND ENGINEERS, INC.

PROJECT: **KODIAK ISLAND TRANSPORTATION ROAD CONCEPT**

TITLE: LAZY BAY TO AKHIOK

DESIGNED BY:	TG	DATE:	JANUARY 2011
CHECKED BY:	DK	PROJECT NO:	101070

SHEET NO: 2 OF 8



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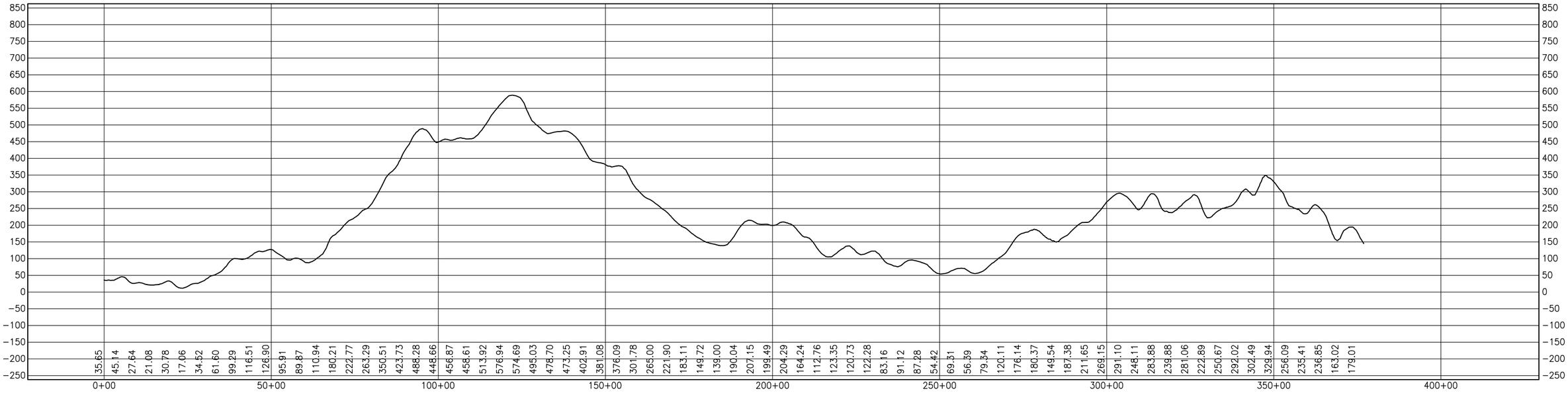

ANTON LARSEN BAY TO SHAKMANOF

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	CONCEPT ASSUMPTIONS	
1	TWO LANE ROAD	MILE	7.1	$518,000	$3,678,000	HAUL DISTANCE	1.0 MILES
2	CULVERTS	EA	49	$4,000	$196,000	ROADWAY SURFACE WIDTH	28 FEET
3	SINGLE LANE BRIDGE	LF	75	$6,000	$450,000	ROADWAY SECTION THICKNESS	3 FEET
4	PULLOUTS	EA	6	$2,300	$14,000	MAXIMUM GRADE	10%
5	CLEARING AND GRUBBING	ACRE	44	$21,500	$946,000	PULLOUT 12'x80'x3't	
				10% MOB/DEMOB:	$529,000	YEAR ROUND ACCESS	
				30% CONTINGENCY:	$1,744,000		
TOTAL CONSTRUCTION COST:	$7,557,000			COST PER MILE:	$1,065,000		

