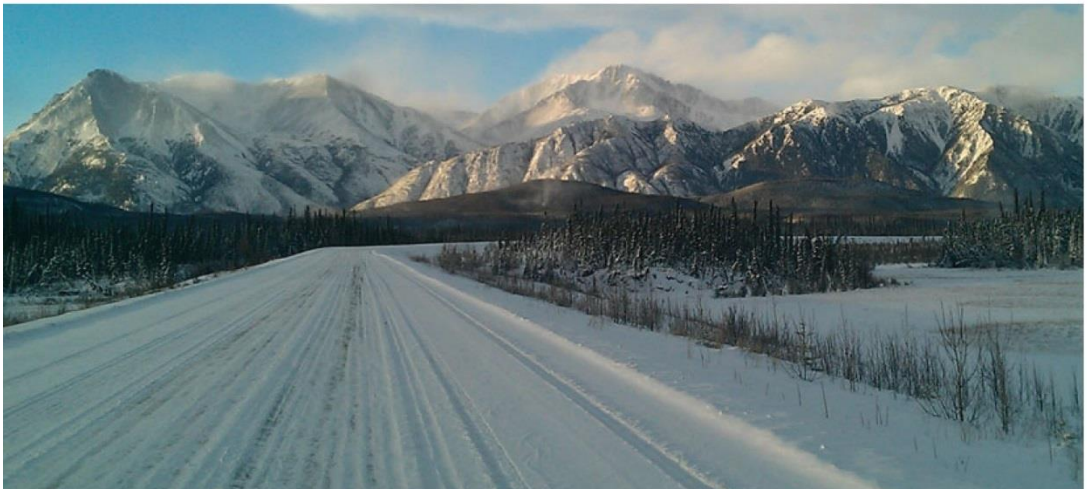
Alaska Statewide Long-Range Transportation Plan

LET'S KEEP MOVING 2036:

Freight Element

December 2016



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EXECUTIVE SUMMARY

This document is the Freight Element of the Alaska Long-Range Transportation Plan (LRTP). It addresses comprehensively Alaska's major freight transportation modes: truck, air, water, rail, and pipeline. Special attention is paid to the critical role that Alaska's freight transportation system plays in the State's economy.

The Freight Element:

- Identifies and supports strategies, policies, and actions to achieve Alaska's economic development and transportation goals
- Addresses federal guidance (established in the Fixing America's Surface Transportation [FAST] Act) for preparation of Statewide Freight Plans. The FAST Act calls for State Freight Plans to identify the intended use of National Highway Freight Program funds; the LRTP does not contain projects, so this information is presented in a separate Freight Investment Element Implementation Guidance. Together, the two documents—the Freight Element and the Implementation Guidance—satisfy federal requirements.

While Alaska has addressed freight transportation in many prior studies and plans—such as modal system plans, facility development plans, metropolitan plans, and area plans—this is the first time that Alaska's freight transportation has been examined systematically from a multi-modal perspective in the context of long-range statewide transportation planning.

The Critical Role of Freight Movement in Alaska

Freight movement was critical to Alaska's initial settlement and development, and it remains extremely important today. Over 90 percent of discretionary revenues collected by the State come from the production of petroleum, and large shares of the State's workforce and wages are directly linked to freight-dependent industries. Alaska has large quantities of petroleum, zinc, coal, copper, gold, rare earth metals, and other valuable commodities that are in high demand around the world. Mining and fishing are key industries that provide employment for many Alaskans. Almost all of these products are exported to other states and countries. Alaska produces few of the consumer goods its workforce and population require, so these goods must be imported from other states and countries. As a result, Alaska's overall economy and quality of life depend on freight transportation "supply chains" that span the State, the nation, and the world.

Alaska's size and geography pose unique challenges for its freight transportation system. Much of Alaska's freight is generated by resource extraction in remote areas, requiring long transportation and service corridors, such as the Dalton Highway and the Trans-Alaska Pipeline System, through sparsely developed regions. Most of the population lives along the triangle created by Anchorage, Fairbanks, and Juneau, and these cities attract the bulk of consumer goods that enter the state. These cities are connected by major seaport, airport, and rail infrastructure, and also serve as hubs for truck transportation. Hundreds of smaller cities and communities are also located throughout Alaska's vast

geography. Many of these communities are not connected to the road network and require basic goods such as food and fuel to be brought long distances by air or barge. The Essential Air Service Program and Bypass Mail Program provide subsidies to resupply these communities with much needed goods. The costs associated with importing and distributing basic consumer goods results in consumer prices that are far above national averages, especially in Alaska's remote low population areas.

To serve its industries, population, military, and government facilities, the state of Alaska has invested heavily in its freight transportation infrastructure. The state has large seaports that handle containerized inbound cargo at Anchorage and other places, and seaports with specialized facilities to handle bulk commodities at Valdez, Nikiski, Seward, and elsewhere. It has two main international airports that serve as hubs for goods to reach remote communities throughout the state. Highways connect the main cities, while smaller roads and seasonal ice roads allow vehicles and trucks access to the interior of the State as far as geography and climate permit. Freight rail and pipelines provide services in critical corridors. In the lower 48 states, "last mile" freight connections usually refer to trucks; in Alaska, those connections are also made by snowmobile and all-terrain vehicles (ATVs). Alaska's freight transportation is truly multi-modal.

In Alaska, the relationship between commodity prices, resource development, and freight transportation infrastructure is especially close. Much of Alaska's freight movement is driven by private-sector resource development, especially petroleum and natural gas. The ongoing decline of North Slope oil production has been recognized as a source of uncertainty (for transportation demand) and risk (for State revenues), but with the recent dramatic declines in global energy prices, uncertainty and risk issues are elevated. How extensive will future private-sector resource development be, and where, and when? What transportation improvements will be required to serve it? How fast will Alaska's workforce and population grow and where, given that a large share of that workforce is supported directly and indirectly by resource industries? What are the likely impacts and opportunities associated with climate change and variability, and other global/external factors? How much funding will be available for the transportation system improvements that Alaska's communities and stakeholders may need or want, from public sources and from private owners and partners?

Against this backdrop, the Alaska Department of Transportation and Public Facilities (DOT&PF) and its state, regional, and local partners face the challenge of managing the existing freight infrastructure and planning for future needs. This Freight Element provides perspective on what drives market demand for freight transportation in Alaska, how this demand is served today, trends impacting the future, and the role that government can play. This Freight Element is intended to support decisions about freight transportation policies, strategies, and actions within the context of the state's broader LRTP.

Freight Element Conclusions

The Freight Element is based on a detailed review of domestic and international commodity flows, economic data, an assessment of Alaska's freight facility performance, recent freight plans (area and modal), and other information. Stakeholders representing owners, operators, freight service providers, and users of freight facilities were engaged throughout the process and the public was invited to provide feedback. The Freight Element is based on a systematic, data-driven evaluation of the demand for freight transportation and how well that demand is met today. The primary conclusions for planning for freight in Alaska are summarized below.

1. **Freight movement in Alaska results from specific demand drivers, primarily requirements to export natural resources from the state to national and international markets; import consumer goods and industrial supplies from other states and countries; satisfy military supply requirements; and distribute goods within Alaska over very long supply chains.**

    1.1. The demand for freight transportation is driven by the amount and type of economic activity—in essence, commerce trade in goods. Demand for freight transportation arises from producing industries and consumers. Producing industries need access to inputs—raw materials, machinery and equipment, components, packaging, etc.—and access to markets where their products are sold. Consumers need access to basic necessities such as shelter, food, fuel, vehicles, clothing, appliances and electronics, construction and building materials, and other supplies and property. In Alaska, the major producing industries include petroleum extraction, mining, commercial fishing and processing, construction, and power generation. Alaska also has a large government (particularly military) presence that requires the shipment of equipment, machinery, fuels, and supplies.

    1.2. Alaska is characterized by a dramatic imbalance between its produced and consumed commodities—most of what Alaska produces is exported to other states and other countries, while most of what Alaska consumes is provided by other states and other countries. This creates an especially strong dependence on effective trading connections and services.

    1.3. Alaska is a very large state with very long supply chains. Freight exported from Alaska must usually be moved long distances, from extraction and production facilities to ports and airports; freight imported must be distributed from a few critical gateway ports and airports to users distributed throughout the entire state. This means that more freight has to move more miles to serve Alaska than any other state.

    1.4. Alaska has a unique geographic position midway between the lower 48 states and Asia, and serves as a gateway for pass-through air cargo. Alaska's freight infrastructure and its economic activity related to the handling of pass-through freight are therefore linked to larger global trades.

2. Freight demand in Alaska is served by multiple transportation modes: road, air, water, rail, and pipeline. Each has a critical role in the state's multi-modal system and must be considered in the context of the entire system.

2.1. Freight transportation demand is generally met through truck, air, water, rail, and pipeline. These five transportation modes accommodate services that represent the supply of freight transportation capacity to meet demand.

2.2. Each mode has a specific set of freight carriers (trucking companies, airlines, vessel operators, railroads, and pipeline operators), who utilize a variety of infrastructure assets. Some of these infrastructure assets are unique to each mode, such as highways, waterways, railroads, and pipelines. Some, known as "intermodal" facilities, are designed to bring together different modes; these include ports (linking water with trucks, rail, and/or pipelines), airports (linking air with trucks and sometimes pipelines), and rail terminals (linking rail, trucks, and ports). Different networks and facilities have different owners, which may be public or private, and the vehicles and vessels that operate over these networks and through these facilities are both publicly and privately owned.

2.3. Alaska's freight movement is highly seasonal due to production and employment cycles, as well as changes in the availability of key infrastructure, especially roads and waterways.

3. Alaska's freight demand drivers are affected by critical trends. This plan is based on the high likelihood that the primary trends experienced in recent years affecting freight will continue. These trends include a growing population that is increasingly concentrated in urban areas; rising overall industrial production but high uncertainty regarding future energy production; and increasing seasonal/annual variability in demand due to climate change and other factors. Critical trends, acting on and over Alaska's freight transportation network, lead to changes in system performance and create both needs and opportunities.

3.1. Alaska's consuming population is expected to grow and to be increasingly concentrated in larger urban areas, consistent with economic opportunity. This will increase demand for urban freight deliveries of consumer goods.

3.2. Alaska's overall economy and its freight-intensive industries will continue to expand, creating increased demand for inbound, outbound, and within-state goods movement.

3.3. The future levels and economics of energy and other resource production will have large impacts on transportation planning and freight demand in particular. For example, if energy production slows significantly, it could not only reduce the flow of resource commodities within and outbound from Alaska but also reduce in-migration and population growth, with the additional effect of flattening demand for inbound consumer goods. If, alternatively, resource production looks to increase rapidly, it may

require the rapid development of new transportation capacity—pipelines, ports, etc.—not only to handle increasing volumes of resource commodities, but also to meet the consumer needs of a rapidly expanding workforce.

3.4. National forecasts anticipate that demand for non-energy related industrial goods and products – consumer goods, machinery, instruments, etc. – will increase, creating greater demand on international gateways and supply chains. National forecasts also anticipate long-term declines in Alaska tonnages of crude petroleum and other energy products. However, there is a high degree of uncertainty regarding energy forecasts since production depends on global demand and pricing, availability of competing supplies, the cost of production/transportation/export from Alaska, and other variable factors.

3.5. Since Alaska freight movement is driven largely by traded commodities, economic and population growth will lead to growth pressures at key trade gateways and on corridors linking these gateways to resources and consumers. As many of these gateways are located in urbanized areas, increased trade gateway traffic will compound urban growth issues associated with population growth.

3.6. Increasing average temperatures, rising sea levels, and related effects will exacerbate seasonal variations in freight demand and freight infrastructure availability, creating greater unpredictability and variability in freight commodity movements from season-to-season and year-to-year.

4. To provide acceptable freight system performance—defined as available, reliable, affordable, timely, safe, and secure—the Freight Element addresses the following needs and opportunities: bringing more resources efficiently to markets; improving truck access to intermodal facilities (ports, airports, etc.); enhancing freight mobility in growing metropolitan areas and key corridors; maintaining and enhancing critical trade gateway and multimodal corridor facilities; maintaining and enhancing critical connections with Alaska's rural communities and military facilities; and doing so with constrained public funds.

4.1. The freight system involves different modes with different operational characteristics, and freight system users, owners, and operators measure performance differently. In addition, many freight trips involve multiple modes. The Freight Element adopts a "user's perspective" on performance. In general, freight system users value reliability, price, speed, safety, and security, in that order. In Alaska, an additional measure is important: whether a mode or service is available at all.

4.2. Freight element analysis identifies a high likelihood of the following needs and opportunities for freight transportation in Alaska:

- Providing freight transportation capacity to directly support new resource development if and when it occurs. This includes a variety of initiatives: new

construction of a statewide liquid natural gas (LNG) pipeline; development of resource access roads; improvement of the Dalton Highway, coastal ports, and possibly other infrastructure to accommodate proposed mining operations; and potential development of an Arctic Port.

- Reducing truck congestion and improving travel time reliability and safety in urban areas and key corridors, especially for movement to/from ports, airports, and other major freight trip generators, while accommodating the needs of a changing population, which will be larger and increasingly concentrated in urban areas.

- Maintaining and improving trade gateways and corridors —seaports, airports, railroads, highways and land border crossings—which are the lifelines for Alaska's producers and consumers.

- Maintaining and improving multi-modal connectivity among and between Alaska's urban and rural communities, including the provision of alternative facilities, services, or modes to improve reliability, cost, and overall performance. Alaska's highway system reaches major cities, but its overall mileage is low; many communities are not connected or served by roads. Alaska's freight rail and pipeline systems operate in limited corridors. Alaska's ports serve coastal and river communities, but their ability to serve inland communities is constrained by the availability of other connections. Roads and ports may be usable only in certain seasons when ice stabilizes road surfaces or lack of ice makes marine traffic possible. As a result, Alaska is highly dependent on air cargo to reach and serve communities with commodities that in the lower 48 would normally be served by truck or rail. In some cases, the "last mile" move from an airport is by snowmobile or sled. In most of the U.S., freight shippers can choose from a full range of modal options, selecting the ones that best suit their needs for reliability, cost, speed, safety, and security; in Alaska, freight shippers may have little or no choice regarding transportation modes.

- Maintaining critical multimodal connections to Alaska's military facilities and ensuring future needs are accommodated.

4.3. Freight planning must consider uncertainty and risk. The key areas where these considerations arise are as follows:

- **How resource development and other freight drivers might evolve in the future.** While the public sector may have some influence on future freight demand, the primary drivers are population growth and private industry activities. However, the public sector can play a very significant role in ensuring the multi-modal transportation system is positioned to meet future needs. Preserving and/or improving performance may involve repairing or expanding infrastructure, implementing new

technologies or management practices, improving service availability and reliability, and/or adopting innovative policy, financing, and implementation approaches.

- **Addressing impacts of climate change and increasing climate variability**, which will impact both the transportation system and the underlying commodity movements and markets that generate demand and utilization over the system. These changes create risks such as increased seasonal fluctuations in demand and infrastructure availability, as well as potential long-term changes in Alaska's economy and infrastructure, but they also create opportunities, such as the potential to develop an Arctic Port.

- **Managing freight transportation costs.** With a high dependence on goods imported from other states and countries, a high dependence on air cargo (one of the most expensive forms of freight transportation), and long supply chain distances within the state, the cost of goods in Alaska tends to be very high. Without "bypass mail" service, where rural air cargo is delivered at postal rates, the cost would be even higher.

- **Addressing funding uncertainties.** Much of Alaska's infrastructure is aging, and the costs to keep the system in operation are increasing. At the same time, system expansion and modernization will be required. The good news is that some of Alaska's freight infrastructure is privately owned, self-funded from revenue streams, or built through public-private partnerships administered through the Alaska Industrial Development and Export Authority (AIDEA) and other public partners. The bad news is that much of Alaska's freight infrastructure is funded through traditional transportation state and federal funding sources that are both projected to decline.

5. The LRTP includes goals, policies, and actions for the freight transportation system. These align outcomes, plans, and projects based on performance-based resource allocation; manage the system to increase performance and reduce risk; and provide accountability for the expenditure of public funds.

5.1. Freight movement is a partnership between public and private freight shippers, carriers, infrastructure owners and operators, and all levels of regulatory and financing responsibility (federal, state, regional, and local). No single entity or agency "controls" freight movement in Alaska or can define its future on its own. Nonetheless, among all state agencies, DOT&PF is best positioned to provide statewide multi-modal leadership and "stewardship of the whole" given that it owns and operates much of the state's freight transportation system (including roads, airports, and marine services).

5.2. The LRTP includes freight-related policies addressing New Facilities and Modernization; System Preservation; System Management and Operations; Economic Development;

Safety and Security; Livability, Community and the Environment; and Accountability for Transportation System Performance.

5.3. The LRTP includes 40 specific freight actions designed to improve performance and advance these strategies and policies.

6. The Freight Element aligns with LRTP goals for performance-based resource allocation by creating first-generation approaches for freight system performance measurement; freight project prioritization and evaluation; and multi-modal freight investment at a program level.

6.1. Alaska's freight transportation infrastructure may accommodate, encourage, or constrain the demand for freight movement based on the level of performance offered; it can significantly affect industry location and expansion decisions, as well as larger population settlement patterns. Transportation system performance measurement—and management—is part of the Alaska Statewide Transportation Planning Process.

6.2. Alaska's freight transportation system is performing reasonably well today. Plan analysis identified the following performance risks that are expected to increase in coming years: congested truck routes and intermodal connectors; limited route and modal service choices, especially for rural communities; unreliability or unavailability of services due to seasonal effects, aging infrastructure, or other disruptions; overall cost of goods; and missing infrastructure links and facility improvements that are needed to serve new industries and population growth.

6.3. This Freight Element provides initial "first generation" freight performance measures for Alaska's highway system, using the National Performance Measurement Research Data Set (NPMRDS) made available by USDOT. Starting in 2018, USDOT will require the annual calculation of Truck Travel Time Reliability (TTTR) scores using NPMRDS.

6.4. The Freight Element provides a framework for additional next-generation performance measures. These include measures that are relatively easy to quantify today (modal/service availability, modal volume and utilization, infrastructure condition, and infrastructure safety/security) as well as measures that will require higher levels of effort to develop (modal and system reliability and resiliency, cost, speed/travel time, cargo safety/security, and environmental measures).

6.5. As a means of linking performance analysis and prioritization, the Freight Element establishes an Alaska Freight Network that is the primary system used for freight transportation. The Freight Network identifies system elements and specific routes across all modes and regions that are especially important to freight. The Freight Network includes facilities and transportation services where freight performance monitoring and freight project development are to be emphasized in the statewide long-range plan.

6.6. The Freight Element includes a starting point approach for estimation of freight project benefits and project prioritization across modes and geographies based on emerging best practices.

7. The Freight Element is a valuable resource for modal plan development and area/local freight planning, and complies with federal guidance for State Freight Plans.

7.1. Data and analysis developed in the Freight Element is designed to be used in a broad range of planning and analysis applications, at the area and local levels, and in the context of modal system planning.

7.2. Projects included within an approved statewide freight plan may be eligible for a new category of federal funding. The FAST Act establishes a new formula-based National Highway Freight Program (Title I, Section 1116) funded at $6.2 billion over five years. Up to 10% of funds may be used for rail or port projects. To be eligible for this funding, projects must be identified within an approved State Freight Plan. This Freight Element provides the basis from which projects eligible for current and future dedicated federal freight funding could be identified. This Freight Element satisfies federal guidance for statewide freight planning.

About This Document

This document is the Freight Element of the Alaska Long-Range Transportation Plan (LRTP). It comprehensively addresses Alaska's major freight transportation modes: truck, air, water, rail, and pipeline. Special attention is paid to the critical role that Alaska's freight transportation system plays in the State's economy.

The Freight Element:

- Identifies and supports strategies, policies, measures, and actions to achieve Alaska's economic development and transportation goals
- Addresses federal guidance (established in the Fixing America's Surface Transportation [FAST] Act) for preparation of Statewide Freight Plans

While Alaska has addressed freight transportation in many prior studies and plans, such as modal system plans, facility development plans, metropolitan plans, and area plans, this is the first time that Alaska freight transportation has been examined systematically in the context of long-range statewide transportation planning.

Freight in the Long-Range Transportation Planning Process

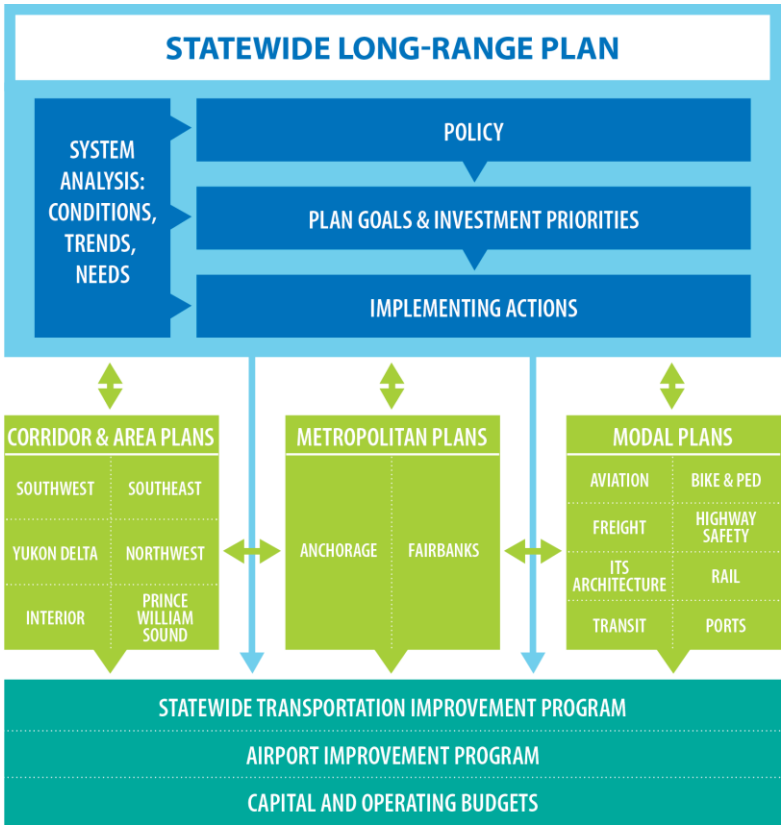
The statewide long-range transportation planning process is a policy planning process led by the Alaska Department of Transportation and Public Facilities (DOT&PF). The resulting LRTP is multimodal. The primary focus is planning for the transportation facilities and services that are owned and operated by the State of Alaska.

Multiple public and private stakeholders have a keen interest in the performance of Alaska's freight transportation system. In general, freight transportation performance is important to all Alaskans because the efficiency of freight transportation affects both the costs of goods and services in Alaska and the ability of the economy to export its products to national and international markets.

The LRTP is a policy plan, an "umbrella" plan that sets direction by specifying policies, strategies, and implementing actions for the operation and management, preservation, and development of Alaska's transportation system, as shown in Exhibit 1. Many levels of government are involved in Alaska's transportation planning and the development of the LRTP. The LRTP implements federal law that requires all states to prepare long-range transportation plans that address national policy considerations.

The Freight Element of The LRTP is developed by the DOT&PF working with a variety of public and private stakeholders. As a policy plan, the LRTP and this Freight Element provide direction to area plans and other transportation planning agencies in the state on policy and strategies with which to align their plans. In turn, they develop plans with regional, metropolitan, or modal focuses that work toward achieving the goals of the LRTP. The last update of the LRTP was published in 2008 and had a planning horizon of 2030. This LRTP has a planning horizon of 2036.

Exhibit 1: Statewide Planning Process



Planning for Freight Transportation in Alaska

The Freight Element is based on a detailed review of domestic and international commodity flows, economic data, an assessment of Alaska's freight facility performance, recent freight plans (area and modal), and other information. Stakeholders representing owners, operators, freight service providers, and users of freight facilities were engaged throughout the process, and the public was invited to provide feedback. The Freight Element is based on a systematic data-driven evaluation of the demand for freight transportation and how well it is met today.

The overall structure of the Freight Element is illustrated in Exhibit 2. The primary Freight Element conclusions, which are used as organizing themes for the Freight Element, are summarized in Exhibit 3.

Exhibit 2: Freight Element Process Diagram

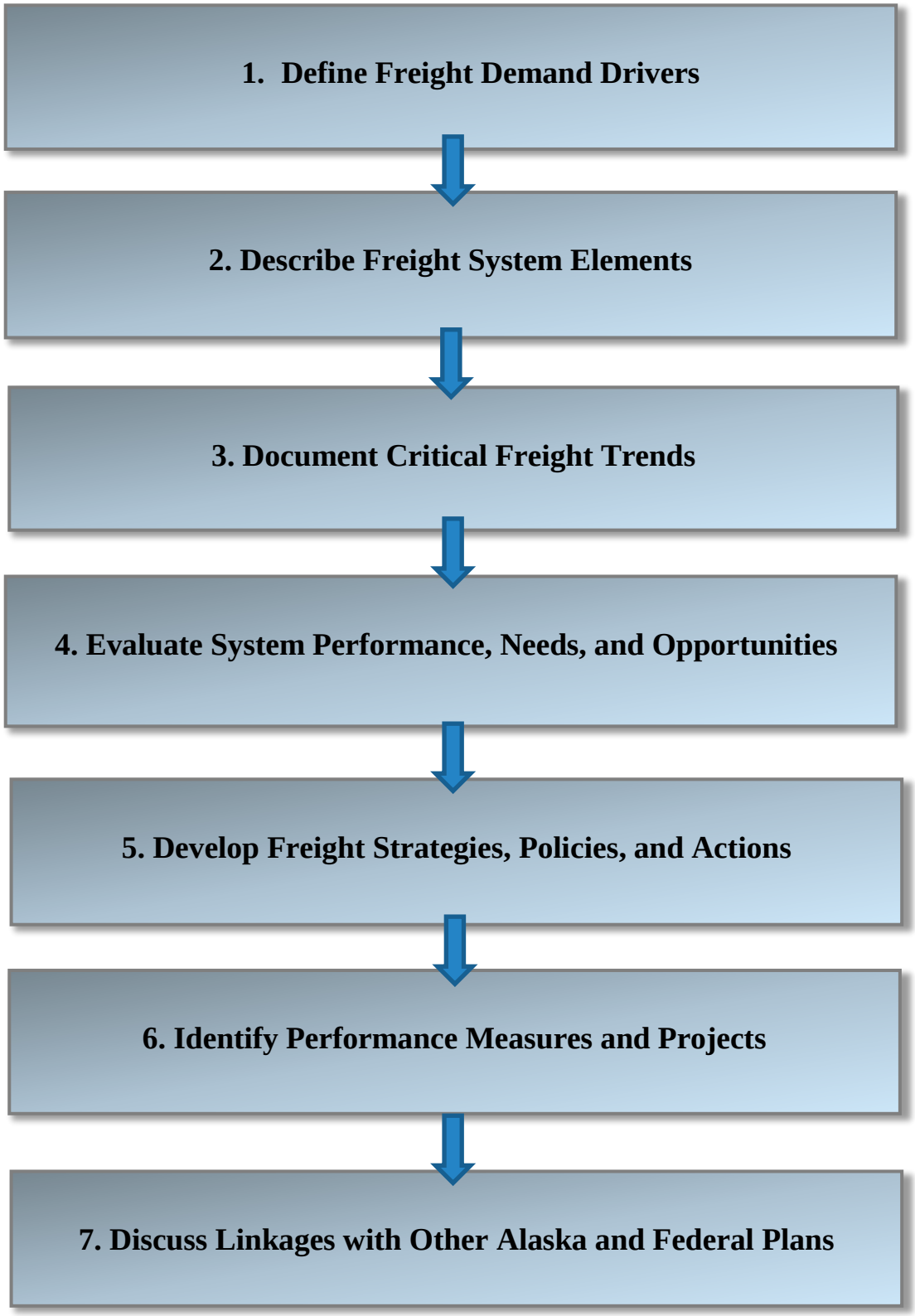


Exhibit 3: Primary Freight Element Conclusions

1. **Freight movement in Alaska results from specific demand drivers**, primarily requirements to export natural resources from the state to national and international markets; import consumer goods and industrial supplies from other states and countries; and distribute goods within Alaska over very long supply chains.
2. **Freight demand in Alaska is served by multiple transportation modes: road, air, water, rail, and pipeline**. Each has a critical role in the state's multi-modal system and must be considered in the context of the entire system.
3. **Alaska's freight demand drivers are impacted by critical trends**. This plan is based on the high likelihood that the primary trends experienced in recent years impacting freight will continue. These trends include a growing population that is increasingly concentrated in urban areas; rising overall industrial production but high uncertainty regarding future energy production; and increasing seasonal/annual variability in demand due to climate change and other factors. Critical trends, acting on and over Alaska's freight transportation network, lead to changes in system performance and create both needs and opportunities.
4. **To provide acceptable freight system performance—defined as available, reliable, affordable, timely, safe, and secure—the Freight Element addresses the following needs and opportunities**: bringing more resources efficiently to markets; improving truck access to intermodal facilities (ports, airports, etc.); enhancing freight mobility in growing urbanized areas; maintaining and enhancing critical trade gateway and corridor facilities; maintaining and enhancing critical connections with Alaska's rural communities; supporting military movements and needs; and doing so with constrained public funds.
5. **The LRTP includes goals, policies, and actions for the freight transportation system**. These align outcomes, plans, and projects based on performance-based resource allocation; manage the system to increase performance and reduce risk; and provide accountability for the expenditure of public funds.
6. **The Freight Element aligns with LRTP goals for performance-based resource allocation** by creating first-generation approaches for freight system performance measurement; freight project prioritization and evaluation; and multi-modal freight investment at a program level.
7. **The Freight Element is a valuable resource** for modal plan development and area/local freight planning, and complies with federal guidance for State Freight Plans.

Organization of the Freight Element

The remainder of the Freight Element is organized into the following sections (Exhibit 2):

- Freight Demand Drivers
- Freight System Elements
- Critical Freight Trends
- Performance, Needs, and Opportunities
- Freight Goals, Policies, and Actions
- Freight Performance Measurement, Prioritization, and Project Evaluation
- Relationships with Other Plans and Federal Guidance

Supplemental detail on truck counts is presented in the Appendix.

This Freight Element is organized and presented to satisfy federal guidance for statewide freight plans. The required and recommended components of State Freight Plans, and the sections of the Freight Element in which they are addressed, are listed in Exhibit 4. The *Relationship with Other Plans and Federal Guidance* section provides additional detail.

Exhibit 4: Federal Guidance and Organization of the Freight Element

FAST Act Freight Requirements	Sections of *Let's Keep Moving 2036: Freight Element* Section that Addresses Requirements
1. The Plan shall include an identification of significant freight system trends, needs, and issues with respect to the State.	▪ *Freight Demand Drivers* ▪ *Freight System Elements* ▪ *Critical Freight Trends* ▪ *Performance, Needs, and Opportunities*
2. The Plan shall include a description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State.	▪ *Freight Goals, Policies, and Actions* ▪ *Freight Performance Measurement, Prioritization, and Project Evaluation*
3. The Plan shall include a listing, when applicable, of: (a) multimodal critical rural freight facilities and corridors designated within the State under section 70103 of this title (b) critical rural and urban freight corridors designated within the State under section 167 of title 23.	▪ *Freight Performance Measurement, Prioritization, and Project Evaluation* identifies an Alaska Multimodal Freight Network (AMFN) that includes all major freight facilities that play a significant role in the state's economy. Portions of the AMFN corresponding to federal designations defined under FAST are identified and may be periodically updated under separately adopted *Alaska Freight Element Implementation Guidance*.
4. The Plan shall include a description of how the plan will improve the ability of the State to meet the national multimodal freight policy goals described in section 70101(b) of this title and the national highway freight program goals described in section 167 of title 23.	▪ *Relationship with Other Plans and Federal Guidance*
5. The Plan shall include a description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, were considered.	▪ *Freight Goals, Policies, and Actions*

Exhibit 4: Federal Guidance and Organization of the Freight Element (continued)

FAST Act Freight Requirements	Sections of *Let's Keep Moving 2036: Freight Element* Section that Addresses Requirements
6. In the case of roadways on which travel by heavy vehicles (including mining, agricultural, energy cargo or equipment, and timber vehicles) is projected to substantially deteriorate the condition of the roadways, the Plan shall include a description of improvements that may be required to reduce or impede the deterioration.	▪ *Performance, Needs, and Opportunities* addresses infrastructure needs and planned improvements associated with natural resource (mineral, oil and gas extraction, timber, etc.) development, including existing roadways as well as potential future roadways. Freight priority projects consistent with this Freight Element, and investment plans to implement them, are identified and may be periodically updated under separately adopted *Alaska Freight Element Implementation Guidance*.
7. The Plan shall include an inventory of facilities with freight mobility issues, such as bottlenecks, within the State, and for those facilities that are State owned or operated, a description of the strategies the State is employing to address the freight mobility issues.	▪ *Performance, Needs, and Opportunities*
8. The Plan shall consider any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay.	▪ *Performance, Needs, and Opportunities* ▪ *Freight Goals, Policies, and Actions*
9. The Plan shall include a freight investment plan that, subject to subsection (c)(2), includes a list of priority projects and describes how funds made available to carry out section 167 of title 23 would be invested and matched.	▪ The Freight Element is part of the LRTP, and the LRTP itself does not include projects or investments. Freight priority projects consistent with this Freight Element, and investment plans to implement them, are identified and may be periodically updated under separately adopted *Alaska Freight Element Implementation Guidance*.
10. The State Freight Advisory Committee shall be consulted in development of the Plan, if applicable.	▪ The Freight Element was developed with the participation of a Freight Working Group, consisting of diverse public and private sector stakeholders, as part of the larger public involvement process guiding development of the full LRTP. The Freight Working Group will be a continuing resource for freight planning, as outlined in the *Alaska Freight Element Implementation Guidance.*

FREIGHT DEMAND DRIVERS

Freight movement in Alaska results from specific demand drivers, primarily requirements to: export natural resources from the state to national and international markets; import consumer goods and industrial supplies from other states and countries; satisfy military supply requirements; and distribute goods within Alaska over very long supply chains.

In this section of the Freight Element, a variety of data sources—including federal economic data, Alaska state economic data and analysis, and federal commodity flow data—are used to define Alaska's key freight drivers and quantify their relative contributions, in terms of tonnage and value, to freight movement activity.

Producers and Consumers

The demand for freight transportation is driven by the amount and type of economic activity—in essence, commerce trade in goods. It is driven by producing industries and consumers. Producing industries need access to inputs such as raw materials, machinery and equipment, components, and packaging, as well as access to markets where their final products are sold. Consumers need access to basic necessities such as shelter, food, fuel, vehicles, clothing, appliances and electronics, construction and building materials, and other supplies and property. In Alaska, the major producing industries include petroleum extraction, mining, commercial fishing and processing, construction, and power generation. Alaska also has a large government presence (particularly military) that requires the shipment of equipment, machinery, fuels, and supplies.

To understand what drives the demand for freight movement, it is useful to distinguish between "freight-intensive" industries, non-freight industries, and government. These three groups can be thought of as three pillars supporting Alaska's economy. Freight-intensive industries are defined as those that handle freight as part of their primary business; this includes manufacturers, construction firms, transportation and warehousing businesses, retailers, manufacturers, utilities, and other natural resource producers (agriculture, forestry, fishing, and hunting). Non-freight industries are predominantly in the service sector, and while they may absolutely depend on freight services—for example, hospitals and military installations need equipment and supplies—their business is not primarily about moving freight. This distinction is helpful because it allows the identification of economic activities that rely directly on freight transportation where a core aspect of their business involves the production, handling, receipt, and/or sales of goods and products (see Exhibit 5).

Alaska's Economy is Highly Dependent on Freight-Intensive Industries

According to federal data, Alaska's Gross State Product in 2015 was $52.8 billion. Of that total, 47% was derived from freight-intensive industries, 34% was from other industries, and 19% was from the government. In other words, nearly half of Alaska's economy depends on the performance of the State's freight transportation system. Almost 18% depends on mining, which includes petroleum, natural gas, coal, and other minerals. About 13% depends on transportation and warehousing, which is

responsible for the physical movement and handling of freight through warehouses, distribution centers, intermodal freight terminals, and other logistics facilities (see Exhibit 6).

Exhibit 5: Freight-Intensive and Non-Freight Industries

Freight-Intensive Industries (Goods and Services)	Non-Freight Industries (Services Only)
Mining (including petroleum, natural gas, and coal)	Health Care and Social Assistance
Construction	Professional, Scientific, Technical
Transportation and Warehousing	Accommodation and Food Services
Retail Trade	Finance and Insurance
Manufacturing (including processing of fish)	Administrative and Waste Services
Utilities	Other Services
Agriculture, Forestry, Fishing, Hunting	Information
	Real Estate, Rental and Leasing
	Management
	Arts, Entertainment, and Recreation
	Educational Services

Source: WSP | Parsons Brinckerhoff

Exhibit 6: Alaska Gross State Product, 2015

Industry	$ Millions	Share
All Industry, Total	**52,804**	**100.0%**
Mining	9.401	17.8%
Transportation and warehousing	6,596	12.5%
Construction	2,432	4.6%
Retail trade	2,253	4.3%
Manufacturing	1,600	3.0%
Wholesale trade	1,300	2.5%
Utilities	744	1.4%
Agriculture, forestry, fishing, and hunting	529	1.0%
Subtotal, Freight-Intensive Industries	**24,855**	**47.1%**
Subtotal of Other Industries	**17,965**	**34.0%**
Subtotal, Government	**9.984**	**18.9%**

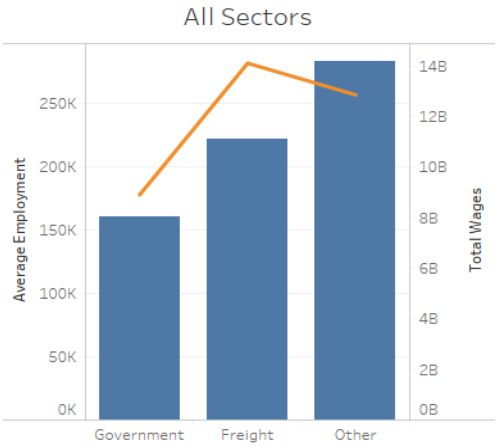
Source: Analysis of U.S. Bureau of Economic Analysis data

Other metrics such as population, employment, and wages can be used to understand these freight drivers in greater detail. Population is a key measure of purchasing demand; wages are key indicators of purchasing power created from various industry sectors; and distribution of employment illustrates important industry sectors and clusters.

Freight-Intensive Industries Generate High-Wage Jobs

In 2015, freight intensive industries were directly responsible for 33% of the state's full-time employment and 39% of the state's wages from employment.[1] On a per-employee basis, wages in freight industries were 40% higher than in non-freight intensive industries and 14% higher than in government. Additionally, wage-earners in freight-intensive industries make purchases that support a broad range of non-freight industries – including health care, real estate, recreation, etc. (see Exhibit 7; the bars show employment while the line shows wages).

Exhibit 7: Employment and Wages by Major Industry Type, 2015



Source: Analysis of Alaska Department of Labor and Workforce Quarterly Census of Employment and Workforce (QCEW) data

Among the various freight-intensive industries, retail trade generates the highest employment, followed by transportation and warehousing, construction, mining (including petroleum), manufacturing, wholesale trade, utilities, and agriculture/forestry/fishing/hunting. Fishing is frequently noted as an important Alaska industry, but its annual employment and wages are relatively low in part because the processing of fresh fish is actually counted as a Manufacturing activity. From a wage perspective, mining generates the highest wages, followed by construction, transportation and warehousing, retail trade, manufacturing, wholesale trade, utilities, and agriculture/forestry/fishing/hunting (see Exhibit 8).

Exhibit 8: Employment and Wages in Freight-Intensive Industries, 2015

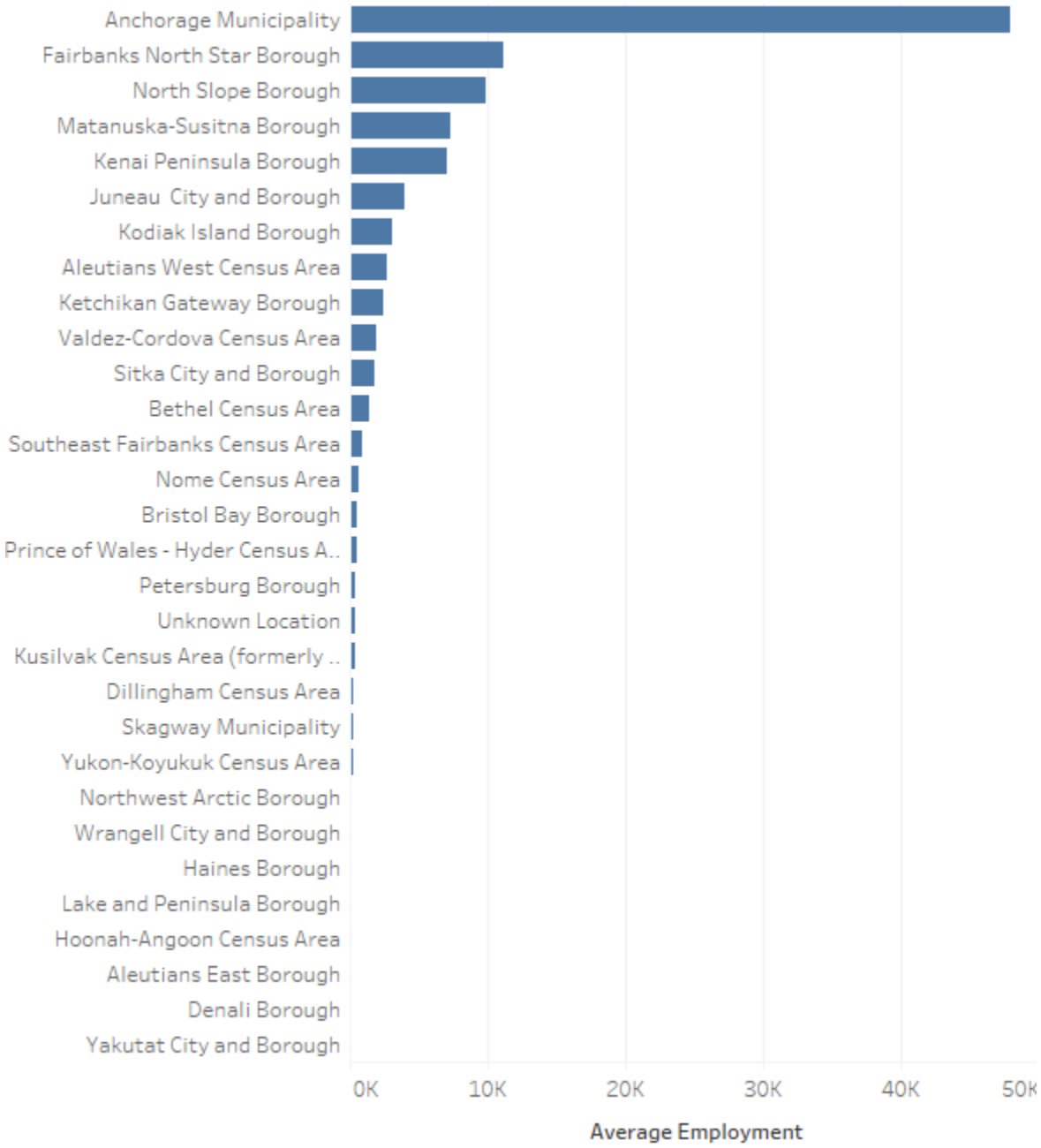
Source: Analysis of Alaska Department of Labor and Workforce QCEW data

[1] Based on Alaska Department of Labor and Workforce Quarterly Census of Employment and Wages (QCEW) data.

Alaska Boroughs Depend on Freight-Intensive Industries

While most Alaska boroughs have some employment in freight-intensive industries, freight employment tends to cluster primarily in Anchorage Municipality, which has by far the largest number of jobs in freight-intensive industries, and in Fairbanks North Star, North Slope, Kenai, Mat-Su, and Juneau (see Exhibit 9).

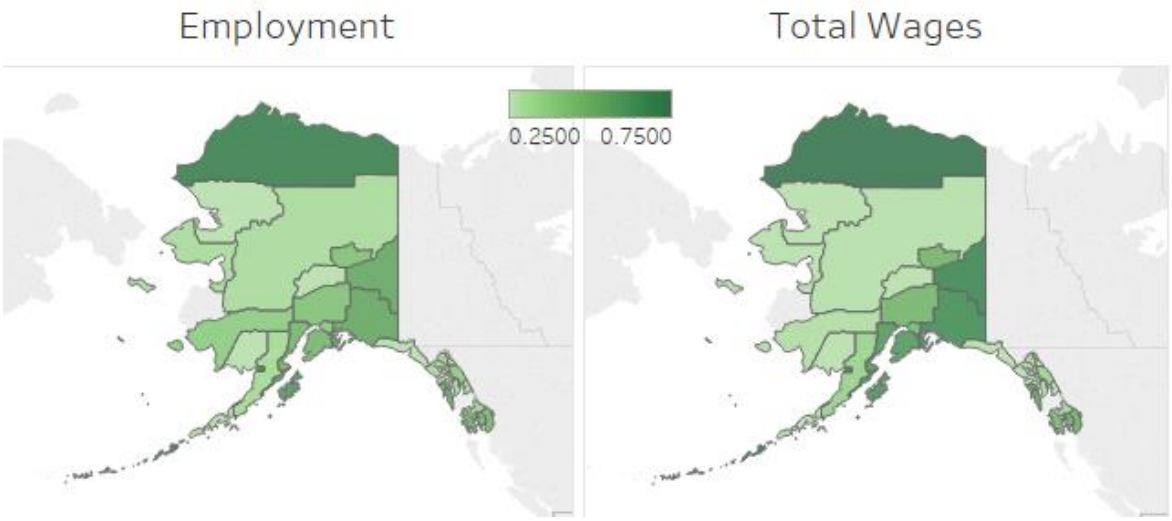
Exhibit 9: Employment in Freight-Intensive Industries, 2015



Source: Analysis of Alaska Department of Labor and Workforce QCEW data

However, many of the Boroughs with fewer freight employees actually have a very high share of their employment and wages in freight-intensive industries. Boroughs with the highest shares of non-government employment in freight-intensive industries include Aleutians West (85%), North Slope (70%), and Bristol Bay (66%). Boroughs with the lowest shares include Denali and Aleutians East (see Exhibit 10).

Exhibit 10: Share of Non-Government Employment and Wages in Freight-Intensive Industries, 2015



Source: Analysis of Alaska Department of Labor and Workforce QCEW data.

Production, Consumption, and Gateway Trade Generate Freight Movement

Alaska's total freight movement picture activity – its domestic and international flows, moving in all directions via all modes – is the result of three main activities:

- Production by Alaska's industries
- Consumption by Alaska's industries, military/government facilities, and resident/visiting population
- Gateway trade (international imports and exports between the rest of the US and other countries that pass through Alaska's transportation facilities)

These activities generate the following kinds of freight movements:

- Domestic freight movement entirely within Alaska (between Alaska origins and destinations)
- Domestic trade between Alaska and other US states
- International trade between Alaska and other countries
- Trade between other US states and other countries, which moves through Alaska infrastructure

These types of flows are discussed in detail in the remainder of this section.

In 2015, Alaska's Economy Generated 77.5 Million Tons and 86.5 Billion Dollars in Freight Movement

To understand these movements and their relative importance, we utilize the Federal Highway Administration's Freight Analysis Framework (FAF) version 4.1. FAF reports the tonnage and value for 42 different commodities (following the Standard Classification of Transported Goods system) and has been estimated for 2015 (the most up-to-date "current" year available).[2] It is important to keep in mind that FAF represents the results of a freight model – it is not an actual comprehensive survey or empirical accounting of commodity flows, and it has some known deficiencies. However, for the most part, FAF results for Alaska are consistent with known facts about Alaska's economy – its largest industries and activities have correspondingly large commodity flows. We should not expect FAF to provide decimal-point accuracy, but it does provide us with the best available approximation of multimodal freight flows.

Overall, in year 2015, it is estimated that Alaska's transportation system handled 77.5 million tons of freight worth over 86.5 billion dollars. These totals are comprised of several components:

- Measures
    - FAF provides estimates of freight tonnage (usually reported as thousands of tons, or ***KTons***) and freight value (usually reported as millions of dollars, or ***M$***)
- Directional components
    - Freight entering Alaska, moving from other states or countries to an Alaska destination
    - Freight exiting Alaska, moving from Alaska origins to other states or countries
    - Freight moving entirely within Alaska, between Alaska origins and destinations
    - Freight passing through Alaska, moving between other US states and other countries but utilizing Alaska's transportation infrastructure as part of the trip
- Trade type components
    - Domestic trade, between Alaska and itself or other states. Domestic trade can be entering, exiting, or within Alaska.
    - Export trade, from Alaska to other countries. Export trade can be exiting or passing through Alaska.
    - Import trade, from other countries to Alaska. Import trade can be entering or passing through Alaska.

[2] FAF 4.1 is based on the 2012 Commodity Flow Survey (CFS). Note that in this Freight Element, FAF 3.5 estimates of 2015 crude petroleum flows were used, due to apparent anomalies in the FAF 4.1 assignments for crude. FAF also indicated volumes of crude oil being imported from other countries to Alaska; these volumes were omitted.

- Commodity type
    - FAF reports Alaska freight volumes separately for 42 different commodity classes, according to the Standard Classification of Transported Goods (SCTG) system at the two-digit classification level.
- Transportation modes. FAF data distinguishes between domestic modes and international modes; moves between states are assigned to domestic modes, while whole moves between states and other countries are assigned to international modes. FAF generally reports import and export trade types as having both an international and a domestic mode, where the domestic mode provides the domestic connections to international seaports and airports. FAF uses the following modal classifications, which are defined in the US Census Commodity Flow Survey of 2012:
    - Air (including truck-air), which includes air not in combination with any other modes except truck
    - Water, which includes water not in combination with any other modes
    - Truck, which includes truck not in combination with any other modes
    - Rail, which includes rail not in combination with any other modes
    - Pipeline, which includes pipeline not in combination with any other modes
    - Multiple modes and mail, which includes any reported combination of two or more modes; this usually represents intermodal containers or mixed freight shipments using multiple modes (air-truck, water-truck, water-rail, rail-truck), or small packages moving generally as air freight
    - No domestic mode which includes imports and exports directly to/from shipping and receiving locations
    - Other and unknown, which includes all other volumes not assigned to the modes above

Alaska Freight Movement by Direction and Trade Type

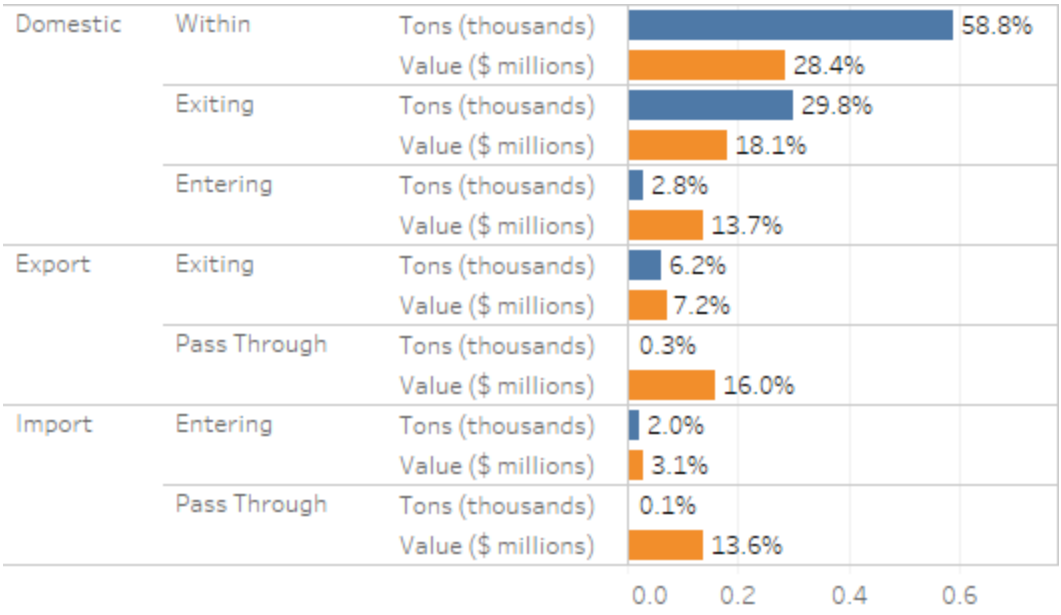
Exhibit 11 and Exhibit 12 following summarize the breakdown of Alaska tonnage and value by direction and trade type. The following conclusions can be drawn from this analysis:

- Domestic trade within Alaska accounted for 59% of tonnage and 29% of value. This is the largest component of Alaska's tonnage and value; it represents shipments and deliveries to, from, and between Alaska's producers and consumers, moving entirely within the state.
- Domestic trade exiting Alaska accounted for 30% of tonnage and 18% of value. This represents freight being moved from Alaska to other states, and consists primarily of crude petroleum moving (via water) from Alaska production facilities to the lower 48 for refining.
- Domestic trade entering Alaska accounted for 3% of tonnage and 14% of value. This represents freight being moved from other states to Alaska users, and includes a broad range of higher-

value consumer and industrial products that cannot be produced in Alaska. Domestic trade exiting Alaska is far higher by tonnage, but not much higher by value.