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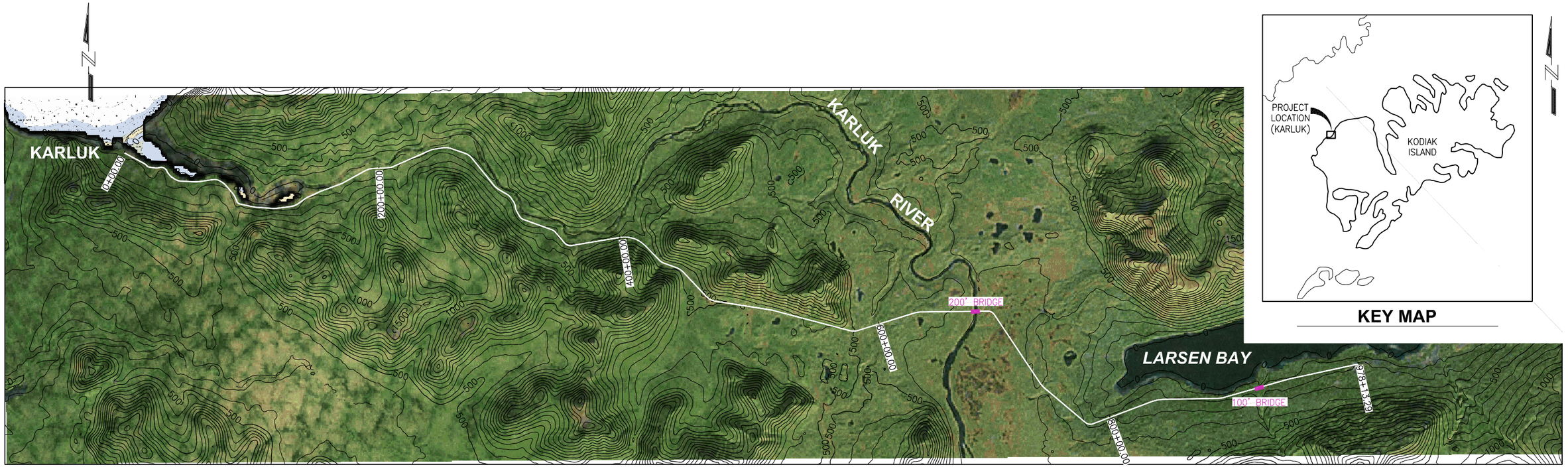
ANTON LARSEN BAY TO SHAKMANOF

DESIGNED BY:	TG	DATE:	JANUARY 2011
CHECKED BY:	DK	PROJECT NO:	101070

SHEET NO: 3 OF 8



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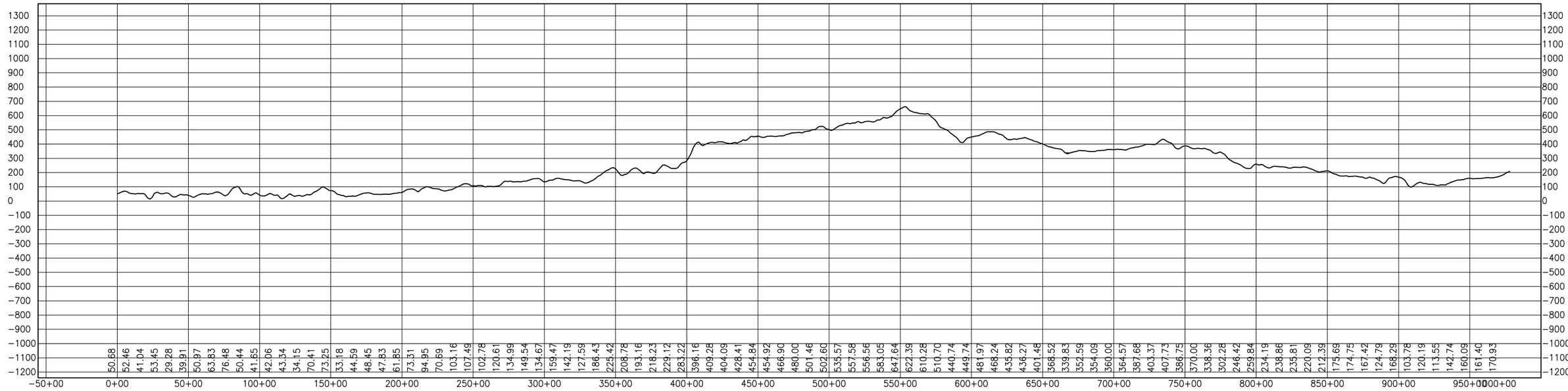