- Export trade exiting Alaska accounted for 6% of tonnage and 7% of value. This represents the shipment of Alaska's natural resources and finished products to other countries.
- Export trade passing through Alaska accounted for 0.3% of tonnage and 16% of value. This represents freight moving from other states to Alaska, then from Alaska to other countries, and consists mostly of very high-value freight moving via air.
- Import trade entering Alaska accounted for 2% of tonnage and 3% of value. This represents a range of resources and products that are shipped from other countries to Alaska users. Alaska exports more than twice as much tonnage and value as it imports.
- Import trade passing through Alaska accounted for 0.1% of tonnage and 14% of value. This represents freight moving from other countries to Alaska, then from Alaska to other states, and consists mostly of very high-value freight moving via air. Interestingly, pass-through trade tonnage is far larger in the export direction, but pass-through trade value is fairly balanced.

Exhibit 11: Overview of Alaska Tonnage and Value Trade Shares, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Exhibit 12: Overview of Alaska Tonnage and Value Trade, Year 2015 Estimate

	Tons (thousands)				Value (millions)			
	Domestic	Export	Import	Total	Domestic	Export	Import	Total
Entering	2,167		1,542	3,709	11,854		2,641	14,494
Exiting	23,117	4,812		27,929	15,648	6,196		21,844
Within	45,551			45,551	24,622			24,622
Pass Through		233	78	311		13,839	11,762	25,602
Grand Total	**70,835**	**5,045**	**1,620**	**77,500**	**52,123**	**20,035**	**14,403**	**86,561**

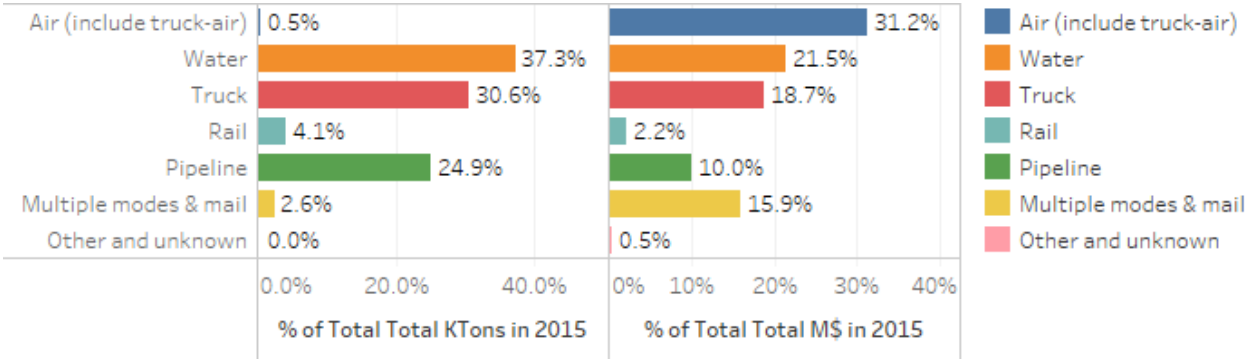
Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Alaska Relies on a Diverse Set of Freight Transportation Modes

Each Alaska freight transportation mode has a specific set of freight carriers (trucking companies, airlines, vessel operators, railroads, and pipeline owners), who use a variety of infrastructure assets. Some of these infrastructure assets are unique to each mode, such as highways, waterways, railroads, and pipelines. Some, known as "intermodal" facilities, are designed to bring together different modes; these include ports (linking water with trucks, rail, and/or pipelines), airports (linking air with trucks, and sometimes pipelines), and rail terminals (linking rail and trucks). Different networks and facilities have different owners, which may be public or private; and the vehicles and vessels that operate over these networks and through these facilities are both publicly and privately owned. This section presents key information for each mode.

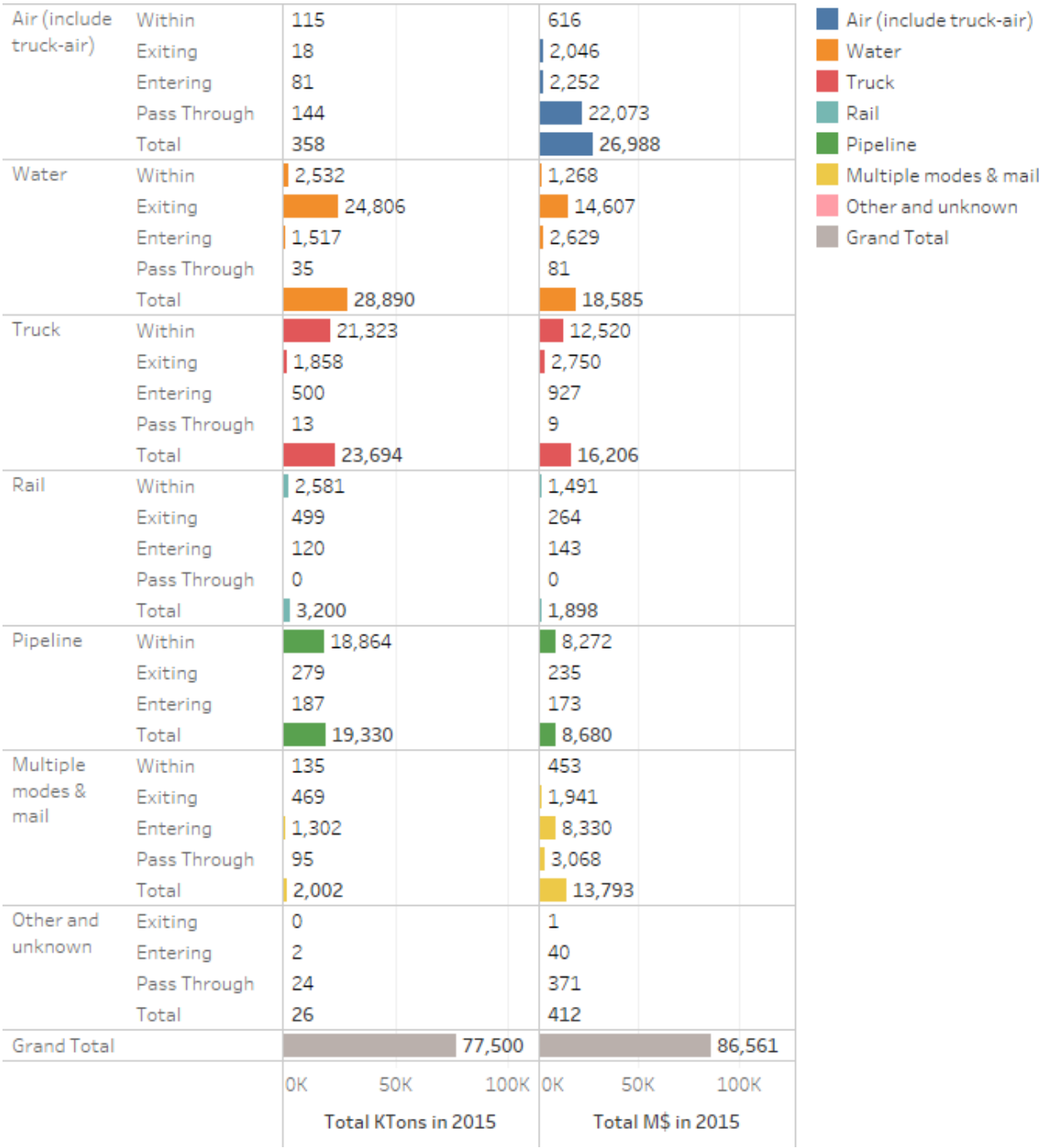
To begin the discussion, the Freight Analysis Framework data can be used to evaluate the relative importance of each freight mode used to provide domestic transportation (entering, exiting and within Alaska) and international transportation (entering, exiting, or passing through Alaska). Exhibit 13 provides a summary of domestic mode tonnage and value shares; Exhibit 14 provides additional detail on the volume of domestic trade by mode and direction.

Exhibit 13: Alaska Domestic Transportation Mode Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Exhibit 14: Alaska Domestic Transportation Mode Tonnage and Value by Direction, Year 2015 Estimate



		Total KTons in 2015	Total M$ in 2015
Air (include truck-air)	Within	115	616
	Exiting	18	2,046
	Entering	81	2,252
	Pass Through	144	22,073
	Total	358	26,988
Water	Within	2,532	1,268
	Exiting	24,806	14,607
	Entering	1,517	2,629
	Pass Through	35	81
	Total	28,890	18,585
Truck	Within	21,323	12,520
	Exiting	1,858	2,750
	Entering	500	927
	Pass Through	13	9
	Total	23,694	16,206
Rail	Within	2,581	1,491
	Exiting	499	264
	Entering	120	143
	Pass Through	0	0
	Total	3,200	1,898
Pipeline	Within	18,864	8,272
	Exiting	279	235
	Entering	187	173
	Total	19,330	8,680
Multiple modes & mail	Within	135	453
	Exiting	469	1,941
	Entering	1,302	8,330
	Pass Through	95	3,068
	Total	2,002	13,793
Other and unknown	Exiting	0	1
	Entering	2	40
	Pass Through	24	371
	Total	26	412
Grand Total		77,500	86,561

Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

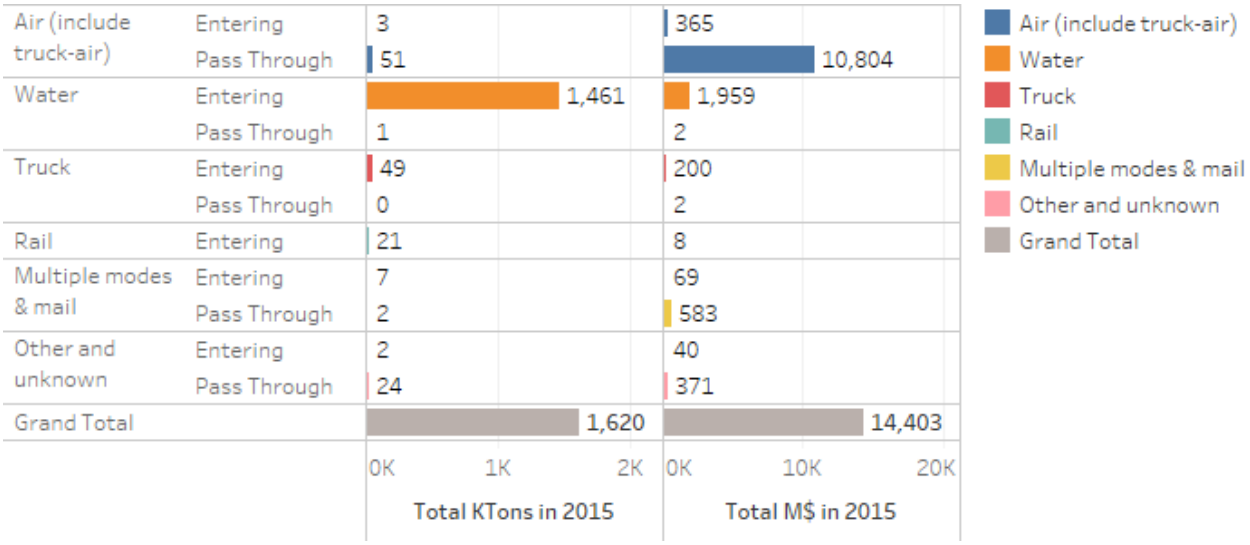
Key findings from Exhibit 13 and Exhibit 14 include:

- Air accounts for 0.5% of domestic mode tonnage and 31.2% of domestic mode value. The majority of tonnage is within, entering, or exiting Alaska, but the great majority of value is passing through Alaska.
- Water accounts for 37.3% of domestic mode tonnage and 21.5% of domestic mode value. The largest shares of tonnage and value are exiting Alaska, primarily in the form of crude oil shipments.
- Trucking accounts for 30.6% of domestic mode tonnage and 18.7% of domestic mode value. The great majority of tonnage and value is for within-state moves.
- Rail accounts for 4.1% of domestic mode tonnage and 2.2% of domestic mode value. Rail is primarily used for shipments within Alaska, but has some entering and exiting tonnage and value.
- Pipeline accounts for 24.9% of domestic mode tonnage and 10.0% of domestic mode value. Pipeline moves are almost entirely within the state.
- Multiple modes and mail account for 2.6% of domestic mode tonnage and 15.9% of domestic mode value. Most of the tonnage and value is entering the state, probably due to movements of containers and other mixed shipments of high-value goods from the lower 48 by air and water.

Exhibit 15 and Exhibit 16 following look at foreign outbound modes and foreign inbound modes use to serve Alaska. Key findings include:

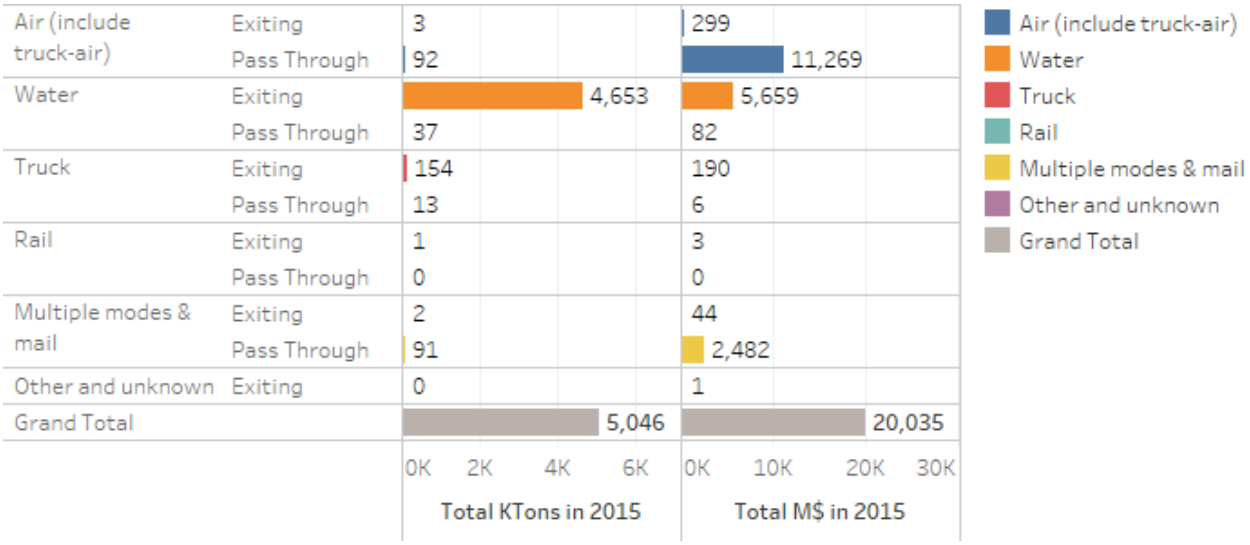
- For inbound moves, the leading tonnage mode is water, with most of the inbound freight entering Alaska (not pass-through). Truck, rail, mail and multiple modes, and air also make contributions. The leading value mode is air, with most of the value being associated with pass through traffic. For import value entering Alaska (not pass-through), water is actually the value leader by a substantial margin, followed by air, truck, and multiple modes and mail.
- For outbound moves, the leading tonnage mode is again water, with most of the inbound freight entering Alaska (not pass-through). Truck also has significant exiting tonnage. The leading value mode is air, with most of the value being associated with pass through traffic. For import value entering Alaska (not pass-through), water is the value leader by a substantial margin, but mail and multiple modes also provide significant value.

Exhibit 15: Alaska Import Transportation Mode Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Exhibit 16: Alaska Export Transportation Mode Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Each transportation mode is addressed in greater detail in the following sections.

Alaska Freight Movement by Commodity, Direction and Trade Type

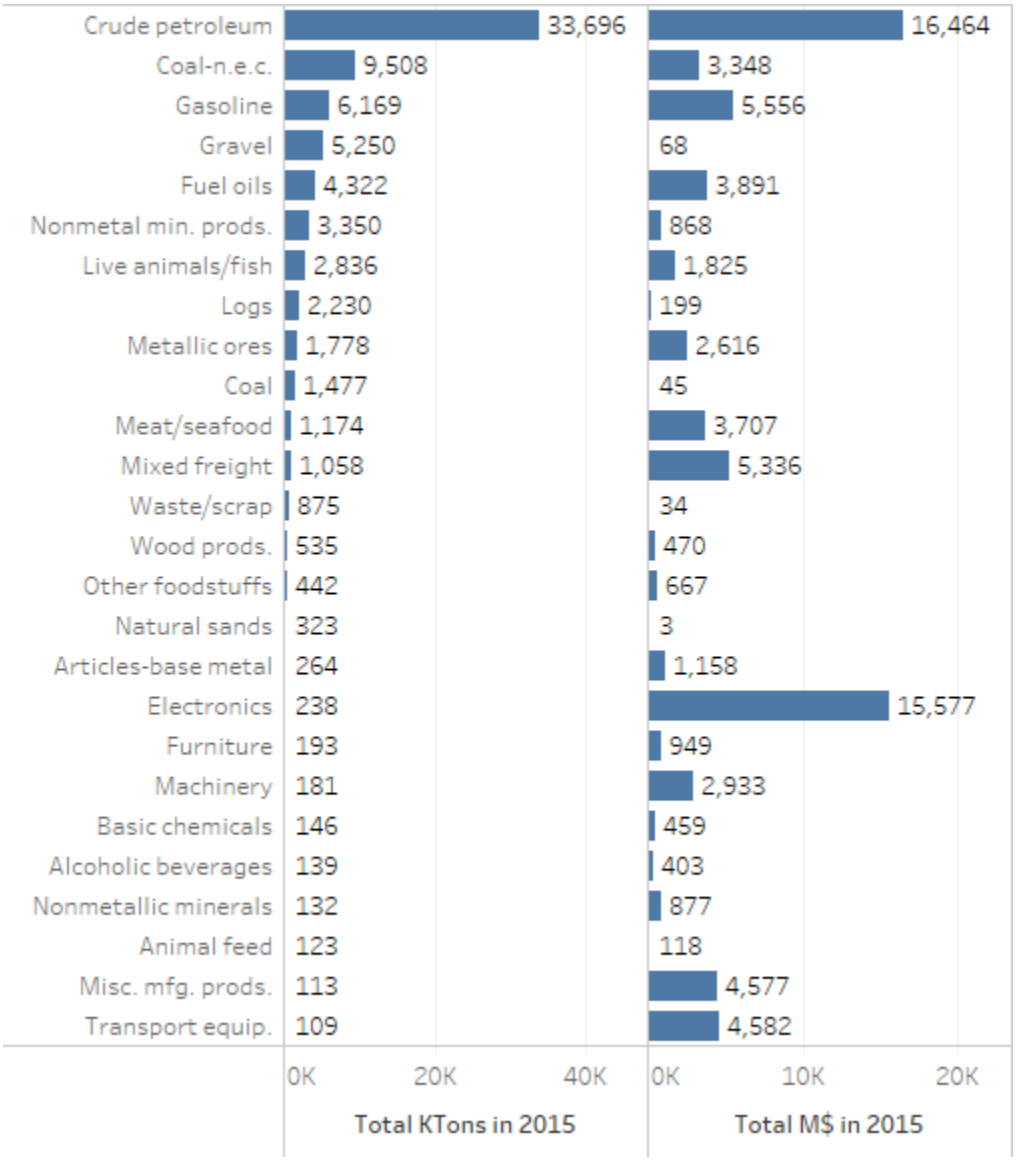
Building on the data in Exhibit 15 and Exhibit 16 as a platform, Exhibit 17, Exhibit 18, and Exhibit 19 following describe Alaska's leading freight commodities by direction and trade type.

As shown in Exhibit 17:

- Crude petroleum is, by far, Alaska's most important tonnage commodity at nearly 34 million tons; it is also Alaska's leading value commodity, at over $16 billion dollars.
- Other important tonnage commodities include coal n.e.c.[3], gasoline, gravel, fuel oils, nonmetallic mineral products, live animals/fish[4], logs, metallic ores, coal, meat/seafood[5], mixed freight[6], and commodity waste/scrap.
- Electronics is Alaska's second leading value commodity, at $15.6 billion, but much of this value is actually passing through Alaska, and does not directly impact its economy. This is still an important finding, because it highlights Alaska's critical role in accommodating this important trade between the rest of the US and its international partners.
- Other important value commodities consist of products consumed by Alaska's industries and population, as well as products of Alaska's core industries. Leading value commodities include gasoline, mixed freight, transportation equipment, miscellaneous manufactured products, fuel oils, meat/seafood, precision instruments, coal n.e.c., metallic ores, and live animals/fish.

[3] Coal n.e.c, ("not elsewhere classified") is a commodity class that includes a range of coal-related products, the most important of which for Alaska is natural gas. Alaska's LNG and CNG shipments will be shown in this group.
[4] In the case of Alaska, this is primarily fish, but FAF does not provide additional detail
[5] This represents meat/seafood products, as opposed to live animals/fish.
[6] Mixed freight typically consists of smaller shipments consolidated in truckloads or containers. Mixed freight is generally higher-value industrial or consumer goods.

Exhibit 17: Alaska's Leading Commodities by Tons and Value, Year 2015 Estimate



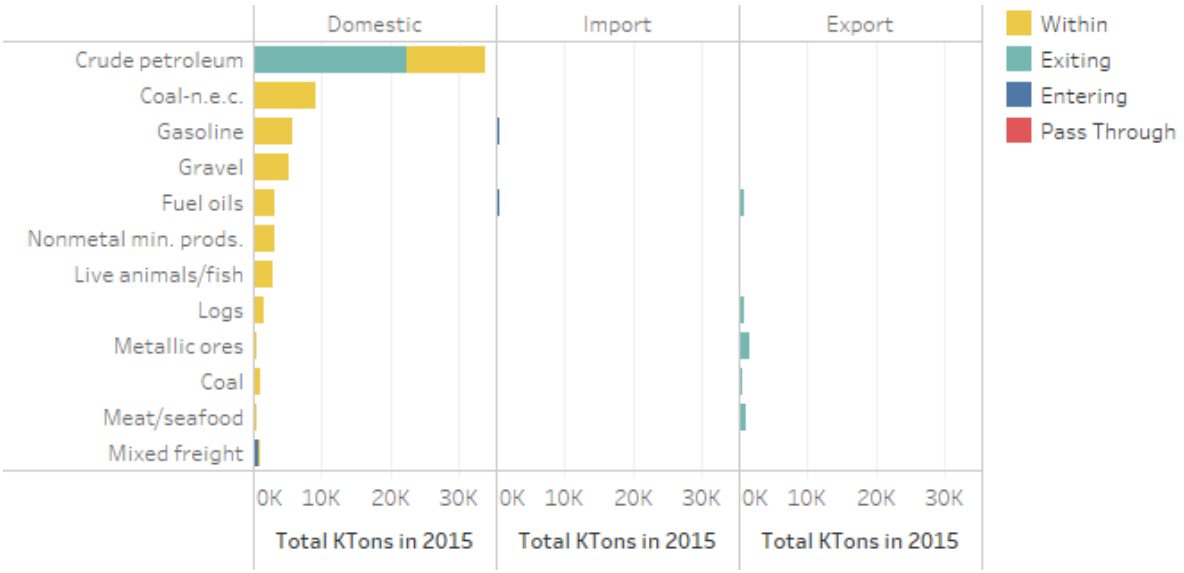
Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Exhibit 18 below provides a more detailed look at these numbers, describing how commodity tonnage is distributed by type and direction of trade.

- Crude petroleum tonnage is domestic, consisting of within-state movements and exiting movements to other states.
- The other leading tonnage commodities – coal n.e.c., gasoline, gravel, fuel oils, nonmetallic mineral products, live animals/fish, logs, and coal – represent domestic moves within Alaska, although there is some small import and export tonnage.

- For exports, the leading tonnage commodities are metallic ores, meat/seafood, logs, coal, and fuel oils. For imports, the leading tonnage commodities are gasoline and fuel oils. While these moves appear minor in Exhibit 18, it is mostly because crude petroleum moves are so large by comparison.

Exhibit 18: Alaska's Leading Commodities by Tons, Direction and Trade Type, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Similarly, Exhibit 19 following provides a more detailed look how commodity value is distributed by type and direction of trade. The value story is more complicated than the tonnage story.

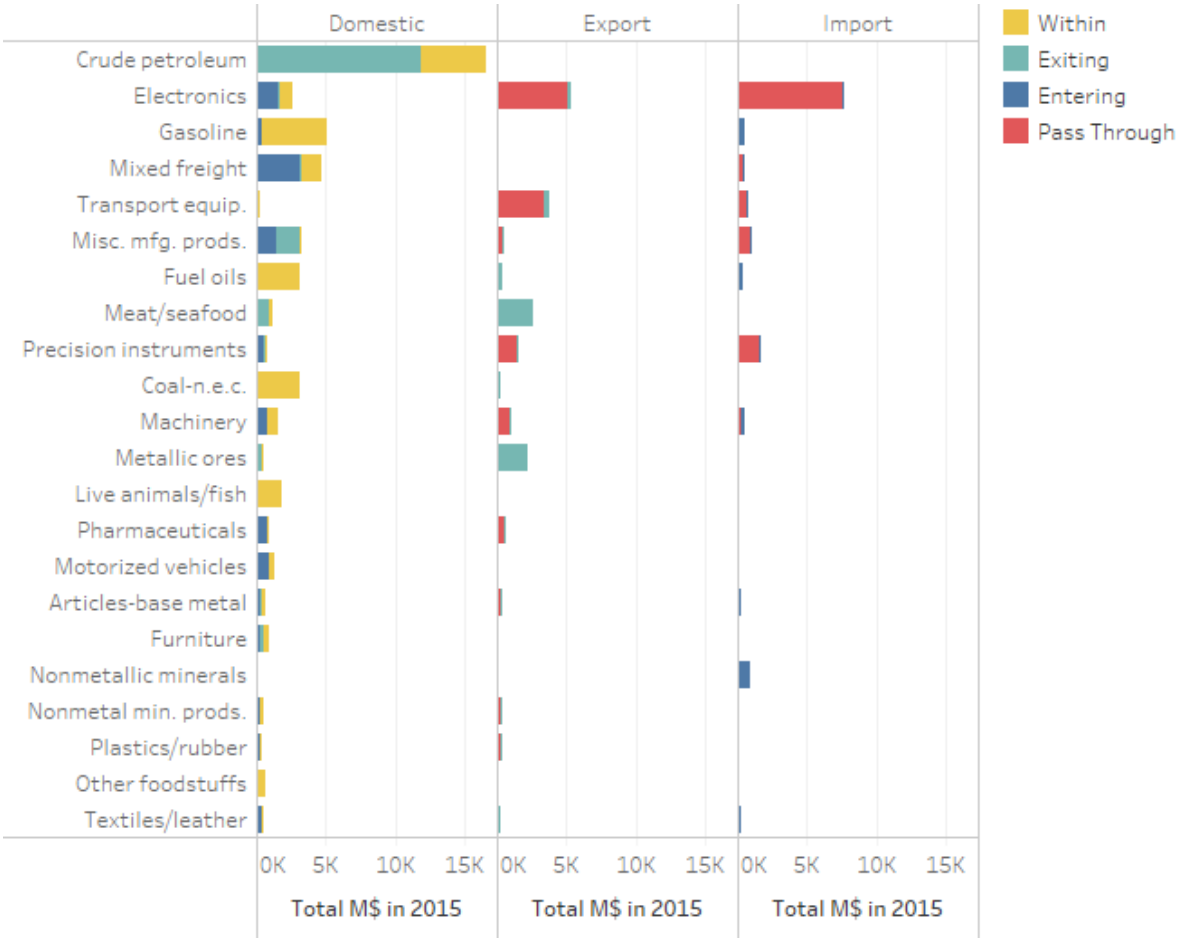
- Crude petroleum value – like tonnage –is domestic and consists of moves within Alaska and from Alaska to other states.

- For electronics, the majority of value is associated with import pass through and export pass through flows. However, there is also significant electronics value associated with domestic freight entering Alaska and domestic freight moving within Alaska.

- For domestic moves, the other leading value commodities include: gasoline, fuel oils, coal n.e.c., and live animals/fish (moving within Alaska); mixed freight (entering and moving within Alaska); miscellaneous manufactured products (both entering and exiting Alaska); meat/seafood (mostly exiting); and a variety of other high-value goods entering and moving within Alaska.

- For export moves, the leading exiting commodities (not pass through) are meat/seafood and metallic ores. For import moves, the leading entering commodities (not pass through) are non-metallic minerals, gasoline, fuel oils, and machinery.

Exhibit 19: Alaska's Leading Commodities by Value, Direction and Trade Type, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Domestic Within-State Flows

Domestic flows within Alaska occur entirely between Alaska origins and destinations, and must be accommodated exclusively by Alaska's transportation assets – its highways, pipelines, waterways, railroads, and airways.

Based on tonnage, the leading within-state flows based on tonnage are:

- Crude petroleum, moving primarily by pipeline[7]
- Coal n.e.c. (primarily natural gas), moving primarily by pipeline with some trucking
- Gasoline, moving by pipeline, truck, rail, and to a lesser extent water
- Gravel moving by truck

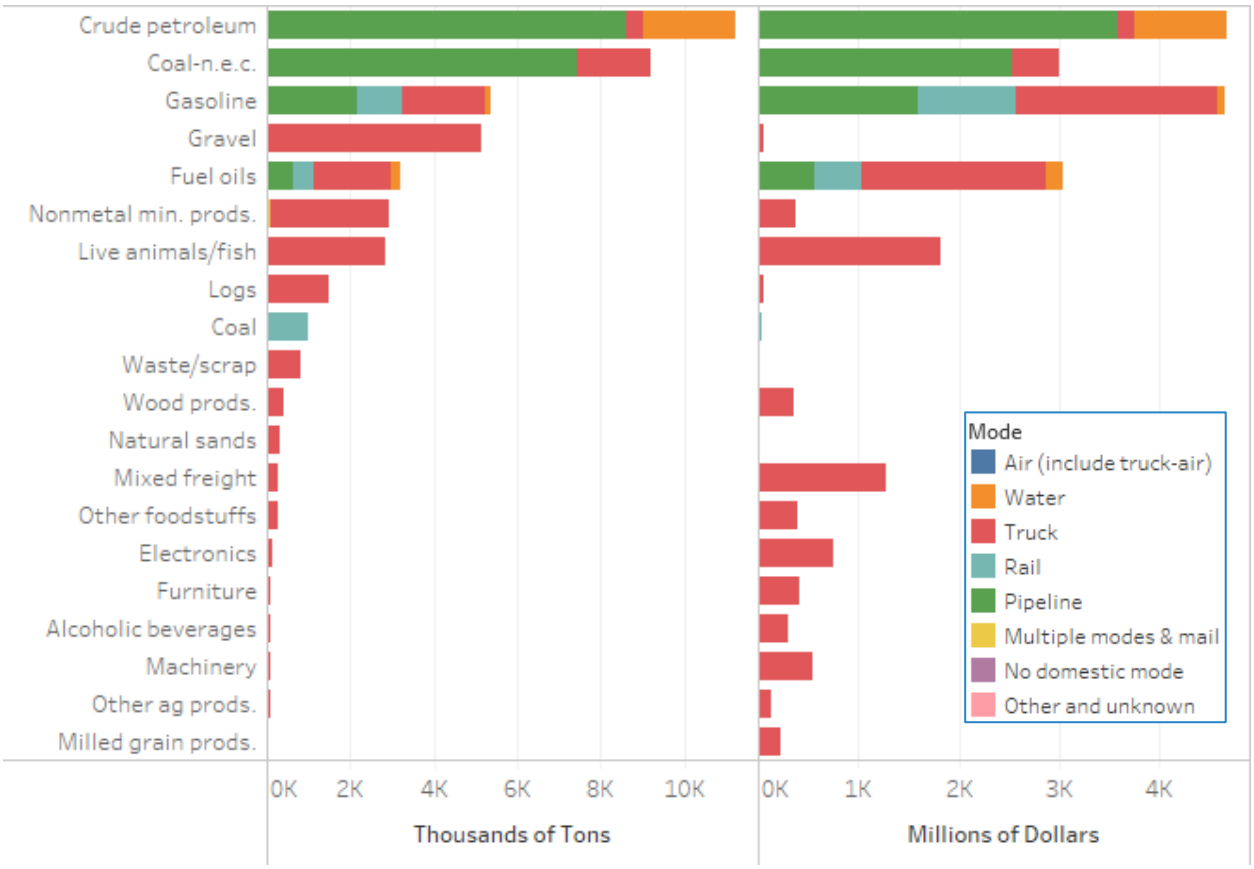
[7] It is possible that FAF is underestimating Alaska's crude pipeline volume. The Alyeska Pipeline Company reports that year 2015 throughput for TAPS was over 185 million barrels, which would be closer to 25 million tons.

- Fuel oils moving by truck, rail, and pipeline, and to a lesser extent water
- Nonmetallic mineral products, live animals/fish, and logs
- Coal moving by rail

Based on value, the leading within-state flows are:

- Gasoline, crude petroleum, fuel oils, and coal n.e.c., moving by a combination of modes.
- Live animals/fish, mixed freight, electronics, machinery, foodstuffs, furniture, nonmetallic mineral products, wood products, alcoholic beverages, and motor vehicles, moving primarily by truck, with some use of air.

Exhibit 20: Tonnage and Value of Domestic Within-State Goods Movements, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

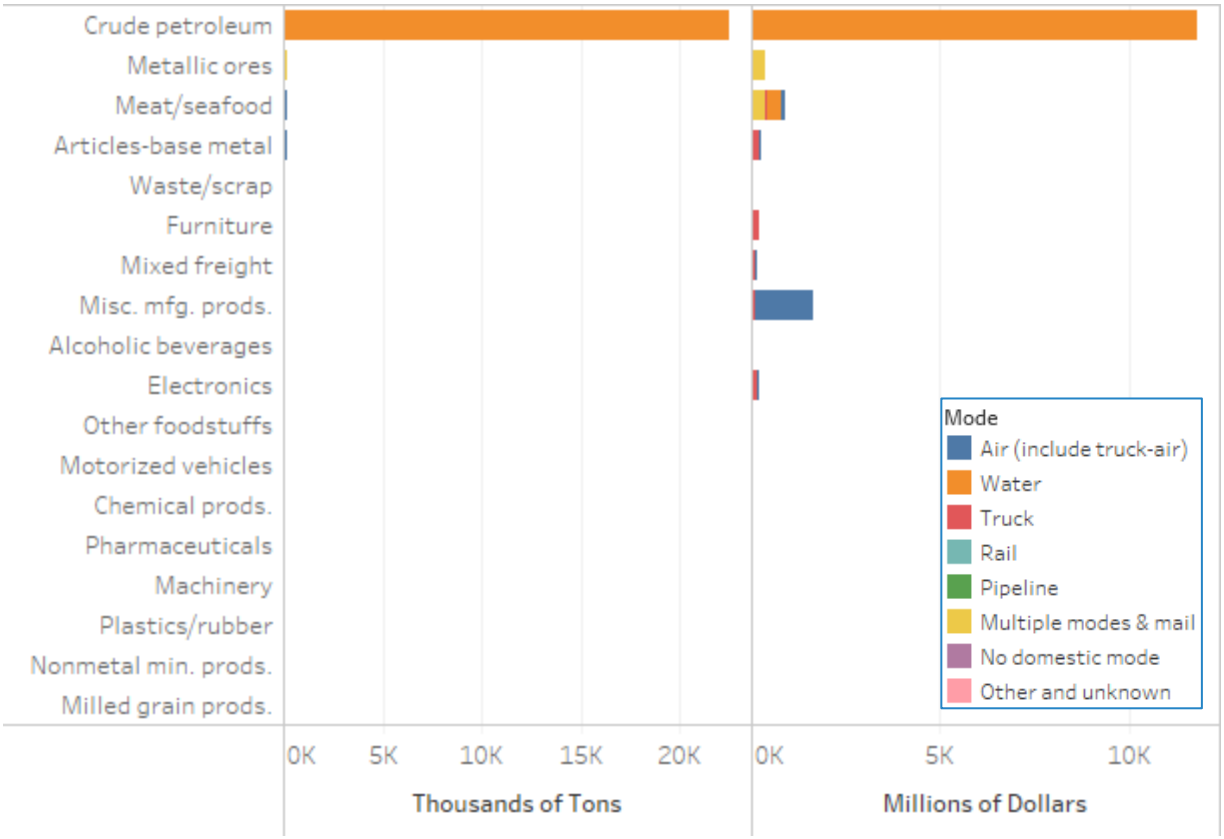
Domestic Outbound Flows

Domestic outbound flows are flows from Alaska to other states. Domestic outbound flows reflect production from Alaska's key industries, moving to markets and users in the lower 48 states. Part of the trip occurs within the boundaries of the state, and part of the trip occurs outside the state. Given

Alaska's geography with respect to the rest of the US, the portions outside the state are largely accommodated by water and air.

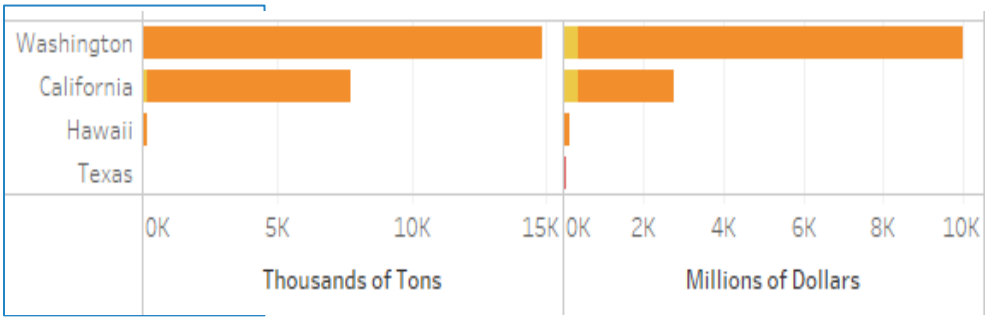
As shown in Exhibit 21 and Exhibit 22, Alaska's leading outbound domestic commodity based on tonnage is crude petroleum, moving by air. Manufactured products moving by air, meat and seafood moving by a variety of modes, and metallic ores moving by multiple modes are also important based on value. Almost all of Alaska's domestic outbound tonnage and value is moving to two states – Washington and California.

Exhibit 21: Tonnage and Value of Domestic Outbound Goods Movements, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

Exhibit 22: Destinations for Domestic Outbound Goods Movements, Year 2015 Estimate



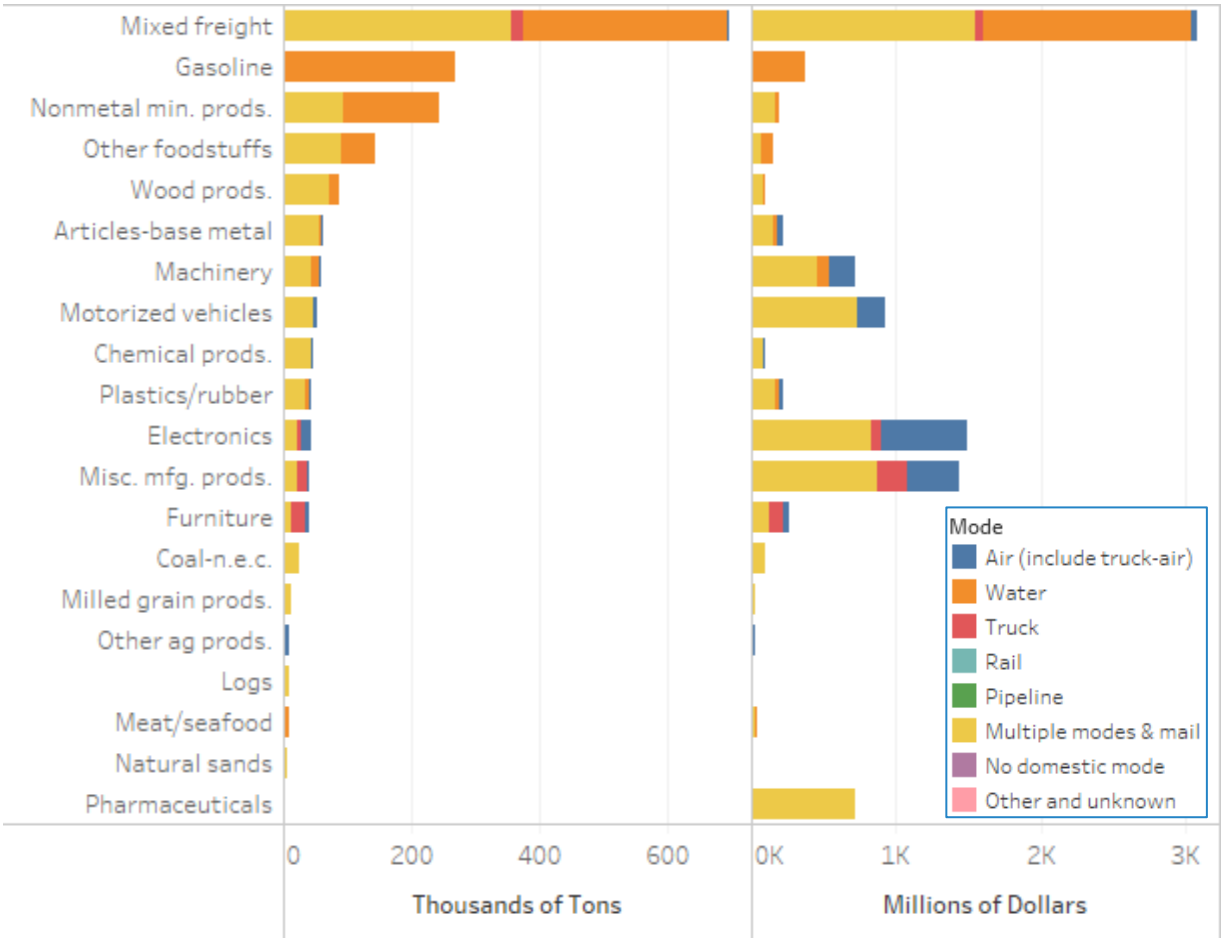
Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

Domestic Inbound Flows

Domestic inbound flows are flows from other states to Alaska. Domestic inbound flows largely reflect demand for consumer goods (food, apparel, vehicles, electronics, etc.) and industrial machinery and parts, which are not produced in Alaska. As with domestic outbound flows, given Alaska's geography with respect to the rest of the US, this trade is largely accommodated by water and air.

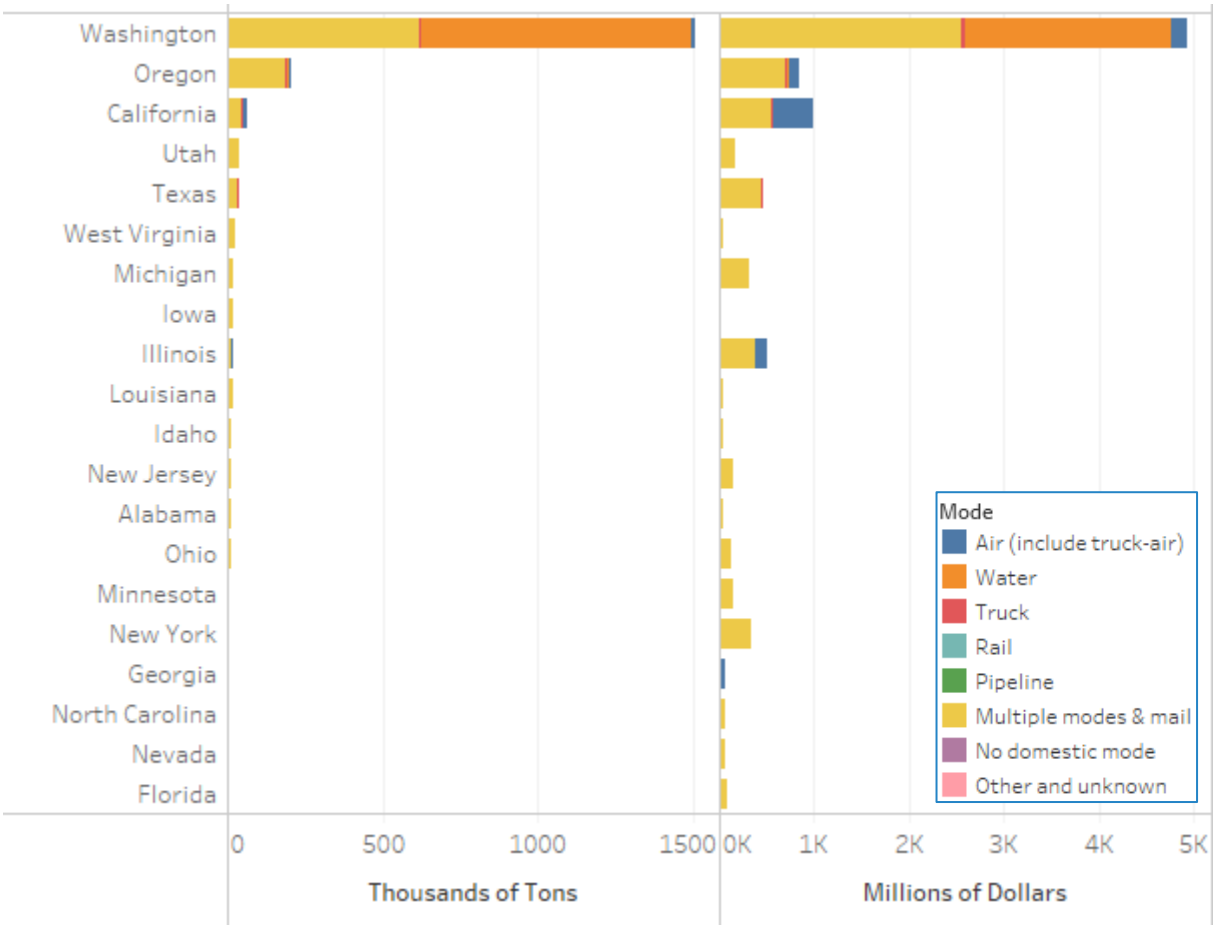
As shown in Exhibit 23 and Exhibit 24, Alaska's leading inbound domestic commodity based on tonnage and value is mixed freight moving by water and multiple modes; typically this is freight moving in international shipping containers through Alaska's seaports. Other leading tonnage commodities are gasoline (by water), nonmetallic mineral products, food, wood, metals, machinery, and motor vehicles. Other leading value commodities are electronics, manufactured products, motor vehicles and parts, and machinery, moving by multiple modes, by air, and to a limited degree by truck. Most of Alaska's inbound domestic freight originates in Washington State; other important partners include California, Oregon, Illinois, Texas, New York, and Michigan.

Exhibit 23: Tonnage and Value of Domestic Inbound Goods Movements, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

Exhibit 24: Origins for Domestic Inbound Goods Movements, Year 2015 Estimate



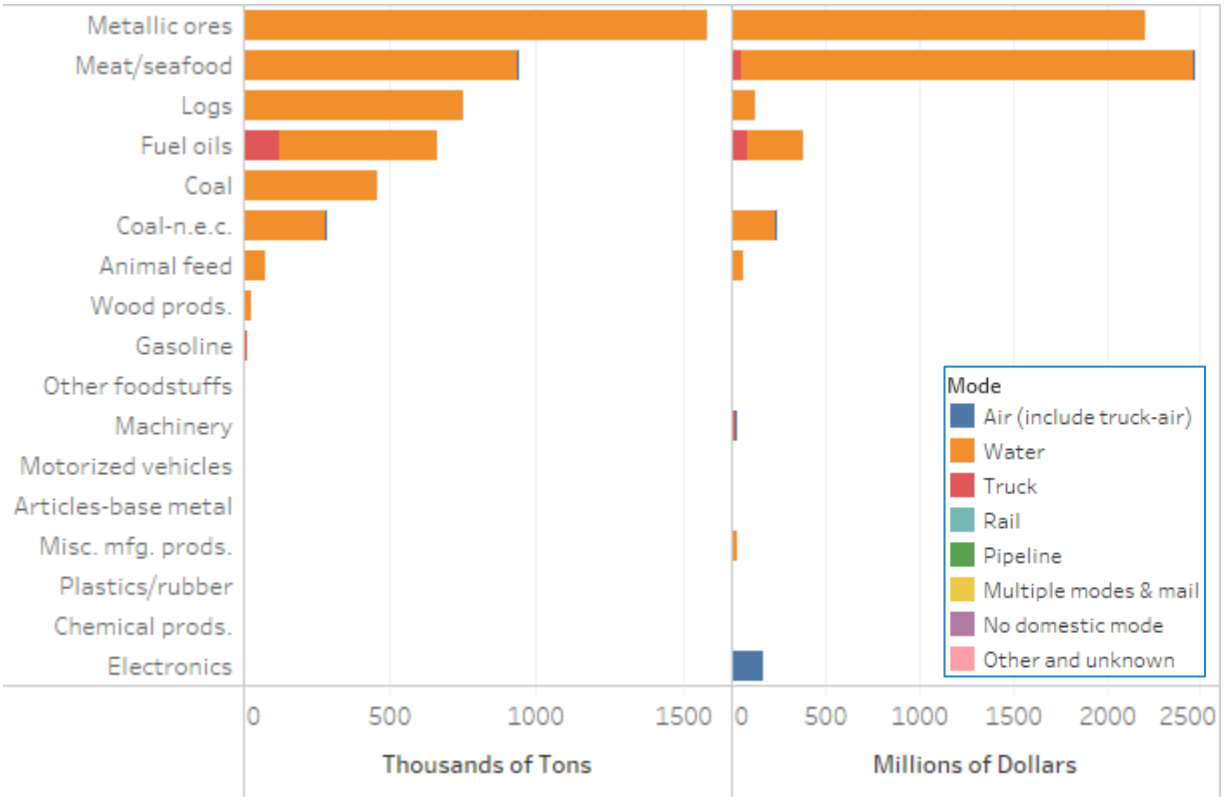
Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

International Exports from Alaska (Excluding Pass Through)

International exports are flows from Alaska to other countries, excluding international outbound freight moving from other states to other countries via Alaska's infrastructure. International exports represent commodities that are produced by Alaska's industries for global markets.