KARLUK TO LARSEN BAY (PIONEER ACCESS ROAD)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
1	SINGLE LANE ROAD	MILES	18.5	$435,000	$8,048,000
2	CULVERTS	EA	74	$2,800	$208,000
3	SINGLE LANE BRIDGE	LF	300	$6,000	$1,800,000
4	PULLOUTS	EA	18	$3,000	$54,000
5	CLEARING AND GRUBBING	ACRE	113	$21,500	$2,430,000
				10% MOB/DEMOB:	$1,254,000
				30% CONTINGENCY:	$4,139,000
TOTAL CONSTRUCTION COST:	$17,933,000			COST PER MILE	$970,000

CONCEPT ASSUMPTIONS	
HAUL DISTANCE	2.5 MILES
ROADWAY SURFACE WIDTH	14 FEET
ROADWAY SECTION THICKNESS	3 FEET
MAXIMUM GRADE	10%
PULLOUT	12'x80'x3't
YEAR ROUND ACCESS	

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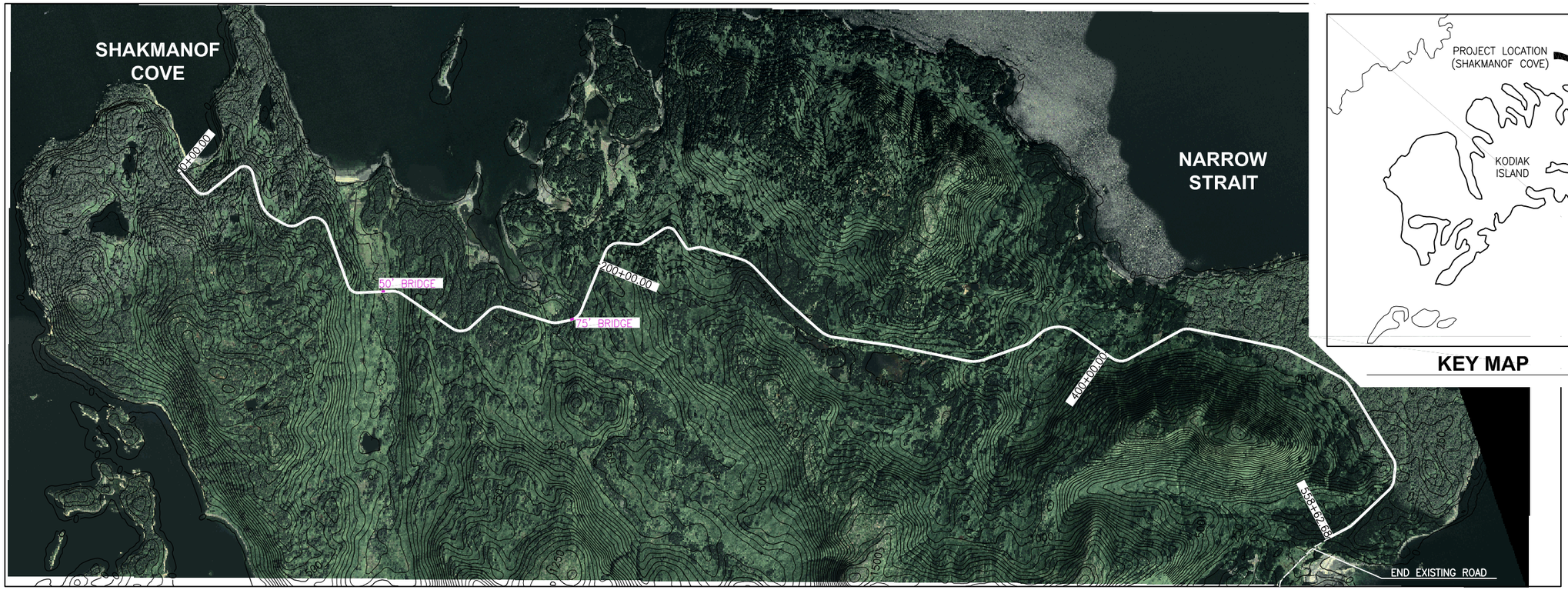
KODIAK ISLAND TRANSPORTATION ROAD CONCEPT