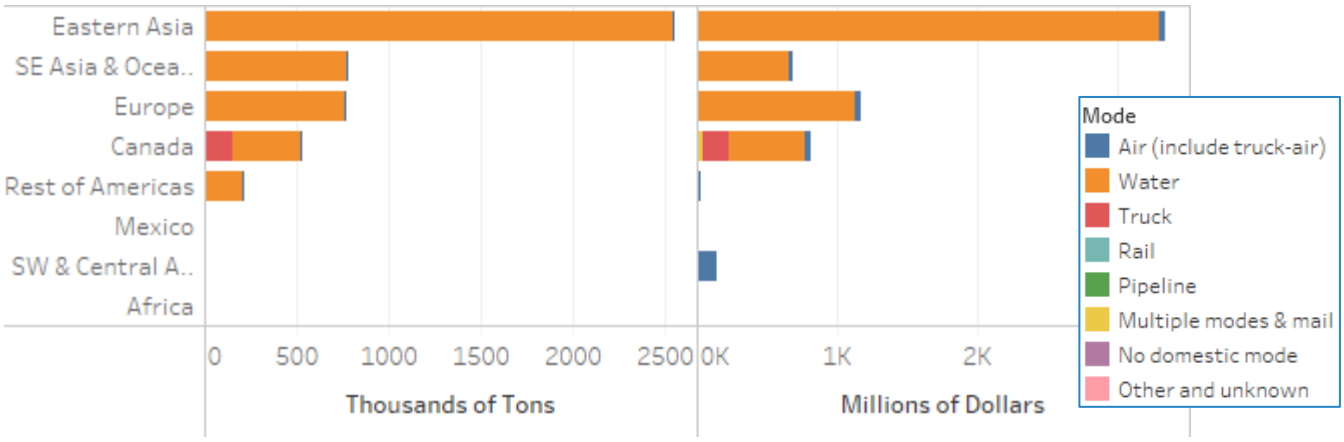
As shown in Exhibit 25 and Exhibit 26, Alaska's leading international exports by tonnage are metallic ores, meat and seafood (primarily seafood), logs, fuel oils, coal, and coal n.e.c. (primarily natural gas), moving mostly by water. Alaska's leading international exports by value are dominated by seafood and metallic ores, moving mostly by water. Alaska's leading export trade partner regions are Eastern Asia, Southeast Asia and Oceania, Europe, and Canada.

Exhibit 25: Tonnage and Value of International Export Goods Movements, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

Exhibit 26: Destinations for International Export Goods Movements, Year 2015 Estimate



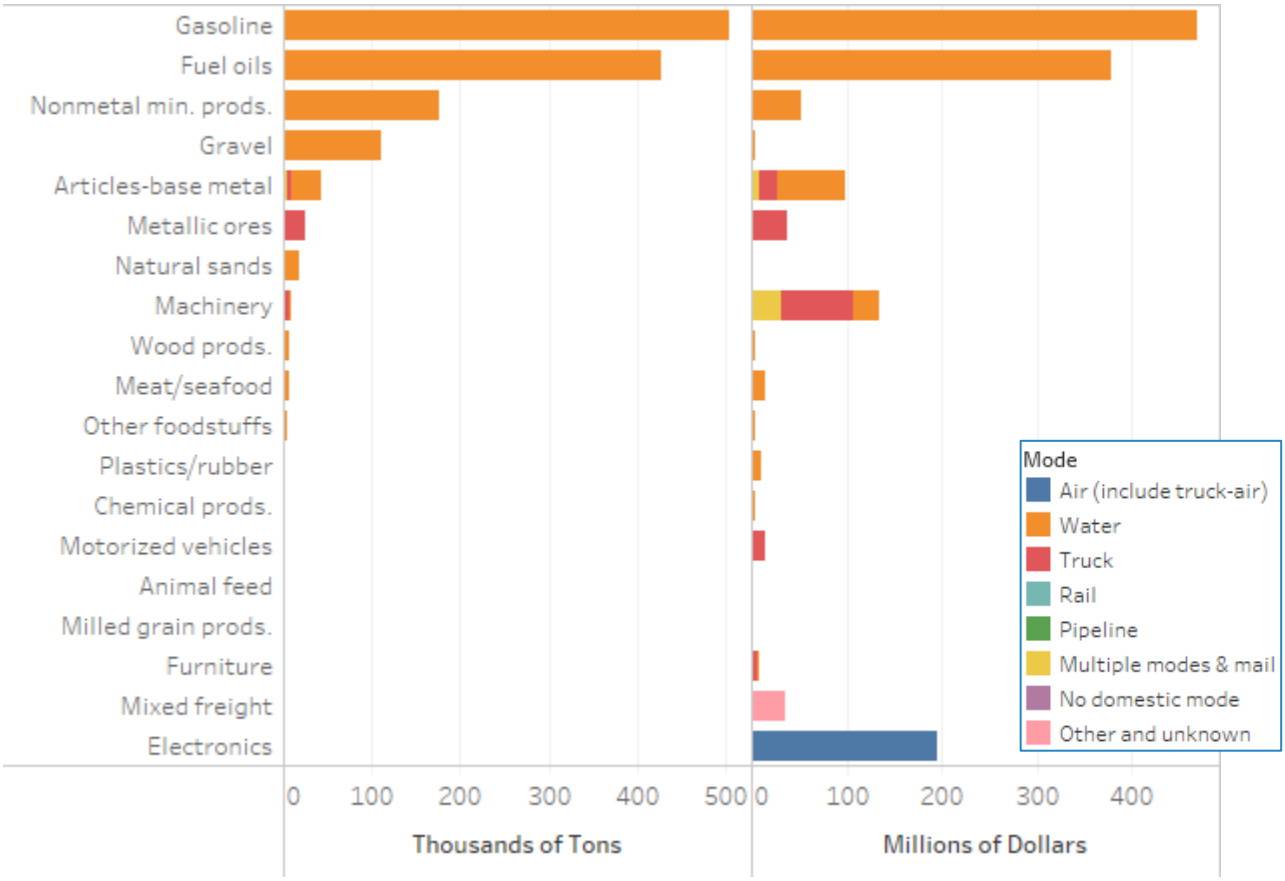
Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

International Imports to Alaska (Excluding Pass Through)

International imports are flows from other countries to Alaska, excluding international inbound freight moving from other countries to other states via Alaska's infrastructure. International imports represent commodities that are consumed by Alaska's residents and industries.

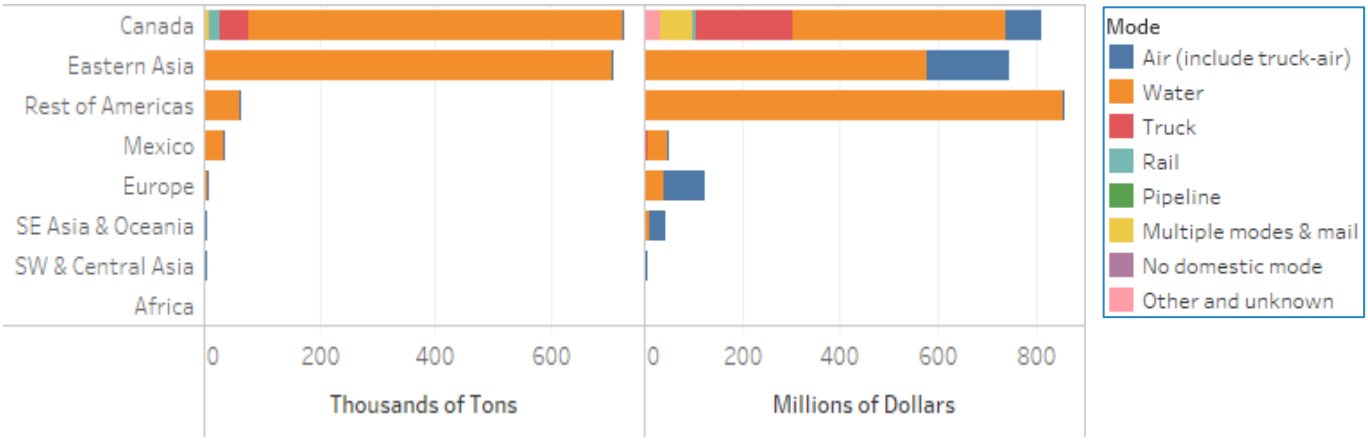
As shown in Exhibit 27 and Exhibit 28, Alaska's leading international imports by tonnage include gasoline, fuel oils, nonmetallic mineral products, gravel, and base metals, all moving by water. Alaska's leading imports by value include gasoline, fuel oils, electronics (moving by air) and machinery and metallic ores (moving primarily by truck). Alaska's leading trade partners for imports include Canada and Eastern Asia (for tonnage and value), and the rest of the Americas (for value).

Exhibit 27: Tonnage and Value of International Import Goods Movements, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

Exhibit 28: Origins for International Import Goods Movements, Year 2015 Estimate



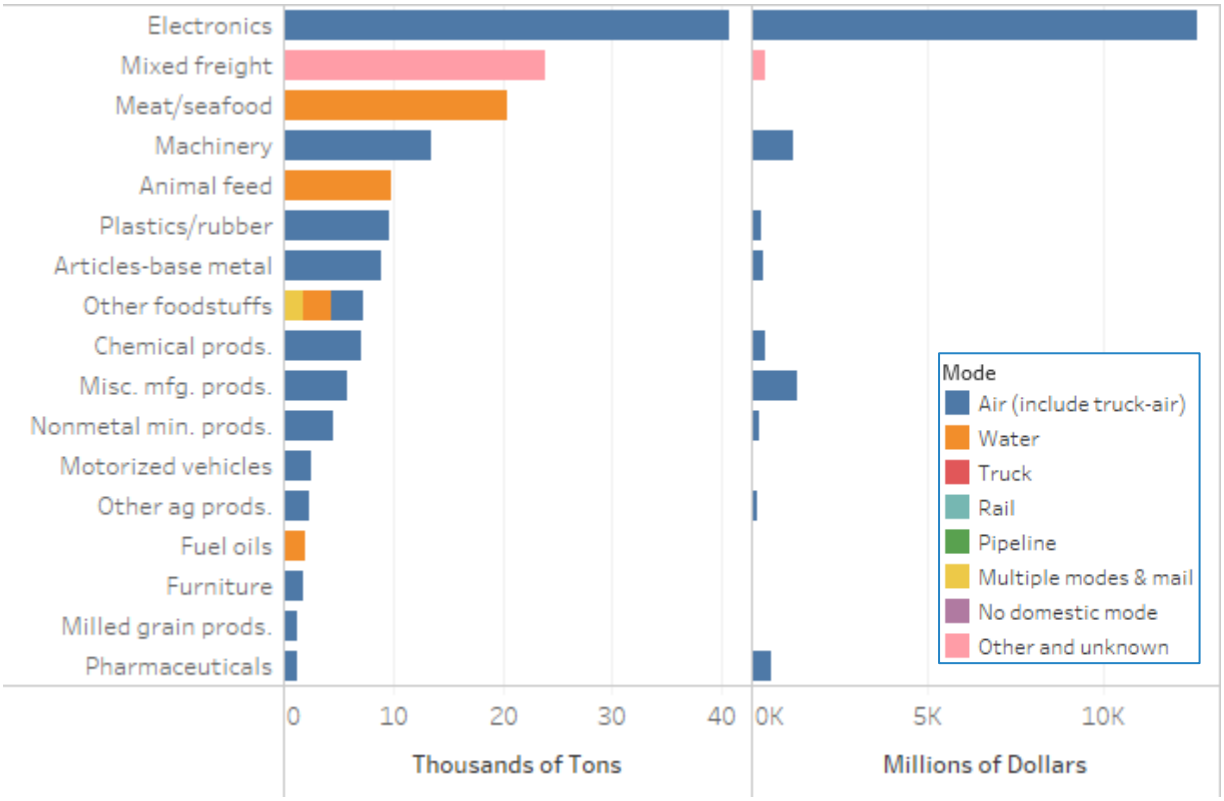
Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

Pass-Through Traffic

Alaska has a unique geographic position, midway between the lower 48 states and Asia, and is extensively used as a global gateway in supply chains that have origins and destinations outside of Alaska. This is due to Alaska being in a prime location for refueling international air cargo flights between the U.S. and Asia, which carry high-value goods such as electronics, machinery, precision instruments, and pharmaceuticals. Almost all of these refueling stops take place at Ted Stevens Anchorage International Airport (ANC), which has become a key part of many high-value supply chains around the world. Global package logistics companies such as UPS and FedEx have sorting and warehousing facilities near ANC. Some international air cargo is also handled at Fairbanks.

As previously noted, pass-through traffic accounts for a small share of Alaska's freight tonnage, but a large share of Alaska's freight value. As shown in Exhibit 29, the leading tonnage commodities are electronics, mixed freight, meat and seafood, machinery, and animal feeds – moving by air, water, and 'other and unknown;' by value, electronics is the clearly dominant commodity.

Exhibit 29: Leading Commodities for Pass-Through Goods Movements, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff analysis of Freight Analysis Framework 4.1 data

FREIGHT SYSTEM ELEMENTS

Freight demand in Alaska is served by multiple transportation modes:—road, air, water, rail, and pipeline. Each has a critical role in the state's multi-modal system, and must be considered in the context of the entire system.

This section describes the primary elements of Alaska's freight transportation system and their key attributes and interconnections. The system is described in terms of the extent of the assets and their use. Basic information on system connectivity and transportation cost are provided. The performance of the system is considered in more detail in *the Freight Performance Measurement, Prioritization, and Project Evaluation* section of this Freight Element.

Role of Truck Transportation

In the lower 48 states, trucks carry far more tonnage and value than other modes. In Alaska, trucks carry lower shares, due to two factors: the absence of trucks passing through Alaska on their way to other states; and Alaska's strong use of air and water modes.

Despite a smaller statistical role than in other states, trucking is an irreplaceable part of Alaska's freight transportation system. It is critical for moving goods from seaports and airports to industrial customers and consumers, and for distributing goods internally within Alaska. It is the only mode that provides door-to-door, on-demand service, which makes it unique.

Trucking generally consists of the following types of activities:

- **Intercity/long-haul** trucking moves freight from one city to another or over long distances via main highways.
- **Drayage** trucking provides connections to/from ports, terminals, distribution centers, and other logistics facilities, which are often located in urban areas.
- **Urban deliveries** are the final legs of supply chains, where (typically) smaller trucks are used to deliver goods to stores or customers.

Commodity Flows by Truck

Exhibit 30 and Exhibit 31 following summarize key data on trucking as a domestic mode. This includes purely domestic movements (within Alaska and to/from the Lower 48) as well as the domestic leg of international trips (where the international mode may be air, water, or truck).

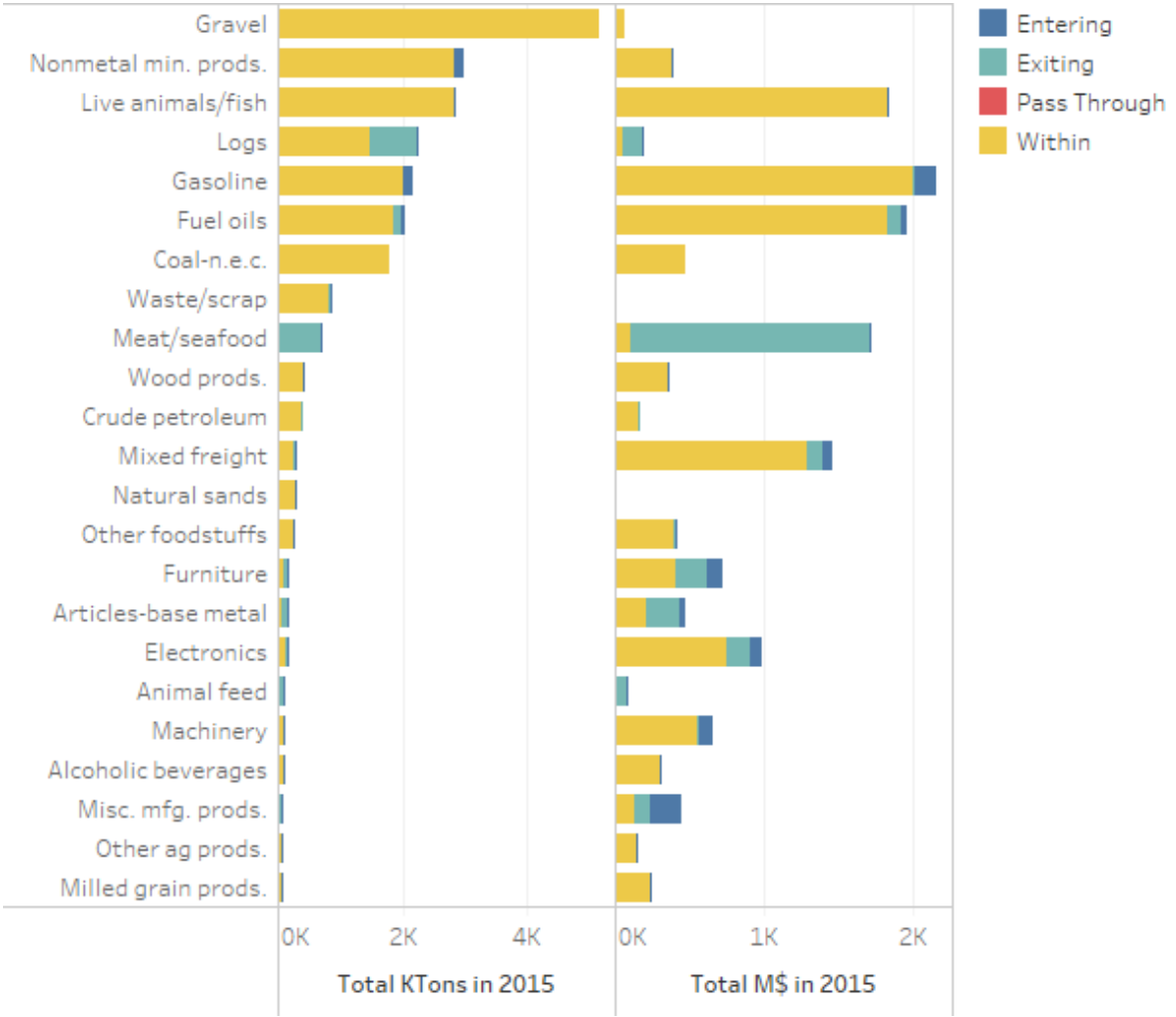
- By tonnage, the leading domestic truck commodities are: gravel, nonmetallic minerals, and live animals/fish, moving entirely within the state; logs for distribution within Alaska and exiting the

state; gasoline, fuel oils, coals n.e.c., and commodity waste/scrap moving primarily within the state; and meat/seafood exiting the state.

- By value, the leading domestic truck commodities are gasoline, fuel oils, and live animals/fish moving primarily within the state; meat/seafood primarily exiting the state; and mixed freight, electronics, furniture, metal products, other foodstuffs, and other higher-value products entering, exiting, and moving within the state.

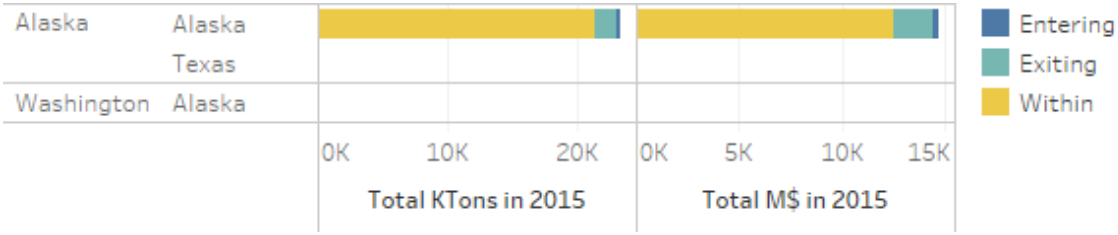
- The majority of domestic truck moves begin and end in Alaska, with a very small amount of trade from Alaska to Texas, and from Washington State to Alaska. In Exhibit 31, note that the "Alaska to Alaska" moves include some 'entering' and 'exiting' tonnage and value, which seems counter-intuitive. The entering tonnage actually represents truck moves within Alaska that are handling the "last mile" of international freight that entered Alaska via other modes (water or air); the exiting tonnage represents the "first mile" of international freight leaving Alaska. Trucking clearly plays a significant role in linking Alaska exporters and importers with seaports and airports.

Exhibit 30: Domestic Truck Mode Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Exhibit 31: Domestic Truck Mode Origins and Destinations, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Key Truck Corridors

Alaska is a large state with very long supply chains. Freight exported from Alaska must be moved long distances, from extraction and production facilities to ports and airports; freight imported must be distributed from a few gateway ports and airports to users distributed throughout the entire state. All of these moves are accommodated as "within state" flows, and trucking plays a critical role in providing these functions.

Exhibit 32 looks at within state Truck Vehicle Miles of Travel (VMT) and tonnage data from the Freight Analysis Framework 3; dividing VMT by truck tonnage yields an estimate of the average distance each ton of truck freight moves within a state. The higher the number, the longer each ton of truck freight is moving, on average. Alaska's average in-state truck VMT per ton is 194 miles, which is the longest of any state, and far larger than the second-ranked state (Montana, at 139 miles per ton).

Exhibit 32: States with Average In-State Truck VMT per Ton > = 100 miles, 2012

State	Within-State VMT	Within-State Tonnage	Average In-State Truck VMT per Ton
Alaska	11,981,000,000	61,705,000	194
Montana	10,635,000,000	76,593,000	139
Idaho	10,482,000,000	90,370,000	116
Texas	197,785,000,000	1,810,492,000	109
New Mexico	6,520,000,000	61,113,000	107
Nevada	8,504,000,000	84,796,000	100
Wyoming	9,409,000,000	94,254,000	100

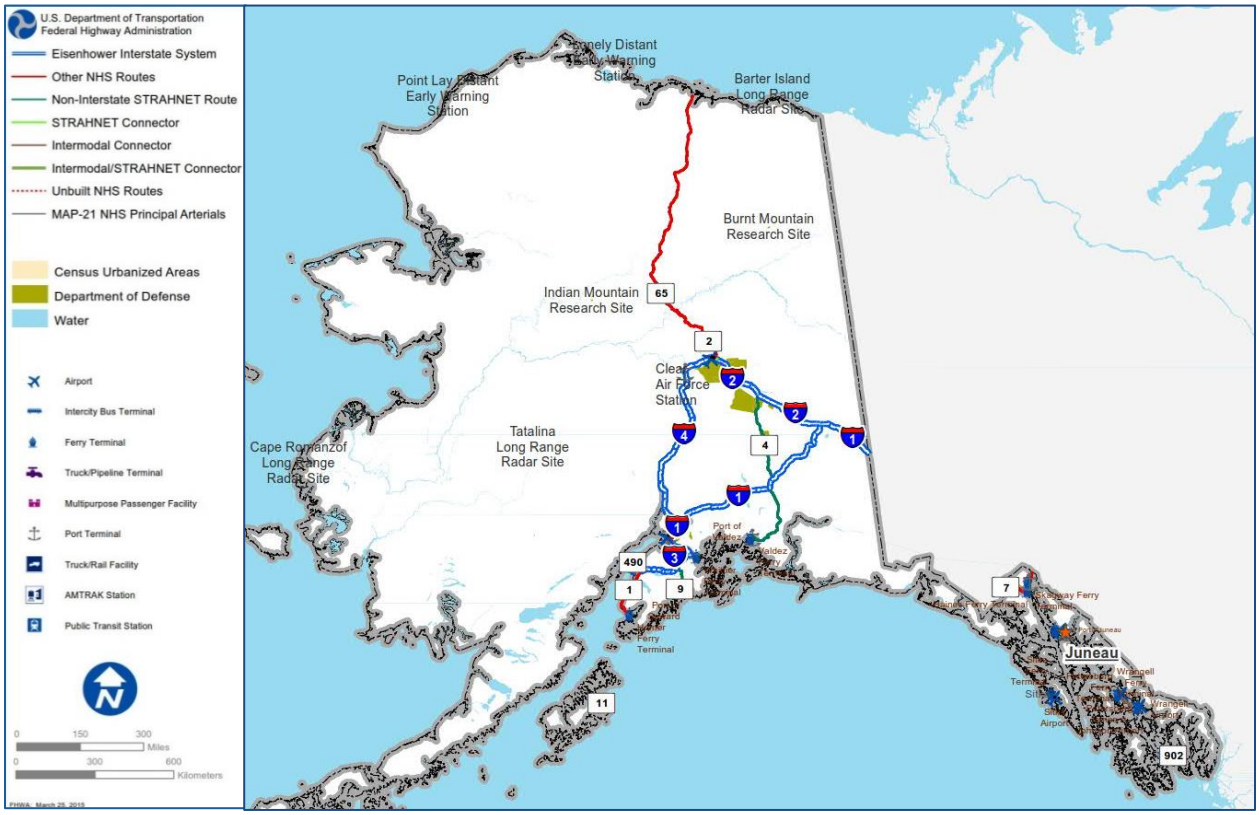
Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 3 data

Longer trucking distances generally mean: higher transportation costs (due to time, fuel, and equipment utilization); greater risk of schedule delays from unforeseen events; and greater reliance on long segments of the statewide highway network for long-haul travel (as opposed to shorter-mileage states, where utilization may be concentrated on much less network mileage).

Despite its reliance on trucking, Alaska has a relatively simple highway system where often there is only one route between important origins and destinations. According to USDOT data, Alaska ranks 47th in highway mileage (despite having the largest area of any state in the U.S.). It has 16,301 miles of publicly owned roads and 1,173 bridges; and it has several highway crossings with Canada (Alaska Highway, Haines Highway, Liard Highway, and others). Key trucking corridors can be identified based on location and functional classification, truck volumes, and truck percentages (share of total vehicle trips that are due to trucks).

Starting with location and functional classification, as shown in Exhibit 33, Alaska has four main highways. The A-1 includes the Glenn Highway, Tok Cut-Off Road, and a section of the Alaska Highway. It is 408 miles long and connects Anchorage to the Canadian Border. This road continues through Canada eventually connecting to the continental U.S. highway network. The A-2 includes sections of the Richardson Highway and Alaska Highway. It is 202 miles long and connects Fairbanks to the A-1. The A-3 includes sections of the Seward Highway and Sterling Highway. It is 148 miles long and connects Anchorage to Soldotna. The Sterling Highway continues until reaching the port town of Homer. Finally, the A-4 (Parks Highway) connects Anchorage to Fairbanks, the second-largest city in the state. Three other highways provide critical freight links to resource production or intermodal facilities. The Dalton Highway, via the Steese and Elliott Highways (red on the map), connects Fairbanks to Prudhoe Bay on the Arctic Coast, spanning 414 miles. The Richardson Highway (dark green on the map) is 368 miles long and connects Fairbanks to the Port of Valdez. The Seward Highway (light green on map) connects the port town of Seward to Anchorage, joining the A-3 after 37 miles.

Exhibit 33: Main Highways in Alaska



Source: http://www.dot.alaska.gov/stwdplng/transdata/pub/NHS_map_Alaska.pdf

To identify the links in the road network that are most critical to trucking operations, Alaska DOT&PF truck count data was tabulated from count stations throughout the state: 97 in the Southeast Region, 63 in the Northern Region, and 103 in the Central Region. This data consisted of estimates of truck Annual Average Daily Traffic (AADT) and truck traffic percentages. However, each region used a different methodology and reported the results differently. To compile the results, several assumptions and approximations were needed to maximize the consistency of the data and allow comparisons between regions. The results are presented in the Appendix, including detailed truck counts and truck percentages for key trucking corridors, and highlights are summarized in Exhibit 34. Annual Average Daily Truck Traffic (AADTT) can exceed 3,000 trucks per day on the Seward Highway in Anchorage, while truck percentages can reach as high as 82% on the Dalton Highway.

Exhibit 34: Leading Alaska Truck Corridors

Route	Estimated Annual Average Daily Truck Traffic (both directions combined) at Highest AADTT Segment	Estimated Truck Percentage (share of total AADT associated with trucks) at Highest Percentage Segment
Dalton Highway	Over 100	82%
Seward Highway	Up to 3,000	18%

Route	Estimated Annual Average Daily Truck Traffic (both directions combined) at Highest AADTT Segment	Estimated Truck Percentage (share of total AADT associated with trucks) at Highest Percentage Segment
Parks Highway below Denali	Over 2,000	22%
Sterling Highway	Nearly 2,000	15%
Steese Expressway	Over 1,400	14%
Tongass Expressway	Up to 1,200	13%
Parks Highway above Denali	Nearly 1,000	21%
Richardson Highway	Over 700	28%

Source: Analysis of Alaska DOT&PF Annual Traffic Volume Reports. The reports cover different years ranging between 2004 and 2012 depending on the region and route. Please refer to the Appendix for details.

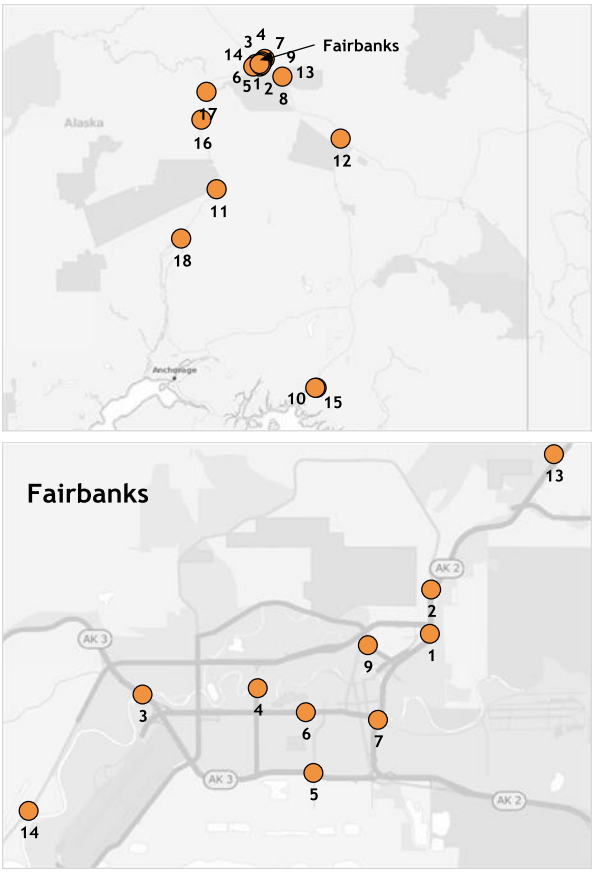
Truck AADT and Percentage—Northern Region

In the Northern Region the roads with the highest truck AADT are located in Fairbanks (see Exhibit 35). Most notably, the Steese Highway exiting Fairbanks to the north has high truck volumes. Roads that access Fairbanks International Airport and other logistics facilities also see substantial truck volumes, either from drayage or intercity operations. Trucks entering Fairbanks use the George Parks Highway and Richardson Highway to the same extent, depending on whether they come from Anchorage or elsewhere. The Richardson highway at Valdez reports high truck counts, likely from the petroleum operations. Overall, truck volumes in the Northern Region tended to be smaller than those in the Central and Southeast Regions. Ranking roads by truck percentages reverses these patterns; now the top segments are in rural areas (not shown on this map). The road in Alaska with the highest proportion of truck traffic is the Dalton Highway, which heads north from Fairbanks to the oil-rich region of Prudhoe Bay in the Arctic. Trucks account for over half of the traffic on this road, reaching to over 80% near Prudhoe Bay. This proportion is likely even higher in winter when travel northward becomes more difficult. High truck percentages from 20% to 25% are found throughout the main highways, including the Parks, Richardson, and Alaska Highways.

Exhibit 35: Top Truck Flows at Count Stations in Northern Region

Northern Region in 2012

	Rank Label	Truck AADT	Truck %
Steese Expressway South of Johansen Express..	1	1,624	7%
Steese Expressway North of Farmers Loop	2	1,168	8%
Parks Highway at Chena Bridge	3	960	6%
Peger Road at Chena Bridge	4	954	6%
Parks Highway at Lathrop Street	5	945	7%
Airport Way between Lathrop Street and Wilb..	6	760	4%
Airport Way between Steese Expressway and ..	7	720	4%
Richardson Highway at Moose Creek	8	719	9%
College Road at Bentley Mall	9	480	3%
Richardson Highway at Valdez	10	470	10%
Parks Highway at MP 216 (230 used for AADT)	11	429	17%
Richardson Highway South of Fort Greely Entr..	12	426	22%
Steese Highway AVC	13	420	14%
Chena Pump Road between Ludecker Road an..	14	371	6%
Richardson Highway at Valdez Scalehouse (MP ..	15	299	8%
Parks Highway at Rex Bridge (Jack Coghill)	16	271	21%
Parks Highway at Nenana	17	261	18%
Parks Highway at Little Coal Creek	18	230	18%
Richardson Highway South of Quartz Lake Road	19	226	19%
Richardson Highway at Birch Lake	20	203	17%
Ballaine Road North of Farmers Loop Road	21	202	4%
Steese Highway North of Fox	22	198	11%
Valdez Airport Road North of Richardson High..	23	196	12%
Chena Hot Springs Road East of Nordale	24	185	6%
Glenn Highway at Nelchina Maintenance Camp	25	176	22%



Source: Analysis of Alaska DOT&PF Annual Traffic Volume Reports

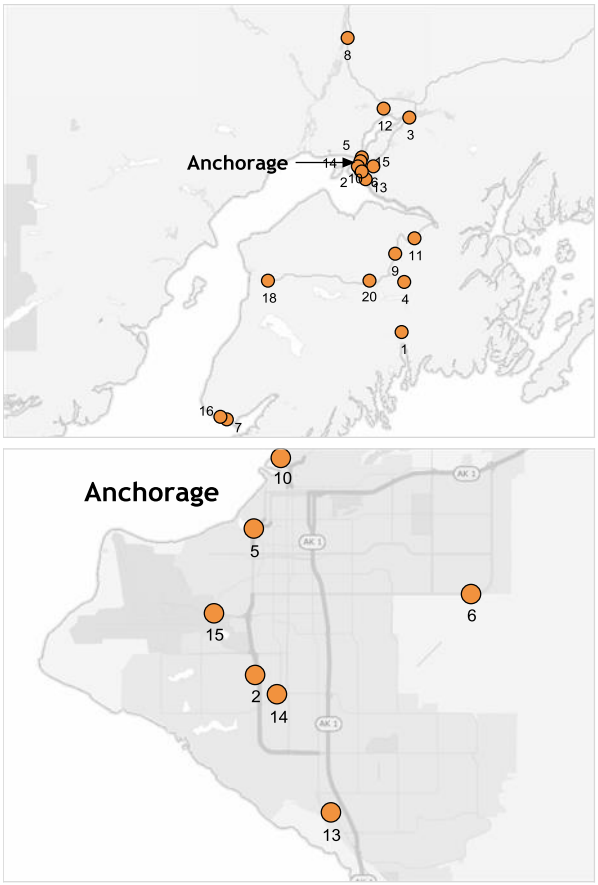
Truck AADT and Percentage—Central Region

The Central Region has the highest truck volumes in the state. As shown in Exhibit 36, the top locations are on roads that access key logistics facilities. The first and fourth truck flow can be found on the way to the Port of Seward, which is primarily used to export cargo. The whole route has high truck volumes all the way to Anchorage. The second and fifth truck volumes can be found on the roads that connect to Ted Stevens Anchorage International Airport, a major cargo handling facility in the state. The Sterling Highway, which provides access to the Port of Homer, also sees significant truck volumes. The roads connecting to the Port of Anchorage also see high truck volumes, which is unsurprising given that the Port of Anchorage it is the main gateway for containerized imports in the state. In fact, this is the road with the highest percent of truck traffic in this region, ranging between 30 and 50%. The road that connects to the cargo facilities of Ted Stevens Anchorage International Airport also has high truck percentages. The Parks, Sterling, Seward, and Glenn Highways have truck percentages of 15 to 20%.

Exhibit 36: Top Truck Flows at Count Stations in Central Region

Central Region 2012

	Rank Label	Truck AADT	Truck %
Seward Highway - South of 76th Ave (WIM)	1	3,101	7
Minnesota Drive, Anchorage - North of Dimond B..	2	2,294	6
Glenn Highway - At Eklutna Flats	3	1,797	6
Seward Highway - North of Bird Creek	4	1,481	17
Minnesota Drive, Anchorage - At Chester Creek	5	1,366	4
Tudor Road, Anchorage - West of Patterson Street	6	1,049	4
Sterling Highway - Btwn Soundview Ave & Thom..	7	1,035	12
Parks Highway - At Milepost 64	8	1,035	17
Seward Highway - North of Portage Glacier Rd	9	979	12
Ocean Dock Road, Anchorage - Port of Anchorag..	10	942	48
Seward Highway - At Bertha Creek Bridge	11	936	14
Knik Goose Bay Road, Wasilla - Btwn Hollywood/..	12	797	7
Old Seward Highway, Anchorage - Btwn Hamilton..	13	790	8
Dimond Boulevard, Anchorage - West of Arctic Bl..	14	788	3
International Airport Road, Anchorage - West of F..	15	779	5
Sterling Highway - Btwn Roger's Loop & Diamon..	16	758	13
Kenai Spur Road - West of Beaver Loop Rd	17	740	8
Sterling Highway - East of Soldotna	18	718	8
Seward Highway - At Potter Marsh	19	712	8
Sterling Highway - Btwn Bean Creek Rd & Quartz ..	20	692	13
Parks Highway - North of Talkeetna Spur Rd	21	687	22
Mountain View Drive, Anchorage - West of Park St	22	666	6
Bridge Access Road, Kenai - North of Kalifornsky..	23	653	6
Eagle River Loop, Eagle River - North of Eagle Ri..	24	642	8
Sterling Highway - At Milepost 127	25	621	15
Whitney Road, Anchorage - 1/2 Way Btwn North ..	26	620	32
Elmore Road, Anchorage - Btwn 84th Ave & Cove..	27	609	4
Main Street, Wasilla - North of Herning Ave	28	600	6
Dimond Boulevard, Anchorage - Btwn Sand Lake ..	29	588	12
Raspberry Road, Anchorage - Btwn Changepoint ..	30	548	6



Source: Analysis of Alaska DOT&PF Annual Traffic Volume Reports

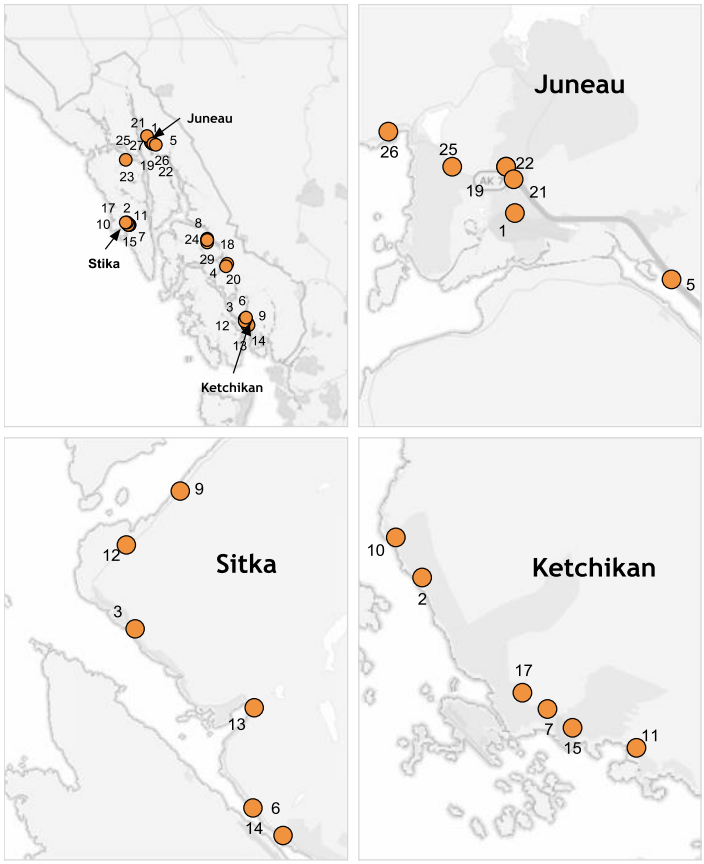
Truck AADT and Percentage—Southeast Region

The Southeast Region has surprisingly high truck volumes considering it has smaller cities that are not as well connected by roads and since it is not linked to other Alaska regions by road or rail, except through the Haines and Klondike Highways. Volumes on the Haines Highway were recorded as reaching 100 to 150 AADT, with a high fraction of truck travel; for the Klondike Highway, the truck share of AADT could not be determined from available data. The highest truck volumes are observed in the urban centers of Juneau, Sitka, and Ketchikan, all seeing some segments with over 1,000 AADT. These high volumes are probably caused by the lack of circuit in the road network, leading to truck drivers having few, if any, options to reach their destinations; therefore trucking concentrates on a few roads. The locations with high volumes are often near locally important logistics facilities, such as seaports and airports. Trucking in these areas is mostly local, providing drayage or delivery services. Trucks are rarely used to travel between main cities because of the lack of direct road connections (see Exhibit 37).

Exhibit 37: Top Truck Flows at Count Stations in Southeast Region

Southeast Region 2003 - 2011

	Rank	Truck AADT	Truck %
Egan Drive @ Sunny Pt. - Yandukin	1	1,773	6
Halibut Pt. Road @ Harbor Mt. Rd - Cascade ..	2	1,325	13
N. Tongass Hwy @ Beechwood Dr. - Pond Re..	3	1,246	13
Zimovia Hwy. @ Pat Creek - End	4	1,156	58
Egan Drive @ McNugget - Yandukin	5	1,093	4
N. Tongass Hwy @ Carlanna Creek Br. - Shor..	6	1,083	11
Sawmill Ck. Road @ Lake - Jeff Davis	7	1,060	12
Nordic Dr. @ Sing Lee Alley - Ferry Term	8	1,051	15
N. Tongass Hwy @ 1st waterfall Cr. - End	9	985	10
Halibut Pt. Road @ Granite Creek. - Harbor ..	10	876	8
Sawmill Ck. Road @ Thimbleberry Creek - Mill	11	834	9
N. Tongass Hwy @ N. Point Higgins - Big Tur..	12	806	9
N. Tongass Hwy @ Ward Lake Rd. - Mill Entr..	13	725	7
N. Tongass Hwy @ Rose's Caboose	14	588	6
Sawmill Ck. Road @ USPS - Rookies Night Club	15	495	6
Kaltian Ave. @ H.P.R. - Thompson Harbor	16	414	9
Lake St. @ Lake Street	17	366	4
Haugen Dr. @ Mitkof Hwy. - 6th Street	18	355	11
Riverside Dr. @ Vintage - James Blvd.	19	353	9
Zimovia Hwy. @ Wrangell Institute - Shoema..	20	328	16
Mendenhall Blvd. @ Mendenhall Loop - End	21	327	9
Riverside Dr. @ Vintage - James	22	306	7
Hoonah Airport Rd @ Ferry - Seaplane Float	23	303	21
Haugen Dr. @ 6th St. - Hammer	24	282	8
Glacier Highway - Egan @ Engineers Cutoff -..	25	234	12
Glacier Highway - Egan @ Waydelich Cr Br - ..	26	222	12
Glacier Highway - Egan @ Dotson's Landing -..	27	220	10
Katlian Ave. @ Thompson Harbor - Cold Stor..	28	197	5
Mitkof Hwy. @ Swan Observatory - Crystal L..	29	197	18
N. Douglas Hwy @ Fish Creek Bridge - Boat ..	30	192	19

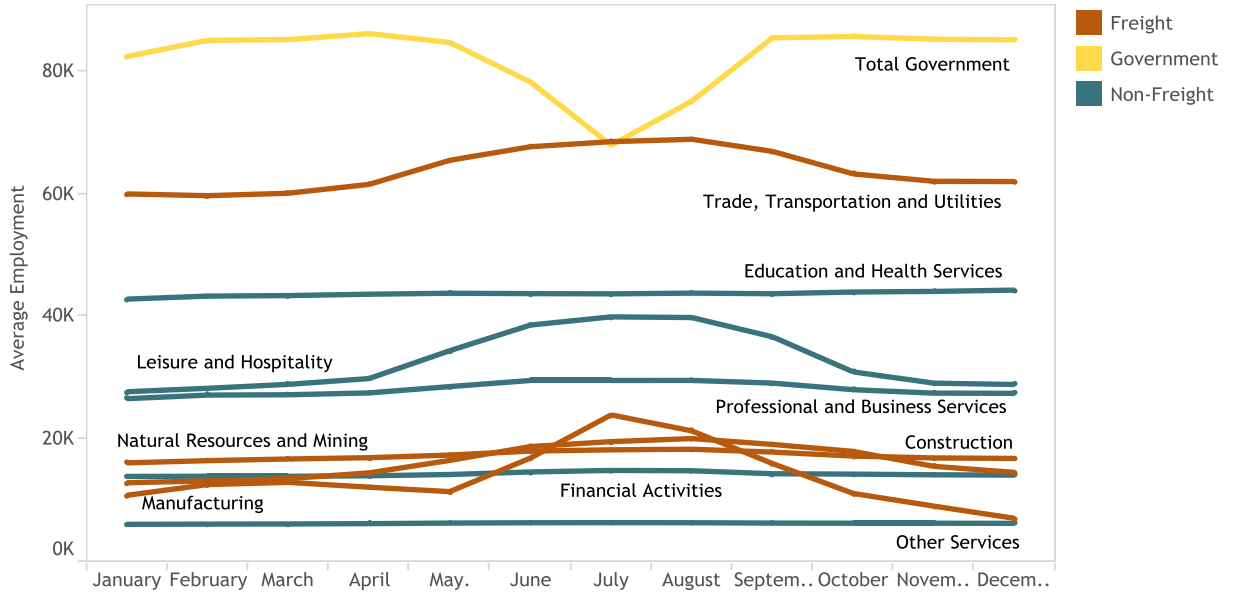


Source: Analysis Alaska DOT&PF Annual Traffic Volume Reports

Seasonal Variations in Multimodal Freight and Trucking Activity

Alaska's freight movement is highly seasonal due to production and employment cycles. Severe winters impact the composition of the economy throughout the year. As can be seen in Exhibit 38, government activity declines in summer; leisure and hospitality employment increases in summer, with other professional services remaining relatively constant; and freight-intensive industries show a general increase in summer, with increases in construction and a fairly dramatic spike in manufacturing largely due to commercial fishing and processing, timber harvesting, and other seasonal activities. With a seasonal economy, freight transportation demand and requirements are seasonal as well. Imports of consumer goods decrease in the winter as the state's population decreases, but imports of heating fuel and other sources of energy increase; materials to support tourism and leisure activities are most needed in summer.

Exhibit 38: Seasonality of Employment by Industry, Averaged 2009 to 2013

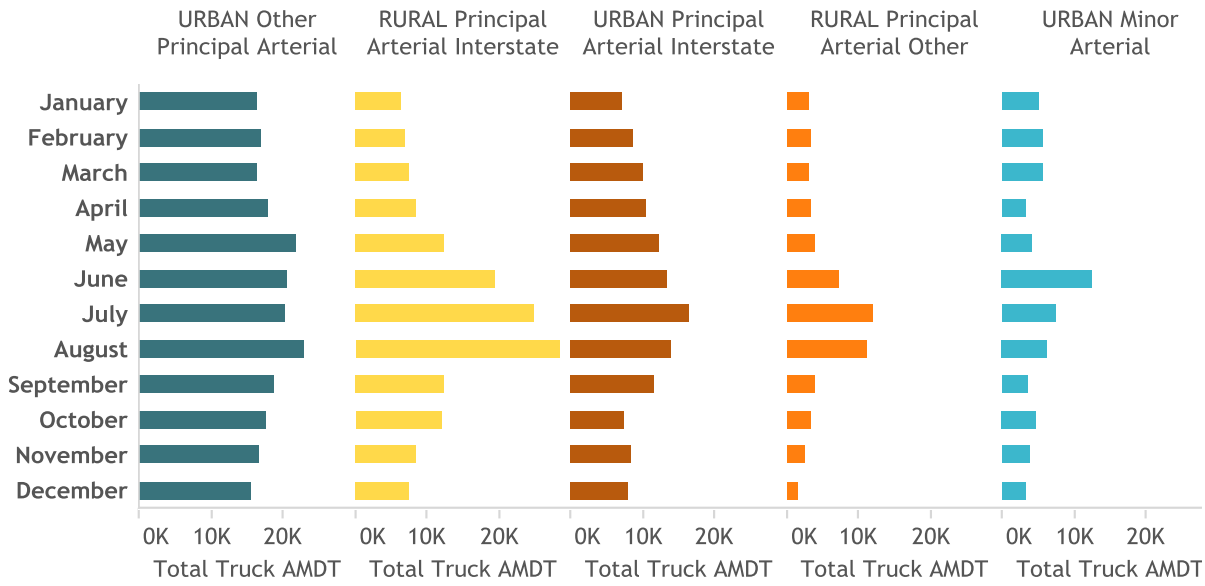


Source: Analysis of Alaska Department of Labor and Workforce Development data

The transportation infrastructure available to meet seasonally fluctuating freight activity needs is also variable. In warmer months, coastal and river communities can be reached by barge shipments of fuel and other heavy bulk commodities; in colder months, when ports and rivers freeze, these communities may only be reachable by air.

Trucking is also highly seasonal, partly in response to changes in demand and partly due to the availability of roads. During spring (April to June), it is necessary to restrict the weight of trucks passing through certain roads. The thawing process during this time of the year makes the subgrade vulnerable to heavy loads, reducing the life of the road. Truck weight is usually restricted by 75% to 85% on these roads during these times of the year. The Dalton Highway was reconstructed to minimize the type of weight restrictions required. However, some remote communities and industrial production sites are reachable only in colder months when ice roads can be constructed across the tundra and frozen waterways. Overall, the least seasonal fluctuations occur on urban roads where demand is largely driven by the needs of urban populations and movements to and from major gateway facilities, and where roads in good condition are typically available all year. The most seasonal fluctuations occur on rural roads where demand is largely driven by industrial production with seasonal peaking characteristics. As an illustration of these effects, Exhibit 39 following reports average monthly truck trips by different road classifications for the Central Region.

Exhibit 39: Seasonality of Trucking in the Central Region (2010, 2011, and 2012)



Source: Analysis of Alaska DOT&PF Annual Traffic Volume Reports (average of three years)

Role of Air Transportation

Alaska has around 300 communities, of which only 100 are connected by the road network.[8] As a result, Alaska relies heavily on other modes of transportation for local freight transportation services. While ports can serve communities that are accessible by water, other communities can be reached only by air. There are around 1,100 airports in the state, including 26 Federal Aviation Administration (FAA) Part 139 public use airports, plus another 3,000 airstrips.

Commodity Flows by Air

Exhibit 40 and Exhibit 41 following summarize key data on air as a domestic mode. This includes purely domestic movements (within Alaska and to/from the Lower 48) as well as the domestic leg of international trips (where the international mode may be air, water, or truck). Highlights include:

- The leading commodity for tonnage and value is electronics; most of the traffic is pass-through, but a significant share is also entering Alaska for use in the state.
- Other leading tonnage commodities include fuel oils, gasoline, and mixed freight, moving primarily within Alaska. It is highly unusual to see fuel and gasoline moving by air, because these are heavy, low-value commodities that normally move by less expensive transportation modes. However, due to the limitations of Alaska's landside transportation infrastructure, air cargo is sometimes the only viable way to provide Alaska's rural communities with fuel, food,

[8] Fried, N. and Keith, B. Alaska Economic Trends: Transportation, January 2005.

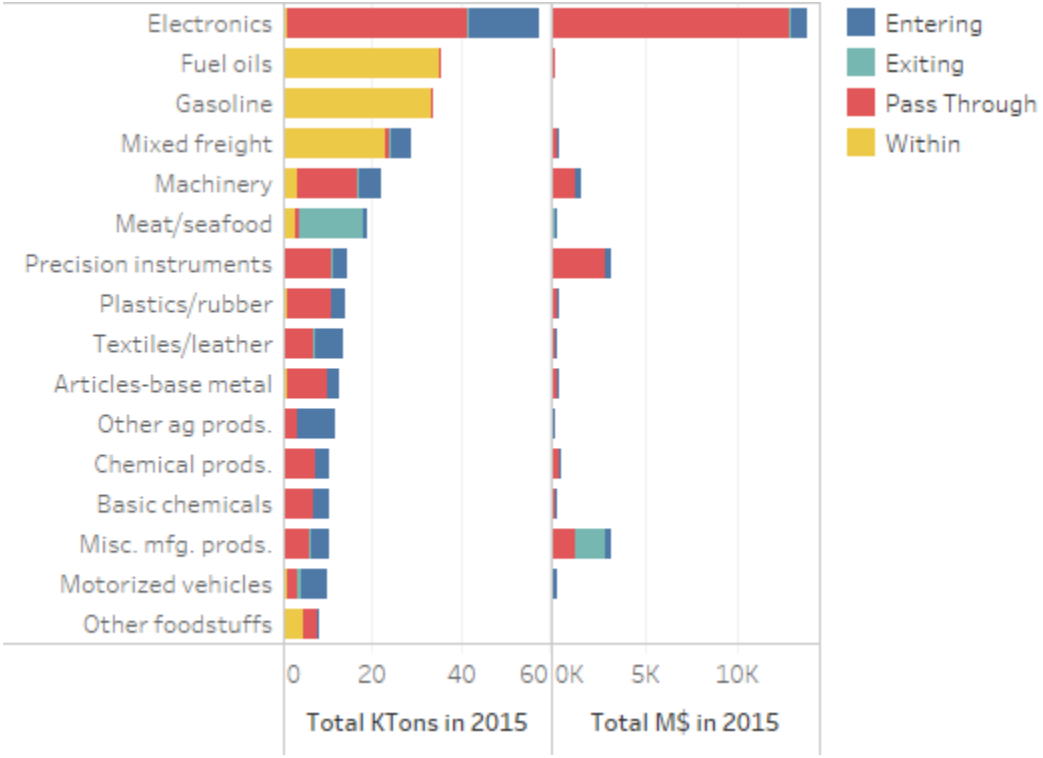
building materials, machinery and supplies, and other essential commodities. The U.S. Postal Service's Bypass Mail Program delivers air freight to rural communities charging standard 4th class postal rates to the shipper, even though the actually delivery costs to USPS are considerably higher. This program operates mainly out of Fairbanks International Airport (FAI). Mail services are provided by a larger number of local airlines departing FAI and ANC. Many of these airlines are supported the Federal Essential Air Service Program. In 2013, the program served 43 communities in Alaska, representing 27% of all communities supported by the program in the U.S.

- Besides electronics and mixed freight, other important tonnage commodities include machinery, instruments, plastics and rubber, textiles and leather, agricultural products, chemicals, miscellaneous manufactured products, and motor vehicles and parts. While the majority of tonnage is passing through Alaska, a significant share is entering Alaska for use by Alaska's industries and population.

- Air is also important for shipments of meat, seafood and miscellaneous manufactured products exiting Alaska for domestic and global markets.

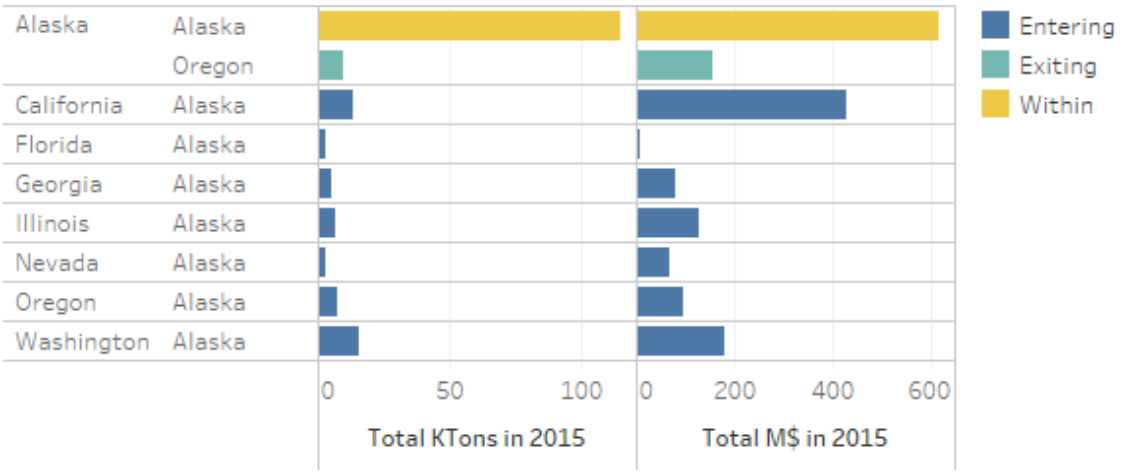
- Looking at origins and destinations of domestic air cargo, the largest share of tonnage and value trade is within Alaska. For shipments exiting Alaska, Oregon is the leading destination. For shipments entering Alaska, the leading origins are California, Washington, Illinois, Oregon, Georgia, and Nevada.

Exhibit 40: Domestic Air Mode Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Exhibit 41: Domestic Air Mode Origins and Destinations, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Looking at air as an international mode, the great majority of tonnage and value is associated with pass-through traffic. However, air cargo is important in exporting Alaska products like seafood to global markets, and also supports imported commodities like electronics and machinery.

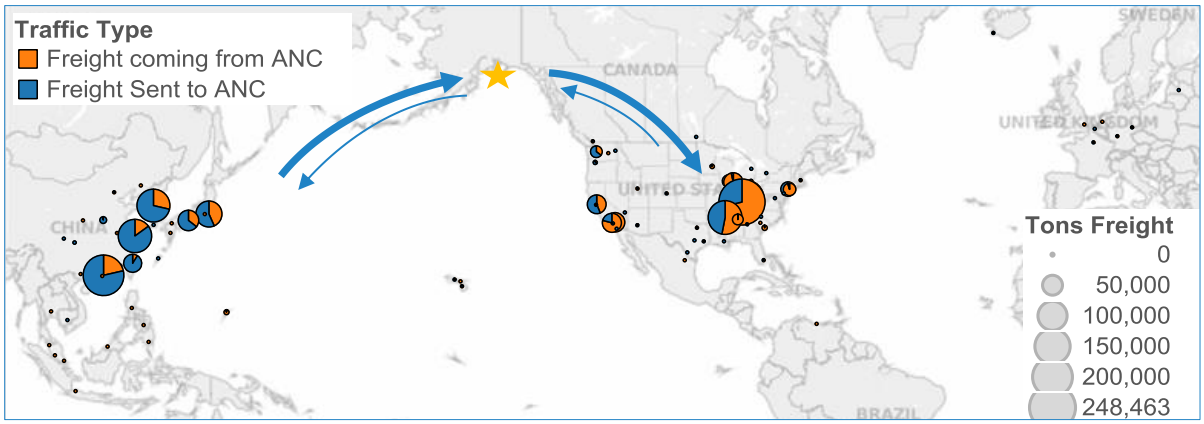
Ted Stevens Anchorage International Airport

Alaska's largest airport is Ted Stevens Anchorage International Airport (ANC). ANC is owned and operated by DOT &PF. In 2013, according to the Airports Council International (ACI), ANC handled 2,543,155 metric tons (around 2.8 million short tons) of freight and mail. It ranked second in the US (behind only Memphis International Airport) and fourth in the world. According to the Federal Aviation Administration's "T-100" series data, ANC handled 1,607,979 tons of enplaned (loaded) and deplaned (unloaded) cargo in 2013. The difference between this figure and the ACI figure is the amount of traffic that lands and takes off again without being unloaded and reloaded.[9] This pass-through cargo is associated with international shipments that stop in Alaska only to refuel. ANC is located strategically between Asia and the U.S, as seen in Exhibit 42, serving as an excellent stopping point for these flights. Nearly all ANC international cargo flights have Asian origins or destinations.

[9] There is also a significant difference between the air cargo tonnage reported in T-100 and the tonnage reported in FAF. For the entire state, FAF reports 509 thousand tons of air cargo, yet ANC alone is reported at 1.6 million tons by T-100, and all Alaska airports are reported at over 1.8 million tons. There are several possible reasons. First, FAF is likely reporting some Alaska air cargo as "mail and multiple modes." Second, T-100 may be double-counting freight which is unloaded, handled, and then reloaded, while FAF may not be. Third, looking at all Alaska airports, domestic moves will be counted at each Alaska airport where they are handled by T-100 data, but counted only once by FAF.

From the T-100 data, the top freight airlines at ANC in 2013 were UPS (606,572 tons), FedEx (336,884 tons), Atlas Air (298,949 tons), Polar Air Cargo Airways (195,629 tons), and Alaska Airlines (39,393 tons). Of these, Alaska Airlines and a set of smaller airlines (Everts Air Cargo, Northern Air Cargo, and Lynden Air Cargo, among others) provide air freight service within Alaska.

Exhibit 42: Air Freight to/from ANC, Excluding Within-State Moves, 2013

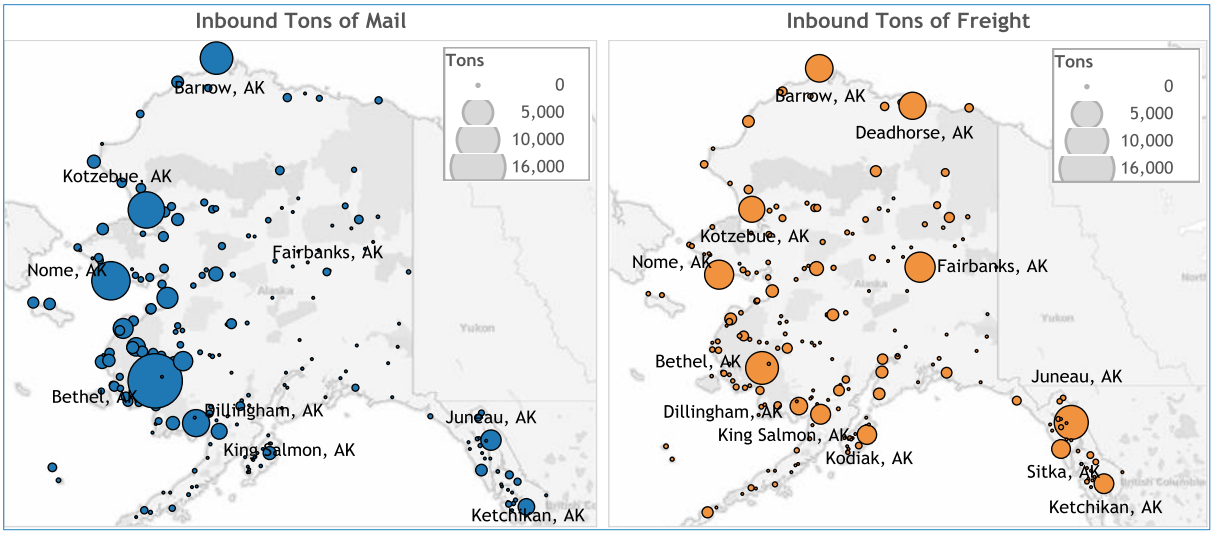


Source: Analysis of USDOT T-100 Air Cargo data

Other Cargo Airports

The relative volumes of other Alaska cargo airports are illustrated in Exhibit 43 (with Anchorage not shown) and tabulated in Exhibit 44. Fairbanks International Airport (FAI) is the second-busiest airport in Alaska and the seventh-largest air cargo airport at 13,996 tons of enplaned and deplaned freight and mail in 2013. It serves as a distribution hub for many communities in the interior. As with ANC, it is owned and operated by DOT&PF. Other airports handling over 10,000 tons of enplaned and deplaned mail and freight in 2013 include Bethel, Kotzebue, Nome, Deadhorse, Juneau, and Barrow.

Exhibit 43: Inbound Tons of Mail and Freight in 2013 (Note: ANC not shown)



Source: Analysis of USDOT T-100 Air Cargo data

Exhibit 44: Deplaned and Enplaned Freight and Mail, All Alaska Airports, 2013

		Deplaned (tons)		Enplaned (tons)		Total
		Domestic	International	Domestic	International	
1	Anchorage, AK	300,067	507,325	642,358	158,229	1,607,979
2	Bethel, AK	21,615	-	10,104	-	31,719
3	Kotzebue, AK	10,606	-	8,012	-	18,618
4	Nome, AK	12,306	-	5,358	10	17,674
5	Deadhorse, AK	4,039	-	11,040	-	15,079
6	Juneau, AK	8,297	-	6,353	-	14,650
7	Fairbanks, AK	5,079	81	8,682	154	13,996
8	Barrow, AK	9,602	-	2,243	-	11,845
9	Kodiak, AK	2,794	-	4,802	-	7,596
10	Dillingham, AK	5,427	-	1,522	-	6,949
11	Ketchikan, AK	3,407	-	2,310	-	5,717
12	Unalakleet, AK	3,051	-	2,382	-	5,433
13	Emmonak, AK	2,751	-	2,128	-	4,879
14	Sitka, AK	2,480	-	2,294	-	4,774
15	King Salmon, AK	3,317	-	1,292	-	4,609
16	Alpine, AK	2,536	-	1,653	-	4,189
17	St. Mary's, AK	2,211	-	1,935	-	4,146
18	Aniak, AK	2,398	-	1,708	-	4,106
19	Galena, AK	1,970	-	950	-	2,920
20	Togiak, AK	1,145	-	1,209	-	2,354
21	Cordova, AK	780	-	1,560	-	2,340
22	Unalaska, AK	1,091	-	1,170	-	2,261
23	Red Dog, AK	1,689	-	301	-	1,990
24	Yakutat, AK	477	-	1,397	-	1,874
25	Nixon Fork Mine, AK	1,335	-	362	-	1,697
	All Other	49,315	52	8,871	-	58,238
	Total	**459,785**	**507,458**	**731,996**	**158,393**	**1,857,632**

Source: Analysis of USDOT T-100 Air Cargo data

Role of Marine Transportation

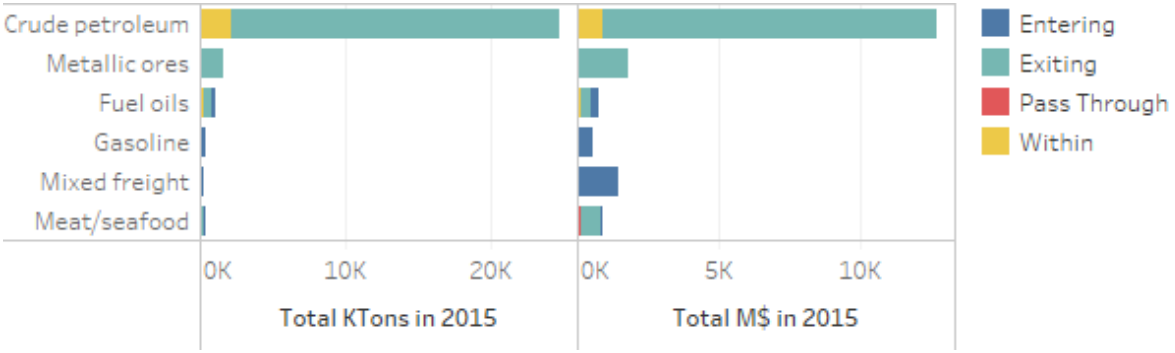
Waterborne transportation plays a central role in the movement of people and goods throughout Alaska. Around 84% of the population lives in coastal areas, with almost all major cities located on coastal shipping routes or navigable inland waterways. Alaska depends on water for trade with other states and countries, to export the state's products and to receive critical supplies and consumer goods.

Commodity Flows by Water

Exhibit 45 following summarizes key data on water as a domestic mode. This includes purely domestic movements (within Alaska and to/from the Lower 48) as well as the domestic leg of international trips (where the international mode may be air, water, or truck). Key findings include:

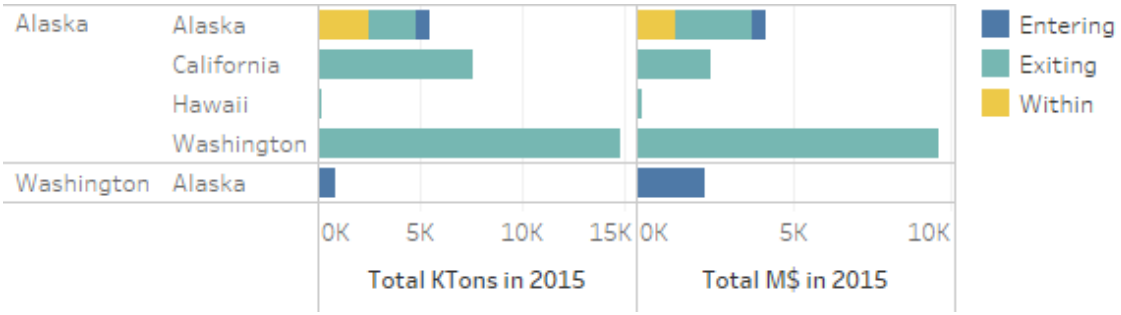
- For water as a domestic transportation mode, crude petroleum exiting Alaska is the primary commodity by tonnage and value. As previously noted, this represents shipments to refineries in the lower 48. Crude oil movements within Alaska are also accommodated by water.
- Other important tonnage commodities exiting Alaska include metallic ores, meat and seafood.
- The leading commodities entering Alaska include mixed freight, gasoline, and fuel oils. Mixed freight includes containerized freight arriving from the lower 48, primarily Washington. Some of this mixed freight may also be reported by FAF as Multiple Modes and Mail, so the tonnage and value figures shown in Exhibit 46 may be low for this commodity class.
- The leading states for exiting flows are Washington and California; the leading state for entering flows is Washington. Interestingly, much of the Alaska to Alaska trade is associated with entering and exiting movements; this represents the use of water as the domestic "last mile" for international waterborne movements.

Exhibit 45: Domestic Water Mode Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

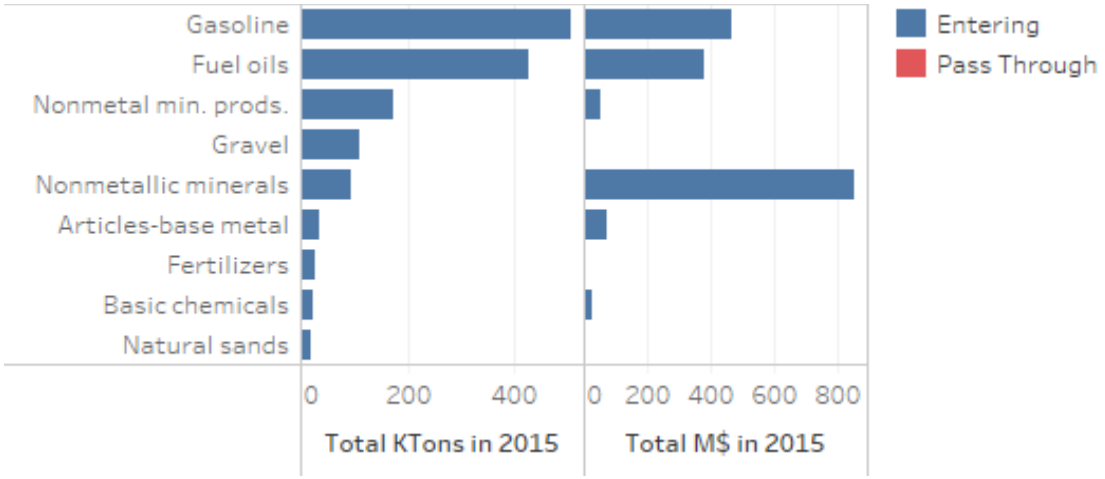
Exhibit 46: Domestic Water Mode Origins and Destinations, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

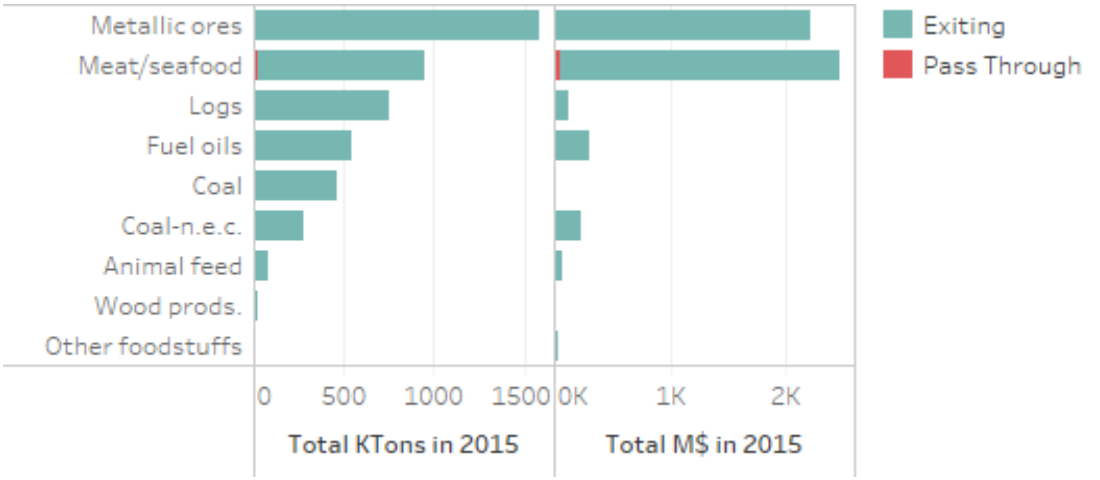
As previously mentioned, water is Alaska's leading mode for international trade tonnage and value. Exhibit 47 and Exhibit 48 following summarize role of water as a foreign inbound and foreign outbound mode. Leading import commodities entering Alaska by water include: gasoline, fuel oils; non-metallic minerals and mineral products. Leading export commodities leaving Alaska include: metallic ores; meat and seafood; logs; fuel oils; coal; and coal n.e.c. Unlike air, water handles only minimal amounts of pass-through international traffic.

Exhibit 47: International Water Mode, Inbound Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Exhibit 48: International Water Mode, Outbound Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Waterborne transportation is critical for the entire state, but especially for communities and regions with ocean-oriented economies. In the Southeast Region, around 26% of all employment income comes directly from marine trades, particularly from fishing and related activities.[10] This represents the bulk of exports and plays a central role in the economy. Marine transportation is the primary way that products enter and leave the region. Freight barges bring around 90% of the goods consumed, and on return trips they carry fish and other exports. In the Southwest the seafood industry is the largest sector of the economy and is responsible for the majority of private sector jobs. Much of the marine economy in this area revolves around the Aleutian Islands, which is home to the largest fishing port in the U.S. at Dutch Harbor.

Port Locations and Tonnages

Just as ANC has a dominant share of tonnage for Alaska's air cargo, the Port of Valdez has a dominant share of tonnage for Alaska's waterborne freight. However, as with airports, each of Alaska's marine ports plays a critical role in serving local and regional transportation needs. Major port locations and tonnages are shown in Exhibit 49 and Exhibit 50.[11]

The vast majority of waterborne freight tonnage is associated with deep-water coastal ports. However, Alaska also has the largest inland waterway mileage of any state, with ports on the Yukon, Tanana, and other rivers. These smaller inland ports are vital links for many local communities.

[10] The Maritime Economy of Southeast Alaska, Southeast Conference, 2013

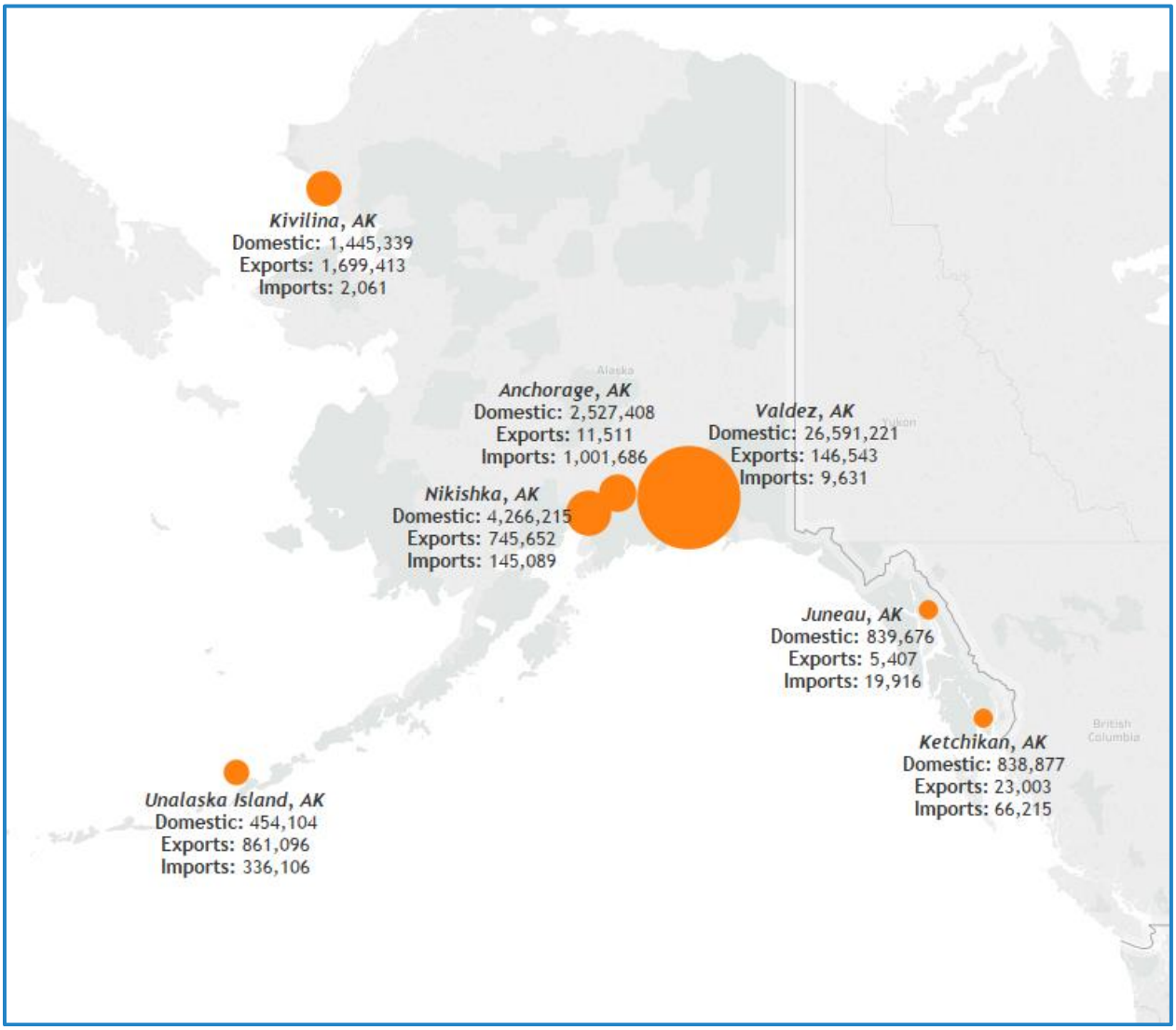
[11] Note that port tonnages exceed estimated FAF tonnages, similar to air cargo, for the same reasons: FAF assigns some waterborne traffic to Mail and Multiple Modes; cargo may be double-counted at each port if it is handled twice, but counted only once by FAF; and cargo moving between Alaska ports will be counted at each port, versus only once in FAF.

Exhibit 49: Alaska Port Tonnages, 2014

Name	Foreign Imports	Foreign Exports	Canadian Imports	Canadian Exports	Domestic Coastwise	Internal and Local	Total
VALDEZ HARBOR		130,000			26,375,000	7,000	26,512,000
NIKISHKA	534,000	327,000			2,708,000	856,000	4,425,000
ANCHORAGE	457,000		25,000		2,380,000	2,000	2,864,000
KIVALINA	82,000	978,000	4,000		18,000	1,394,000	2,476,000
TONGASS NARROWS		36,000	73,000		499,000	1,312,000	1,920,000
CLARENCE STRAIT		133,000			513,000	960,000	1,606,000
REVILLAGIGADO CHANNEL		36,000		73,000	486,000	957,000	1,552,000
WRANGELL NARROWS					293,000	1,216,000	1,509,000
FREDERICK SOUND		10,000		33,000	467,000	973,000	1,483,000
SUMNER STRAIT					510,000	909,000	1,419,000
STEPHENS PASSAGE		10,000		33,000	220,000	894,000	1,157,000
CHATHAM STRAIT		61,000	7,000	33,000	634,000	311,000	1,046,000
KETCHIKAN HARBOR		36,000	65,000		196,000	715,000	1,012,000
JUNEAU HARBOR		10,000	33,000		169,000	707,000	919,000
SEWARD HARBOR		554,000			46,000		600,000
PETERSBURG HARBOR						584,000	584,000
ICY STRAIT		66,000		23,000	438,000	29,000	556,000
LYNN CANAL		40,000		16,000	67,000	360,000	483,000
HOMER	43,000	243,000			22,000	141,000	449,000
WHITTIER HARBOR			10,000		306,000	43,000	359,000
KODIAK HARBOR		99,000			215,000	-	314,000
SKAGWAY HARBOR		40,000	16,000		13,000	146,000	215,000
SERGIUS AND WHITESTONE NARROWS					28,000	127,000	155,000
All Other	56,000	35,000	43,000		420,000	270,000	824,000
TOTAL	**1,172,000**	**2,844,000**	**276,000**	**211,000**	**37,023,000**	**12,913,000**	**54,439,000**

Source: Analysis of U.S. Army Corps of Engineers Waterborne Commerce of the U.S. data

Exhibit 50: Locations of Major Ports by Tonnage, Excluding Internal/Local Moves, 2014



Source: Analysis of U.S. Army Corps of Engineers Waterborne Commerce of the U.S. data

Port of Valdez

Alaska's main trade flow is the export of crude petroleum by sea. The Port of Valdez handles 92% of Alaska's crude petroleum exports; this makes the port central to Alaska's economy, as crude petroleum exports account for 43% of all exports and imports by value and 65% by tonnage. The Trans-Alaska Pipeline moves oil from the Prudhoe Oil Field to the Port of Valdez to be shipped to refineries in the U.S., mainly in California and Washington State.

Port of Anchorage

Port of Anchorage (PoA) is Alaska's main cargo terminal. It handles almost four million tons of fuel and freight annually that is distributed to 85% of all Alaska residents and businesses located in communities, military bases and other destinations across the state. It is Alaska's main intermodal transport hub and

connects the state's marine, roadway, rail, pipeline and air cargo systems. The Port of Anchorage handles containerized cargo, bulk commodities, and refined petroleum products.

PoA is one of 23 Department of Defense-designated strategic seaports nationwide. It is Alaska's only Foreign Trade Zone (number 160) that currently incorporates some 1,000 acres located at the Port of Anchorage, Ted Stevens Anchorage International Airport and other Anchorage-area sites. Half of the state's inbound freight crosses PoA docks, and half of this cargo is transported to destinations outside of Anchorage. PoA serves deep-water vessels operating year round, including four scheduled, weekly container ships from the Port of Tacoma. Both domestic and foreign carriers provide routine bulk deliveries of petroleum products, cement, building materials and other commodities.

PoA includes: three general cargo terminals, two petroleum terminals, a dry barge landing, bulk cement-handling, gantry cranes and roll on/roll-off capability. Its docks are maintained at a full seaway depth of 35 ft. PoA has or is adjacent to more than 100 acres of cargo handling and storage yard, 59,200 tons of bulk cement storage and 3.4 million barrels of liquid fuel storage. Its facilities handle 95 percent of all refined petroleum products distributed into Southcentral/Railbelt Alaska, including virtually all AV gas consumed statewide, jet fuel used at Ted Stevens International Airport and Joint Base Elmendorf-Richardson, as well as liquid fuels for motor vehicles, power utilities, home-heating, etc.

Exhibit 51: Port of Anchorage Tonnage, 2011-2015

	2015	2014	2013	2012	2011
Vans/Flats/Containers	1,681,222	1,811,136	1,742,704	1,735,615	1,705,176
Petroleum, Bulk Dockside	1,592,317	580,343	586,041	829,900	931,931
Petroleum, Shoreside	368,294	916,050	952,631	1,046,636	1,376,909
Dry Bulk Goods	126,737	140,684	119,271	119,939	118,280
Petroleum, Vessel Fueling	5,013	2,031	2,615	1,454	2,052
Vehicles	-	-	-	-	864
Other Freight	2,000	5,463	4,897	15,333	2

Source: Port of Anchorage

Port Specialization

Most of Alaska's ports fill specialized roles, providing necessary goods for local communities, or taking resources and products to market. For example:

- The majority of tonnage at Nikiski is petroleum moving in coastwise domestic trades.
- The Port of Kivalina handles outbound shipments of smelted products and non-ferrous ores. Almost all of the non-ferrous ores are transported domestically, while the smelted products are shipped to foreign countries. This port also plays a key role in the importation of distillate fuel oils from Canada and other sources.

- The two main ports of Unalaska, at Dutch Harbor and Iliuliuk, serve primarily to export seafood products to foreign countries and import distillate fuel oils to power fishing boats and heat homes.
- Seward is specialized in exports of coal lignite brought from the Usibelli coal mine by the Alaska Railroad, which accounted for 890,000 tons in 2012, shipped almost entirely to foreign countries.

A wider network of public and private ports serve communities all around Alaska and is just as vital as the larger ports. One source estimated that they totaled 240 ports in the Southeast Region and 236 in the Central Region.[12] Typically, these ports consist of wharves or piers where barges or vessels can be tied up, and facilities (cranes, pumps, conveyors, etc.) for loading or unloading freight to covered or uncovered storage areas. These facilities are important, if not essential, for their host communities.

Alaska Marine Highway System

The Alaska Marine Highway System (AMHS) is a ferry system operated by DOT&PF that serves Alaska and connects to the lower 48 states (see Exhibit 52). The AMHS primarily carries walk-on passenger traffic, autos, and bicycles, but it also carries trucks, serving as a "floating bridge" between distant waterfront communities.

Exhibit 52: Alaska Marine Highway System

Source: Alaska DOT&PF

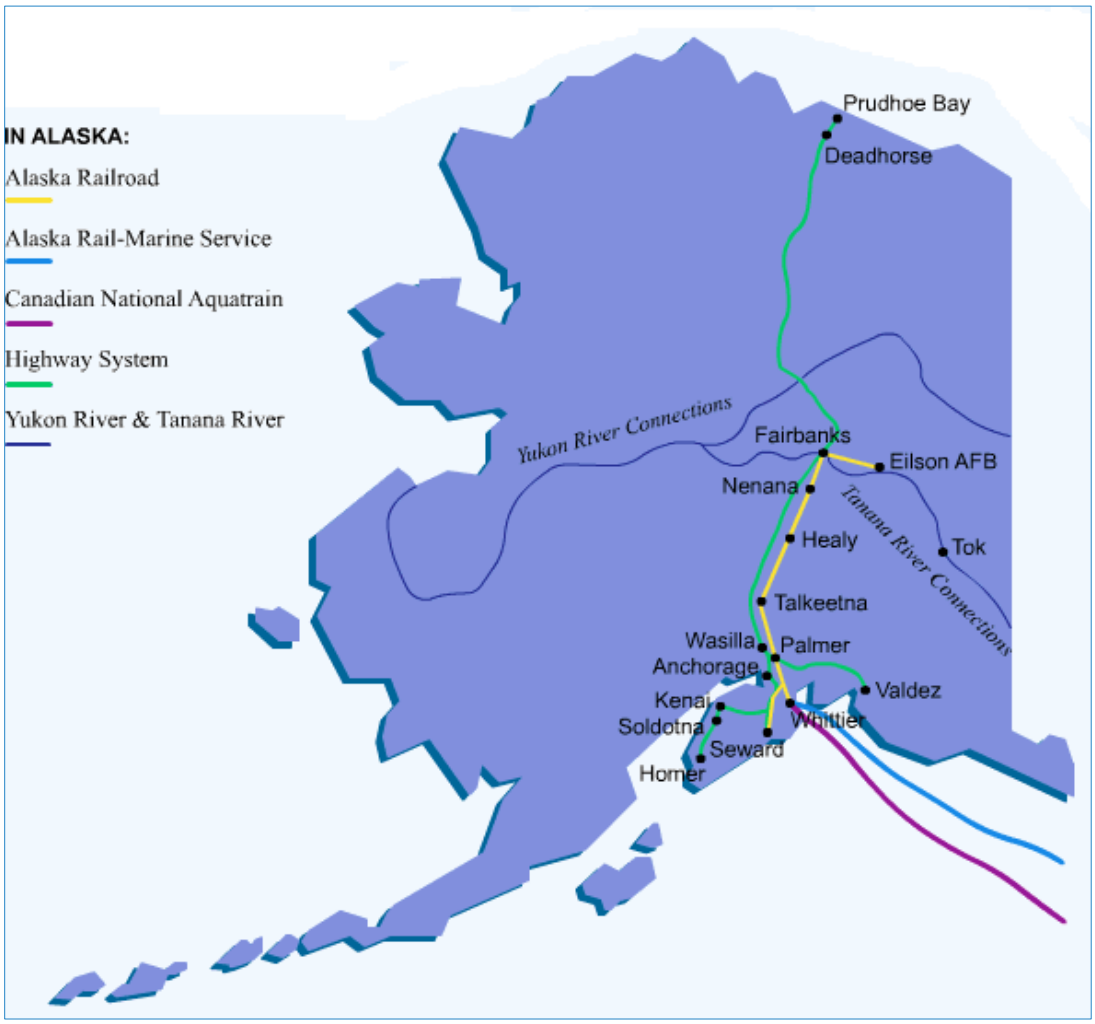
The AMHS has 11 vessels that stop at 32 ports stretched over 3,700 miles of coastline. For the last 10 years AMHS has carried, on average, over 317,000 passengers, over 104,000 vehicles, and over 3,400 freight vehicles per year. The system is funded one-third by operational revenues and two-thirds by subsidies from the Alaskan State Government. In the Southeast Region, the AMHS is the primary mode for providing transportation between many communities.

[12] Fay, G., Schworer, T., Guettabi, M. and Armagost, J., 2013. Analysis of Alaska Transportation Sector to Assess Energy Use and Impacts of Price Shocks and Climate Change Legislation, Institute of Social and Economic Research, University of Alaska Anchorage

Role of Rail Transportation

The Alaska Railroad (ARR) transports both freight and people through the central region of the state from Eielson AFB and Fairbanks to Anchorage, Whittier and Seward (see Exhibit 53). The Alaska Railroad Corporation (ARRC) owns 656 miles of track and operates yards in Seward, Whittier, Anchorage, and Fairbanks. The ARR is contained entirely in the state of Alaska, and does not connect directly to other North American railroads.

Exhibit 53: The Alaska Railroad



Source: Alaska Railroad Corporation

Because of its limited extent and lack of physical interchanges with other railroads, it utilizes and offers extensive connections with other modes, especially water.

- It provides critical connections between population centers, military installations, resource facilities, and the Ports of Anchorage, Seward and Whittier.

- At Whittier, it connects to the Alaska Rail-Marine Service, which moves railcars on barges on a route terminating in Seattle, with stops along the way; what the AMHS is for trucks, this service is for railcars. At Whittier, the ARR also connects with the Canadian Northern Railroad's "Aqua Train" service to Prince Rupert, BC.

- The ARR also links to key interior freight highways between Fairbanks and Seward/Whittier, as well as inland waterway traffic on the Yukon and Tanana rivers.

North American railroads typically serve a set of key industries – liquid and dry energy products, rock and aggregates, chemicals, intermodal containers, etc. – moving hundreds or thousands of miles across the continent. Alaska's freight rail service is similar with respect to its commodity mix.

- In 2012, according to the American Association of Railroads, the ARR handled: 2.0 million tons of stone, sand and gravel; 1.8 million tons of coal; 1.1 million tons of refined petroleum products; 410,000 tons of miscellaneous freight; 140,000 tons of intermodal freight; and 180,000 tons of other freight; for a total of 5.6 million tons.

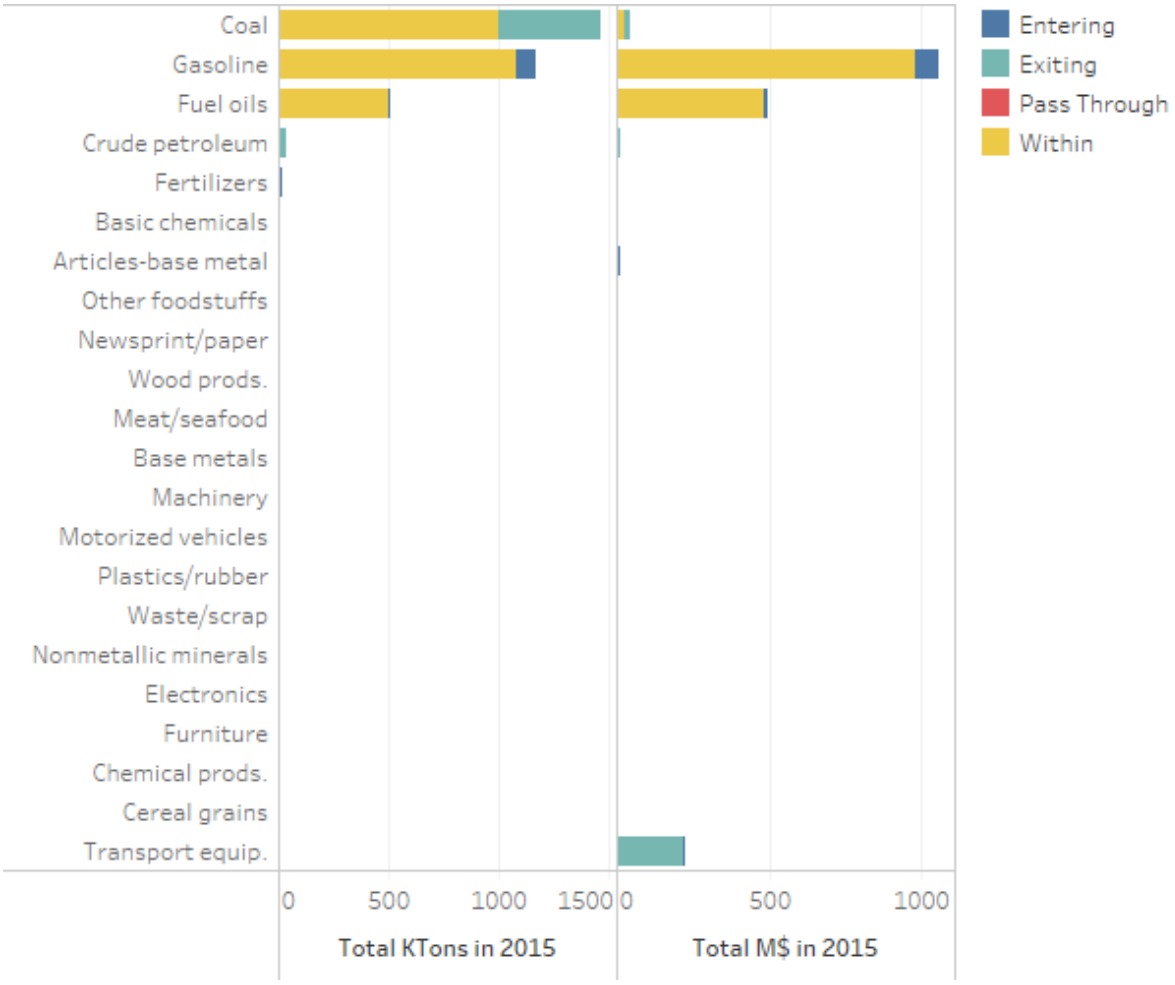
- In 2013, according to the Draft Alaska State Rail Plan, the ARR handled: 2.0 million tons of stone, sand and gravel; 1.4 million tons of coal; 0.9 million tons of petroleum products; 155,000 tons of chemicals; and 104,000 tons of intermodal freight.[13] Most of the railroad's coal originates at the Usibelli coal mine near Fairbanks, and terminates at the Port of Seward (which has a specialized coal-handling terminal) where it exits the state.

- In 2015, according to the ARRC 2016 Fact Sheet, the railroad handled 4.29 million tons of freight, including 22,386 containers and trailers, along with 37,492 hopper and tanker cars. The ARR recently began hauling LNG.

- The FAF estimates for rail as a domestic mode in year 2015 do not show any intermodal container traffic (this traffic is assigned to Multiple Modes and Mail) and also reports no tonnage for gravel. Otherwise, the FAF profile is generally consistent with 2013 data. Coal is the leading commodity by tonnage, with some moving purely within Alaska and some moving to Seward for export. Gasoline moving within Alaska and entering Alaska is the second largest tonnage commodity and the largest value commodity; fuel oils moving almost entirely within Alaska rank third on tonnage and second on value.

[13] DOT&PF, Alaska State Rail Plan, Draft, October 2014

Exhibit 54: Rail Shipments to/from and within Alaska by Tons and Value, 2012



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

Role of Pipeline Transportation

For any cargo that flows, pipelines are a very efficient way to move large quantities over long distances. Alaska's pipeline systems carry crude oil, natural gas, gasoline, and fuel oils within the state. Pipelines handle more than 40% of Alaska's within-state tonnage and nearly 25% of its within-state value.

Alaska's most well-known pipeline, the Trans-Alaska pipeline, is operated by the Alyeska Pipeline Service Company and was commissioned in 1977 to link the Prudhoe Bay Oil Fields in northern Alaska to the Port of Valdez in the Pacific (see Exhibit 55). It is one of the largest pipelines in the world, spanning 800 miles and having a diameter of 48 inches. Oil shipments though this pipeline peaked in 1988 at 2 million barrels a day and have been declining since; in 2016, volume averaged less than 518,000 barrels per day.[14]

[14] Source: www.alyeskapipeline.com

Exhibit 55: Map of Trans-Alaska Pipeline

Source: www-tc.pbs.org/wgbh/amex/pipeline/map/map.gif

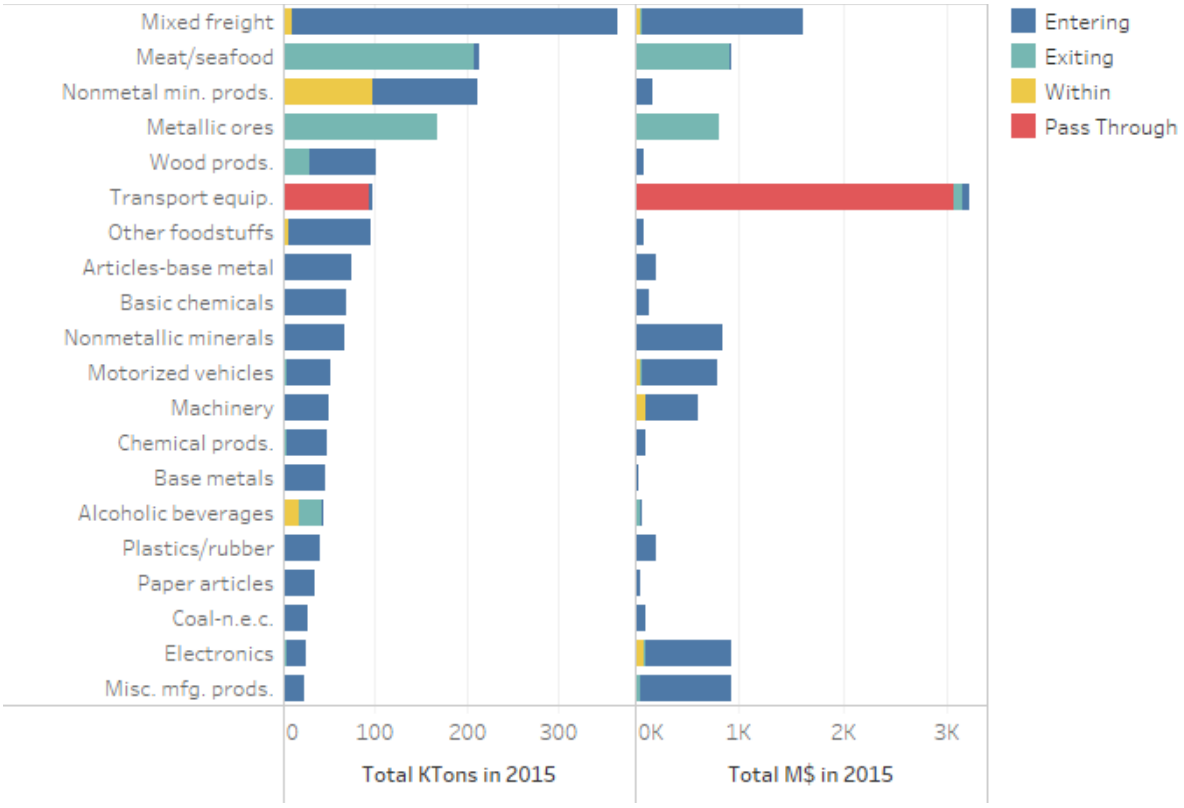
Pipelines also provide important connections between Alaska's ports and commodity users. These include: a pipeline that connects the Tesoro Nikiski refinery to both the Port of Anchorage and Ted Stevens Anchorage International Airport; a pipeline that connects the Port of Anchorage to Joint Base Elmendorf-Richardson, and another pipeline that connects the Port of Anchorage to Ted Stevens Anchorage International Airport.

Role of Multiple Modes and Mail

Mail and Multiple Modes is a "catch all" category representing freight that uses more than one mode as part of a linked end-to-end trip, mail and small packages, intermodal shipping containers, and freight moving through warehouse/distribution or other handling facilities along its end-to-end trip. Typically, Mail and Multiple Modes reflects a combination of air, truck, water, and rail tonnage and value. As

shown in Exhibit 56, for Mail and Multiple Modes moving domestically, mixed freight entering Alaska from other states is the leading tonnage commodity; transportation equipment passing through Alaska is the leading value commodity; meat/seafood and metallic ores are the leading exiting commodities; and a variety of higher-value goods follow mixed freight as important entering commodities.