TITLE:
KARLUK TO LARSEN BAY

DESIGNED BY:	TG	DATE:	JANUARY 2011
CHECKED BY:	DK	PROJECT NO:	101070

SHEET NO: 4 OF 8



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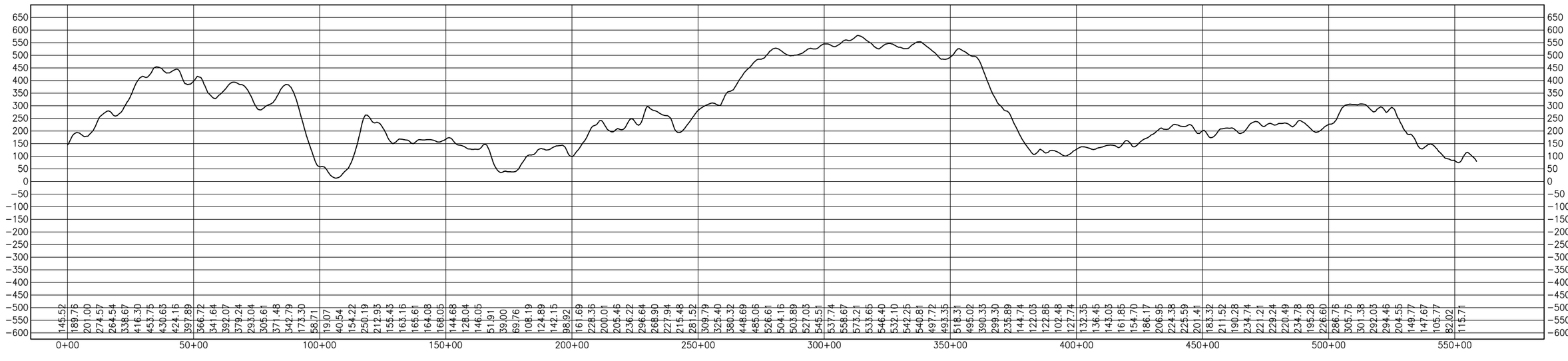

KODIAK TO SHAKMANOF

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	CONCEPT ASSUMPTIONS	
1	TWO LANE ROAD	MILE	10.6	$518,000	$5,491,000	HAUL DISTANCE	1.0 MILES
2	CULVERTS	EA	73	$4,000	$292,000	ROADWAY SURFACE WIDTH	28 FEET
3	SINGLE LANE BRIDGE	LF	125	$6,000	$750,000	ROADWAY SECTION THICKNESS	3 FEET
4	PULLOUTS	EA	9	$2,300	$21,000	MAXIMUM GRADE	10%
5	CLEARING AND GRUBBING	ACRE	65	$21,500	$1,398,000	PULLOUT	12'x80'x3't
				10% MOB/DEMOB:	$796,000	YEAR ROUND ACCESS	
				30% CONTINGENCY:	$2,625,000		
TOTAL CONSTRUCTION COST:	$11,373,000			COST PER MILE	$1,073,000		

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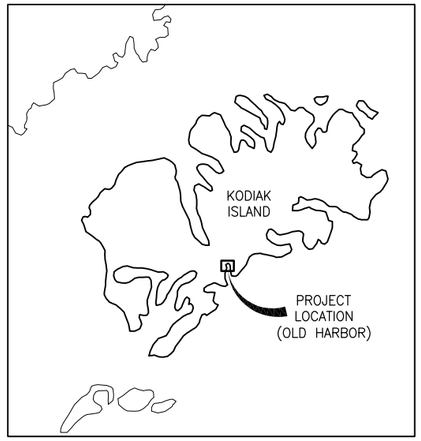
PROJECT:
KODIAK ISLAND TRANSPORTATION ROAD CONCEPT

TITLE:
KODIAK TO SHAKMANOF

DESIGNED BY:	TG	DATE:	JANUARY 2011
CHECKED BY:	DK	PROJECT NO:	101070

SHEET NO: 5 OF 8



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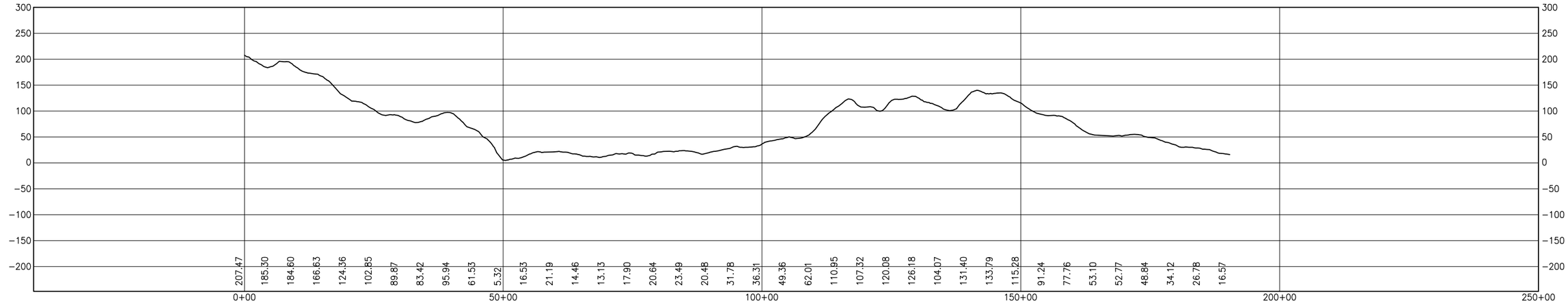

OLD HARBOR

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
1	SINGLE LANE ROAD	MILES	3.6	$376,000	$1,354,000
2	CULVERTS	EA	24	$2,800	$68,000
3	SINGLE LANE BRIDGE	LF	175	$6,000	$1,050,000
4	PULLOUTS	EA	8	$2,500	$20,000
5	CLEARING AND GRUBBING	ACRE	22	$21,500	$473,000
				10% MOB/DEMOB:	$297,000
				30% CONTINGENCY:	$979,000
TOTAL CONSTRUCTION COST:	$4,241,000			COST PER MILE	$1,179,000

CONCEPT ASSUMPTIONS	
HAUL DISTANCE	1.5 MILES
ROADWAY SURFACE WIDTH	14 FEET
ROADWAY SECTION THICKNESS	3 FEET
MAXIMUM GRADE	10%
PULLOUT 12'x80'x3't	
YEAR ROUND ACCESS	

REV	DATE	DESCRIPTION

DATE: _____

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PROJECT:
KODIAK ISLAND TRANSPORTATION ROAD CONCEPT

TITLE:
OLD HARBOR

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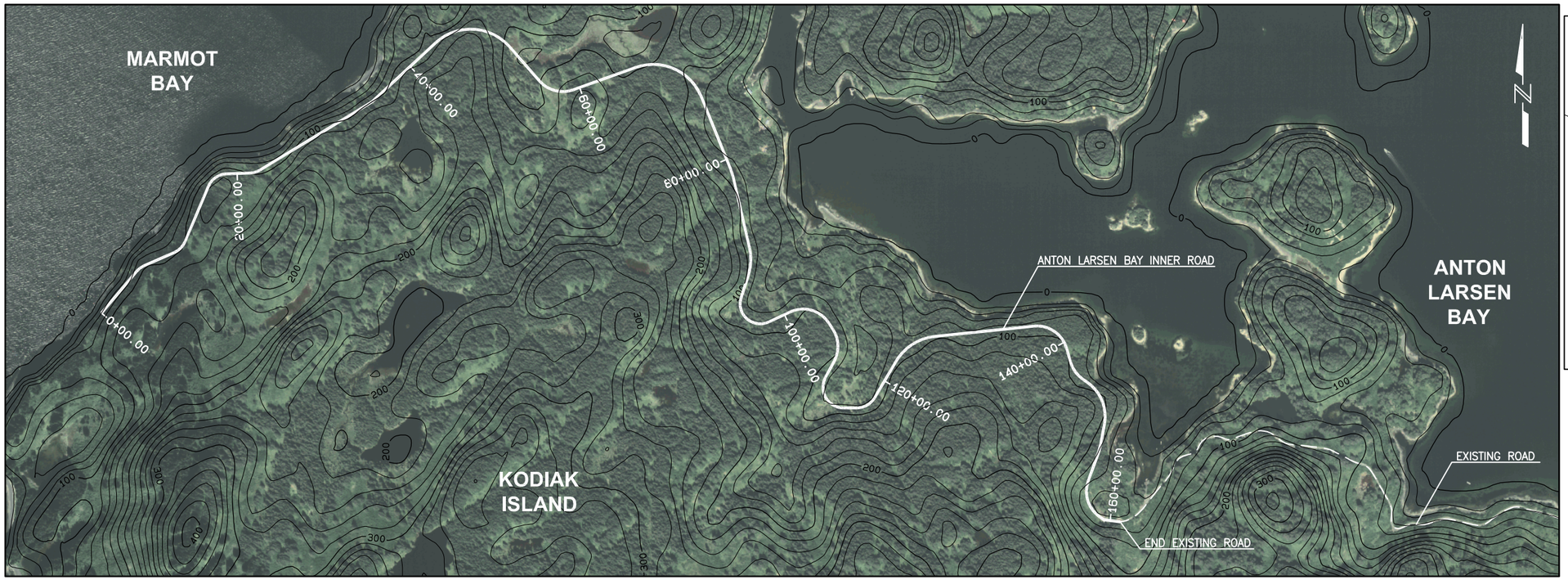
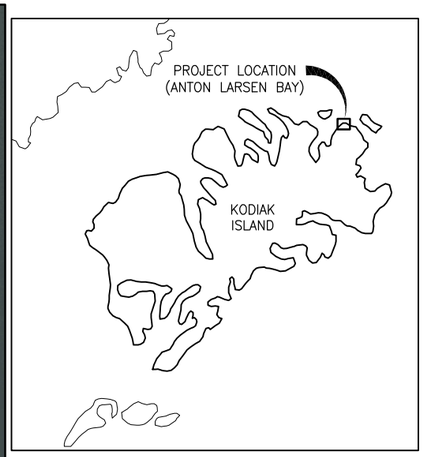
CHECKED BY:	DK	PROJECT NO:	101070