Exhibit 56: Domestic Mail and Multiple Modes Tonnage and Value, Year 2015 Estimate



Source: WSP | Parsons Brinckerhoff Analysis of Freight Analysis Framework 4.1 data

CRITICAL FREIGHT TRENDS

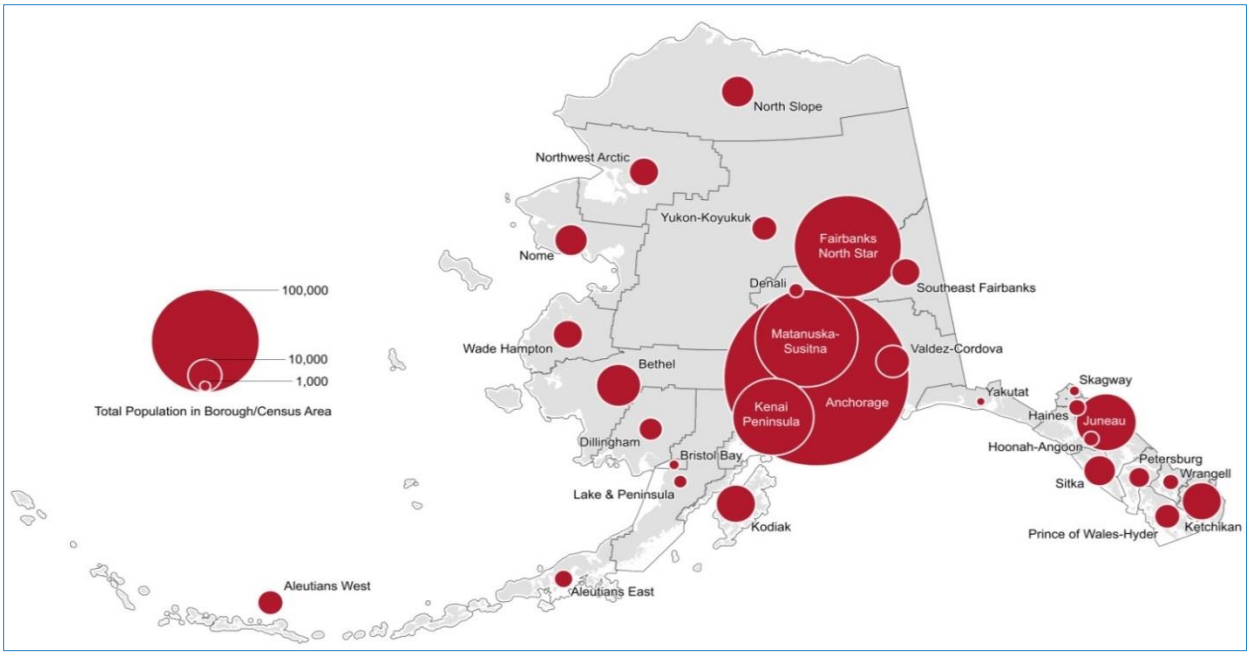
Alaska's freight demand drivers are affected by critical trends. This plan is based on the high likelihood that the primary trends experienced in recent years affecting freight will continue. These trends include a growing population that is increasingly concentrated in urban areas; rising overall industrial production but high uncertainty regarding future energy production; and increasing seasonal/annual variability in demand due to climate change and other factors. Critical trends, acting on and over Alaska's freight transportation network, lead to changes in system performance and create both needs and opportunities.

In this section of the Freight Element, critical statewide and modal trends are examined using available state and federal data to identify possible effects on the freight drivers identified in the *Freight Demand Drivers* section and the *Freight System Elements* section. In particular, potential changes in the ways that freight demand will need to be accommodated in the future are identified.

Population Growth will Drive Increased Consumption

Alaska's consuming population is expected to grow and to be increasingly concentrated in larger urban areas, consistent with economic opportunity (see Exhibit 57). This will increase the demand for urban freight deliveries of consumer goods, resulting in more freight tonnage and (especially) more truck movement.

Exhibit 57: Alaska Population by Borough/Census Area



Source: Analysis of Alaska Department of Labor and Workforce Development Research and Analysis Section data

In 2012, Alaska's population of over 730,000 lived predominantly in urban areas scattered throughout the vast geography of the state. Only two cities have more than 50,000 people—Anchorage and Fairbanks—but 66% of all Alaskans live in areas designated by the Census Bureau as Urban. By 2042, Alaska's population is projected to exceed 925,000. Alaska will add nearly 193,000 residents, and 88% of the added growth will be in three regions: Mat-Su Borough, Anchorage, and Fairbanks North Star Borough (see Exhibit 58).

Exhibit 58: Projected Alaska Population Growth, 2012 to 2042

2012 Rank	Area	2012	2042	Added	% Change	Growth Rate
	Alaska Total	**732,298**	**925,042**	**192,744**	**26%**	**0.8%**
3	Matanuska-Susitna Borough	93,801	166,338	72,537	77%	1.9%
1	Anchorage Municipality	298,842	364,871	66,029	22%	0.7%
2	Fairbanks North Star Borough	100,343	132,030	31,687	32%	0.9%
4	Kenai Peninsula Borough	56,756	65,647	8,891	16%	0.5%
6	Bethel Census Area	17,600	23,696	6,096	35%	1.0%
15	Southeast Fairbanks Census Area	7,218	11,112	3,894	54%	1.4%
14	Wade Hampton Census Area	7,700	11,400	3,700	48%	1.3%
10	Nome Census Area	9,869	12,997	3,128	32%	0.9%
13	Northwest Arctic Borough	7,716	9,926	2,210	29%	0.8%
5	Juneau, City and Borough	32,832	33,617	785	2%	0.1%
7	Kodiak Island Borough	14,041	14,435	394	3%	0.1%
19	Dillingham Census Area	4,988	5,341	353	7%	0.2%
26	Lake and Peninsula Borough	1,673	1,779	106	6%	0.2%
28	Skagway Municipality	961	1,005	44	5%	0.1%
11	North Slope Borough	9,727	9,757	30	0%	0.0%
22	Haines Borough	2,620	2,649	29	1%	0.0%
21	Aleutians East Borough	3,227	3,120	(107)	-3%	-0.1%
29	Yakutat, City and Borough	622	459	(163)	-26%	-1.0%
23	Wrangell, City and Borough	2,448	2,243	(205)	-8%	-0.3%
27	Bristol Bay Borough	987	779	(208)	-21%	-0.8%
17	Aleutians West Census Area	5,881	5,639	(242)	-4%	-0.1%
25	Denali Borough	1,871	1,609	(262)	-14%	-0.5%
16	Prince of Wales-Hyder Census Area	6,439	6,027	(412)	-6%	-0.2%
24	Hoonah-Angoon Census Area	2,210	1,534	(676)	-31%	-1.2%
20	Petersburg Borough	3,269	2,574	(695)	-21%	-0.8%
12	Sitka, City and Borough	9,084	8,300	(784)	-9%	-0.3%
9	Valdez-Cordova Census Area	9,953	8,985	(968)	-10%	-0.3%
8	Ketchikan Gateway Borough	13,938	12,762	(1,176)	-8%	-0.3%
18	Yukon-Koyokuk Census Area	5,682	4,411	(1,271)	-22%	-0.8%

Source: Analysis of Alaska Department of Labor and Workforce Development Research and Analysis Section data

This urbanization trend has been primarily driven by two factors. One is that the population of Alaska is getting older. The number of people over 65 is expected to triple by 2035, and the majority of them will live in or around Anchorage, which will see the fastest growth of senior population in the state. Older people are settling in Anchorage because it offers better health services and everyday conveniences. The other factor driving urbanization is economic opportunity. Cities are seeing the fastest job creation rates in the state, and they often have much lower costs of living. In Matanuska-Susitna, the availability of affordable land and housing combined with its proximity to Anchorage has made it an attractive place to settle.

These demographic trends will have a large and specific impact on freight infrastructure in Alaska. The consumption of goods will likely increase in proportion to population growth. This means significant growth in consumer goods entering Alaska, primarily via the Port of Anchorage and Ted Stevens Anchorage International Airport; significant growth in urban freight delivery activities in Anchorage, Mat-Su, and Fairbanks; and significant growth in distribution links (primarily truck and air) between Anchorage and Mat-Su, Fairbanks, and other Alaska communities.

Most of the populations of the remote communities along the Bering Sea are forecasted to increase. By 2035, the Bethel Census Area will have increased by 29%, Wade Hampton by 40%, Nome by 26%, and Northwest Artic by 24%. While the total number of people migrating might not be large in the aggregate, as a percentage it is significant.

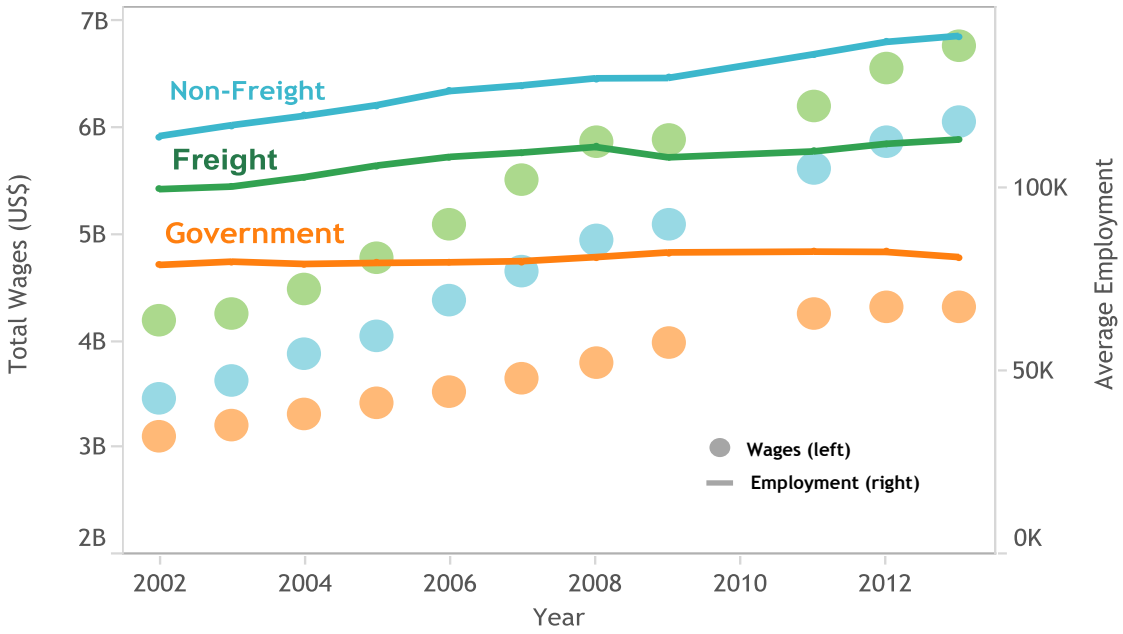
However, the Southeast Region of Alaska is expected to see decreases in population. Although the projected decreases are small in absolute terms, they are large in percentages because the population base is small. These communities will continue to require effective freight services and connections, but planning for these communities does not need to accommodate increasing levels of consumer demand for freight, although some may need to accommodate increased levels of produced commodities.

Overall Growth in Freight-Intensive Industries

Alaska's overall economy and its freight-intensive industries will continue to expand, creating increased demand for the movement of inbound, outbound, and within-state goods movement. This will create increased volumes of freight by all modes, in both urban areas (where gateway and logistics facilities are located) and in rural areas (where resource extraction and other freight activities are located).

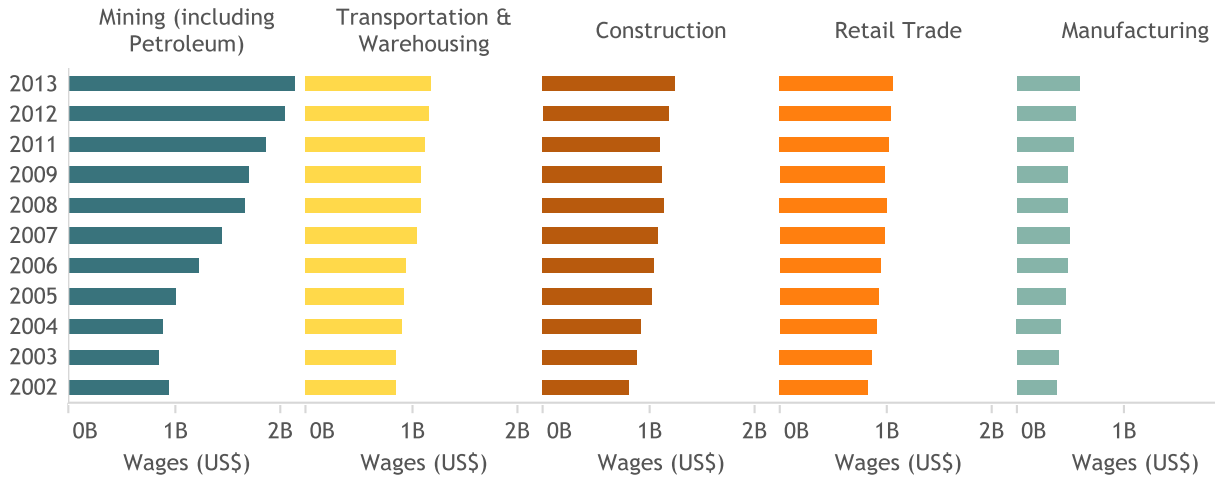
Over the past 10 years, employment growth in Alaska has been driven largely by non-freight-intensive industries (as defined previously in Exhibit 5). While the number of jobs in freight-intensive industries has grown only modestly since 2002, freight-intensive industries have been and remain the leading source of wages in Alaska. Since 2002, total wages in the transportation, construction, retail, and manufacturing sectors have grown modestly, while total wages in the mining sector have nearly doubled (see Exhibit 59 and Exhibit 60).

Exhibit 59: Total Non-Freight, Freight, and Government Wages (left axis) and Employment (right axis) by Sector, 2002 to 2013



Source: Analysis of Alaska Department of Labor and Workforce Development Research and Analysis Section data

Exhibit 60: Composition of Total Wages in Freight Intensive Industries, 2002 to 2013

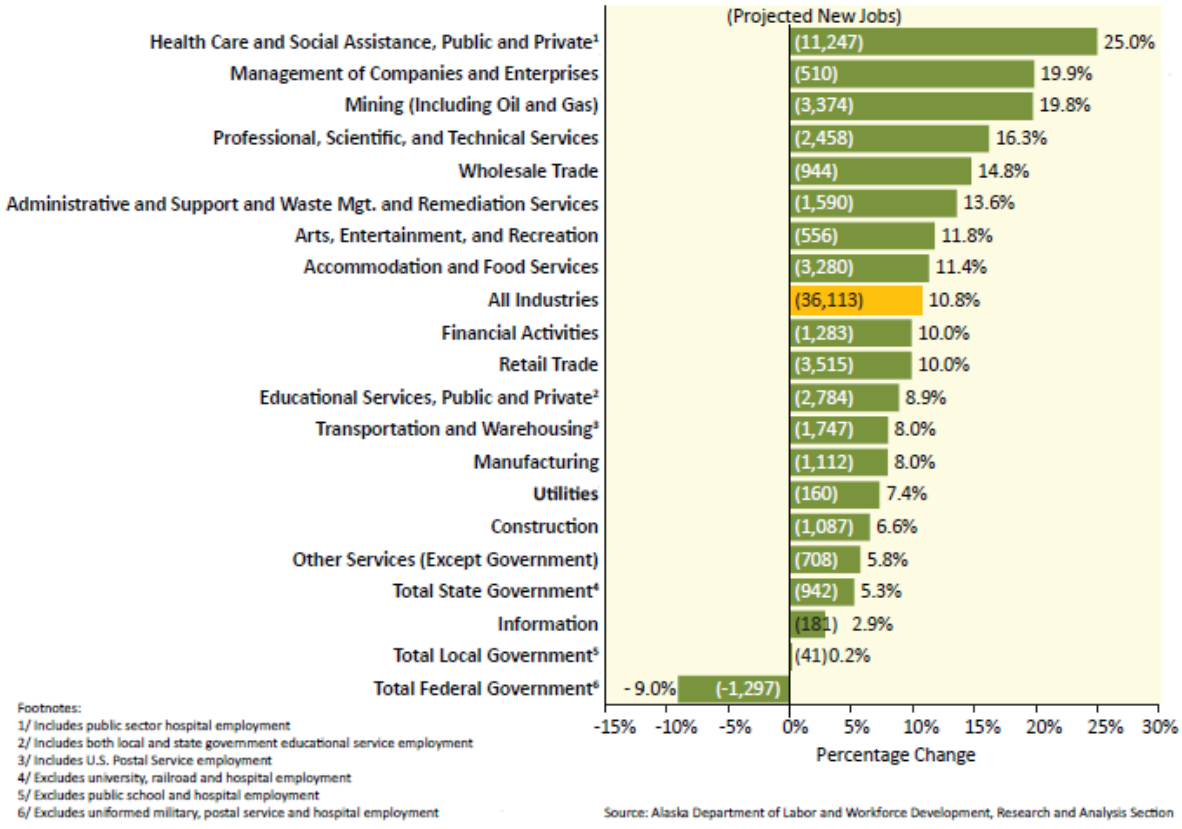


Source: Analysis of Alaska Department of Labor and Workforce Development Research and Analysis Section data

Looking ahead to 2022, Alaska is projected to add 36,113 new jobs, a 10.8% increase relative to 2012. An estimated 11,939 new jobs will be in freight-intensive industries. Mining is projected to see especially strong growth (3,374 jobs representing a 19.8% increase). Wholesale trade, retail, transportation and

warehousing, manufacturing, utilities, and construction are projected to grow by 6.6% to 14.8% (see Exhibit 61).

Exhibit 61: Alaska 2012 to 2022 Industry Projections (New Jobs and Percentage Change)



Source: Alaska Department of Labor and Workforce Development Research and Analysis Section graphic

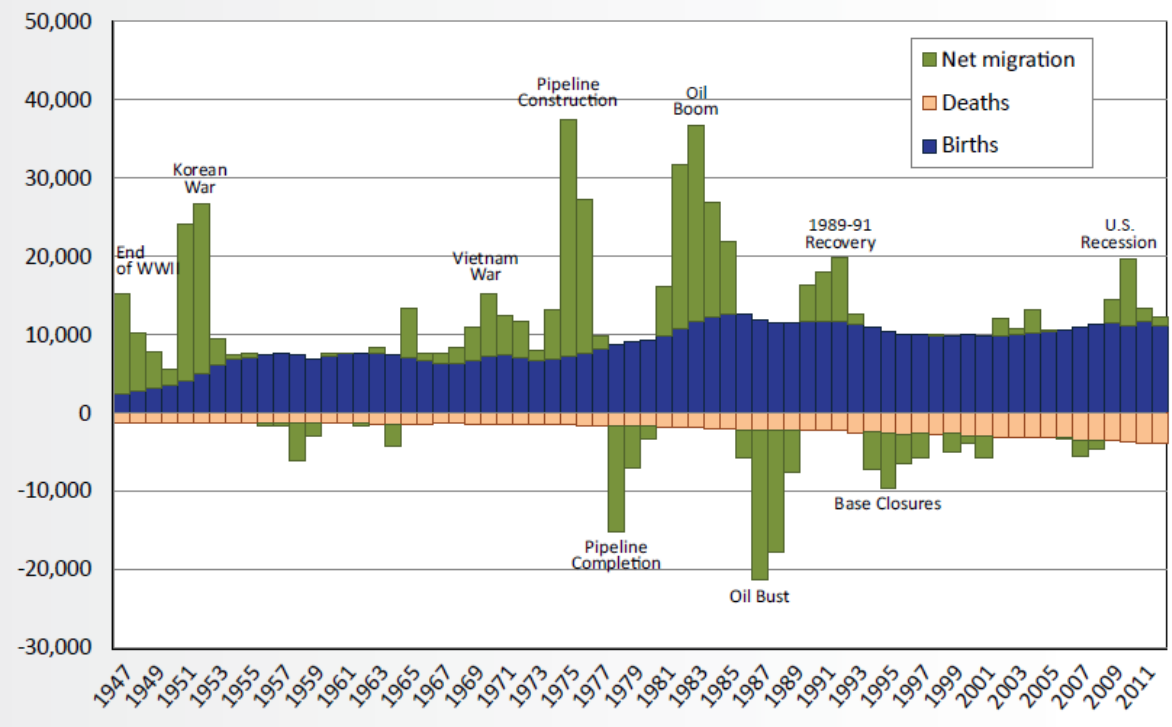
Changes in Resource Development Industries

The future levels and economics of energy and other resource production will have large impacts on transportation planning and freight demand in particular. For example, if energy production slows significantly, it could not only reduce the flow of resource commodities within and outbound from Alaska, but also reduce in-migration and population growth, with the additional effect of flattening demand for inbound consumer goods. Alternatively, if resource production increases rapidly, it may require the rapid development of new transportation capacity, such as pipelines or ports, not only to handle increasing volumes of resource commodities, but also to meet the consumer needs of a rapidly expanding workforce. The combinations of public policies, private investments, and market prices for resource commodities are in constant flux, and future conditions cannot be predicted reliably. What is

known is that Alaska will need to appropriately position its freight transportation infrastructure to match the types of resource development opportunities it expects to pursue.

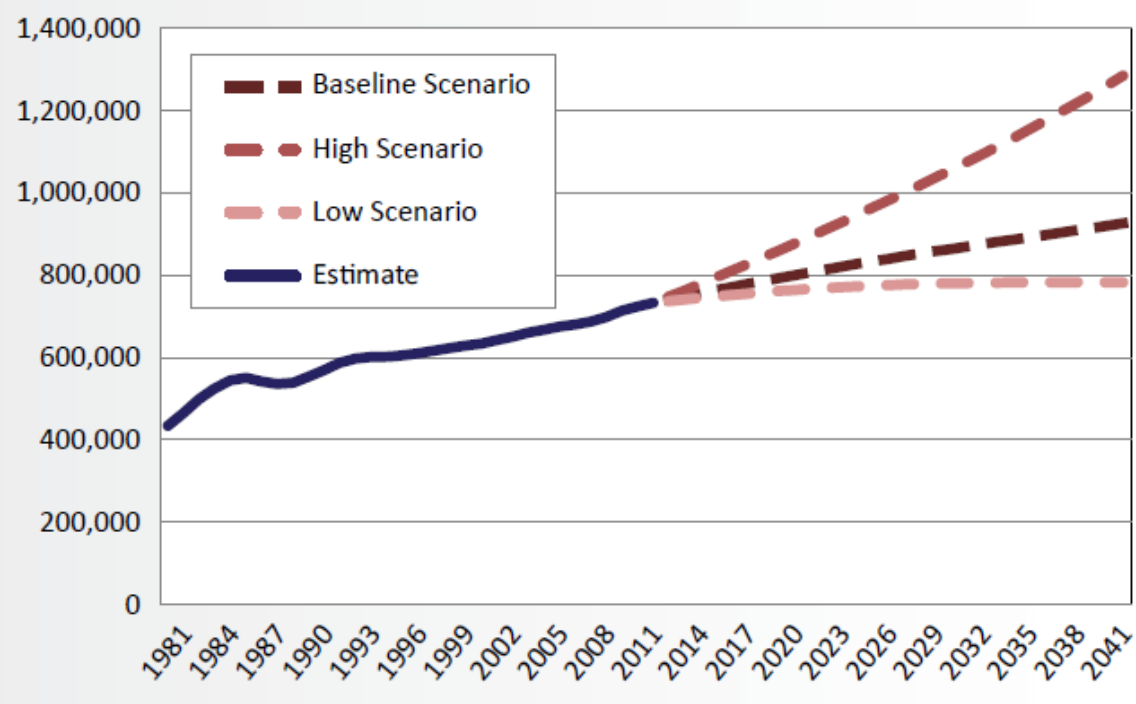
Historically, large swings in Alaska's population have been directly linked to resource development. This is clearly shown in a graphic prepared by the Alaska Department of Labor (see Exhibit 62). There are actually three forecasts for Alaska population growth: a baseline forecast (discussed in the *Population Growth will Drive Increased Consumption* section) that assumes stable migration; a high forecast that assumes more in-migration in response to rising economic opportunity; and a low forecast that assumes more out-migration in response to declining economic opportunity (see Exhibit 63). Resource development is a proven driver for migration, so to some extent, Alaska's population will reflect the vitality of its resource industries.

Exhibit 62: Alaska Population Trends and Migration Events



Source: Alaska Department of Labor and Workforce Development Research and Analysis Section graphic

Exhibit 63: Population Growth Alternative Scenario Projections



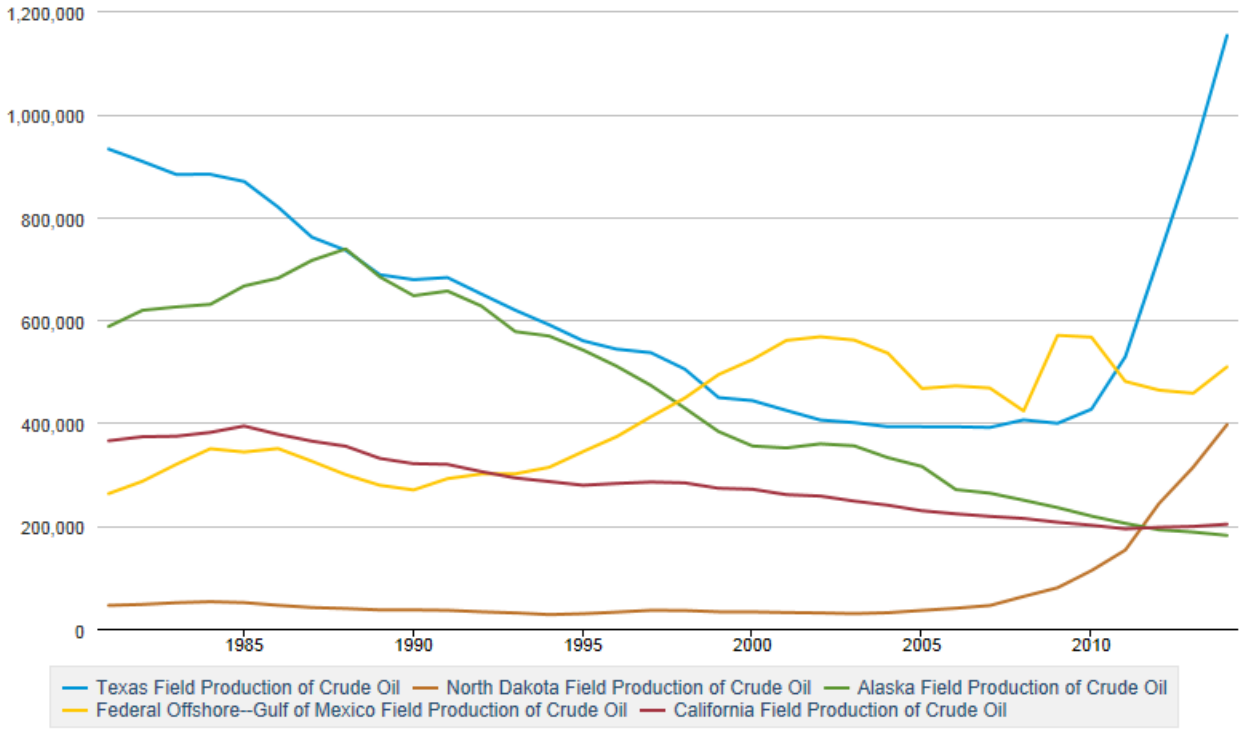
Source: Alaska Department of Labor and Workforce Development Research and Analysis Section graphic

Oil

Oil has unequivocally been Alaska's most important commodity. Historian Terrence Cole estimated that the Prudhoe Bay field has been worth more to the state than everything "dug out, cut down, caught, or killed since the beginning of time."[15] However, oil production has been declining since the late 1980s, as illustrated in Exhibit 64. In the 1970s and 1980s, oil was also produced from fields in Cook Inlet, but this has diminished significantly since (in 2012, production was 12,154 barrels per day). In the late 1980s, Alaska was tied with Texas as the leading U.S. producer of crude, and its volume declines tracked those of Texas through the late 1990s; over the same period, development of Gulf of Mexico reserves increased significantly. However, since the mid-2000s, there has been a dramatic recovery in Texas and a dramatic increase in North Dakota production, due in part to hydraulic fracturing technology; while at the same time, Alaska's production has declined; Alaska now trails Texas, the Gulf of Mexico, North Dakota, and California. Alaska's Department of Revenue anticipates continuing declines through 2023.

[15] Alaska Economic Trends, June 2013.

Exhibit 64: Leading U.S. Crude Oil Producing States/Regions, 1981 to 2013 (thousands of barrels)

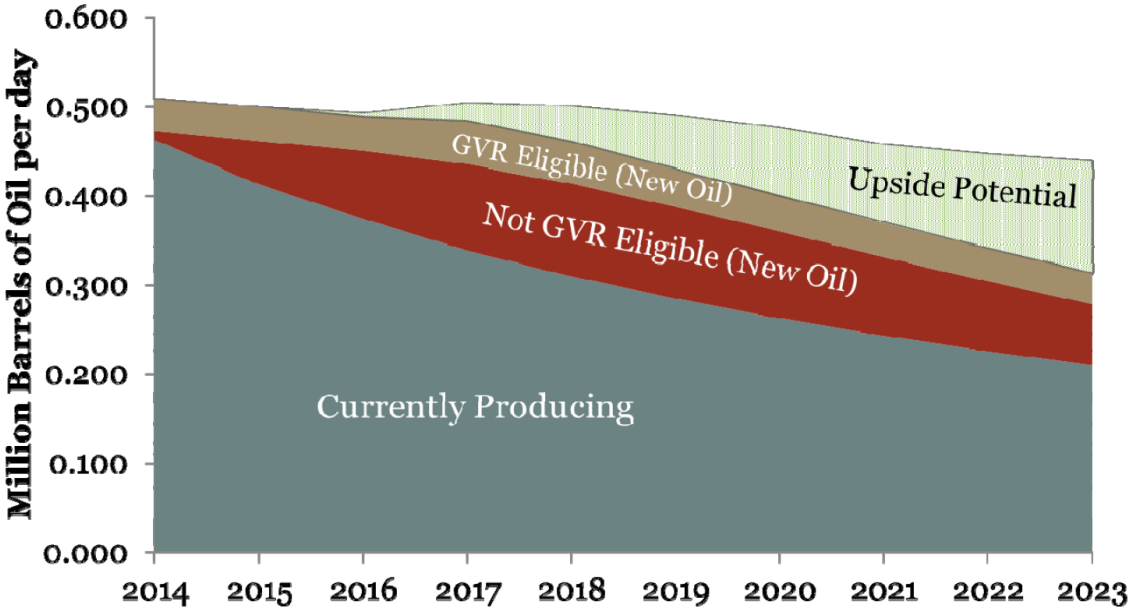


Source: Alaska Department of Labor and Workforce Development Research and Analysis Section graphic. More recent data (https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRFPAK1&f=M) suggests Alaska Field production has slowed and is currently on pace for around 170,000 thousand barrels per year.

Exhibit 65 shows the potential for new oil production in the future. *Non-GVR Eligible New Oil* includes petroleum from infill drilling at existing fields, incremental oil production from enhanced recovery methods, and development of new fields (considering those under development and under evaluation).[16] The "upside potential" wedge represents the best-case scenario where all potential oil production enhancements are realized. The Gross Value Reduction New Oil (GVR) category considers oil production from new fields that fall into a reduced tax bracket that incentivizes exploration and extraction.

[16] State of Alaska Department of Revenue, Revenue Source Book - Fall 2013.

Exhibit 65: Near-Term Oil Extraction Potential



Source: J. Tichotsky, Alaska State Revenues: Overview, History, and Forecast, Presentation to Forum on Alaska's Fiscal Future, October 4, 2014

Declining oil production in the North Slope has increased interest to explore elsewhere in the state. This includes several parts of the Central Region, near the Bering Sea (and recently near the Outer Continental Shelf), although no exploration efforts are currently underway or are planned for the near future.[17] If this were to materialize, Dutch Harbor could again become a key oil gateway in the region. Many decades ago, Shell Oil Company used this harbor to support Arctic explorations. Another possibility is the development of an Arctic Port to provide vessel operation services and support for increased global trade via polar waterways. This Port could also support offshore oil operations as they may develop in the future. The Arctic Port concept has been under study since 2011, but was suspended in 2015 when Royal Dutch Shell announced it was suspending offshore exploration activities. This opportunity is discussed later in the *Performance, Needs and Opportunities* section.

Transportation demand associated with North Slope crude production is examined in a DOT&PF report on Dalton Highway Corridor Traffic Estimates (Draft, April 30, 2014). That report anticipates the potential for near-term increases in production:

"Almost all of the truck traffic on the Dalton Highway Corridor to the north of Coldfoot currently serves the oil exploration and production activities on the North Slope. The development activities are conducted through leases on federal and state lands in Prudhoe Bay, Kuparuk, Qugruk, Colville River, Nikaitchuq, Milne Point, Nuiqsuit, Ignik/Sikumi, Beechey Point, Point Thompson, and the National Petroleum Reserve-Alaska (NPR-A). The primary companies involved in the oil activities are ConocoPhillips, BP, ExxonMobil, Brooks Range Petroleum, ENI, Repsol, and Pioneer Natural Resources. With the opening of TAPS in 1977, oil production on the North Slope rose to a peak of over 2 million

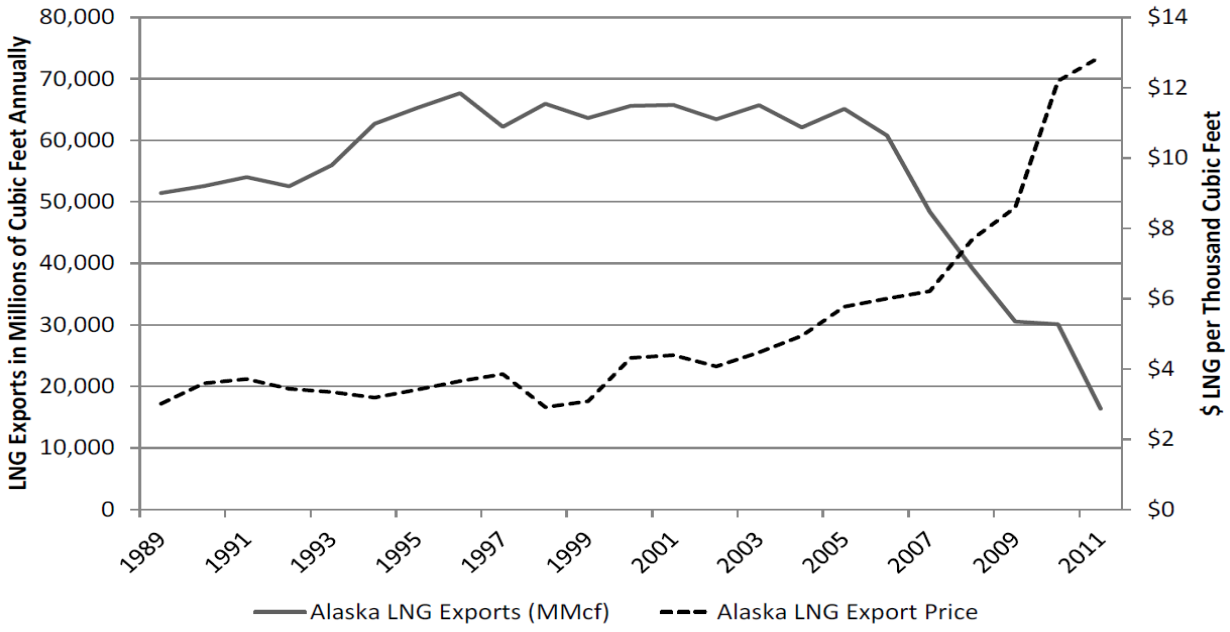
[17] Southwest Alaska Transportation Plan Update, Phase 1 Report.

barrels per day (BPD) in 1988. Since 1988 the oil production has been decreasing, with the average production in 2013 at about 500,000 bpd. According to Alaska Department of Revenue Tax Division records, production in March 2014 was 546,000 bpd. According to the major stakeholders, increased exploration efforts on the North Slope are occurring in 2014, particularly in the Point Thompson and NPR-A. The anticipated opening of new production wells in these areas, coupled with new technologies enabling better production in the legacy fields, should see an increase in the overall production of oil on the North Slope during the coming years. With this increase in exploration and production, truck traffic volumes serving the North Slope are estimated to increase by about 25% during the next five years."

Natural Gas

Natural gas was once Alaska's most important export, but over the last decade production has declined rapidly and today it does not supply any international markets. From 1969 to 2011, liquefied natural gas (LNG) was exported from Cook Inlet (near Anchorage) to Japan. During this time, Alaska invested significantly in liquefaction technology, becoming a world leader in the handling and transporting of natural gas. However, natural gas exports ended when dwindling reserves at Cook Inlet increased extraction costs above international prices (see Exhibit 66). Gas from this location was still economical for nearby communities, such as Anchorage, leading it to be used primarily for meeting local electricity and heating needs. Natural gas from Cook Inlet will continue to play a major role in meeting the energy needs of nearby communities, especially those of Anchorage.

Exhibit 66: Alaska LNG Exports and Price



Source: State of Alaska Department of Revenue, Revenue Sources Book—Fall 2013 graphic

Natural gas deposits in the North Slope are very large, but historically commercialization has proven difficult because of the high transportation costs to domestic and international markets. This can potentially change in the near future as a consortium comprised of the State of Alaska and three major

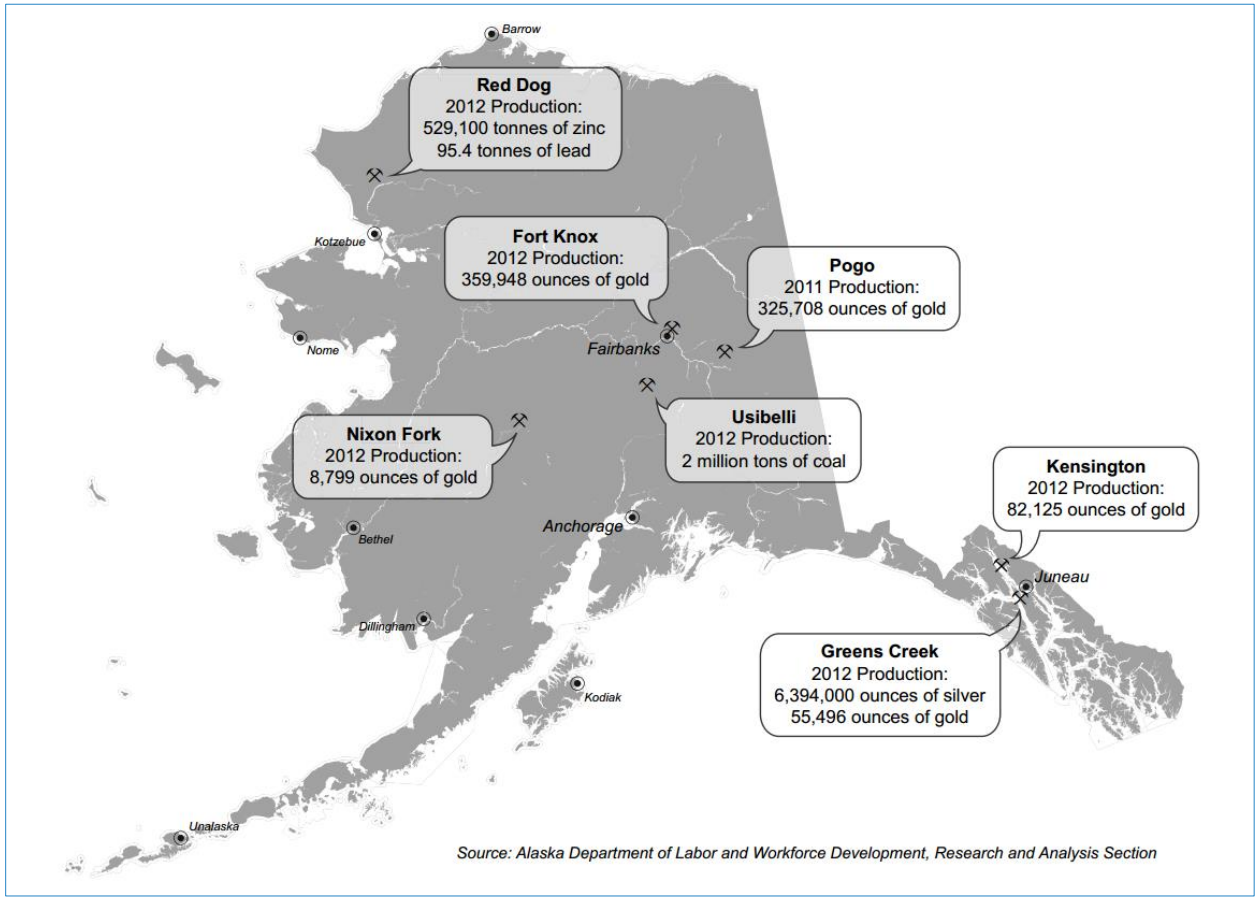
oil companies is planning a project that will finally allow access to this valuable resource via an 800-mile pipeline that will connect gas deposits in the North Slope with a liquefaction and storage facility that is being built in Nikiski. This opportunity is discussed in more detail in the *Performance, Needs and Opportunities* section.

Minerals

Alaska has significant deposits of zinc, gold, silver, coal, and other valuable resources distributed throughout the state. Often, high transportation costs and environmental effects have made the extraction of these valuable resources unfeasible; but in cases where these challenges could be overcome, mineral extraction has been a significant contributor to the state's economy.

Most of Alaska's mineral production comes from the six facilities shown in Exhibit 67. The only coal mine in the state is in Usibelli, which exports half of its production (primarily to Asia); the rest is used to supply coal-fired power plants in Fairbanks to meet the city's electricity needs.

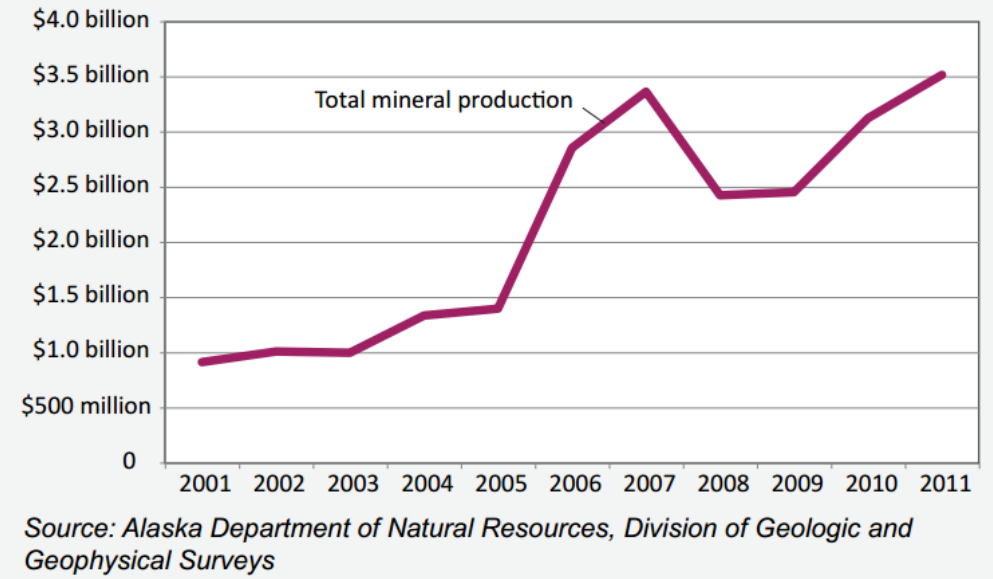
Exhibit 67: Largest Mines in Alaska



Source: Alaska Economic Trends, June 2013

As shown in Exhibit 68, the value of mineral production in Alaska has grown dramatically, from $1 billion in 2001 to $3.5 billion in 2011. This trend is expected to continue, albeit to a lesser degree in the near future because most of the growth has come from mines that have recently leveled off their production. However, there are opportunities for new mines to come on line relatively soon. For example, the Pebble Mine Project found very large deposits of copper and gold in Bristol Bay; however, this project has been controversial because of how its operations might affect the nearby ecology, especially fisheries. Additionally – and not shown in Exhibit 68– is the fact that coal production and export volumes have declined in recent years.

Exhibit 68: Mineral Production Boom

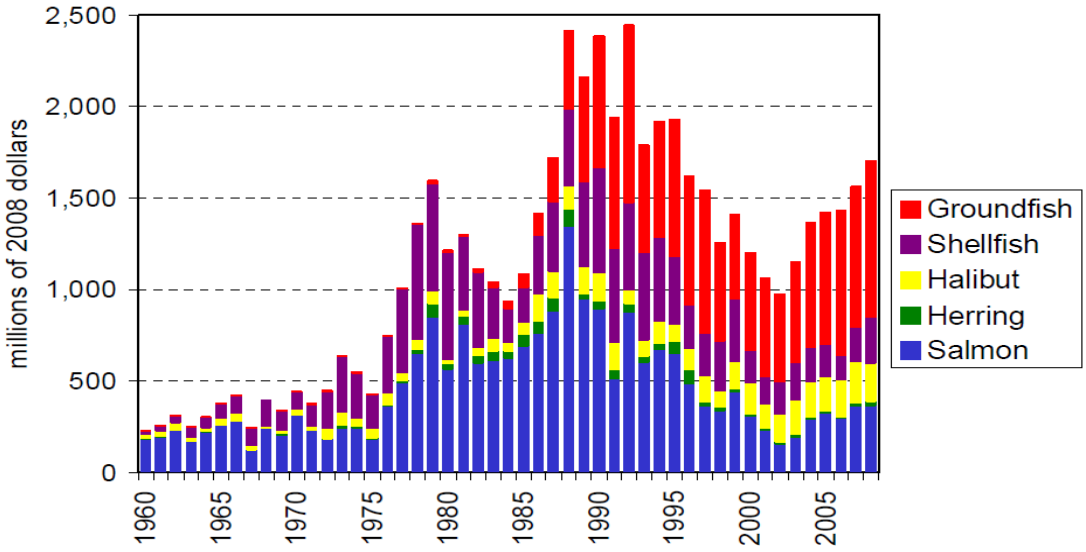


Source: Alaska Economic Trends, June 2013 graphic

Seafood

Fishing is the most important economic activity in many parts of Alaska. The Southeast and Southwest Regions are critically dependent on the productivity of local fisheries, and exports to domestic and international markets. As Exhibit 69 shows, the main seafood exports are salmon, halibut and other groundfish (fish that live on or near the bottom), and shellfish.

Exhibit 69: Value of Alaska Seafood Harvest



Source: Exhibit from Presentation: "An Introduction to the Economy of Alaska" by Gunnar Knapp in 2012, data from National Marine Fisheries Service

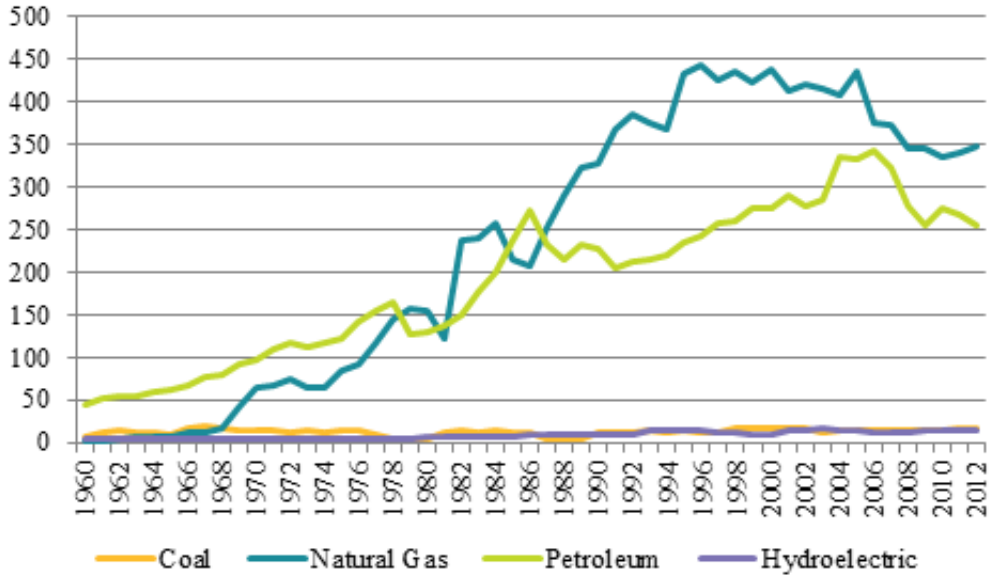
The drop in the 1990s resulted from a worldwide decrease in prices following the explosion of farm fishing. Farm fishing, however, is illegal in Alaska (for finfishes), which has served as a positive differentiator, protecting the quality and brand of Alaska's seafood. However, producers have had to reduce prices in order to be more competitive in global markets. Farm fishing of shellfish is allowed in Alaska and is a growing sector.

Some fish stocks in Alaska have declined over the years, but as a whole they are healthier than in most places in the world. The early introduction of fishing regulations has maintained stocks at sustainable levels for decades. Most forecasts show that fishing activity in the state is not expected to grow or decline considerably in the near-term. As a consequence, freight transportation needs from fish production are not likely to change. Local port infrastructure that caters to fishing will require upkeep and maintenance, but probably not significant capacity expansions. However, forecasting the fishing industry is a difficult task because it can fluctuate considerably. It is affected by many external factors that include changes in climactic conditions from El Niño, decadal Pacific Oscillations, and global warming.

Power Generation

Alaska's residents, industries, and transportation services consume fuel produced from a variety of sources, including coal, natural gas, petroleum, and hydroelectric facilities (see Exhibit 70). In 1960, petroleum was the leading source of fuel consumed in Alaska; since the late 1980s, and continuing to the present, the leading source has been natural gas. Power-generating facilities are a major consumer of fuels, and generate significant freight traffic, usually by barge, rail, or truck.

Exhibit 70: Alaska Energy Consumption by Source, 1960-2013 (trillions of BTUs)



Source: Analysis of U.S. Energy Information Administration data, www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/total/use_tot_AKcb.html&sid=AK

While comparatively lower in volume, coal and hydroelectric also play important roles. According to studies performed for the Susitna-Watana Hydro Project, Alaska currently receives 21% of its electricity from 40 hydropower projects throughout the state.[18]

Forecasted Changes in Commodity Flows and Modal Volumes

National forecasts anticipate that demand for non-energy-related industrial goods and products—consumer goods, machinery, instruments, etc.—will increase, creating greater demand on international gateways and supply chains. National forecasts also anticipate long-term declines in Alaska tonnages of crude petroleum and other energy products. However, there is a high degree of uncertainty regarding energy forecasts since production depends on global markets, availability of competing supplies, the cost of production/transportation/export from Alaska, and other variables. Forecasting how the economy will develop in the future is fundamental to understanding freight transportation needs. Projected changes in traded commodities—those moving to, from, or through Alaska—are summarized in Exhibit 71 and Exhibit 72 by trade type and transportation mode.[19]

[18] Source: www.susitna-watanahydro.org/

[19] USDOT's Freight Analysis Framework includes projections of changes in freight tonnage for the period 2015-2045. It uses the IHS "Macroeconomic Service Long-Term Trends Scenario" which provides a comprehensive picture of how the economy will evolve into the future, by industry and region. This forecast is generated by using a set of assumptions and models to extrapolate historical trends. The FAF combines these results with other similar models around the world to generate a high-level forecast of commodity flows by mode. The forecasts do not consider the effects of significant transportation or industrial development projects.

Exhibit 71: Forecasted Changes in Tonnage to, from, and through Alaska, 2015 to 2045

Changes in Tons (000) Between 2015 and 2045	Air (include truck-air)	Multiple modes and mail	Other and unknown	Pipeline	Rail	Truck	Water	Total Change	Average Annual Growth Rate
DOMESTIC TRADE									
Dom. AK to US	0	-17	0	0	-20	92	-12,306	-12,251	-2.5%
Dom. US to AK	57	1,063	0	0	0	36	815	1,971	2.2%
INT'L TRADE, NOT PASS-THRU									
Intl. Export AK-Origin AK-Gateway	4	11	0	23,853	105	2,645	960	27,578	6.7%
Intl. Export AK-Origin US-Gateway	1	202	0	0	9	8	0	220	2.5%
Intl. Import AK-Gateway AK-Destination	5	31	3	-103	-51	314	-600	-401	-1.0%
Intl. Import US-Gateway AK-Destination	3	169	1	0	16	31	0	220	2.6%
INT'L TRADE, PASS-THRU									
Intl. Export US-Origin AK-Gateway	310	226	0	0	0	13	103	652	4.6%
Intl. Import AK-Gateway US-Destination	161	5	70	0	0	1	1	238	4.8%
TOTAL									
Tonnage	***541***	***1,690***	***74***	***23,750***	***59***	***3,140***	***-11,027***	***18,227***	***1.1%***
Average Annual Growth Rate	***3.2%***	***2.2%***	***4.6%***	***3.0%***	***-0.4%***	***1.6%***	***-1.7%***	***1.1%***	

Source: Analysis of Freight Analysis Framework 4.1 data

Looking at tonnage, the key takeaways are as follows:

- Domestic trade from Alaska to other states will decline significantly, at an average rate of -2.5% per year, mostly due to declining movements of crude petroleum by water. Domestic trade from other states to Alaska are expected to increase at -2.2% per year.

- International exports from Alaska are forecast to increase substantially, at an average rate of 6.7% per year (through Alaska gateways) and by 2.5% per year (through other US gateways, primarily seaports).

- International imports to Alaska are forecasted to decrease at an average rate of -1.0% per year (through Alaska gateways) and increase by 2.6% per year (though other gateways, although this represents minimal traffic).

- International pass-through traffic is forecast to increase substantially at an average rate of 4.6% per year in the export direction and by 4.8% per year in the import direction.

- Despite the decline in crude petroleum tonnage, total volume is projected to increase overall, at a rate of 1.1% per year.

Changes in trade tonnage will impact the need to distribute goods within Alaska; production and consumption of non-traded commodities will also impact the volume of goods distributed within Alaska. As shown in Exhibit 72, annual demand is expected to rise for the following modes: multiple modes and mail (2.2%, which includes intermodal freight services); trucking (1.4%, in addition to truck tonnage included in the previous two modes); pipeline (0.5%); and domestic air (0.3%). Annual demand is expected to decline for water (-2.1%) and rail (0.6%) largely based on forecasted changes to resource commodities; as previously mentioned, resources are very difficult to forecast with reliability, so actual growth for these modes could be very different over the long-term.

Exhibit 72: Forecasted Changes in Tonnage within Alaska, 2011 to 2040

	Difference 2045 to 2015 (000')	Average Annual Growth Rate 2015 – 2045
Air (include truck-air)	12	0.3%
Multiple modes & mail	126	2.2%
Pipeline	3,374	0.5%
Rail	-445	-0.6%
Truck	11,121	1.4%
Water	-1,209	-2.1%

Source: Analysis of Freight Analysis Framework 4.1 data

Modal Network and Facility Trends

Trucks

According to analysis of regional traffic reports, in the year 2013, combination trucks traveled 122 million miles in Alaska, with 34% of these occurring on interstate highways, 40% on arterials, and 26% on other roads. Combination trucking activity is on the rise, seeing a 33% increase in Alaska from 2010 to 2013. Around half of the miles driven by these types of trucks are in urban areas and the other half in rural areas. While combination trucking activity is increasing rapidly in the state, single-unit trucking activity has remained stagnant. In 2013, these trucks drove 3% fewer miles than in 2010; however, they

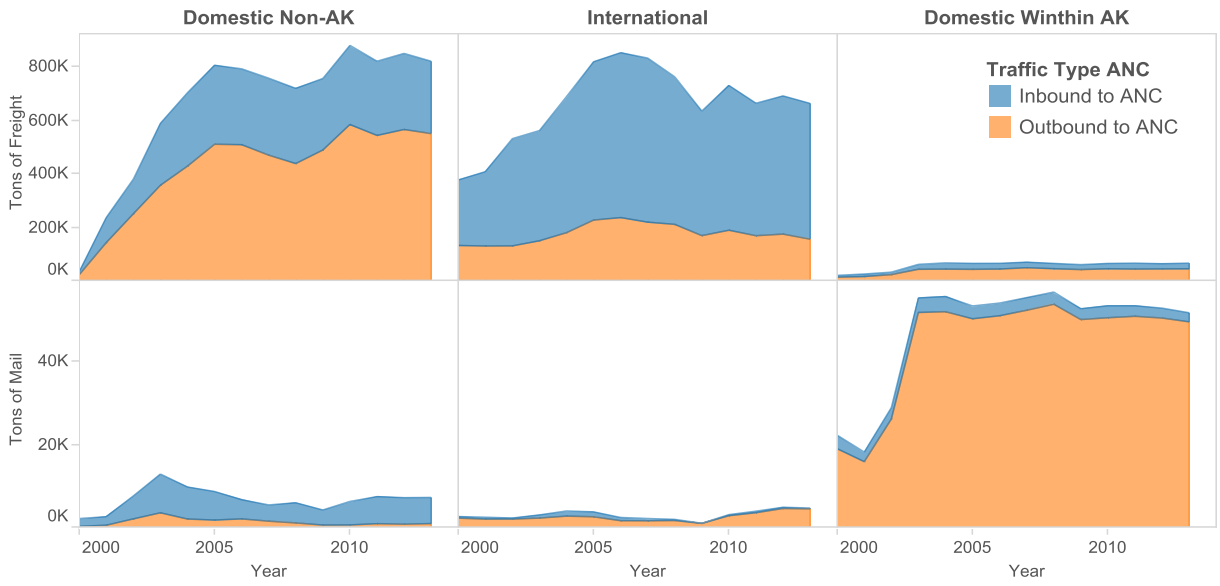
still contributed to 360 million miles on Alaska's roads. Just as with combination trucks, single-unit trucks were used in equal proportions for urban travel and for rural travel.

Air Cargo

Historic air cargo trend data is available for ANC; projections are available for ANC, FAI, and Alaska's aviation system as a whole from the 2013 Alaska International Airport System Planning Study.

Since 2004, ANC air cargo has remained generally constant, with some yearly fluctuations (see Exhibit 73). Domestic non-Alaska freight peaked before the recession, dipped slightly, and has recovered to similar levels. International freight also peaked before the recession, but has not recovered to pre-recession levels. Mail tonnage grew but has been relatively constant for the past decade. Looking ahead, the 2013 Alaska International Airport System Planning Study projects that ANC, transit (or pass-through) tonnage will grow 2.7% per year, while domestic and international cargo enplaned or deplaned will grow 4.3% per year (see Exhibit 74). Within-state air cargo enplaned at ANC is projected to grow 0.8% (see Exhibit 75).

Exhibit 73: Cargo Operations at ANC Airport



Source: Analysis of USDOT T-100 Air Cargo Data

Exhibit 74: Domestic and International Trade Tonnage at ANC, 2010 to 2030

Tons (000s)	Enplaned	Deplaned	Transit
2010	366	412	2,030
2015	400	451	2,199
2020	526	593	2,688
2025	678	765	3,071
2030	844	950	3,442
Average Annual Growth Rate 2010 to 2030	4.3%	4.3%	2.7%

Source: 2013 Alaska International Airport System Planning Study

Exhibit 75: Intra-Alaska Cargo Tonnage at ANC, 2010 to 2030

Tons (000s)	Enplaned	Deplaned
2010	89	21
2015	97	23
2020	100	23
2025	102	23
2030	104	24
Average Annual Growth Rate 2010 to 2030	0.8%	0.6%

Source: 2013 Alaska International Airport System Planning Study

At Fairbanks International Airport (FAI), transit tonnage is projected to grow 3.0% per year, while domestic cargo enplaned or deplaned is projected to grow 4.3% per year—rates that are very similar to ANC (see Exhibit 76). However, within-state air cargo is projected to be relatively unchanged (see Exhibit 77).

Exhibit 76: Domestic and International Trade Tonnage at FAI, 2010 to 2030

Tons (000s)	Enplaned	Deplaned	Transit
2010	0.07	0.15	6.6
2015	0.08	0.17	7.2
2020	0.11	0.22	9.0
2025	0.13	0.28	10.5
2030	0.17	0.35	11.9
Average Annual Growth Rate 2010 to 2030	4.3%	4.3%	3.0%

Source: 2013 Alaska International Airport System Planning Study

Exhibit 77: Intra-Alaska Cargo Tonnage at FAI, 2010 to 2030

Tons (000s)	Enplaned	Deplaned
2010	16.9	4.8
2015	17.1	5.2
2020	17.1	5.0
2025	17.0	4.8
2030	17.1	4.7
Average Annual Growth Rate 2010 to 2030	0.1%	-0.1%

Source: 2013 Alaska International Airport System Planning Study

At other airports in Alaska, air cargo tonnages are expected to increase moderately, at an average rate of 1.8%. The Northern region is expected to grow the fastest at 1.9%, with the Southeast the slowest at 1.4% (see Exhibit 78).

Exhibit 78: Enplaned and Deplaned Air Cargo Forecasts Excluding ANC and FAI, 2008 to 2030

Tons (000s)	Central	North	Southeast	Total
2008	93.4	111.5	34.1	**238.9**
2015	101.1	118.8	36.8	**256.8**
2020	111.0	132.9	39.5	**283.5**
2030	136.7	169.8	46.1	**352.7**
Average Annual Growth Rate (%) 2008 to 2030	1.7%	1.9%	1.4%	**1.8%**

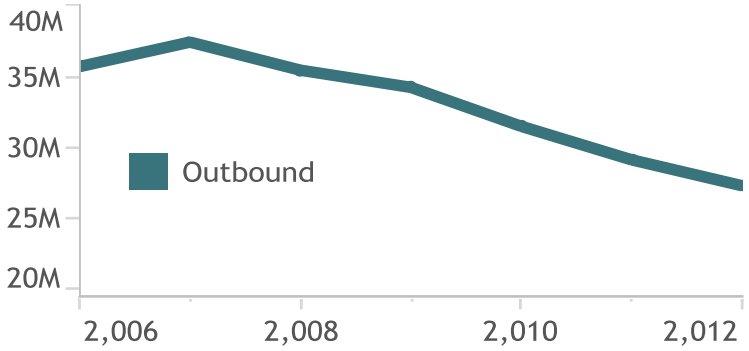
Source: Alaska Aviation System Plan Forecasts, Prepared by HNTB Corporation, June 2011

Marine Cargo

Historic trends and future projections for marine cargo tell a mixed story: future volumes will largely depend on the extent of resource development projects and construction activity supported by marine freight.

Looking at recent trends, the Port of Valdez has seen significant declines in volume since 2006 due to reduced production of North Slope crude moved by pipeline to the port for shipment to out-of-state refineries (see Exhibit 79). If declines continue, as currently projected, the same level of year-over-year traffic losses can be anticipated. Alternatively, if crude production stabilizes or increases, port volumes could stabilize or increase.

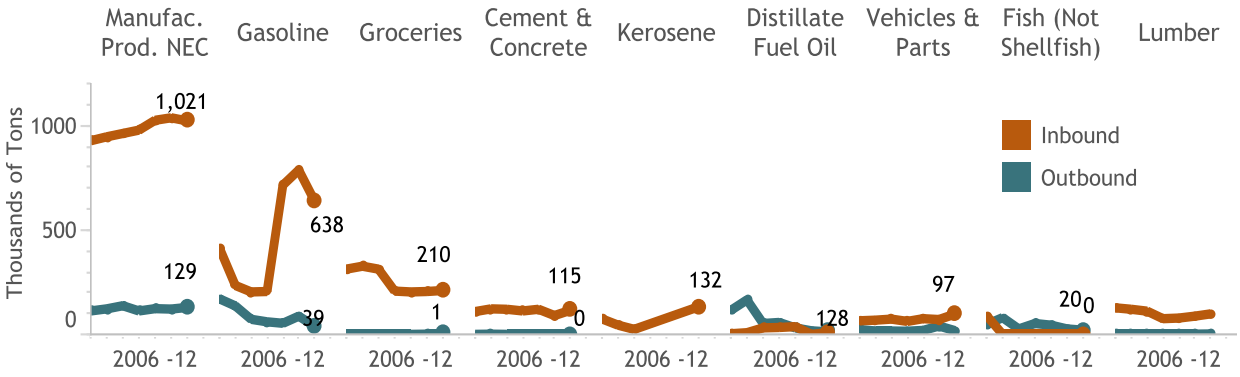
Exhibit 79: Crude Petroleum Exports from Port of Valdez, 2006 to 2012 (millions of tons)



Source: Analysis of U.S. Army Corps of Engineers data

The Port of Anchorage handles a diverse set of commodities that in many cases are basic necessities for Alaska's population and industries, in contrast to Valdez which handles essentially one commodity bound for U.S. and global markets. Manufactured products have grown steadily; gasoline has spiked and then declined; but overall activity at the Port of Anchorage has remained relatively steady through the past decade (see Exhibit 80).

Exhibit 80: Commodity Flows through Port of Anchorage, 2006 to 2012

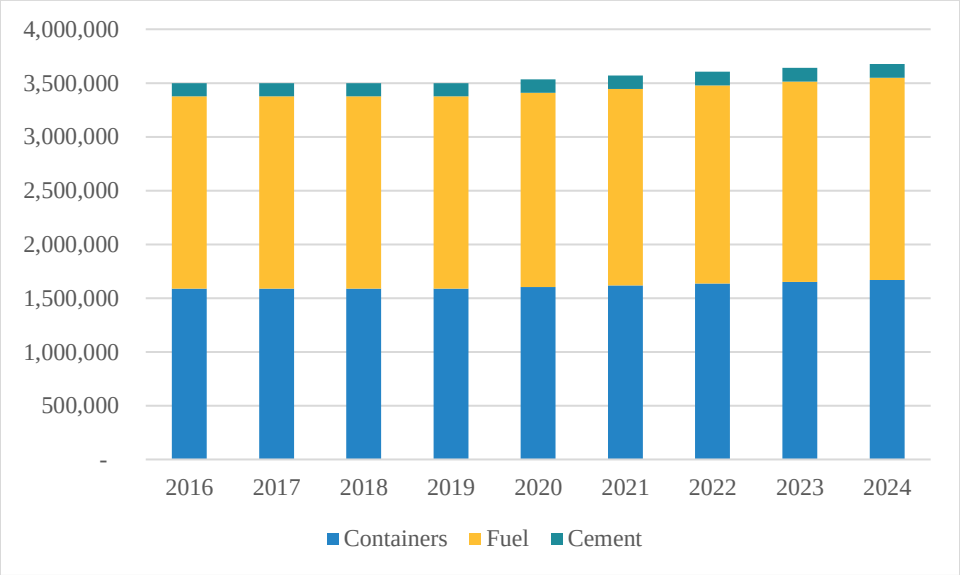


Source: Analysis of U.S. Army Corps of Engineers data

According to information provided by the Port of Anchorage, container traffic through the Port of Anchorage has been flat for several years, and is forecasted to decrease through 2018 in response to the

downturn in the oil and gas industry. Fuel volumes have been on the rise since the closure of the Flint Hills refinery and changes to the military jet fuel market but should now remain stable. The Port of Anchorage also has annual tonnages of cement coming in to support planned construction projects throughout the state (see Exhibit 81).

Exhibit 81: Forecasted Cargo at Port of Anchorage



Source: Port of Anchorage

Finally, another important trend is that vessel traffic through the Northern Sea Route has been growing rapidly over the last few years. In 2013, 71 vessels took this route, up from 46 the year before.[20] It is difficult to predict how many vessels will use this route in the future because of the lack of historical data or precedent to draw from. One estimate cited by the U.S. Army Corps of Engineers calculated that the figure could be as high as 1,200 ships per year by 2020.

Rail

A rail tonnage forecast was developed for the Alaska State Rail Plan, using the year 2013 as a base, as shown in Exhibit 82. However, there have been significant recent changes that impact this forecast. Bulk petroleum tonnage has fallen to 300,000 tons; export coal volume has essentially disappeared due to global market oversupply; and ARRC has temporarily closed its coal export facility at Seward; so the forecast for these commodities is not certain at this time. The forecast for other commodity groups – stone, sand, and gravel, chemicals, iron/steel, and intermodal -- suggests only modest changes. Importantly, these forecasts do not include the effect of potential new rail freight customers or rail extensions that could be built over the coming decades.

[20] U.S. Army Corps of Engineers.

Exhibit 82: Forecasted Tonnage by Rail, 2013 to 2035

Tons (000)	Stone, Sand, Gravel	Petroleum Products	Coal	Chemicals	Iron/Steel Products	Intermodal
2013	2,025	947	1,427	155	70	104
2025	2,124	Not applicable		207	63	104
2035	2,187			264	58	107
Annual Growth (%)	0.5%			3.2%	-1.1%	0.2%

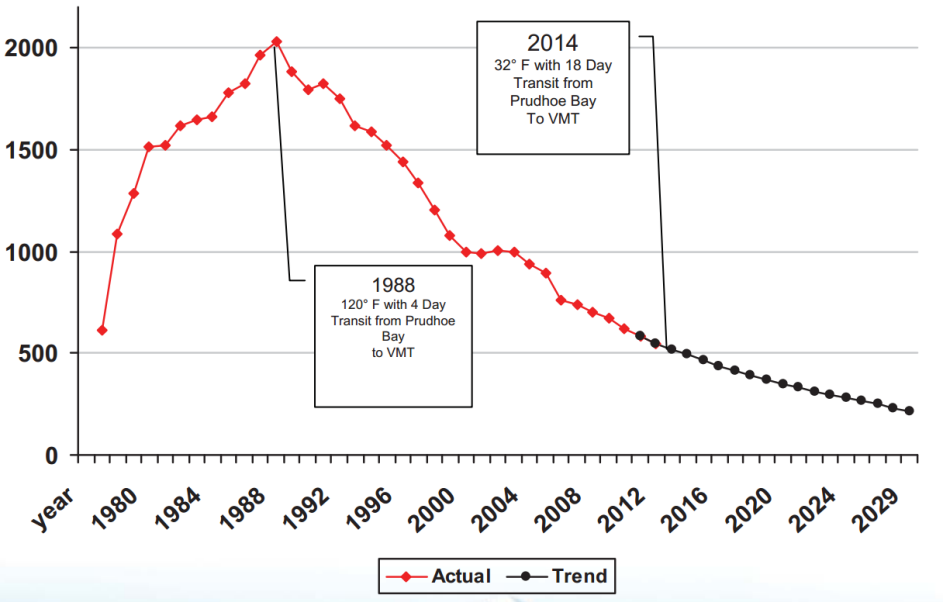
Source: Alaska State Rail Plan - Draft, October 2014 (excluding Petroleum Products and Coal)

Pipeline

Projections for the pipeline's future use are very uncertain as they depend on the amount of exploration and drilling that occur, especially in the Arctic National Wildlife Refuge region. The pipeline currently serves as the only alternative for transporting Alaska's oil so it can be exported and commercialized. As volume on the pipeline has decreased, so has the travel speed of the petroleum. Travel times from Prudhoe Bay to Valdez are over four times longer today than during peak flow in the late 1980s.

Exhibit 83 shows how volumes on this pipeline have been decreasing since peaking in the late 1980s. Forecasts indicate that these declines will continue into the foreseeable future. The average rate of annual decrease is -4.5% from 2014 to 2029. This is decrease is higher than FAF's prediction of an average annual decline of -2.8% through 2040, and clearly does not reflect the possibility of increased near-term production increases on the North Slope.

Exhibit 83: Forecasted Volumes (thousands of barrels per day) on Trans-Alaska Pipeline



Source: Alyeska Pipeline, Declining throughput: a continuum of challenges, January 2013. Fact Sheet. www.alyeska-pipe.com/TAPS (Accessed Feb 2015)

Likelihood of Increased Seasonal Variability

Increasing average temperatures, rising sea levels, and related effects are likely to exacerbate current seasonal variations in freight activity and the availability of freight infrastructure, creating greater unpredictability and variability in freight commodity movements from season-to-season and year-to-year. One set of anticipated effects relates to water resources and transportation, the other to surface transportation.

- It is expected that climate change effects are likely to produce longer periods of warmer temperatures. On the plus side, this will allow more Alaska ports to operate in ice-free conditions for more of the year, reducing their dependence on other modes. Ocean warming will also support dramatically increased vessel traffic in Arctic shipping lanes, which leads to the federal interest in an Arctic deep-water port; such a facility, as previously described, could benefit Alaskans by supporting offshore oil exploration and possibly the shipment of natural resources. Warmer temperatures may improve Alaska's harvest of timber and other agricultural products. However, ocean warming may lead to acidification, potentially changing characteristics of Alaska's fisheries, such as the types and numbers of fish or when and where they are found, which would affect the demand for transporting this commodity. Overall, it would be expected that more goods would be moved in warmer months by water.

- Longer periods of warmer temperatures, and more unstable climatic conditions, will affect the reliability and performance of Alaska's transportation system. Roads, bridges, rail lines, and any low-lying infrastructure may be subject to increased flooding from more severe storms and more extreme snowmelt. Roads and runways built on permafrost, which serve as important infrastructure links throughout the state,[21] will see increased damage and more frequent temporary closures as their substrate thaws and becomes unstable. Ice roads will be available for less time each year. This could lead to concentrations of traffic in shorter travel windows. However, for roads not built on permafrost or ice, the opposite effect may occur, as commercial traffic could be increasingly spread throughout longer warm-weather periods.

[21] U.S. EPA, http://www.epa.gov/climatechange/images/impacts-adaptation/PermafrostHighways-large.gif (accessed July 2015).

OPPORTUNITIES AND NEEDS

To provide acceptable freight system performance—defined as available, reliable, affordable, timely, safe, and secure—freight planning should address the following needs and opportunities: bringing more resources efficiently to markets; improving truck access to intermodal facilities (ports, airports, etc.); enhancing freight mobility in growing metropolitan areas; maintaining and enhancing critical trade gateway and multimodal corridor facilities; maintaining and enhancing critical connections with Alaska's rural communities and military facilities; and doing so with constrained public funds.

This section considers a broad spectrum of freight improvement opportunities and needs, in light of the key factors deemed necessary for acceptable system performance.

The LRTP Freight Element introduces the concept of freight system performance measurement, adopting a "user's perspective" on performance. Generally, freight system users value reliability, price, speed, safety, and security, in that order. In Alaska, an additional measure is important: whether a mode or service is available, or available only seasonally. Data and procedures for systematic performance measurement is addressed later in this Freight Element.

As a starting point, based on the analysis of Alaska's freight infrastructure and the key trends and drivers affecting it, the following general freight-related performance goals for the Alaska transportation system have been identified:

- Providing freight transportation capacity to directly support resource development
- Reducing truck congestion and improving travel time reliability and safety in urban areas
- Maintaining and improving trade gateways and corridors: seaports, airports, railroads, and land border crossings
- Maintaining and improving multi-modal connectivity among and between Alaska's urban and rural communities
- Addressing uncertainty and risk

To achieve these performance goals, Alaska must address freight needs and take advantage of freight opportunities, through initiatives already underway and through new plans, policies, and actions. Key opportunities and needs are discussed below.

Initiative Areas

Providing Infrastructure for Resource Development

Resource development generally involves the movement of heavy bulk commodities, including but not limited to petroleum, metals, coal and other minerals, stone, and timber. Nationally, these types of

commodities generate significant movements of heavy trucks, with corresponding impacts to the nation's highways, and are an area of special emphasis in the FAST Act. For Alaska, performance issues related to resource development fall into three broad categories:

- Sufficiency of existing infrastructure and service capacity, speed, reliability, cost, etc.
- Provision of missing connections, without which resources cannot be brought to market
- Accommodation of temporary demand related to resource facility construction and start-up

The related needs and opportunities include a variety of initiatives: new construction of a statewide liquid natural gas (LNG) pipeline; development of resource access roads; improvement of the Dalton Highway, coastal ports, and possibly other infrastructure to accommodate proposed mining operations; and potential development of an Arctic Port to support exploration of offshore petroleum reserves.

In general, because resource development is market driven, it is important that the state respond flexibly when market conditions result in a project-specific need for freight-related infrastructure improvements. As a state government, Alaska can neither afford to invest in infrastructure ahead of demand nor "pick winners," meaning those who will be successful with resource development.

Alaska LNG Pipeline and Export Project

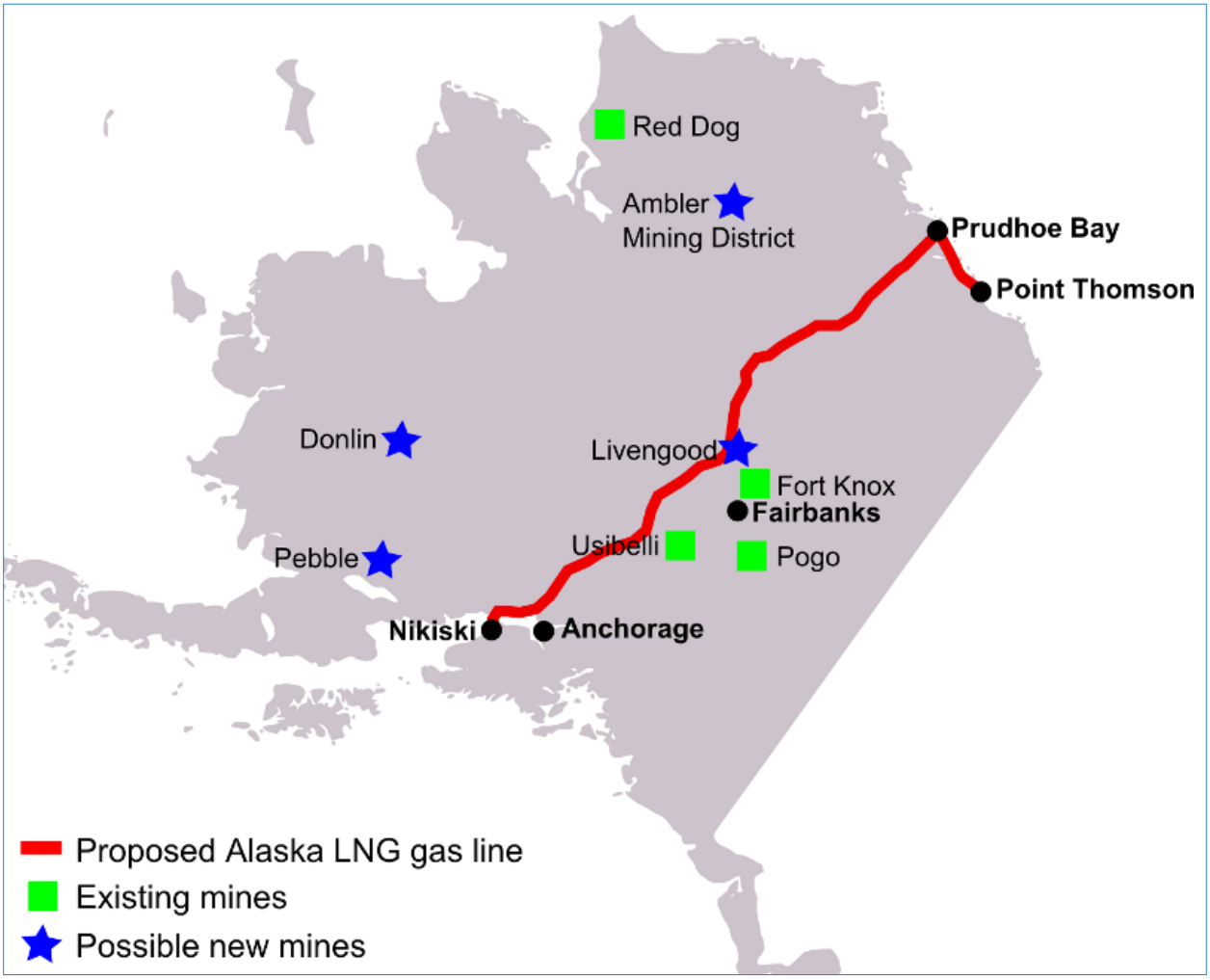
The Alaska LNG pipeline is planned to follow the route shown in Exhibit 84, connecting gas deposits at Prudhoe Bay and Port Thomson on the North Slope with a liquefaction and storage facility being built at Nikiski. This project is estimated to cost from $45 billion to $65 billion and will likely represent the largest single investment in Alaska freight infrastructure over the coming decade. The project is sponsored by ExxonMobil, BP, ConocoPhillips, and TransCanada in partnership with the State of Alaska's Department of Natural Resources, Department of Revenue, and Alaska Gasline Development Corporation.

The pipeline is being designed to deliver 3.5 billion cubic feet of gas per day; the LNG facility will produce up to 20 million metric tons (around 22 million short tons) per year for export by ship to East Asian markets via the Port of Nikiski. Additionally, Alaska's mines could benefit from the natural gas produced at Prudhoe and Port Thomson, including the proposed Pebble, Donlin, Ambler, and Livengood mines.

Today, the Port of Nikiski handles over 4 million tons per year. Historically, it handled LNG from the local BP plant, but over the past decade those LNG volumes have been declining. This project will dramatically increase tonnages exported from Nikiski, putting it nearly on par with Valdez as Alaska's leading tonnage seaport. Plant and pipeline construction will also generate significant movements of building materials and machinery to Alaska (largely via port) and within Alaska (via truck, rail, and air) to construction sites.

In March 2015, the Federal Energy Regulatory Commission issued a notice of intent to prepare an Environmental Impact Statement (EIS) for the project. Natural gas exports are expected to begin at the earliest in 2023, although the start date may depend to some extent on global LNG prices.

Exhibit 84: Proposed Natural Gas Pipeline



Source: Bill White, 2014. Alaska Natural Gas Transportation Projects, Office of the Federal Coordinator

Other LNG Production and Transportation

Several other LNG production and transportation initiatives are being, or have recently been, considered. Descriptions of these projects are presented in Exhibit 85.

Exhibit 85: Other Alaska LNG Initiatives

North Slope LNG and the Interior Energy Project: Ideas have been generated for moving North Slope natural gas to the Fairbanks area where energy costs are much higher than in Southcentral Alaska and only a small amount of natural gas is available from Cook Inlet via truck deliveries from a privately owned LNG plant north of Anchorage. In 2013, the Alaska Legislature approved a $333 million cash-and-loan package requested by Gov. Sean Parnell for a small-volume North Slope LNG plant as well as storage and distribution infrastructure in the state's Interior. A year earlier, state lawmakers approved $30 million in tax credits for the LNG storage tanks that the Fairbanks area would need to receive trucked deliveries. In January 2014, the AIDEA board chose global infrastructure firm MWH Americas Inc. to acquire a gas supply from North Slope producers, develop and run the LNG plant at Prudhoe Bay, and find gas buyers in the Fairbanks area. In January 2015, AIDEA and MWH ended their agreement. That leaves the project in limbo as of early 2015.

Southcentral LNG: A Japanese company Resources Energy Inc. is proposing a smaller-scale LNG plant in Southcentral Alaska. As conceived, the smaller-scale plant would cost around $1 billion and make up to 1 million metric tons of LNG per year, or an average of about 133 million cubic feet of natural gas per day, for export to Japan by 2019. In late 2014, the company said its preferred site is Port MacKenzie, across Knik Arm from Anchorage. California-based WesPac Midstream is also looking at building a Port MacKenzie LNG plant, which would be a smaller plant to serve Alaska markets, particularly Fairbanks. The plant capacity would be up to 250,000 gallons of LNG per day, or about 160,000 metric tons a year.

Cook Inlet LNG: Out of concern that aging Cook Inlet fields might not produce enough gas for local needs after doing so for nearly 50 years, in 2011 two Anchorage electric utilities and a gas utility jointly began considering the idea of importing liquefied natural gas or compressed natural gas to Southcentral Alaska. Since then, their sense of urgency has eased as Cook Inlet producers have increased gas production to cover the next several years. In June 2011, the U.S. Geological Survey said that the Cook Inlet region still holds an estimated 19 trillion cubic feet of natural gas that could be produced using current technology.

LNG Pipeline to Alberta: The Pipeline to Alberta project conceived an approximately 1,700-mile, 48-inch buried pipeline from the Prudhoe Bay field on Alaska's North Slope to the British Columbia–Alberta border in Canada. From there, the gas could flow to the Lower 48 via an extensive network of existing pipelines. The gas pipeline would run parallel to the trans-Alaska oil pipeline from Prudhoe Bay to Delta Junction, then continue into Canada roughly parallel to the Alaska Highway. The project is inactive.

LNG Pipeline to Southcentral: The project conceived a 727-mile, 36-inch buried pipeline from the Prudhoe Bay field on Alaska's North Slope to the Big Lake area north of Anchorage. From there, the gas could flow to consumers, utilities, and other industry via the local distribution pipelines of ENSTAR Natural Gas Co. The pipeline also would supply the Fairbanks area. The line would parallel the trans-Alaska oil pipeline from Prudhoe Bay to just north of Fairbanks, then continue south to Big Lake, roughly parallel to the Parks Highway. The project also is known as the "bullet line," the in-state line, and the Alaska Stand Alone Pipeline, or ASAP. Many of its supporters intend the line as a backup plan if the Alaska LNG project does not advance.

Cook Inlet to Donlin Gold Mine: This is proposed to be a 14 inch, 312-mile long buried pipeline to supply gas for powering mining operations, and would have a significant impact on gas movement in-state.

Sources: Cited and adapted from www.arcticgas.gov/guide-alaska-natural-gas-projects; additional information provided by AIDEA

Resource Access Roads

DOT&PF has, over the years, identified many different opportunities for the improvement or development of roads to access Alaska's natural resources. Some of the leading initiatives are summarized in Exhibit 86 and Exhibit 87 below.

Exhibit 86: Resource Access Road Opportunities — Northern Region

Ambler Mining District Industrial Access Project: This project will provide an all-season transportation access road [of approximately 200 miles] to promote exploration, development, and production of known mineral resources in the Ambler mineral belt. This will be an example of private funding where AIDEA will raise the money from the bond market to build the road.

Road to Tanana: This project will provide improved road access to known mineral developments in the Manley region mineral belt to support mining opportunity expansion and resource exploration, plus provide an all-season road to the Yukon River near the community of Tanana. The road will improve access to Tanana by connecting to the Elliot Highway near Fairbanks. Construction began in late 2013 and is nearly complete.

Dalton Highway Traffic Forecast: This is an effort to look into the future to determine what to expect in the future for the Dalton Highway in light of anticipated new activity on the North Slope from shale petroleum and other exploration and production activity. In addition, substantial new traffic is expected as a result of new mine development in the Ambler Mining District and construction and operation of a North Slope LNG plant.

Source: Alaska DOT&PF

Exhibit 87: Resource Access Road Opportunities -- Central and Southeast Regions

West Susitna Surface Access Reconnaissance Study: This is a study to determine what resource developments on the west side of the Susitna River might benefit from surface access—most likely an industrial haul road—and where to route the access, including potential river crossing sites. An initial report is expected in January 2014. Early indications point to resource opportunities that would benefit from surface access, so a follow-up study is anticipated that will refine the economic parameters and lead to a go/no-go decision. For more information, visit the West Susitna site.

Mat-Su Borough, Little Susitna River Access: A $400,000 project to extend a road to the east bank of the Little Susitna River that will enable winter roads on the west side for timber extraction.

LiDAR for Southeast Alaska Corridors: This was a $5 million capital budget item for aerial topographic mapping of transportation corridors in Southeast Alaska. The project began in early FY13 with the selection of corridors and some initial flying. The route from the current highway terminus in Sitka to Katlian Bay was flown in the fall of 2012 and substantial flying is planned for the summers of subsequent years.

Bostwick Road to Vallenar Bay: Funded at $5 million, this project has been re-routed and the work will be done by the Department of Natural Resources Forestry Division, Ketchikan office.

Mill Access Road Upgrade: This $2.5 million project will upgrade 3 miles of single-lane road on Gravina Island between Lewis Reef Road and the site previously occupied by the Seley Sawmill. Bridge evaluation and preliminary work is underway.

Ketchikan to Shelter Cove Road: This project, funded from two voter-approved General Obligation (GO) Bonds, will be ready for construction soon. There will be preliminary resurfacing of an existing road segment, and a reconnaissance report has been published. Right-of-way transactions are underway, along with environmental work and permitting.

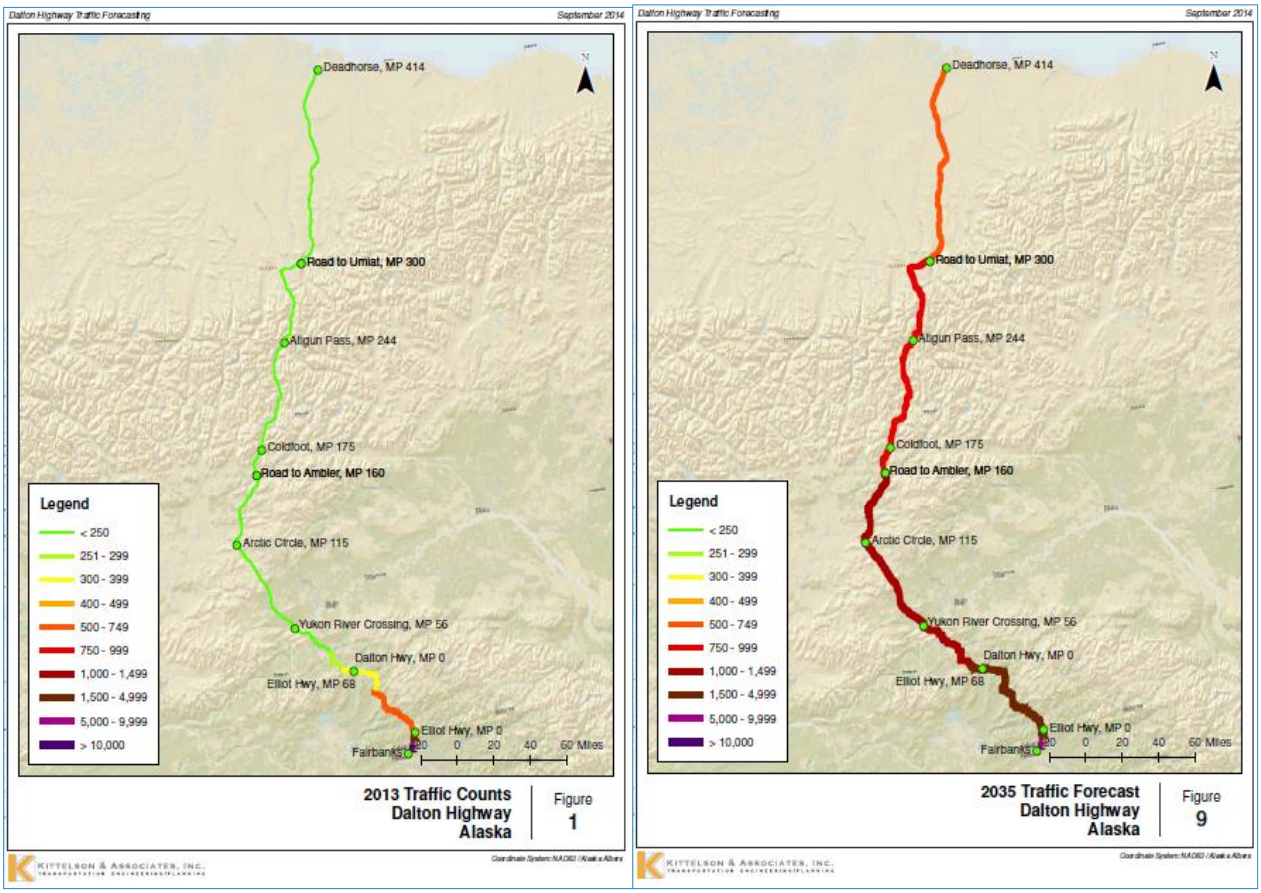
Sitka, Road Extension to Katlian Bay: This project was funded at $14 million in the 2012 GO Bond. A reconnaissance site visit occurred in the fall of 2012 and LiDAR was flown at that time as well.

Source: Alaska DOT&PF

Dalton Highway

As noted in Exhibit 88, the Dalton Highway Traffic Forecast study looks at current traffic volume on the Dalton Highway, as well as potential future demand from expanded North Slope LNG production and from additional mining activity that would use the Dalton Highway for access. The forecast will assist DOT&PF in planning for capital improvements and seasonal maintenance (winter storms and avalanches, summer permafrost melt, etc.) on this critical trucking corridor. Key drivers of future demand growth include an anticipated North Slope LNG refinery; an anticipated North Slope LNG pipeline; increased North Slope oil exploration and production for the Trans-Alaskan Pipeline System; oil and gas exploration in the Alaskan Outer Continental Shelf; shale oil exploration on the North Slope; and resource access road projects. As shown in Exhibit 88, AADT over the full extent of the Dalton Highway could increase substantially by 2035 with implementation of planned and potential resource projects.

Exhibit 88: Dalton Highway AADT (All Vehicle Types), Actual 2013 and Forecast 2035



Source: Dalton Highway Traffic Forecast Study, Kittelson and Associates, September 2014

Mining Access

Planned or proposed access improvements to support new mining activities include the following:

- Livengood Gold Project, located northwest of Fairbanks, is already accessible by road.
- Ambler Mining District (copper, zinc, lead, and gold) will be accessed by the proposed Ambler Mining District Industrial Access Project as pursued by AIDEA.
- Chuitna Coal Project on the west side of Cook Inlet is proposed to move coal outbound through a new port facility.
- Donlin Gold Project, located in southwest around 277 miles west of Anchorage and 145 miles northeast of Bethel, would need to develop a barge landing on the Kuskokwim River, deep-water port improvements at Bethel, a 30-mile road from the barge landing to the mine site, an airstrip, and a pipeline for receiving natural gas.
- Pebble Project (copper, gold, and molybdenum) is located in the Bristol Bay Region, around 17 miles northwest of Iliamna and 200 miles southwest of Anchorage. The project would need to build a deep-water port at Inishkin Bay and a haul road between the port and the mine site.

Other mine-serving transportation improvement concepts include Brooks to Norton Sound Rail (an idea to develop a rail connection between coal fields at the western end of the Brooks Range and a year-round deep-water port at Nome) and the "G7G" Northern Pacific Tidewater Project (which would create a mine and port-serving rail corridor between the Alaska Railroad terminating point at Delta Junction and the Canadian transcontinental rail network at Fort McMurray, Alberta).

Arctic Port

As previously noted, with reduced quantities and frequencies of ice in northern global waters, commercial (U.S. and foreign flag) and military vessel traffic using the Northwest Passage is expected to increase dramatically in coming decades. However, north of Prince Rupert in British Columbia and the U.S. Coast Guard station at Juneau, there are no major ports on this route for vessel servicing, accident and emergency response, regulatory/security enforcement, or military operations.

In response, DOT&PF and the U.S. Army Corps of Engineers co-sponsored the Alaska Deep-Draft Arctic Ports Study as a means of evaluating potential locations for a new port. The study identified Nome as the preferred site. The new port would serve as the northernmost port for the U.S. Coast Guard, Navy, and National Oceanic and Atmospheric Administration; it would provide critical support services to vessels traversing the Northwest Passage; it could potentially serve as a base of vessel operations to support exploration of offshore petroleum reserves; and it could potentially support the inbound movement of industrial machinery and local supplies, along with the outbound movement of oil, gas, and mining products.

Preliminary investigations considered a huge extent of Alaska's Arctic coastline, from Bethel to Prudhoe Bay. Initial screening narrowed the sites to Nome, Point Spencer, and Cape Riley. Nome was ultimately selected as the preferred location. However, the study was suspended in 2015 to allow for a period of economic re-evaluation, as one of the intended justifications – support for offshore oil production – is in question. In 2015, Royal Dutch Shell announced it would be suspending its exploration activities. Given the volatile and cyclic nature of oil production, it is possible that work to advance the concept may be resumed in the future.

Improving Metropolitan Area Freight Movement and Reducing Performance Risks

Reducing truck congestion and improving travel time reliability and safety in urban areas and key corridors is a key performance area addressed in the LRTP, especially for truck moves to/from ports, airports, and other major freight trip generators, and while also accommodating the needs of a changing and growing population increasingly concentrated in urban areas. The policy direction is that DOT&PF will collaborate with other units of government so that freight-related performance is addressed in area and Metropolitan Planning Organization (MPO) plans.

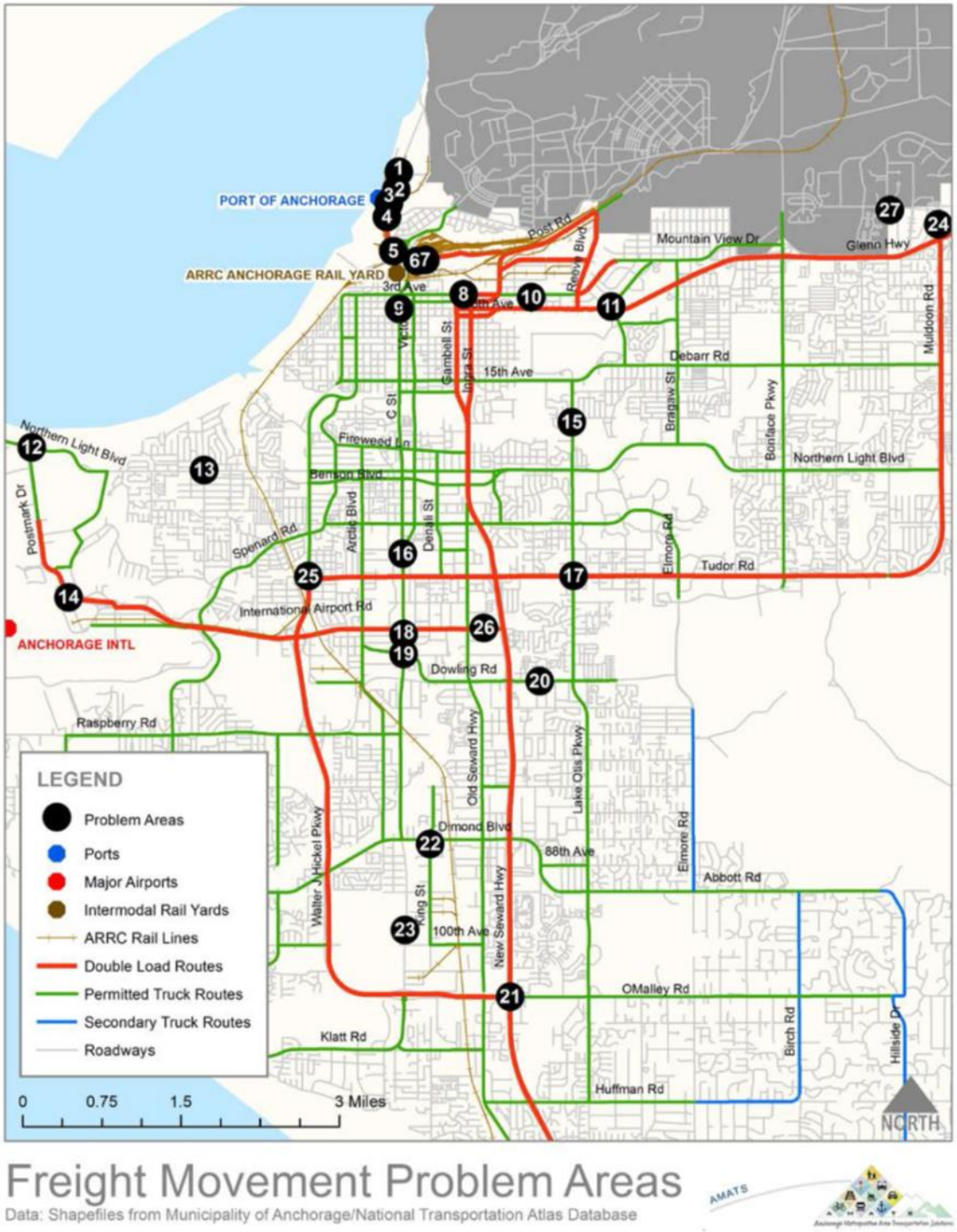
AMATS Region

As part of ongoing planning, Anchorage Metropolitan Area Transportation Solutions (AMATS) has identified a set of "Freight Movement Problem Areas" in Anchorage (see Exhibit 89). For the AMATS region, the draft AMATS Freight Mobility Study[22] provides the following information (italicized text is cited verbatim) on bottlenecks and improvement opportunities:

- ***Water:*** *Although the* Port of Anchorage *(POA) plays a critical role in providing goods for Anchorage and the rest of the state, it needs a number of critical future projects to reduce bottlenecks and improve operations. Current bottlenecks and capacity issues within the POA are a result of existing infrastructure-related deficiencies. The POA suffers from severely corroded docks and wharf piles that are over 40 years old. There is a need for additional petroleum storage at the POA. Approximately one-third of all refined petroleum products used in Alaska come through the POA's valve yard and over the dock (McDowell Group, 2016:9). The majority of the POA's infrastructure has not been updated since it opened in 1961. This weakness in the freight transportation system can have significant repercussions should an emergency (i.e., earthquakes, or extreme weather changes impact these facilities. Most infrastructure age and maintenance issues that cause freight delays and bottlenecks will be addressed through the APMP. This modernization effort will help improve resiliency of port operations in the event of threatening hazards and will optimize the facilities so that the POA can accommodate future growth and market needs for the entire state. The APMP will also reinforce safety, reliable, and cost-effective operations with energy-savings technology. The modernization effort will allow for larger container vessels with new ship-to-shore cranes. Improvements will include increased intermodal access that will also help to prevent water transport delays at the POA*

[22] Draft AMATS Freight Mobility Study, August 2016, pages 46-49

Exhibit 89: Anchorage Freight Movement Problem Areas (AMATS)



Source: Draft AMATS Freight Mobility Study

- ***Port Access Issues**: C Street and POA – 3rd and 4th Avenues.*

- ***Air:*** *TSAIA* (Ted Stevens Anchorage International Airport) *is undergoing a variety of improvements to address current bottlenecks and operational issues. These include utility repairs, improved access to hangers, airfield taxi area widening, airfield pavement reconstruction, and parking area reconstruction. Improvements made to airfield taxi and runway pavements are being designed to address dimensional concerns and to meet Aircraft Design group VI Standards. In terms of intermodal movements at TSAIA, the Air Cargo Related Economic Development Opportunity Assessment (GLDPartners, 2014) identified limited direct cargo movements between air and rail modes within Alaska. This report cited air connectivity to other modes as of great concern for future freight movements in the state and the AMATS region, as increased connectivity would allow for more efficient freight movement (GLDPartners, 2014).*

- ***Rail***: *Rail cargo bottlenecks may be operational or infrastructural. Operational concerns exist at the POA and other intermodal centers in the region, where cargo movement relies on tight schedules. For example, the ARRC tracks function as the loading area when freight exits the POA via rail. This loading process creates delays based on scheduling and loading crew member availability. Additionally, ARRC noted that some of the most significant delays to their operations are related to truck traffic through downtown Anchorage during the commuter rush hour. Delays in truck arrival time currently affect loading and departure times and are expected to continue into the future. Railroad project improvements and expansions may also impede other freight movements. For example, there are a number of at-grade crossings in the AMATS region that not only affect the safety of the overall transportation system, but also constrain the efficiency of freight rail operations.*

- ***Grade-Separated Road/Rail Crossing Issues:*** *C Street and 68th Street Rail Crossing.*

- ***Highway Traffic Signal Issues:*** *Raspberry Road and Airpark Place; C Street and International Airport Road; Hoyt Street (Costco access) and Debarr Road; Boundary Avenue to Glenn Highway; C Street and Ocean Dock Road; and King Street and Dimond Avenue.*

- ***Unresolved Highway Problem Locations:*** *In addition to the list of stakeholder issues identified above, the MOA identified a series of "problem locations" for freight movement in the Anchorage Bowl in 2009. Of these locations, 19 of the 27 problem locations identified have not been resolved to date, including:*
    1. *Ocean Dock Road access and crossing from POA to Terminal Road;*
    2. *Ocean Dock Road and Terminal Road intersection;*
    3. *Ocean Dock Road alignment near POA entrance;*
    4. *North C Street and Ocean Dock Road intersection (multiple railroad crossings);*
    5. *Whitney Road (size, turning movements, no shoulders, trail/pedestrian/fishing concerns);*
    6. *School bus storage area (use not ideally suited, some compatibility concerns);*
    7. *3rd Avenue and Ingra/Gambell improvements (connects to the Ship Creek/POA area);*
    8. *Industrial area circulation and access concerns;*

9. *Postmark Drive and Point Woronzof/West Northern Lights intersection (stop signs, tight intersections, left and right turns);*
10. *Lake Otis Pkwy: Debarr Road to Northern Lights Boulevard (capacity concerns/4-lane transition to 3 lanes at Chester Creek);*
11. *C Street: Tudor Road to 36th Avenue, northbound (capacity concerns);*
12. *Tudor Road at Lake Otis Parkway intersection improvements (capacity congestion);*
13. *C Street at International Airport Road intersection (turning movements);*
14. *New Seward Highway at O'Malley Road interchange;*
15. *King Street at Dimond Boulevard intersection (turning movements);*
16. *Access off the Glenn Highway from Muldoon Road (capacity development for freight);*
17. *Tudor Road and Minnesota Drive intersection;*
18. *International Airport Road extension to the New Seward; and*
19. *Tikhatnu Commons (Best Buy/Kohl's/Lowes) and Muldoon Post Gate (access improvements).*

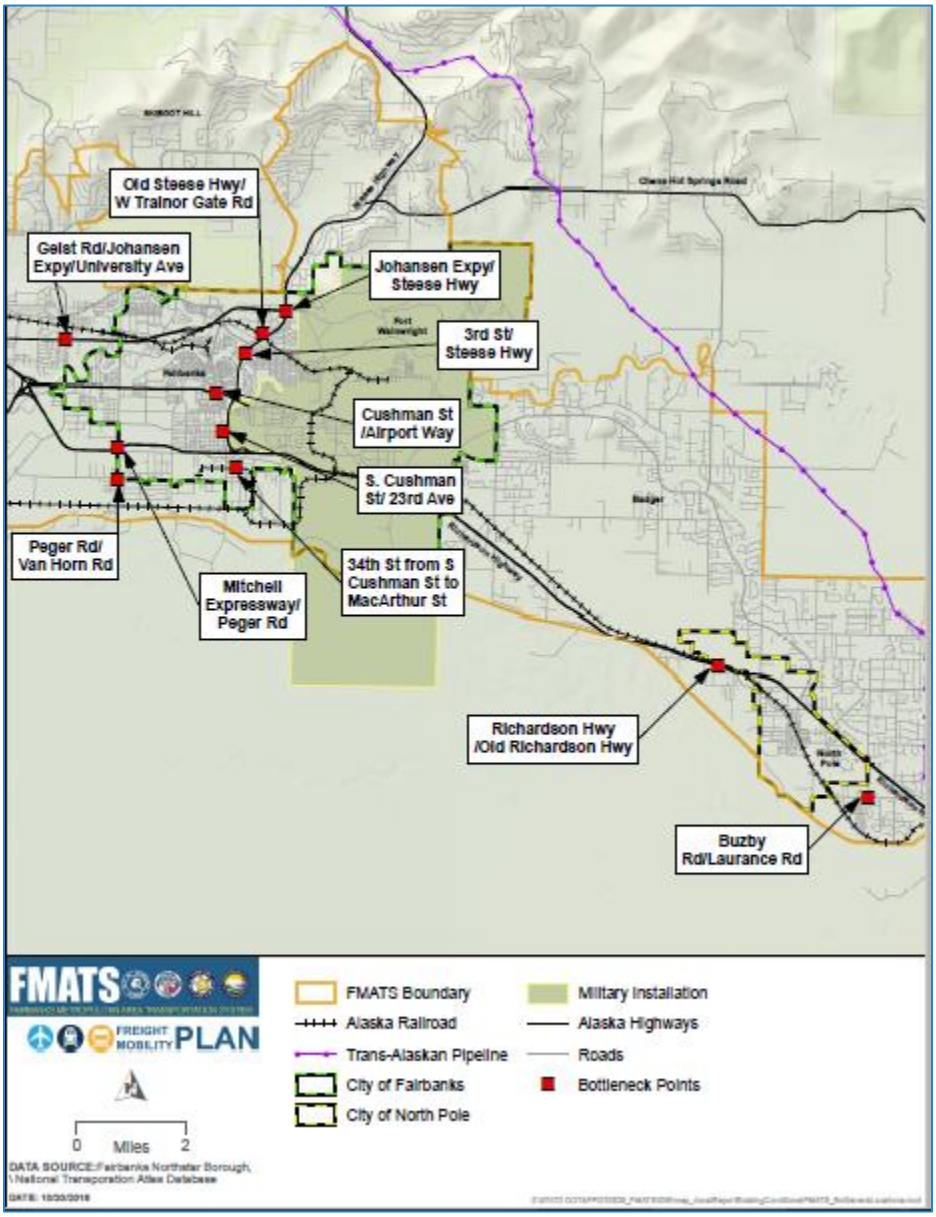
FMATS Region

The Fairbanks Metropolitan Area Transportation System (FMATS) is currently developing a regional freight plan. While a draft document is not yet available, initial investigations and outreach have identified the following concerns and potential bottleneck locations[23], listed below (italicized text is cited verbatim):

- J*ohansen and Steese Hwy Geist and Johansen;*
- *Parks Hwy railroad stops. Steese Hwy as it goes through FBKS;*
- *Railroad crossing on University Ave;*
- *At railroad crossings on Steese Hwy, Old Steese Hwy, and College Rd;*
- *3rd & Steese, University Ave & Johansen Expressway;*
- *Airport west ramp onto Mitchell express way has no merge area (several others in the city);*
- *Everywhere near Home Depot, Johansen & Geist at rush hour;*
- *The rail crossing on University Avenue between Geist Road and College Road;*
- *Sandvik and University;*
- *(New) Steese & Johansen (New) Steese & Airport Road College Road & Old Steese;*
- *The intersection of Peger and Van Horn;*
- *Geist/Parks, Geist/University, Johansen Epy/Steese, Richardson/Airport Way, Steese/ 3rd;*
- *University Ave and ARRC intersection delays; and*
- *University Avenue rail crossing. When a train comes through at 7:40 a.m., traffic can back up on Farmers Loop, Geist Road, Johansen Expressway, College Road and Alumni Drive. Students are rushing to get to class at Hutch and West Valley; other commuters are trying to get to work. It can be a very dangerous bottleneck.*

[23] *Source: AMATS, 10/21/16*

Exhibit 90: FMATS Region Freight Concerns and Potential Bottlenecks



Source: Draft FMATS Freight Mobility Plan

Maintaining and Improving Trade Gateways and Multimodal Corridors

Alaska's seaports, airports, railroads, and land border crossings are the lifelines for producers and consumers. Maintaining and improving their performance are essential for Alaska's economy and the well-being of its population.