SHEET NO: 6 OF 8





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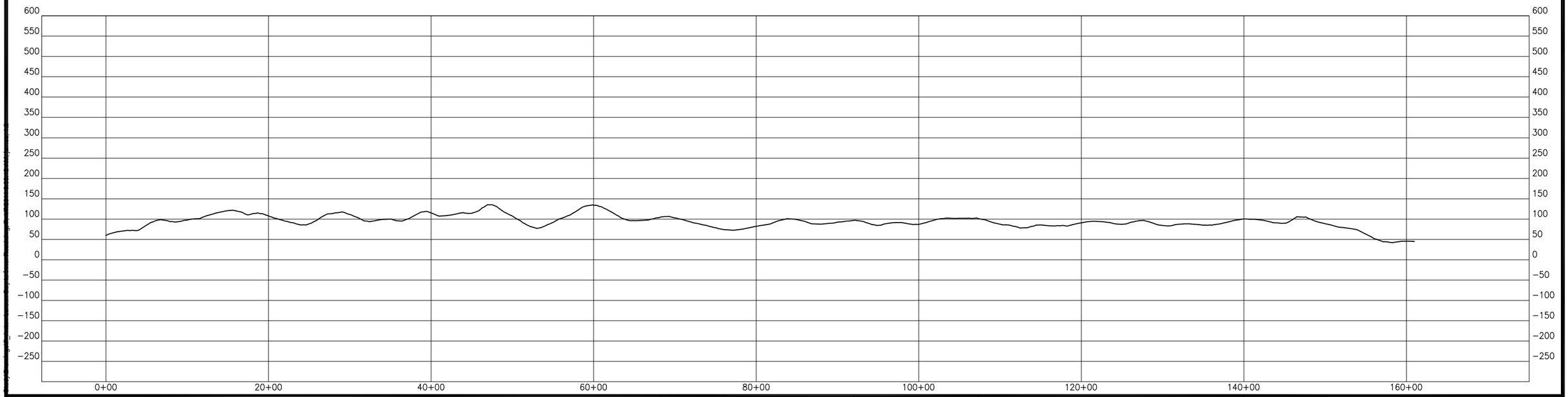