Generally, ports, airports and railroads measure performance based on volumes (tonnage, units handled, value handled, vessels or aircraft handled), utilization (tons or units per acre), and financial

returns (profit/loss, return on investment). These are measures that are appropriate to their facilities as independent entities but do not necessarily reflect their role and value within the larger multimodal freight transportation system.

When thinking about the goals of a high-functioning freight transportation system for Alaska—one that is reliable, affordable, fast, safe, secure, and connected—then the performance priorities for trade gateways are as follows:

- **Ensuring the viability and performance of critical marine import gateways that serve Alaska consumers and industries.** Most of Alaska's inbound marine cargo arrives through the Port of Anchorage, but the port's dock infrastructure is suffering from severe corrosion. It is currently 20 years beyond its original design life. While annual maintenance efforts keep the port open and operational, those efforts only provide a temporary fix. Without permanent repairs, POA reports that portions of the docks will have to start shutting down in the next 10 years. An effort is underway to replace the existing docks with new ones built to current seismic resilience standards, which will provide a 75-year design life. Partial funding is in hand and work is underway, but there are insufficient funds to complete the full program. Additionally, the need for truck access improvements to reduce delays and improve reliability has also been identified, both in Ship Creek near the main entrance to the port (to address truck congestion and at-grade rail crossings) and through Anchorage.

- **Ensuring that Alaska's major commodity exporting seaports provide adequate capacity and performance to meet market requirements.** Alaska's leading tonnage export ports (e.g., Valdez, Nikiski, Red Dog Port (Kivalina), Unalaska, Seward, and Ketchikan) all play a role in the state's economy. As previously noted, major expansion at the Port of Nikiski would be required to support the Alaska LNG project. Expansion is also underway at Port MacKenzie, in the Upper Cook Inlet. Port MacKenzie is capable of handling a variety of inbound and outbound products (gravel, coal, wood chips, cement, manufactured products, etc.) and is looking at LNG development and a direct connection to the Alaska Railroad. Port MacKenzie does not appear on the list of Alaska's leading tonnage ports in 2014 (Exhibit 49) because it handled no tonnage that year.

- **Ensuring the viability and performance of critical air cargo gateways.** Ted Stevens Anchorage International Airport is the dominant air cargo gateway. According to the recent Alaska International Airport System Planning Study, the increasing number of aircraft operations at ANC could result in unacceptable levels of runway delay within a 20-year planning horizon. Runway delay means not only late flights, but also increasing unreliability, as aircraft miss delivery windows or airport curfews. One recommendation of the study is to explore capacity improvements at ANC; another is to explore the potential for Fairbanks International Airport to support the state's international air cargo operations.

- **Ensuring some share of air cargo that passes through Alaska's gateways, as part of moves between other countries and the lower 48, undergoes value-added handling** (sorting,

deconsolidation, and consolidation, etc.). This may offer an opportunity to derive greater economic value from pass-through activity.

- **Ensuring safe, reliable, and efficient freight rail operations** as a means of transporting critical commodities and of providing vital connections to Alaska's coastal and inland waterway systems, freight highways, industries, and communities, within a larger multimodal planning framework.

Maintaining and Improving Multi-Modal Connectivity

Maintaining and improving multi-modal connectivity among and between Alaska's urban and rural communities is an essential planning consideration that includes the provision of alternative facilities, services, or modes to improve reliability, cost, and overall performance for rural communities. Alaska's highway system reaches major cities, but its overall mileage is low; many communities are not connected or served by roads. Alaska's freight rail and pipeline systems operate in limited corridors. Alaska's ports serve coastal and river communities, but their ability to serve inland communities is constrained by the availability of other connections. Roads and ports may be usable only in certain seasons when ice stabilizes road surfaces or lack of ice makes marine traffic possible. As a result, Alaska is highly dependent on air cargo to reach and serve communities with commodities that in the lower 48 would normally be served by truck or rail. In some cases, the "last mile" move from an airport is by snowmobile or sled. In most of the U.S., freight shippers can choose from a full range of modal options, selecting those that best suit their needs for reliability, cost, speed, safety, and security. In Alaska, freight shippers may have little or no choice regarding transportation modes.

In part, the lack of modal redundancy results from economic considerations: because of insufficient demand or lack of "economies of scale," in many cases it has been uneconomical to provide anything other than air or water service. However, this can result in emergencies when the available modal system is unavailable due to disruption. There are practical limits to improving modal redundancy for freight service to rural communities, but opportunities should be carefully considered.

Maintaining Critical Connections to Alaska's Military Facilities

Maintaining critical multimodal connections to Alaska's military facilities and ensuring future needs are accommodated is a vital national interest. Key facilities include:

- Fort Wainwright, Eielson AFB, and Fort Greely near Fairbanks
- Joint Base Elmendorf-Richardson at Anchorage
- US Coast Guard Base Ketchikan and Air Station Sitka
- US Coast Guard Marine Safety Unit Valdez and Prince William Sound Vessel Traffic Service
- US Coast Guard Base and Air Station Kodiak
- Clear Air Force Station near Anderson

Addressing Risk and Uncertainty

The Freight Element considers uncertainty and risk. The key areas where these considerations arise are as follows:

- How resource development and other freight drivers might evolve in the future
- Addressing impacts of climate change and increasing climate variability
- Managing freight transportation costs
- Addressing funding uncertainties

Resource Development Questions

The planning process must recognize risks and uncertainties regarding how resource development and other freight drivers might evolve in the future. Improving performance may involve repairing or expanding infrastructure, implementing new technologies or management practices, improving service availability and reliability (reducing seasonal risks, etc.), and/or adopting innovative policy, financing, and implementation approaches.

For example, with respect to resource development, the question of performance is largely binary: if transportation improvements are provided, the resource can be produced and moved to market; if not, then nothing can happen. Alaska's approach has been that the beneficiaries of resource-driven transportation improvements should be primarily responsible for the cost of those improvements. When Alaska's public agencies are not financially invested, they are still critical decision-makers in the approval and implementation process. Resource development markets are highly volatile and subject to global pricing and competitiveness factors; those pressures may delay the implementation of certain projects or accelerate the timeline for others.

The discussion on population growth demonstrates the significant role resource development has played in Alaska's in-migration and overall economic growth. Whatever the State of Alaska, federal regulatory agencies, and private investors agree to and accomplish with respect to resource development will undoubtedly have significant impacts on Alaska's freight volumes and freight transportation needs.

Climate Change and Disruption

Climate change is expected to affect Alaska disproportionately because of its unique geographical location. In the past 50 years, average temperatures have increased twice as fast as in the contiguous U.S.[24], with interior regions experiencing the most rapid increases. [25] Over this period, precipitation has increased by 10% on average,[26] except in the Arctic where large decreases have been observed. Freezing

[24] Karl, T. R., Melillo, J. M., and Peterson, T. C. (2009). *Global Climate Change Impacts in the United States*. *Society*.
[25] Markon, C. J., Trainor, S. F., and Chapin, F. S. (2012). *The United States National Climate Assessment - Alaska Technical Regional Report*. Reston, Virginia, 148
[26] Wendler, G., and Shulski, M. (2009). "A Century of Climate Change for Fairbanks, Alaska." 62(3), 295–300.

and thawing cycles are changing, and the permafrost is degrading from increased temperatures.[27] The Arctic is warming faster than anywhere else in the world, which is causing significant reductions in ice formation on sea and land. It is expected that by 2037, there will be no sea ice left during summer.[28] These changes to Alaska's climate, geography, and geology are expected to affect freight transportation in the following ways:

- Changes in permafrost near the Arctic will reduce the amount of time during the year that ice roads are passable.[29]
- Increased coastal extreme weather events will accelerate coastal erosion. This, combined with rising sea levels (small in this part of the world) and soil subsidence, is likely to force the relocation of communities. There are an estimated 180 coastal communities in Alaska that are at risk for erosion. Of these, the state has identified six that are in immediate jeopardy and may require relocation.[30]
- The melting of Arctic sea ice will lead to the opening of the Northwest Passage, which presents new opportunities and challenges for international shipping.
- More frequent extreme precipitation events are likely to accelerate asset deterioration.

Cumulatively, these effects are likely to exacerbate seasonal fluctuations in freight demand and freight infrastructure availability, as described in the *Critical Freight Trends* section. They may also lead to permanent changes in Alaska's economy and its freight transportation infrastructure.

Incorporating climate change impacts into the planning processes will help mitigate the effects of many of these environmental factors on freight infrastructure. Designing according to historical standards might not be appropriate in many cases, as forecasts of storm frequency and strength could be higher. The resiliency of the infrastructure is therefore an important consideration in planning, design, and benefit-cost evaluation. Alaska has many transportation links on which disruptions would affect a large proportion of the state's population or economy. Efforts should be made to forecast potential impacts while keeping in mind the uncertainties involved in climate models and the risk tolerances of local communities. Infrastructure that is already built should be monitored often to see how it might be affected in order to increase certainty and react more quickly to adverse impacts.

Significant research has been conducted to understanding how climate change will affect Alaska. Much of this work has been sponsored by the Alaska government, which has been proactive on these issues. In 2007, the governor of Alaska created a Climate Change Sub-Cabinet to develop policies for adapting to and mitigating climate change and outlining future research needs. This group authored the Adaptation

[27] Markon, C. J., Trainor, S. F., and Chapin, F. S. (2012). *The United States National Climate Assessment - Alaska Technical Regional Report*. Reston, Virginia, 148

[28] Markon, C. J., Trainor, S. F., and Chapin, F. S. (2012). *The United States National Climate Assessment - Alaska Technical Regional Report*. Reston, Virginia, 148

[29] Clement, J. P., Bengston, J. L., and Kelly, B. P. (2013). *Managing for the Future in a Rapidly Changing Arctic: A Report to the President*. Washington, D.C., 59.

[30] Connor, B., and Harper, J. (2013). "How Vulnerable Is Alaska's Transportation to Climate Change?" *TR News*, Washington, D.C., (284), 23–29.

Advisory Group Draft Final Report in 2009 which provided a preliminary assessment of various adaptation strategies. However, this report only addressed freight needs indirectly; if and when it is updated, a more extensive treatment of freight would be useful.

Addressing recurring climate-related and geologic disruptions (e.g., icing of harbors and rivers, melting of winter roads, avalanches, debilitating storms, fires, floods, and earthquakes) is already part of "normal" planning for DOT&PF and other Alaska infrastructure owners and operators. Disruptions that might occur once in a decade in the lower 48 are business as usual for Alaskans. Nevertheless, these represent significant risks to system operations, and the state incurs significant costs in preparing for and addressing them. With climate change, the frequency of disruptive events will likely increase.

Managing Transportation Costs

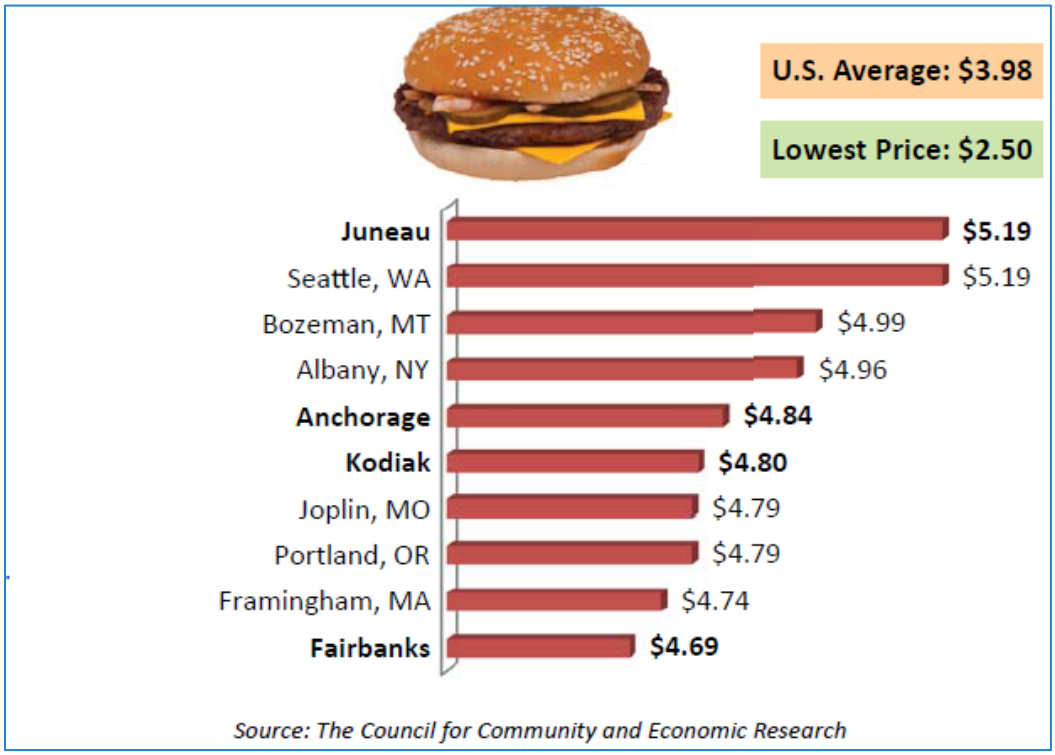
Alaska has some of the highest costs of living and conducting business in the U.S., primarily because of high transportation costs. This results from the large size of the state, its difficult geography, and the relatively small population that lives there. There are relatively few users for the freight transportation assets that exist, which does not allow for economies of scale to reduce unit transportation costs, as is the case elsewhere in the U.S. The costs for industrial materials and consumer goods are well above national averages.

With a high dependence on goods imported from other states and countries, a high dependence on air cargo (one of the most expensive forms of freight transportation), and long supply chain distances within the state, the cost of goods in Alaska tends to be very high. Without "bypass mail" service, where rural air cargo is delivered at 4th class postal rates, the cost would be even higher.

Exhibit 91 shows the "Quarter Pounder Index" that is often used as an informal measure of the cost of everyday consumables. By this measure, four of the ten most expensive locations for which data is available in the U.S. are located in Alaska.

Anchorage ranks fifth on the "quarter pounder" index, and its annual grocery costs are an estimated 1.285 times the national average. Alternatively, if you consider Anchorage to have an indexed cost of 1.00, then the US average is 0.88. Anchorage has the lowest food costs in Alaska, and other Alaska communities have food costs that are double the U.S. average, in large part due to the cost of transporting these goods.

Exhibit 91: Cost of a McDonalds "Quarter Pounder" in the First Quarter of 2016



Source: Alaska Economic Trends, July 2016

Exhibit 92: Alaska Prices of Food, March 2016

Community	Food at Home for a Week	Relative to Anchorage
Anchorage	$170.40	1.00
Cordova	$282.40	1.66
Delta	$247.20	1.45
Fairbanks	$190.30	1.12
Haines	$240.20	1.41
Kenai	$200.10	1.17
Ketchikan	$216.70	1.27
Mat-Su	$185.20	1.09
Portland, OR	$160.50	0.94
Sandpoint	$337.50	1.98
Sitka	$231.40	1.36
U.S. average	$149.20	0.88

Note: The weekly cost for a family of four with children ages 6 to 11

Source: University of Alaksa Fairbanks, Cooperative Extension Service

Source: Alaska Economic Trends, July 2016

Energy costs are another important concern, as many Alaskan communities depend on barges or even aircraft to supply them with motor vehicle fuel and heating fuel. Exhibit 93 shows the costs of heating fuel and gasoline at many communities throughout the state. Communities served by trucking generally enjoy the lowest costs, while communities dependent on barge or air generally see the highest costs.

Exhibit 93: Alaska Energy Prices by Mode of Transportation, January 2016

Selected Communities[1]	Heating Fuel #1 Residential	Gas, Regular
Angoon	$3.55	$3.55
Arctic Village	$12.00	$10.00
Atka	$6.85	$7.65
Barrow	Natural Gas	$6.50
Bethel	$5.67	$5.75
Chignik	$3.25	$4.38
Circle	$2.45	$3.70
Deering	$4.89	$5.15
Dillingham	$3.57	$4.75
Eagle	$4.25	$5.00
Fairbanks	$2.32	$2.67
Galena	$6.21	$6.81
Gambell	$5.25	$5.65
Golivin	$5.00	$5.00
Holy Cross	$5.55	$6.00
Homer	$2.35	$2.56
Hooper Bay	$6.45	$6.25
Huslia	$6.50	$5.75
Juneau	$3.15	$3.20
King Cove	$3.37	$4.51
Kokhanok	$7.00	$7.00
Kotzebue	$3.16	$6.09
Nenana	$2.69	$2.69
Noorvik	$6.56	$7.87
Nuiqsut	$2.05	$5.00
Nulato	$4.45	$5.40
Pelican	$3.43	$3.46
Pilot Station	$7.32	$5.25
Port Lions	$3.45	$3.75
Ruby	$3.70	$5.40
Sand Point	$4.48	$4.26
Unalaska	$3.54	$3.90
Wales	$7.21	$8.24
Wrangell	$3.85	$3.66

[1]This is just a partial list of the 100 communities surveyed.

Source: Alaska Department of Commerce, Community, And Economic Development, Current Community Conditions: Fuel Prices Across Alaska, January 2016 Update

Source: Alaska Economic Trends, July 2016

It is doubtful whether Alaska costs can be reduced to levels found in the lower 48, but the provision of efficient multi-modal freight transportation will go a long way to ensure those costs are as low as possible. Ultimately, it will be necessary for Alaska to address needs and seize opportunities within the context of projected constraints in state funding, along with uncertain federal assistance.

Transportation Funding

Much of Alaska's infrastructure is aging, and the costs to keep the system in operation are increasing. At the same time, system expansion and modernization will be required. The good news is that some of Alaska's freight infrastructure is privately-owned, self-funded from revenue streams, or built through public-private partnerships administered through AIDEA and other public partners. The bad news is that much of Alaska's freight infrastructure is funded through traditional transportation state and federal funding sources that are both projected to decline.

Alaska's budget comes from very different sources than the rest of the U.S. Around half comes from taxes and royalties on the extraction of petroleum, mostly from North Slope oil fields. This represents over 90% of discretionary funds available to the state. Having such a large fraction of revenues come from a single source exposes the state to significant funding uncertainty. Revenues are tied to the price of oil in international markets, which has fluctuated considerably in recent years. Additionally, recent regulatory changes (including Senate Bill 21) have reduced state revenues from petroleum, especially when prices drop. This bill was introduced in the hopes of spurring new resource exploration and economic growth. In 2009, the Alaska Transportation Finance Study[31] recommended that the state increase fuel taxes, vehicle registration fees, and vehicle sales taxes, as well as encourage local governments to impose sales taxes. However, this approach to revenue enhancement has not advanced. At the federal level, the shortfalls at the Highway Trust Fund will continue to increase competition for scarce resources from around the country. Further compounding the problem, construction costs in Alaska have increased rapidly over the last few years. Current budgets are insufficient, leading to an accumulation of deferred maintenance costs from aging infrastructure.[32] This is a common problem throughout the U.S.; in some cases, the budget is only sufficient to fund maintenance, to the exclusion of new projects.

Generally, Alaska's freight infrastructure is funded through the following mechanisms.

- **Roads:** The traditional funding source for road projects in Alaska, or elsewhere in the U.S., is the Highway Trust Fund. This is managed by FHWA and follows processes laid out in national transportation policies, including the FAST Act. It represents the bulk of roadway funding, but other non-traditional sources are becoming more relevant with constrained budgets. One of these alternatives, which has not been used significantly in the past for transportation projects, is the issuance of State General Obligation Bonds; another is the use of Grant Anticipation Revenue Vehicle Bonds to pay for projects that have already received federal funds. Impending funding shortfalls have increased interest in partnering with the private sector to build strategically

[31] Alaska Municipal League, Alaska Transportation Finance Study, January 2009.
[32] Alaska Municipal League, Alaska Transportation Finance Study, January 2009.

important projects for the state. So far, Private-Public Partnerships have been used in specific projects, but not widely, throughout Alaska for several reasons. Foremost, involving the public sector usually delays new construction or upgrading projects considerably. If federal funds are used, project timelines tend to grow even more. It is not atypical for new road sections to take five to seven years from concept to opening. In contrast, the private sector desires to operate on much faster schedules. Moreover, for these arrangements to be successful and coordination to be possible, the private sector needs to be comprised of one or a few firms that have closely aligned objectives.

- **Airports:** Most airport capital expenses are funded through the federal Airport Improvement Program. This program is supported by the Airport and Airway Trust Fund, which collects taxes on passengers, air cargo, and aviation fuel. To receive these funds, airports are often required to be open year-round, which is an issue in some places of Alaska where travel demand is highly seasonal. These funds cannot be used to pay for maintenance and operations costs. Most non-primary airports (less than 10,000 passenger enplanements) receive operational subsidies from DOT&PF, which has been unable to fully fund all airports in recent years.[33] The Ted Stevens Anchorage International Airport 2014 Master Plan Update recommended that capital projects be financed with grants and revenues from operations. The grants could come from the FAA's Airport Improvement Grants and other federal sources. Airport revenues could come from facility charges and airport revenue bonds. This Master Plan stresses that no improvement project needs to be financed with general state funds. Many states have created their own airport improvement grant programs, but Alaska has not. These funds typically collect revenues from user fees and distribute them to public-use airports. Introducing this program has been contemplated in Alaska.

- **Railroads**: Rail capital projects in Alaska are funded by a mix of federal, state, and private sources. The Federal Railroad Administration has provided significant funds over the years, but the total amount fluctuates considerably from year to year. For federally funded projects, the state typically has provided 9% to 25% matching contributions from the state-owned Alaska Railroad Commission (ARRC). In addition, the ARRC also makes their own internal investments without matching funds and issues bonds that are repaid with Federal Transit Administration formula funds. ARRC receives no state funding for operations, but does receive state funding for capital projects.

- **Ports:** Some of Alaska's ports are privately operated and self-funded. Others, such as the Port of Anchorage (which is owned and operated by the Municipality of Anchorage), are funded in part through internal operating revenues but also require local, state, and federal funding support for capital projects. Federal funding for port improvements can be extremely difficult and time-consuming to obtain; the types of improvements that are eligible for federal funding are very limited; the budget of the U.S. Army Corps of Engineers is chronically and consistently underfunded by Congress; and the Corps is subject to a variety of internally and externally imposed procedures

[33] Alaska Aviation System Plan

for project analysis and funding prioritization. Some funding for the AMHS is recovered through operating revenues, but the majority of its funding comes from the state's General Fund.

- **Pipelines**: Pipeline infrastructure is typically privately built, except in the case of utility services (gas, etc.) to Alaska residents.

The question of funding for freight improvements is largely inseparable from the overarching question of funding for Alaska's transportation system as a whole, but it does have one important distinction: freight investments generate economic returns for Alaska in the form of industry productivity, reduced consumer costs, and job creation. There is a direct and observable payback to Alaska from its freight transportation investments.

Looking ahead, the key opportunities combine revenue enhancement and cost management: increased use of private funding and public-private partnership structures in cases where private interests benefit from transportation investments; procedures to identify annual freight needs and annual funding; strategies to increase the total combined pool of state and federal funds; and a strategy for prioritizing public investments in maintenance and new construction for freight facilities.

FREIGHT GOALS, POLICIES, AND ACTIONS

The LRTP includes goals, policies, and actions for the freight transportation system. These align outcomes, plans, and projects based on performance-based resource allocation; manage the system to increase performance and reduce risk; and provide accountability for the expenditure of public funds.

Freight movement is a partnership between public and private freight shippers, carriers, infrastructure owners and operators, and all levels of regulatory and financing responsibility—federal, state, regional, and local. No single entity or agency "controls" freight movement in Alaska, or can on its own define its future. Nonetheless, among all state agencies, DOT&PF is best positioned to provide statewide multi-modal leadership and "stewardship of the whole," given that it owns and operates much of the state's freight transportation system (including roads, airports, and marine services).

In this section, freight-related goals, policies, and actions developed as part of the larger LRTP process are presented. These goals, policies, and actions are designed to respond to Alaska's freight drivers, system conditions, critical trends, and needs and opportunities, and were crafted with substantial input from a wide range of public and private-sector stakeholders.

LRTP Goals, Policies, and Actions

The Policy Plan of the Long-range Transportation Plan provides the overall umbrella for statewide transportation planning, under which the Freight Element falls. The direction for the plan is applicable to this Freight Element:

1. Align outcomes, plans, and projects based on performance-based resource allocation
2. Manage the system to increase performance and reduce risk
3. Increase revenue and provide accountability

The goals, policies, and actions described below implement each of these strategies. It is also important to note that based on the Freight Element analysis, much of the Policy Plan goals, policies, and actions in themselves address freight performance.

Freight Policies

The LRTP includes freight-related policies addressing New Facilities and Modernization; System Preservation; System Management and Operations; Economic Development; Safety and Security; Livability, Community, and the Environment; and Accountability for Transportation System Performance.

1 New Facilities and Modernization

Develop new capacity and connections that cost-effectively address transportation system performance. Make the existing transportation system better and safer by applying state-of-the-art technologies and

techniques that support productivity, improve reliability, and reduce safety risks to improve performance of the system. The policies and actions that follow apply to both new facilities and modernization policy areas.

Policy 1.A: Develop the multimodal transportation system to provide safe, cost-effective, and reliable accessibility for people and freight.

- We will identify multimodal solutions and regional priorities for the development of the transportation system through area, corridor and modal plans that appropriately and realistically address the values of communities and stakeholders.
- We will address efficient intermodal connections between roads, airports, rail, harbors, transit terminals, and bicycle and pedestrian facilities through area, corridor and modal plans to improve asset utilization, safety, reliability, and the cost-effective movement of people and freight.
- We will evaluate projects for funding by considering the overall benefits and costs to the State in meeting Long-Range Transportation Plan New Facilities and Modernization goals.
- We will ensure investments for rural and non-rural Alaska are evaluated through a decision-making methodology applicable to their circumstances.

Policy 1.B: Prioritize new construction projects by considering overall benefits and costs over time to the State as the key consideration.

- We will continue to add new strategic links to the system based on their benefits and costs in improving access, connectivity, and efficiency, as well as their resulting economic benefit.
- We will reduce the vulnerability of the Alaska Transportation System to safety and security risks from seismic events, climate change, and man-made disasters by incorporating those considerations in project development.

Policy 1.C: Upgrade and modernize passenger and freight transportation systems to increase productivity and reliability, and to reduce safety risks.

- We will invest in modernizing and upgrading facilities based on the expected impact of these projects on asset condition, reliability, and safety.
- We will continue to consider all approaches: use of new technologies, travel demand management, coordination with land use and development control, and nontraditional approaches to modernizing the Alaska Transportation System.
- We will continue to support the modernization and improvement of transit systems in Alaska.

2 System Preservation

Manage the Alaska Transportation System to meet preservation performance targets and acceptable levels of service for all modes of transportation.

Policy 2.A: Apply asset management best practices to preserve the existing transportation system.

- We will strengthen our asset management systems and practices, including those for highway and airport pavements, and bridges. We will add culverts and other assets when it is cost effective.
- We will reduce the risks due to the limited redundancy in the Alaska Transportation System from natural disasters, climate change, and other events through corridor planning and our asset management plan.
- We will work toward optimal life-cycle management practices for all assets and capital equipment.
- We will coordinate with MPOs when establishing performance targets for asset management of the federally funded surface transportation system.
- We will improve and use our management systems to support our asset management plan.
- We will address failed and failing assets using a risk-based approach, recognizing that we cannot afford full reconstruction or replacement of the growing backlog of such assets.
- We will support local governments in Alaska in meeting federal transit asset management requirements.
- We will monitor and report annually via Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS) reporting, the condition of our bridge and pavement assets.

Policy 2.B: Increase understanding of, and communicate DOT&PF's responsibilities for, system preservation as the owner of highways, airports, harbors, marine terminals, and vessels.

- We will monitor and report annually, to the extent practicable, the condition of our assets.
- We will adhere to the reporting timeframes established in the Final Rule for National Performance Management Measures.
- We will communicate the anticipated level of service and predict future system conditions based on the planned allocation of funds for preservation and maintenance treatments.
- We will address bicycle and pedestrian needs as a part of system preservation and modernization.
- We will establish and communicate our performance metrics and targets, planned funding levels, and prioritization framework for asset preservation to the general public.

- We will consider the performance of passenger and freight movement in system preservation decisions.

3 System Management and Operations

Manage and operate the system to improve operational efficiency and safety.

Policy 3.A: Ensure the efficient management and operation of the passenger and freight transportation system.

- We will preserve transportation corridors and pursue corridor management.
- We will increase understanding of, and communicate DOT&PF's operational responsibilities for, highways, bridges, airports, and vessels.
- We will support cost-effective and sustainable efforts by the Alaska Railroad, local public transit providers, and regional entities that improve the department's ability to manage and operate its facilities.

Policy 3.B: Use technology and Intelligent Transportation Systems where cost-effective.

- We will deploy Intelligent Transportation Systems that increase asset utilization and transportation system capacity, and reduce safety and security risks.
- We will follow national developments in intelligent infrastructure and connected and autonomous vehicles, and seek opportunities to cost-effectively and sustainably apply changing technology in Alaska.
- We will follow commercial development in unmanned aerial technologies and evaluate their application for use in Alaska's rural and remote areas.
- We will apply research results and technology transfer to our design, construction, and maintenance practices to reduce costs and improve efficiency and safety.

4 Economic Development

Promote and support economic development by ensuring safe, efficient, and reliable access to local, national, and international markets for Alaska's people, goods, and resources, and for freight-related activity critical to the State's economy.

Policy 4.A: Identify new construction and modernization needs that address travel demand growth, economic development, travel and tourism needs and funding strategies through area and metropolitan plans.

- We will monitor and plan for acceptable levels of mobility and reliability to support the Alaska economy.

- We will target system development investments based on their benefits, costs, and sustainability in supporting market-driven economic development.
- We will cooperate with federal and tribal partners in the programming of projects developed through tribal LRTPs and federal land management agency LRTPs, and funded through Tribal Transportation Program, Federal Lands Access Program and Federal Lands Transportation Program.
- We will continue to include a Freight Element in the Statewide Long-Range Transportation Plan to identify transportation infrastructure barriers to economic development.

Policy 4.B: Preserve and operate Alaska's multimodal transportation system to provide efficient and reliable access to and from local, national, and international markets to support economic development goals.

- We will focus on preserving and modernizing the existing system while recognizing that system development is also necessary in Alaska.
- We will maintain and operate the system to provide acceptable reliability and performance.
- We will provide safe, secure, reliable, and cost-effective freight transportation infrastructure for Alaska's freight shippers, receivers, and communities to support Alaska's economic vitality and growth.
- We will monitor climate change to plan for its impacts on transportation-related economic development.
- We will preserve and identify cost-effective opportunities to increase freight modal choices available to rural communities.

5 Safety and Security

Improve transportation system safety and security.

Policy 5.A: Improve transportation system safety in Alaska.

- We will use new technology to improve safety for people and freight through Alaska's Intelligent Transportation Systems Architecture and related use of new technology.
- We will address airport safety and the role of aviation in ensuring health and safety across Alaska in DOT&PF's aviation system plan.
- We will ensure safe transportation by means of timely compliance with national and federal safety standards.

Policy 5.B: Work with federal, local, and state agencies to provide a safe, secure, and resilient transportation system and emergency preparedness for all modes.

- We will improve system resiliency of freight and passenger transportation to reduce the safety and security risks of natural events such as earthquakes, climate change, and man-made disasters (e.g., accidents).
- We will address the security of airports, vessels, rail, and highways in our operating plans, manuals, and guidelines.
- We will partner with other governmental agencies, private and public transportation providers, and their customers to address security.
- We will address security and resiliency as part of our emergency preparedness and response planning.
- We will address security and resiliency as we plan and develop infrastructure projects.
- We will apply technology to improve security and resiliency in all transportation modes.

6 Livability, Community, and the Environment

Incorporate livability, community, and environmental considerations in planning, delivering, operating, and maintaining the Alaska Transportation System.

Policy 6.A: Address quality-of-life, livability, and community considerations in the Statewide Long-Range Transportation Plan, area and corridor plans, asset management, and other plans and project investment decisions.

- We will continue to emphasize effective public involvement, consultation, and cooperation with local units of government, tribal governments, stakeholders, and local communities in the development of transportation plans at all levels.
- The State will consider the formation of Regional Transportation Planning Organizations as appropriate.
- We will recognize the critical role of transportation in all aspects of quality of life.
- We will address livability and community considerations in project development and work with local governments for roads that are managed to serve local and regional mobility needs.
- We will consider the accessibility needs of mobility-impaired individuals, including the senior population, in designing facilities.

Policy 6.B: Preserve the integrity of the ecosystems and the natural beauty of the State, limit the negative impacts, and enhance the positive attributes – environmental, social, economic, and human health – from the Alaska Transportation System.

- We will evaluate and consider environmental outcomes in area plans, modal plans, and project development.

- We will approach transportation planning and project development to minimize adverse environmental, economic, or social impacts on the State and its traveling public.
- We will support Planning and Environmental Linkage where appropriate and consider Programmatic Mitigation Plans and efforts during the planning process.
- We will use the area and modal planning processes to consult with resource agencies in the early identification of environmental sensitivities, avoidance areas, and potential mitigation measures.
- We will monitor the issues and assess the actions we can take to address climate change concerns.
- We will promote environmentally friendly, affordable transportation solutions.

Policy 6.C: Support energy conservation, specifically in our consumption of fossil fuels to address climate change.

- We will implement strategies for energy conservation of our transportation system that are identified in area plans, metropolitan plans, and community plans.
- We will support transit, ride sharing, trip reduction, non-motorized transportation, and the use of alternative fuels where economically feasible.
- We will continue the State's role in establishing and supporting coordinated community transit systems.

Policy 6.D: Develop transportation plans in close coordination with local communities to ensure transportation investment decisions reflect Alaskans' quality of life values.

- We will coordinate with local jurisdictions to provide transportation enhancements such as waysides, trailheads, and trails for residents and visitors as funding becomes available.
- We will coordinate with and support local land use planning to ensure livable communities.
- We will encourage local jurisdictions to make transportation investment and land use decisions that protect the efficient functioning of the highway system.

7 Transportation System Performance

Ensure broad understanding of the level, source, and use of transportation funds available to DOT&PF; provide and communicate the linkages between this document, National Goals and Performance Measures, State Performance Targets, area transportation plans, asset management, other plans, program development, and transportation system performance.

Policy 7.A: The statewide plan will provide the framework from which DOT&PF sets investment priorities.

- We will monitor, forecast, and report transportation system performance with an emphasis on the federally funded surface transportation system.
- We will embrace a results-based alignment for performance-based planning and budgeting.
- We will promote and work to improve coordination between public transportation and human services transportation.
- We will use best practice techniques and technology for involving public and private sector stakeholders in the transportation planning and funding process.

Freight Actions

The LRTP includes 40 specific freight actions designed to implement and advance these strategies and policies. Many of the full set of Goals and Actions included in the Policy Plan address all users of the transportation system and therefore address the freight travel demands and associated trends analyzed in this Freight Element. The actions that address freight, and that were informed by technical analysis and stakeholder input, are listed in Exhibit 94 through Exhibit 100.

Exhibit 94: Freight Actions—New Facilities and Modernization

LRTP Action #	Description
1.1	Focus State surface transportation finance responsibilities on the Interstate, Non-Interstate National Highway System, Alaska Highway System, and other high-functional class routes.
1.2	Establish an approach to better align needs analyses in area plans and other transportation plans with goals for surface transportation using a performance based approach to planning-level project evaluation.
1.3	Continue to participate in U.S. Army Corps of Engineers ports planning and federal efforts to monitor and plan for increased Arctic maritime traffic and the transportation infrastructure needs that it may generate for Alaska.
1.6	Incorporate demand management and multimodal solutions into transportation plans at all levels.
1.8	Monitor and regularly evaluate performance of the Alaska Transportation System in meeting freight demand as part of the statewide transportation planning process on an ongoing basis (this Statewide Long-Range Transportation Plan establishes a Statewide Freight Vision and identifies a framework for the Alaska Freight Transportation Network).
1.9	Establish a formal methodology to evaluate freight projects using cost-effectiveness as a key criterion and provide for consistent application in area and modal plans.
1.10	Implement and adapt to new technologies applicable to Alaska, such as Intelligent Transportation Systems, NextGen aviation technologies, and others, to improve asset utilization, system productivity, and reduce safety risks.
1.11	Maintain and report core freight-related multimodal performance measures to inform system expansion and upgrading decisions. Through the Freight Element, establish FAST-compliant highway metrics reflecting system performance, user experience, and other factors based on readily available information. Identify metrics for other freight modes that are available today or that could be developed in the future.

Exhibit 95: Freight Actions—System Preservation

LRTP Action #	Description
2.1	Establish Asset Management Plans for DOT&PF bridges and pavements. o Support consistency in area plans to address overarching asset management plans.
2.2	Implement a formal and consistent process for linking the asset management plans for pavement, structures, vessels, airports, and where applicable, ancillary assets to capital project selection and scope.
2.3	Implement a formal and consistent process for linking asset management plans to DOT&PF's capital improvement program and Statewide Transportation Improvement and Airport Improvement Program(s) development.
2.4	Strengthen analytical and reporting capabilities, including supporting data reliability and accessibility, to support asset management planning and federal reporting.
2.5	Work toward coordination of maintenance activities and the timing of work performed through DOT&PF's Capital Improvement Program process through incorporation of maintenance considerations in asset management plans.
2.6	Work with the U.S. Army Corps of Engineers and other agencies to ensure that federal responsibilities for maintaining navigation channels are met in an adequate and timely manner.

Exhibit 96: Freight Actions—System Management and Operations

LRTP Action #	Description
3.1	Address corridor preservation and access management in area, corridor and local plans to preserve the transportation system.
3.4	Support broader use of Intelligent Transportation System technologies in the truck freight network to improve routing, coordination, reliability, and overall system efficiency.
3.5	We will collaborate with MPOs and coordinate with their Intelligent Transportation Systems plans to establish regional approaches.

Exhibit 97: Freight Actions—Economic Development

LRTP Action #	Description
4.1	Support and facilitate Alaska's continued economic development and growth by providing access to new resource development areas, new intermodal infrastructure, and other major freight generating projects through the private development of required transportation infrastructure, and where public investments are required, recover those costs from the proceeds of resource development.
4.2	Work with the Alaska Industrial Development and Export Authority and other partners to coordinate funding and development opportunities for freight transportation facilities and supporting economic development.
4.3	Monitor and take all available actions for the continuation of the U.S. Postal Service bypass mail program.
4.4	Implement the freight rail policy and plan priorities established by the State Rail Plan.

Exhibit 98: Freight Actions—Safety and Security

LRTP Action #	Description
5.1	Address the safety goals and implement the strategies established in the Alaska Strategic Highway Safety Plan and subordinate safety plans.
5.2	Identify the facilities that present the greatest risks from lack of redundancy in Alaska's primary transportation corridors and appropriate risk response strategies.
5.3	Address lack of redundancy and climate change resiliency in asset management plans, project identification, and prioritization within area, corridor and metropolitan plans.
5.4	Incorporate emergency freight management in Alaska's emergency response plan.
5.5	Work with federal partners to streamline and reduce the cost of security measures related to international trade.

Exhibit 99: Freight Actions—Livability, Community, and the Environment

LRTP Action #	Description
6.1	Align project design elements with the project purpose.
6.2	Implement the process and methods required for the early identification and evaluation of environmental outcomes in area and modal planning.
6.3	Review industrial and resource roads and alternative mechanisms to fund them.
6.4	Work cooperatively with federal agencies and industry partners to support practical strategies that reduce fuel consumption and emissions from freight movement through a combination of improved logistics, higher efficiency, lower emission vehicles, and/or alternative fuels.
6.5	Reestablish and maintain the Statewide Freight Advisory Committee comprised of public and private sector owners, operators, customers, and others.

Exhibit 100: Freight Actions—Accountability for Transportation System Performance

LRTP Action #	Description
7.1	Communicate the current and forecast levels of funding available for transportation and pursue increased transportation revenue.
7.2	Collaborate with local units of government and, where applicable, private entities, to transfer state-owned and/or state-maintained local facilities that have no regional or statewide function to local ownership and local financing mechanisms.
7.3	Advance regional funding approaches for major new construction and transit service needs identified in area and MPO plans.

FREIGHT PERFORMANCE MEASUREMENT, PRIORITIZATION, AND PROJECT EVALUATION

The Freight Element aligns with LRTP goals for performance-based resource allocation by creating first-generation approaches for: freight system performance measurement; freight project prioritization and evaluation; and multi-modal freight investment at a program level.

Alaska's freight transportation infrastructure may accommodate, encourage, or constrain the demand for freight movement based on the level of performance offered; it can significantly affect industry location and expansion decisions, as well as larger population settlement patterns. Transportation system performance measurement and management is part of the Alaska Statewide Transportation Planning Process. This Freight Element provides a first examination of the topic, consistent with Federal guidance and with the adoption of best planning practices.

Value of Freight Performance Measurement

At the highest level, Alaska's freight transportation system must be evaluated against the overall goal "to maintain and improve Alaska's multi-modal freight transportation system, providing an acceptable level of performance in light of anticipated population growth, desired economic expansion, and known or anticipated risks."

Based on available data and the direct experience of freight system users, operators, and infrastructure owners, Alaska's freight transportation system is performing reasonably well today. However, Freight Plan analysis has identified the following performance risks that are expected to increase in coming years: congested truck routes and intermodal connectors; limited route and modal service choices, especially for rural communities; unreliability or unavailability of services due to seasonal effects, aging infrastructure, or other disruptions; overall cost of goods; and missing infrastructure links and facility improvements that are needed to serve new industries and population growth.

The value of freight performance measurement is to improve Alaska's ability to quantify key performance dimensions in a consistent and systematic way, to track its progress towards meeting its freight goals and objectives, and to identify emerging bottlenecks or deficiencies at the early stages so they can be appropriately addressed.

First-Generation Freight Performance Measures

Roadway congestion is one of the main sources of unpredictability and costs of supply chains. It causes unnecessary costs to trucking firms in greater fuel consumption and costs to shippers in increased inventories from unreliability. Roadway congestion, especially in urban areas, represents major bottlenecks in Alaska's freight transportation system. .

To date, there has not been a systematic state-wide definition of what constitutes an acceptable truck "problem area," "issue," or "constraint." An important opportunity to establish a consistent state-wide measure of truck network performance is available, using truck travel speed data from FHWA. FHWA's

National Performance Management Research Data Set (NPMRDS) includes truck travel speeds based on Global Positioning System transponder reports and provides useful information for much of Alaska. [34]

The results indicate that, as expected, most of the unreliability occurs in urban areas. The key seven highways in the state operate at near free flow on most miles, with the exception of a couple of miles on Sterling Highway at Soldotna (Kenai Peninsula), upstream of key on-ramps; a segment of the Parks Highway through Denali and Yukon-Koyukuk close to Fairbanks; at the junction where Alaska Highway branches out to the Richardson Highway; and at the point where the Alaska Highway crosses the border into Canada (where the data is presumably measuring border crossing processing delays).

Exhibit 101 shows an overview of the analysis results. Only weekdays were considered, as on weekends travel patterns are very different and there is less congestion. Planning Travel Time Indices were only calculated for road segments that had more than 50 records in the database.

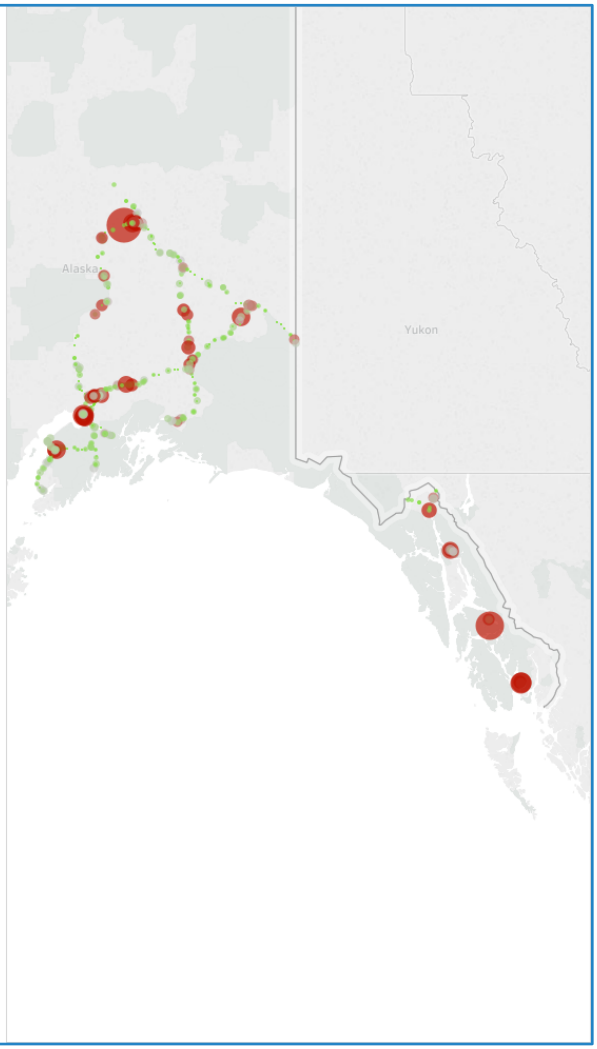
Exhibit 102 and Exhibit 103 provide detailed views of the results for downtown Anchorage and Fairbanks, respectively. Two maps are provided for each, showing all travel directions.