ANTON LARSEN BAY TO INNER ROAD

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
1	TWO LANE ROAD	MILES	3.0	$518,000	$1,580,000
2	CULVERTS	EA	21	$4,000	$84,000
3	PULLOUTS	EA	2	$2,300	$5,000
4	CLEARING AND GRUBBING	ACRE	19	$21,500	$409,000
				10% MOB/DEMOB:	$208,000
				30% CONTINGENCY:	$686,000
TOTAL CONSTRUCTION COST:	$2,972,000			COST PER MILE	$975,000

CONCEPT ASSUMPTIONS	
HAUL DISTANCE	1.0 MILES
ROADWAY SURFACE WIDTH	28 FEET
ROADWAY SECTION THICKNESS	3 FEET
MAXIMUM GRADE	10%
PULLOUT 12'x80'x3't	
YEAR ROUND ACCESS	

REV	DATE	DESCRIPTION

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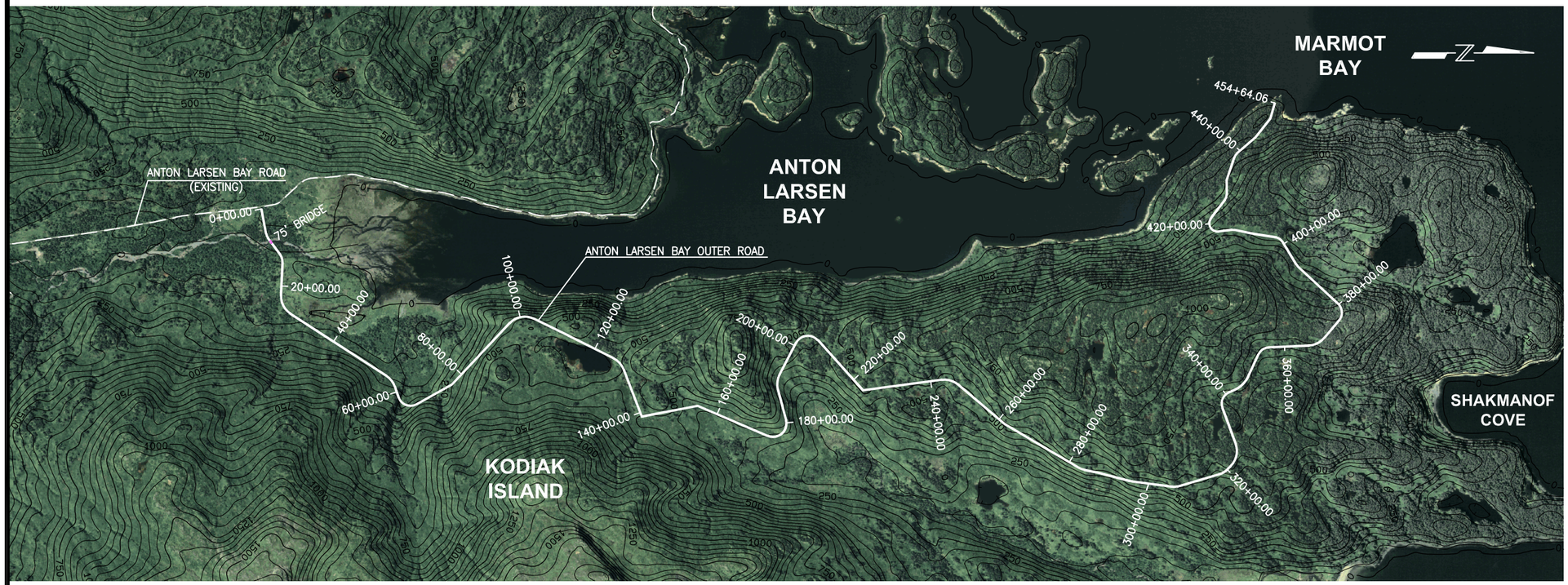
PND ENGINEERS, INC.

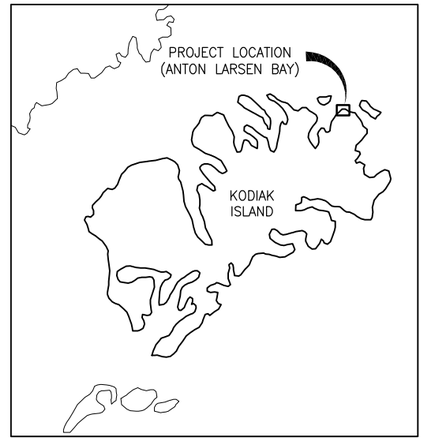
PROJECT:
KODIAK ISLAND TRANSPORTATION ROAD CONCEPT

TITLE:
ANTON LARSEN BAY TO INNER ROAD

DESIGNED BY:	TG	DATE:	JANUARY 2011
CHECKED BY:	DK	PROJECT NO:	101070

SHEET NO: 7 OF 8





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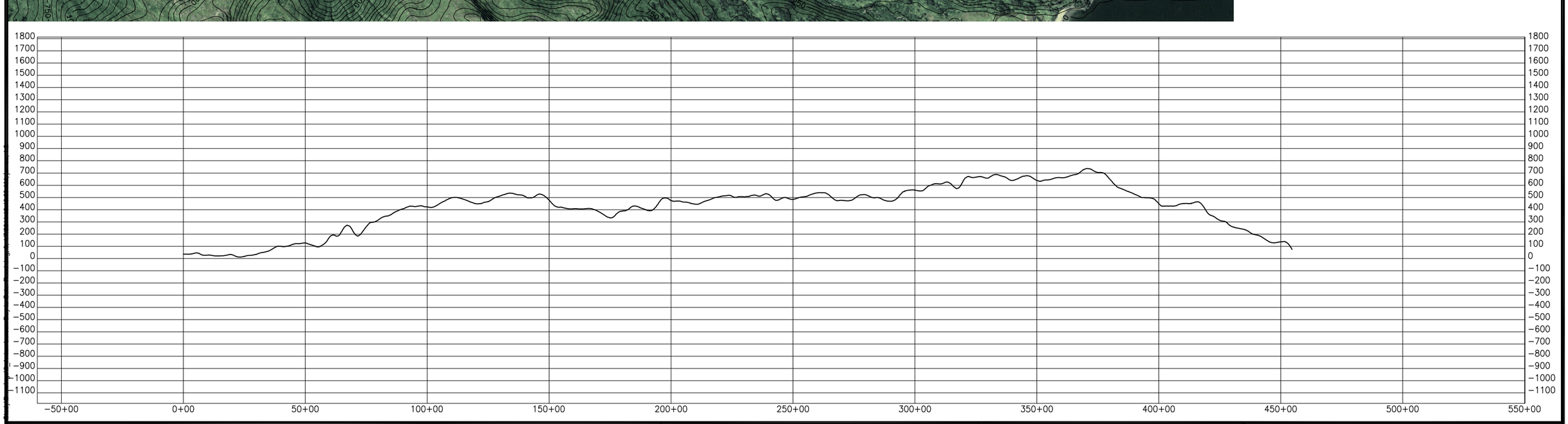

ANTON LARSEN BAY TO OUTER ROAD

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	CONCEPT ASSUMPTIONS	
1	TWO LANE ROAD	MILES	8.6	$518,000	$4,455,000	HAUL DISTANCE	1.0 MILES
2	CULVERTS	EA	60	$4,000	$240,000	ROADWAY SURFACE WIDTH	28 FEET
3	SINGLE LANE BRIDGE	LF	75	$6,000	$450,000	ROADWAY SECTION THICKNESS	3 FEET
4	PULLOUTS	EA	7	$2,300	$17,000	MAXIMUM GRADE	10%
5	CLEARING AND GRUBBING	ACRE	53	$21,500	$1,140,000	PULLOUT 12'x80'x3't	
				10% MOB/DEMOB:	$631,000	YEAR ROUND ACCESS	
				30% CONTINGENCY:	$2.080,000		
TOTAL CONSTRUCTION COST:	$9,013,000			COST PER MILE	$1,049,000		

REV	DATE	DESCRIPTION

DATE: _____

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PROJECT:
KODIAK ISLAND TRANSPORTATION ROAD CONCEPT

TITLE:
ANTON LARSEN BAY TO OUTER ROAD

DESIGNED BY:	TG	DATE:	JANUARY 2011
CHECKED BY:	DK	PROJECT NO:	101070

SHEET NO: 8 OF 8