[34] As a demonstration analysis, the NPMRDS information was used to identify the travel times of trucks along key road segments in Alaska, every 15 minutes, from October 1, 2015 to September 30, 2016. Travel speeds were recorded by segment for every hour of the day, and ratios between uncongested and congested travel speeds by segment were calculated. This ratio represents a Planning Travel Time Index; the higher the index, the greater the difference between uncongested and congested speeds. The data therefore supports measurement of three basic performance indicators: overall speed; congested (low speed) locations; and low-reliability locations (where the Planning Travel Time Index is high). For this study we define this index as the ratio of the 95th Percentile Travel Time to 50th Percentile Travel Time. Results are displayed as point measurements for simplicity. These points are located at the start or end of the roadway segment being analyzed.

Exhibit 101: Weekday Truck Travel Time Index Results for Alaska (10/01/2015 to 09/30/2016)

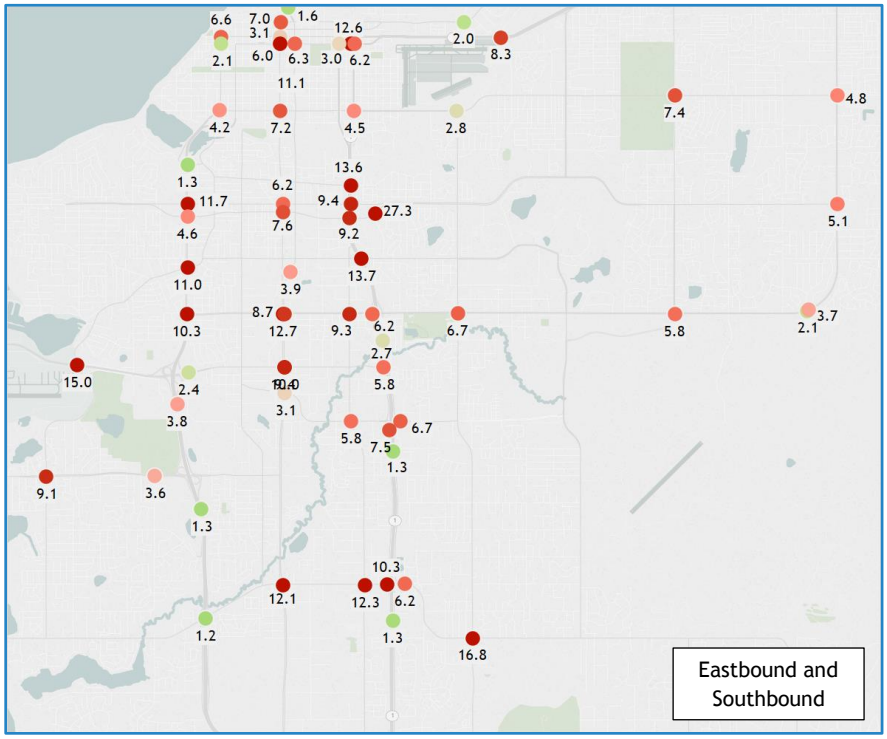
Road Segments with the Highest Trucking Congestion

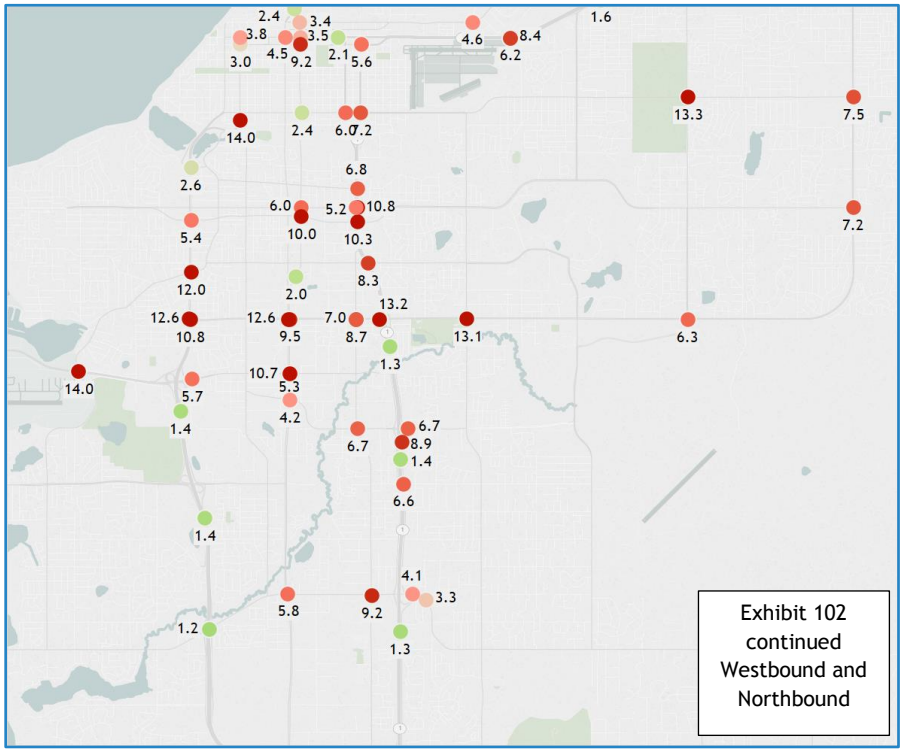
Road ID	Location	Road Name	Road Direction	Planning Travel Time Index
133N50..	Petersburg	Mitkof Hwy	Southbound	48.01
133P04..	Anchorage	Benson Blvd	Eastbound	27.32
133P50..	Ketchikan Ga..	Front St	Eastbound	27.00
133P50..	Ketchikan Ga..	Stedman St	Eastbound	25.01
133N04..	Juneau	Glacier Hwy	Southbound	21.44
133N04..	Fairbanks Nor..	Airport Way	Westbound	21.31
133N04..	Kenai Peninsula	Sterling Hwy	Southbound	20.64
133N04..	Anchorage	Old Seward H..	Southbound	17.31
133N04..	Matanuska-Su..	W Evergreen ..	Westbound	14.70
133N04..	Anchorage	Raspberry Rd	Westbound	13.99
133N04..	Haines	Main St	Westbound	13.98
133N04..	Anchorage	Seward Hwy	Southbound	13.67
133P04..	Anchorage	Boniface Pky	Northbound	13.30
133P04..	Anchorage	Brayton Dr	Northbound	13.26
133N04..	Fairbanks Nor..	Old Richards..	Westbound	13.26
133P04..	Kenai Peninsula	Sterling Hwy	Northbound	13.25
133N04..	Fairbanks Nor..	Johansen Expy	Westbound	13.21
133N04..	Fairbanks Nor..	Johansen Expy	Westbound	12.83
133N04..	Anchorage	Tudor Rd	Westbound	12.58
133P04..	Anchorage	6th Ave	Eastbound	12.57
133N04..	Valdez-Cordova	Richardson H..	Southbound	12.39
133N04..	Anchorage	Old Seward H..	Southbound	12.34
133N04..	Anchorage	C St	Southbound	12.11
133P04..	Anchorage	15th Ave	Eastbound	12.01
133N04..	Anchorage	Minnesota Dr	Southbound	11.72
133P04..	Valdez-Cordova	Richardson H..	Northbound	11.67
133P04..	Anchorage	Brayton Dr	Northbound	11.33
133N04..	Fairbanks Nor..	Badger Rd	Southbound	11.18
133N04..	Anchorage	C St	Southbound	11.11
133N04..	Anchorage	Minnesota Dr	Southbound	11.05
133P04..	Anchorage	Minnesota Dr	Northbound	10.80
133P04..	Anchorage	C St	Northbound	10.72
133N50..	Ketchikan Ga..	Null	Westbound	10.67
133N04..	Kenai Peninsula	Sterling Hwy	Southbound	10.58
133N04..	Fairbanks Nor..	College Rd	Eastbound	10.50
133P04..	Anchorage	Omalley Rd	Westbound	10.39
133N04..	Anchorage	Homer Dr	Southbound	10.33
133P04..	Anchorage	Seward Hwy	Northbound	10.29
133N04..	Matanuska-Su..	E Parks Hwy	Southbound	10.25
133N04..	Kenai Peninsula	Sterling Hwy	Southbound	10.18
133P04..	Fairbanks Nor..	Richardson H..	Northbound	10.12
133N04..	Anchorage	Omalley Rd	Eastbound	9.97
133P04..	Anchorage	Muldoon Rd	Northbound	9.87



Source: Analysis of National Performance Management Research Data Set

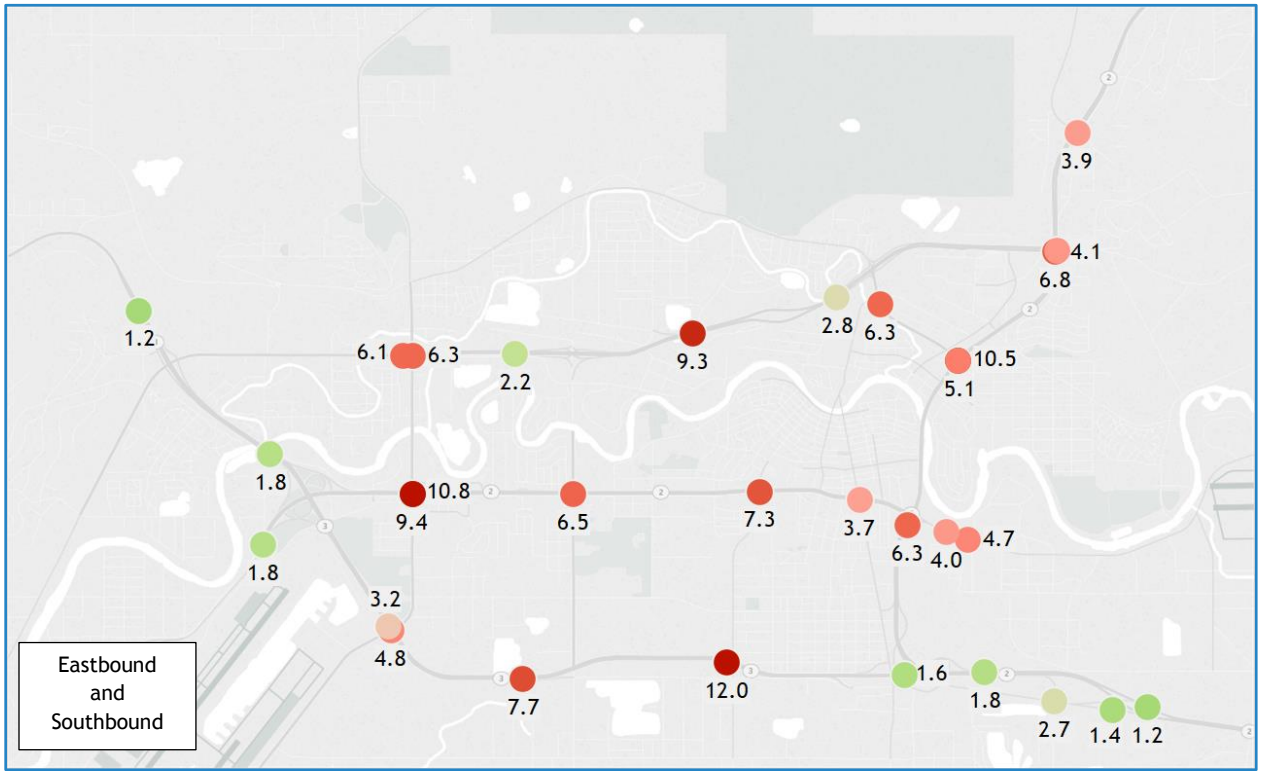
Exhibit 102: Weekday Planning Travel Time Indices in Anchorage (10/01/2015 to 09/30/2016)

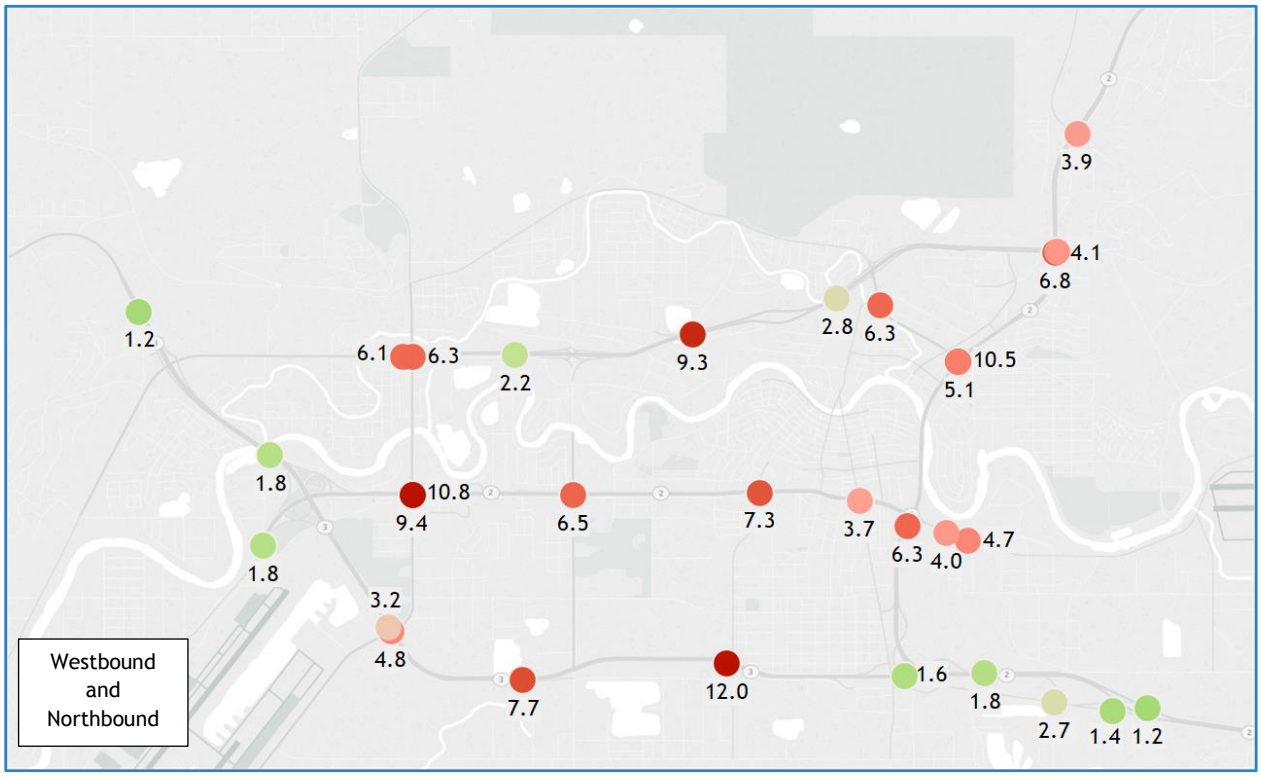




Source: Analysis of National Performance Management Research Data Set

Exhibit 103: Weekday Planning Travel Time Indices in Fairbanks (10/01/2015 to 09/30/2016)





Source: Analysis of National Performance Management Research Data Set

Recent Federal guidance has specified that beginning in 2018, states must report freight performance over their interstate facilities, along with their annual submittal of Highway Performance Monitoring System (HPMS). The federal measure consists of a Truck Travel Time Reliability Index, to be calculated for interstate facilities using the NPMRDS or comparable data. The federal TTTR metric incorporates travel speed, segment length, and measurement period (AM peak, PM peak, etc.) considerations. Although simpler in one respect than the example analyses shown in Exhibit 102, Exhibit 103, and Exhibit 104– in that the metric applies only to interstates – it is a significantly more complicated calculation.

Each approach has value. The federal metric is required for compliance, while the "example" process provides useful data for each network segment in the entire NPMRDS (not just interstates) with a simple and straightforward calculation. Moving forward, it is suggested that Alaska produce both of these measures and explore the possibility of producing other next-generation measures.

Next-Generation Freight Performance Measures

To advance LRTP actions related to performance-based planning, and to look beyond the constraints of NPMRDS-based performance measures that address only truck travel time speed, the Freight Element has formulated a set of potential next-generation performance measures.

The Freight Element builds on the general user-based freight performance categories discussed earlier—availability, reliability, affordability, speed, safety, and security—and proposes a framework to quantify, measure, and monitor key freight performance metrics. Some of these metrics can be calculated today; others will require further definition and data collection.

Metrics that are already calculated, or can be developed relatively easily, include the following:

- **Availability** measures whether a modal service is available to a community. Measures could include number/share of communities served by a given mode; number/share of residents served by a given mode; and number/share of freight-intensive business establishment locations served by a given mode. All of these measures could be calculated from available information.

- **Utilization** measures the cargo volumes moving through freight facilities and networks. For Alaska this could include the following: truck tonnage and value; rail tonnage and value; air cargo tonnage and value; port and waterway tonnage and value; and pipeline tonnage and value.

- **Infrastructure condition** affects the costs and reliability of moving goods throughout the state, which in turn affects trade and economic activity. Key measures could include pavement and bridge condition, structural condition of port facilities and rail infrastructure, etc.
- **Infrastructure safety and security** measures could include fatal crashes, injury crashes, property damage crashes, and other incidents involving freight vehicles (trucks, trains, vessels, and aircraft).

Measures that would require higher levels of effort to develop include the following:

- **Reliability and Resiliency** measures include door-to-door on-time performance, risk of temporary or sustained disruption, possibility that a service may not be available within a given planning horizon, risk of losing connectivity or service due to reliance on a single mode, etc. In repeated surveys, freight shippers rank reliability as the most important factor in freight transportation logistics decisions. Measures could include highway travel time reliability (similar to the example analyses presented earlier) and number/duration of highway closure events (should be available from existing data); port and airport delivery reliability (vessel arrivals and departures versus schedule) and number/duration of closure events, which should be available from ports and airports; and rail delivery reliability (train arrivals and departures versus schedule) and number/duration of closure events, which should be available from the Alaska Railroad. Essentially, this would provide a systematic mechanism for bottleneck identification across all Alaska freight modes and geographic regions.

- **Cost** measures include prices paid for transportation services, inventory, "buffering" against risks, and premiums paid because a preferred mode is not available (e.g., where air is used because trucking or water services are not provided). Useful transportation cost data is challenging to develop and would require new techniques (for example, perhaps confidential rate surveys of key freight facilities, shippers, and carriers) but represents a critically important benchmark. Response resistance and confidentiality issues would need to be successfully addressed.

- **Speed and Travel Time** is the total end-to-end delivery time. Some freight (for example, perishables) requires speed as a top priority, and shippers will pay premium prices for the fastest available services; other freight (for example, coal or stone) is less concerned with speed and more with price, and shippers will prefer slower modes at lower prices. Travel speed is most important for time-sensitive freight, which is typically moving by truck or air. The NPMRDS data on average travel speed, combined with improved truck counts (e.g., regular, systematic, and at more locations) would allow for the accurate estimation of average travel speeds in key trucking corridors. For air cargo, aircraft arrival and departure data would provide the needed information. It is more difficult to obtain the total end-to-end delivery time, including time outside of trucks or aircraft for pick-up, drop-off, waiting at terminals, etc. For this, the best approach might be a shipper or customer survey program that could address all modes and would not have to be limited to truck or air shipments. As with cost, response resistance and confidentiality issues would need to be successfully addressed.

- **Cargo Safety and Security** measures address the risk of loss, breakage, tampering, loss of visibility, or other loss of value during the shipment process. Crash and incident data should be available for highways, airports, ports, railroad, and pipeline modes. Carriers and insurance companies would have additional information, but may not be positioned to release it. The promise of confidentiality, and care in aggregation, might help address any concerns.

- **Environmental measures** could address criteria pollutant emissions for greenhouse gases, nitrogen oxide, volatile organic compounds, particulate matter, and ozone from the totality of freight operations across all modes and facilities.

Freight Network Designations

Under the FAST Act, the US Department of Transportation designated a National Freight Highway Network (NHFN) and a National Multimodal Freight Network.

- The NHFN was designed to assist in the targeting of the FAST Act's National Highway Freight Program (NHFP) funds ($6.2 billion over 5 years nationally); at least 90% of NHFP funds must be spent on NHFN facilities. USDOT designated some of the NHFN, while allowing the states to designate the remainder, through the designation of Critical Urban Freight Connectors and Critical Rural Freight Connectors. These NHFN designations can be amended, consistent with evolving goals for the allocation of NHFP funds. Recommendations for Alaska's urban and rural connector mileage are presented in the Alaska Freight Element Implementation Guidance, adopted separately.

- The National Multimodal Freight Network was designed to supplement the NHFN by additionally including non-highway elements that are critical to a fully-functioning freight transportation system.

Building on the approach laid out in the National Multimodal Freight Network, and considering the key findings documented in this Freight Element, an initially recommended Alaska Multimodal Freight Network (the Freight Network) has been identified. It emphasizes transportation infrastructure that plays a critical role in supporting the economy of the state, allowing it to export valuable natural resources and import indispensable consumer products that improve quality of life. Links and nodes were selected as part of this network because they handle significant quantities of freight, in tonnages or value, without which large segments of the state's economy could not operate. Identifying a Freight Network does not imply that the remainder of the freight infrastructure in the state is unimportant. The Freight Network includes primarily major facilities, corridors, and connectors, but it also recognizes that last-mile deliveries to smaller communities, through small ports and small airport and landing strips, are essential. Issues and needs for smaller facilities will become obvious to their users without the need for ongoing performance monitoring at a system level.

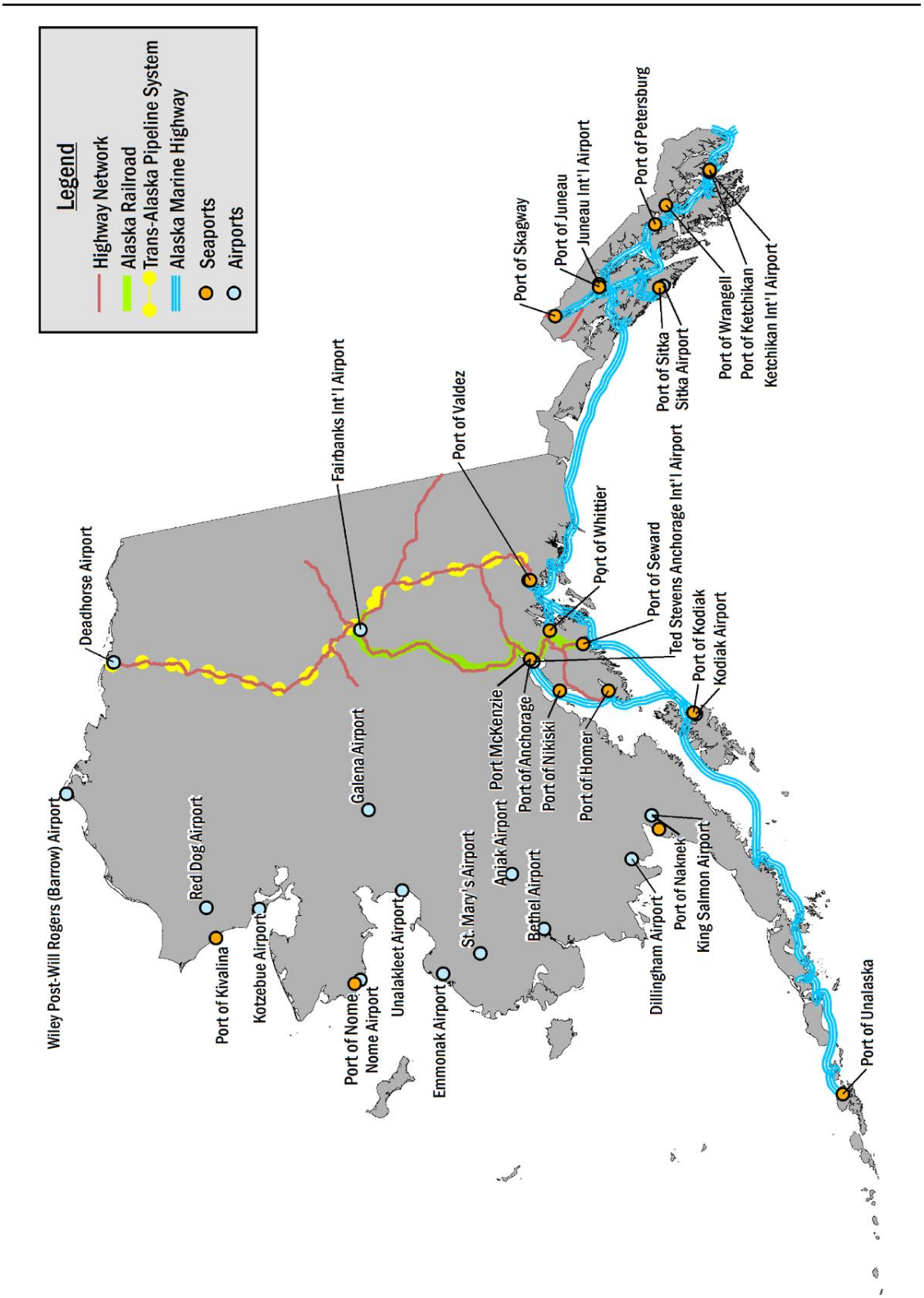
The initially recommended Freight Network, shown in Exhibit 104, is composed of the following:

- Highways
    - Parks Highway
    - Seward Highway
    - Sterling Highway
    - Dalton Highway
    - Richardson Highway
    - Glenn Highway
    - Alaskan Highway
    - Klondike Highway
    - Haines Highway
    - Steese Expressway in Fairbanks
    - Airport Way in Fairbanks
    - Minnesota Drive in Anchorage
    - International Airport Road in Anchorage
    - C Street in Anchorage
    - Ocean Dock Road in Anchorage
- Seaports that handle more than 140,000 tons per year (which represent 98% of all seaports in the state),[35] plus other strategically important seaports
- Airports that handle more than 1,500 tons per year (which represent 88% of all air cargo tons handled in the state)[36]
- Alaska Pipeline
- Alaska Railroad
- Alaska Marine Highway, navigable Coastal Corridors, and navigable Inland Waterways

The Freight Network is conceived as a "living" system, with procedures for adding or modifying facilities and routes.

[35] As reported in the U.S. Army Corps of Engineers Waterway Data
[36] As reported in the Bureau of Transportation Statistic's T-100 Data

Exhibit 104: Initially Recommended Alaska Multimodal Freight Network



Source: WSP | Parsons Brinckerhoff

Evaluating Multimodal Freight Investments

The Freight Element is not a capital investment program. Capital programs are developed by DOT&PF at the state and modal level, by MPOs, and by facility owners and operators. Projects are additionally identified through local and regional planning studies addressing all modes. The question arises, however: if making freight investments improve the overall performance of Alaska's Multimodal Freight Network and achieve the kind of public benefits sought, which of the many possible investments in different regions or different modes should be given higher priority? The LRTP includes policy and actions to evaluate projects based on their effectiveness in meeting plan goals. The Freight Element provides a starting point for the future estimation of freight project benefits and project prioritization across modes and geographies based on emerging best practices.

Developing a freight project prioritization evaluation approach that is applicable at all levels of planning (state, regional, local) and geographies (urban, rural), and across all modes (road, rail, air, water, pipeline) will require the cooperative efforts of many stakeholders. The tools and methods must be highly customized to Alaska's specific needs. This Freight Plan cannot offer the final answer, but it can suggest a potential framework that has proven successful in other states.

Freight projects involve multiple modes, address both transportation and economic considerations, and can produce very different types of benefits depending on their location, type, and extent. Currently, there is no systematic process for evaluating freight investments relative to each other, or to non-freight investments. Such a process, while not necessarily a requirement for sound freight planning, could be useful and instructive, and could be largely built on the analytical framework established in the USDOT's Transportation Investments Generating Economic Recovery (TIGER) grant program.

In one possible approach, Alaska could develop a freight prioritization tool as a spreadsheet application, with standard input/output formats and built-in factors. The tool might consist of three modules: a Data Input Module, a Processor Module, and an Output Calculation Module.

- The Data Input Module could accept user inputs describing the type, location, and extent of the project, along with the key metrics necessary for the Processor Module. For example, if the user enters a rail improvement project, the module might ask for location; capital cost; operating and maintenance cost; incremental changes in volume (in tons, railcars, containers, etc.) each year that are directly associated with the project; associated reductions in truck vehicle miles of travel per year; associated increases in rail ton-miles of travel per year; etc. It could also ask for any additional data needed for economic analysis, along with the user's evaluation of the key Policy Analysis factors.

- The Processor Module could perform three distinct and mutually supporting types of evaluations:

    - Benefit Cost Analysis, following TIGER guidance: The module could estimate non-monetary effects (changes in VMT, congestion, fuel consumption, etc.) and translate these into monetized equivalents (representing benefits to state of good repair, economic competitiveness, livability,

environmental sustainability, and safety). Benefits could be discounted to Net Present Value and divided by project cost to produce a Benefit Cost Ratio (BCR).

  - Economic Impact Analysis: TIGER BCAs are designed to capture transportation-related benefits and do not include measures of economic impact (e.g., jobs, wages, industry output and value-added, tax payments, and return on investment to the public sector). These are often important factors in making transportation investments and in developing support for planned investments across diverse stakeholder groups and geographic regions. Therefore, an economic impact calculation module could be developed. The module could include per-unit factors for estimating the various direct impacts, along with appropriate multipliers for indirect and induced effects.

  - Policy Analysis: Successful prioritization cannot be a purely mathematical or mechanical exercise; it must also reflect qualitative evaluations of whether a state's policy goals are being advanced. The policy analysis function could address key questions: Is the project consistent with Alaska's freight vision? Is it consistent with Alaska's economic development and industry retention/attraction objectives? Is there an acceptable level of risk or is there some uncertainty whether the project will deliver the desired benefits? Is adequate funding available? Are the necessary stakeholder partnerships in place? Is it consistent with other state, regional, and local plans? Is it consistent with state economic development policy? Does it provide immediate benefit and value to Alaska industries, communities, and residents? Projects with very high BCAs and economic impacts that fail on one or more of these questions may be less desirable than projects with lower BCAs and economic impacts that do meet these criteria.

- The Output Module could perform two basic functions. The first is to report raw numbers: BCR scores, economic impact scores, and policy analysis scores. The second is to weight and sum those factors according to user-defined criteria. For example, if the user determines that the most important prioritization factor is the BCR, it could be assigned a weight twice as high as the economic impact or policy factors, etc. Weighting of sub-scores—safety benefits from the BCR or job creation from the economic impact analysis—is also possible.

RELATIONSHIP WITH OTHER PLANS AND FEDERAL GUIDANCE

The Freight Element is a valuable resource for modal plan development and area/local freight planning, and complies with federal guidance for State Freight Plans.

Modal Plans and Area/Local Freight Planning

Data and analysis developed in the Freight Element should be useful in a broad range of planning and analysis applications, at the area and local levels, and in the context of modal system planning. Many modal and regional plans address freight issues. The Alaska LRTP Freight Element aligns these different planning efforts under Alaska-specific goals, policies, and strategies.

Freight Plans developed by Alaska's MPOs—in Anchorage, AMATS, and in Fairbanks, FMATS—will continue to play a key role in freight planning at the urban level. Both of these organizations are actively undertaking freight planning efforts. Federal guidance encourages the involvement of MPOs in the state's effort to develop performance measures and set targets, especially relating to the movement of freight through urban areas. This Freight Element provides some suggestions for measures that could be used.

DOT&PF also prepares multimodal transportation plans for different regions in Alaska. In the last five years it developed plans for the Southwest, Southeast, and "Interior" regions. DOT&PF has also prepared modal plans for the State's Aviation System, Ports, and Rail. This Freight Element is intended to help in the preparation of these more specific plans because policies and strategies should be broadly consistent throughout the state. Most of the specificity will come in the way of more targeted actions.

Preparation of this Freight Element for Alaska has also highlighted opportunities where infrastructure can be improved to grow the economy and further develop resources. Many of the economic opportunities in Alaska are limited by the availability of cost-effective methods of transportation that permit the commercialization of resources. The opportunities identified in this plan could be advanced through state economic development plans and priorities.

FAST Act Compliance

While the primary benefit and value of this Freight Element is to serve the needs of Alaska, it also satisfies federal guidance for statewide freight planning. Projects included within an approved statewide freight plan may be eligible for a new category of federal funding. The FAST Act establishes a new formula-based National Highway Freight Program (Title I, Section 1116), funded at $6.3 billion over five years. Up to 10% of funds may be used for rail or port projects. To be eligible for this funding, projects must be identified within an approved State Freight Plan. This Freight Element provides the basis from which projects eligible for current and future dedicated federal freight funding could be identified. This Freight Element satisfies federal guidance for statewide freight planning and supports other freight planning efforts in Alaska, which include modal and regional plans generated by DOT&PF and the local MPOs.

Exhibit 4 (in the *About this Document* section) presented a summary of the FAST Act requirements for State Freight Plans and identified which sections of the Freight Element address each requirement.

The FAST Act establishes broad national freight goals that should form the foundation for USDOT's efforts. Exhibit 105 lists some of the specific Policies and Actions of the Alaska Freight Plan Framework that address these seven broad national goals.

Exhibit 105: Correspondence of Alaska LRTP Freight Element and National Freight Goals

National Multimodal Freight Policy	Corresponding Alaska Freight Plan Policies
"…To identify infrastructure improvements, policies, and operational innovations that: - *strengthen the contribution of the National Multimodal Freight Network to the* ***economic competitiveness*** *of the United States"* - *reduce* ***congestion*** *and eliminate bottlenecks on the National Multimodal Freight Network* - ***increase productivity****, particularly for domestic industries and businesses that create high-value jobs"* - *"…To improve the* ***economic efficiency and productivity*** *of the National Multimodal Freight Network"* *"…To improve the short- and long-distance movement of goods that:* - *travel across rural areas between population centers;* - *travel between rural areas and population centers; and* - *travel from the Nation's ports, airports, and gateways to the National Multimodal Freight Network"*	**Policy 1A:** Develop the multimodal transportation system to provide safe, cost-effective, and reliable accessibility for people and freight. **Policy 1B:** Prioritize new construction projects by considering overall benefits and costs over time to the State as the key consideration. **Policy 1C:** Upgrade and modernize passenger and freight transportation systems to increase productivity and reliability, and to reduce safety risks. **Policy 3A:** Ensure the efficient management and operation of the passenger and freight transportation system. **Policy 4A**: Identify new construction and modernization needs that address travel demand growth, economic development, travel and tourism needs and funding strategies through area and metropolitan plans. **Policy 4B**: Preserve and operate Alaska's multimodal transportation system to provide efficient and reliable access to and from local, national, and international markets, to support economic development goals.
"…To improve the ***safety, security, efficiency, and resiliency*** *of multimodal freight transportation"*	**Policy 5A:** Improve transportation system safety in Alaska. **Policy 5B:** Work with federal, local, and state agencies to provide a safe, secure, and resilient transportation system and emergency preparedness for all modes.
"…To achieve and maintain a ***state of good repair*** *on the National Multimodal Freight Network"*	**Policy 2A**: Apply asset management best practices to preserve the existing transportation system. **Policy 2B**: Increase understanding of, and communicate DOT&PF's responsibilities for, system preservation as the owner of highways, airports, harbors, marine terminals, and vessels.
"…To use ***innovation and advanced technology*** *to improve the safety, efficiency, and reliability of the National Multimodal Freight Network*	**Policy 3B:** Use technology and Intelligent Transportation Systems where cost-effective.

National Multimodal Freight Policy	Corresponding Alaska Freight Plan Policies
*"…To reduce the **adverse environmental impacts** of freight movement on the National Multimodal Freight Network"*	**Policy 6A**: Address quality-of-life, livability and community considerations in the Statewide Long-Range Transportation Plan, area and corridor plans, asset management, and other plans and project investment decisions. **Policy 6B**: Preserve the integrity of the ecosystems and the natural beauty of the State, limit the negative impacts, and enhance the positive attributes – environmental, social, economic, and human health – from the Alaska Transportation System. **Policy 6C**: Support energy conservation, specifically in our consumption of fossil fuels to address climate change. **Policy 6D**: Develop transportation plans in close coordination with local communities to ensure transportation investment decisions reflect Alaskans' quality of life values.
*"…To improve the flexibility of States to support multi-State **corridor planning and the creation of multi-State organizations** to increase the ability of States to address multimodal freight connectivity"*	**Policy 7A**: The statewide plan will provide the framework from which DOT&PF sets investment priorities.

Summary of Strengths, Weaknesses, Opportunities, and Threats Analysis

Federal guidance has suggested that State Freight Plans carefully consider a state's Strengths, Weaknesses, Opportunities, and Threats (SWOT) with respect to freight. Such consideration serves as a useful conclusion to the Freight Element.

SWOT analysis is a tool developed by the business community to help identify the negative and positive factors that prevent or facilitate the achievement of certain objectives. As shown in Exhibit 106, these factors are classified based on whether they are internal or external. In this case, internal is defined as anything that can be directly controlled or influenced by DOT&PF, including infrastructure, regulations, and investments. External factors are defined as the broader trends and constraints in the economy and society that affect freight transportation.

Exhibit 106: Freight Plan SWOT Analysis Framework

	Helpful to achieve plan objectives	**Harmful** to achieve plan objectives
Internal to DOT&PF	Strengths	Weaknesses
External to DOT&PF	Opportunities	Threats

This planning analysis framework explores the possibilities to solve problems by helping direct efforts. The distinction between external and internal factors is important because it underscores the range of

control of the planning agency and shows the feasible steps that could be taken. This methodology is particularly useful if applied frequently as part of a continuous strategic planning process where new threats and opportunities are included and considered as they are encountered. Having this framework at hand helps DOT&PF respond appropriately in uncertain times.

The factors in the SWOT analysis were identified based on stakeholder interviews and workshops, along with the modal analysis and trends discussion presented in this Freight Element.

Strengths

- **Multimodality of existing system:** Alaska is probably the one state in the U.S. that relies on the most variety of transportation modes. All of the conventional ones—road, air, water, rail—are critical in vast areas of the state, and even unconventional ones such as ATVs and snowmobiles are used frequently by certain communities. Few other states, if any, rely on water, pipeline, and air transportation to the extent that Alaska does.

- **System not choked with congestion:** In addition, unlike many parts of the U.S., Alaska's transportation infrastructure is generally not bogged down in congestion. Adequate planning and timely investments have built up an infrastructure system that has kept up with increases in demand and population growth. Congestion occurs at certain bottlenecks, especially in urban areas, but not at the system level.

- **Responsiveness of existing system:** Alaska's freight transportation system has a history of being responsive to the needs of the state. The public sector has embraced resource development as an importance objective, making transportation investments that spur wealth creation and economic growth.

Weaknesses

- **Underdeveloped networks:** The state's highway system reaches much of its population, but many communities are not served. The state's rail network is very limited in scope, although possibilities to expand its reach and utilization are being studied. Alaska therefore relies to an unusually high degree on water transportation (where available) and air (where necessary because no other means is available).

- **Specific bottlenecks:** While congestion is not a pressing system-wide issue, several facilities are operating at or near capacity and cause bottlenecks for the whole network. Logistics facilities in Anchorage, especially the airport and seaport, are expected to see significant increases in demand over the coming decades, combined with urbanization and population growth in the area. These facilities require investments in capacity and modernization to accommodate this growth and not allow congestion to degrade levels of service. Metropolitan area congestion, exacerbated by automobile traffic, is a growing problem in the Anchorage, Mat-Su, and Fairbanks areas. Anchorage, Fairbanks, and many other cities in between have a high proportion of at-grade crossings for the Alaskan Railroad. This leads to congestion and delays many times throughout the day and sometimes causes traffic accidents (although these are infrequent in Alaska).

Opportunities

- **Resource development:** The development of natural resources, including continued operations in crude oil, mining, fishing, and timber, as well as new operations for LNG, crude oil, and minerals, creates transportation needs but also transportation finance opportunities. Increased use of Public-Private Partnerships has helped offset funding uncertainties related to oil taxes and federal transfers.
- **Opening of Northwest Passage and potential Arctic Port:** With the opening of the Northwest Passage over the following decades, Alaska will likely be at the center of new global shipping routes.
- **Value-added trade activities:** Air cargo transit flights will constitute most of the growth in tonnage passing through Alaska's airport system. This represents an opportunity to provide greater value-added services for operations, maximizing the benefit of stopping in Alaska from a logistics perspective.

Threats

- **Urbanization:** The movement of populations to larger cities such as Anchorage and Fairbanks will strain freight transportation infrastructure in those locations.
- **Climate change and disruption:** Climate change and increasing disruptions will affect freight infrastructure in important ways. Considering these impacts in the context of network resilience, with proper caution toward the uncertainties involved, is fundamental to develop realistic plans.
- **Impending funding shortfalls:** Funding shortfalls will continue to strain infrastructure upkeep and development, potentially decreasing levels of service and reliability. This is seen in deferred expenditures for aviation, AMHS, and other system elements.

Appendix: Selected Truck Counts

To identify the most critical roads for trucking operations truck counts were obtained from stations throughout the state,[37] 97 in the Southeast Region, 63 in the North Region and 103 in the Central Region. This data consists of Annual Average Daily Traffic (AADT) and truck traffic percentages. However, each Region used a different methodology to estimate the data and reported the results in a different way. To compile the results, several assumptions and approximations were needed to maximize the consistency of the data. Some of the issues include:

- Only the Central Region reported data on a monthly basis, which allows the study of seasonal trends. For the other two Regions none of this information was available—it is impossible to know to what periods of the year counts were recorded (given that stations often do not record continuously throughout the year).

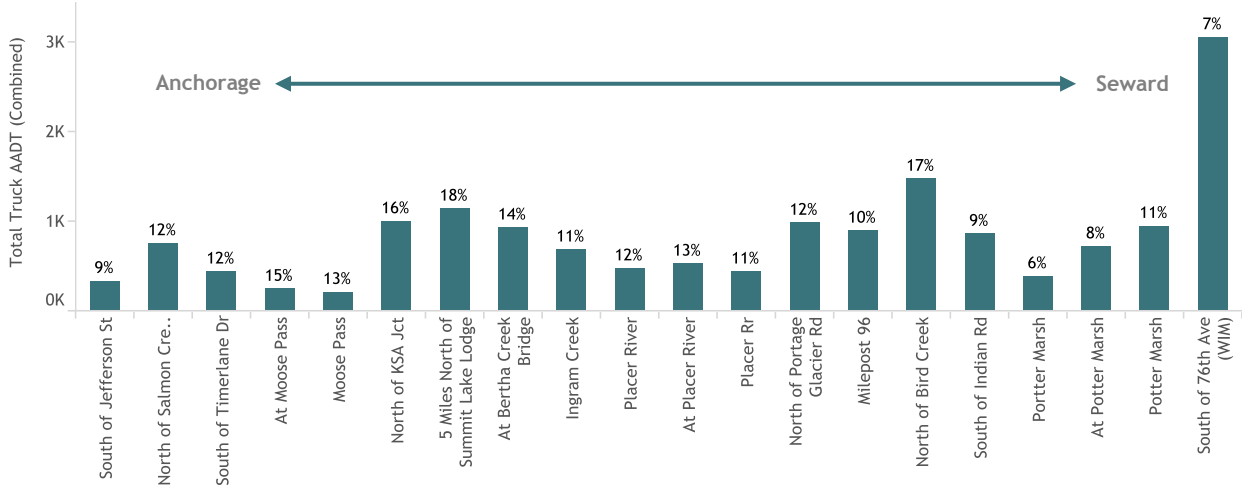
- Only the Central Region reported data on truck percentages and truck AADT (and even differentiated by traffic direction). For the other two Regions it was necessary to combine estimates of truck percentages in particular locations with estimates of general traffic AADT. For the Southeast Region this AADT data came from the 2010 Traffic and Safety Report and for the North Region it came from the Annual Traffic Volume Report. For the majority of stations it was possible to match exactly the AADT estimates with truck percentages, but for others it was necessary to use nearby estimates.

- Both the Central and the North Regions had truck percentage data from 2010, 2011 and 2012, but only the Central one had AADT data for each of these years as well. For the Northern Region AADT estimates were selected from similar years. This was a reasonable approximation because the variation of trucking flows from one year to another is likely relatively small. Data availability was a greater challenge for the Southeast Region because it only had truck AADT estimates for some of the years between 1999 and 2011.

The following figures present estimates of truck volumes (annual average daily trucks, or AADT) and truck percentages (the share of total AADT for which trucks are responsible) for Alaska's leading truck corridors. The information is summed in both directions (north plus south, or east plus west).

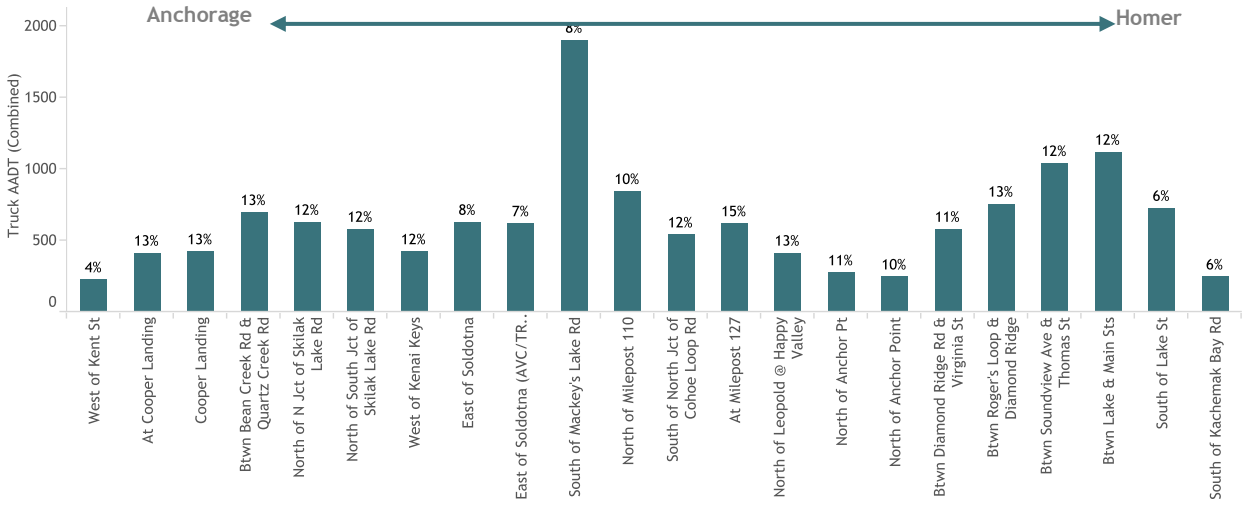
[37] From Alaska DOT&PF

Exhibit A-1: Truck AADT and Percentages (Both Directions), Seward Highway, 2010 – 2012



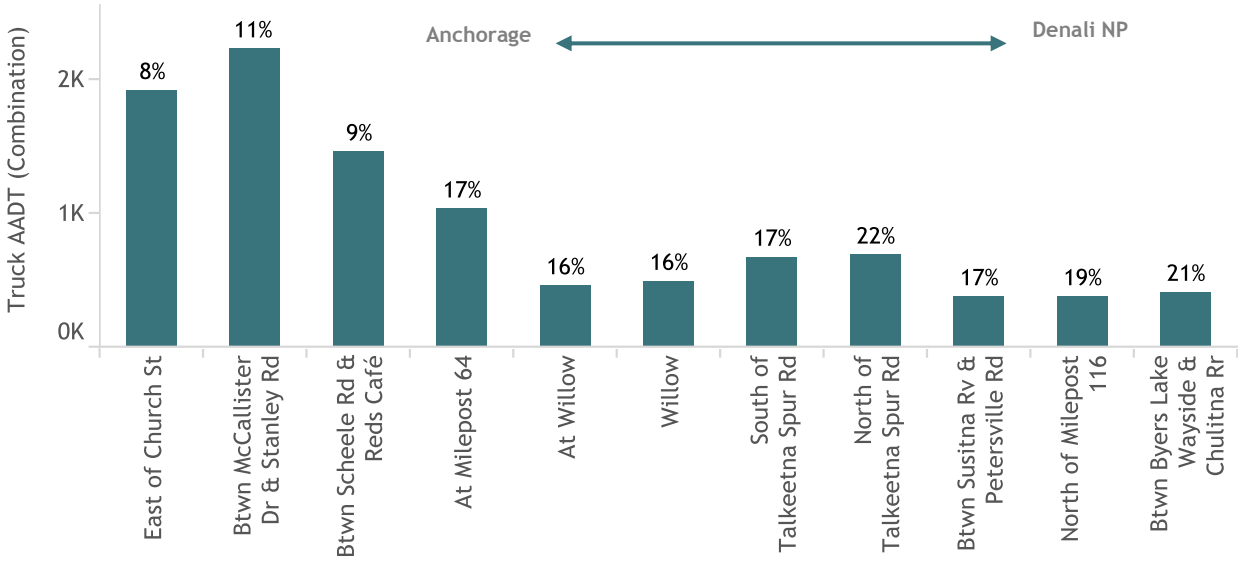
Sources: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-2: Truck AADT and Percentages (Both Directions), Sterling Highway, 2010 – 2012



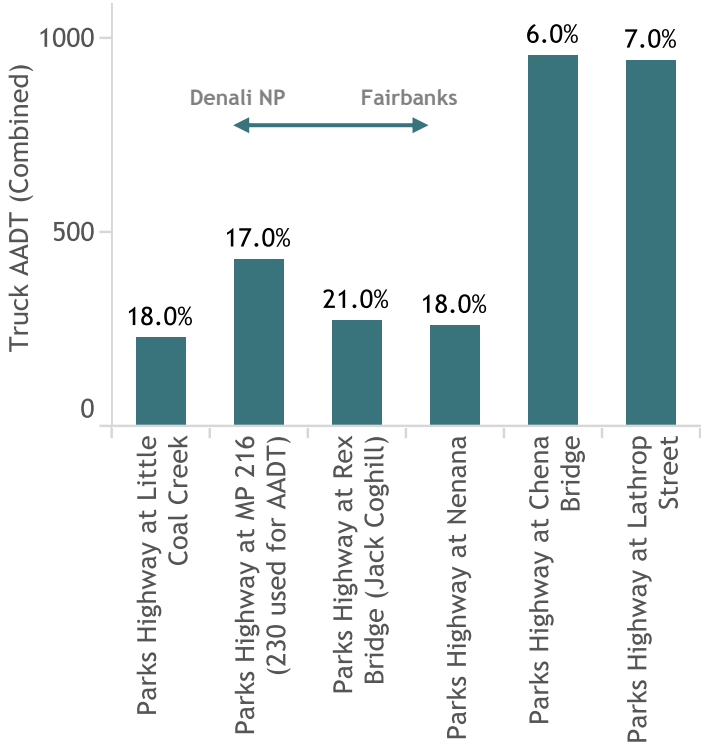
Source: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-3: Truck AADT and Percentages (Both Directions), Parks Below Denali, 2010 - 2012



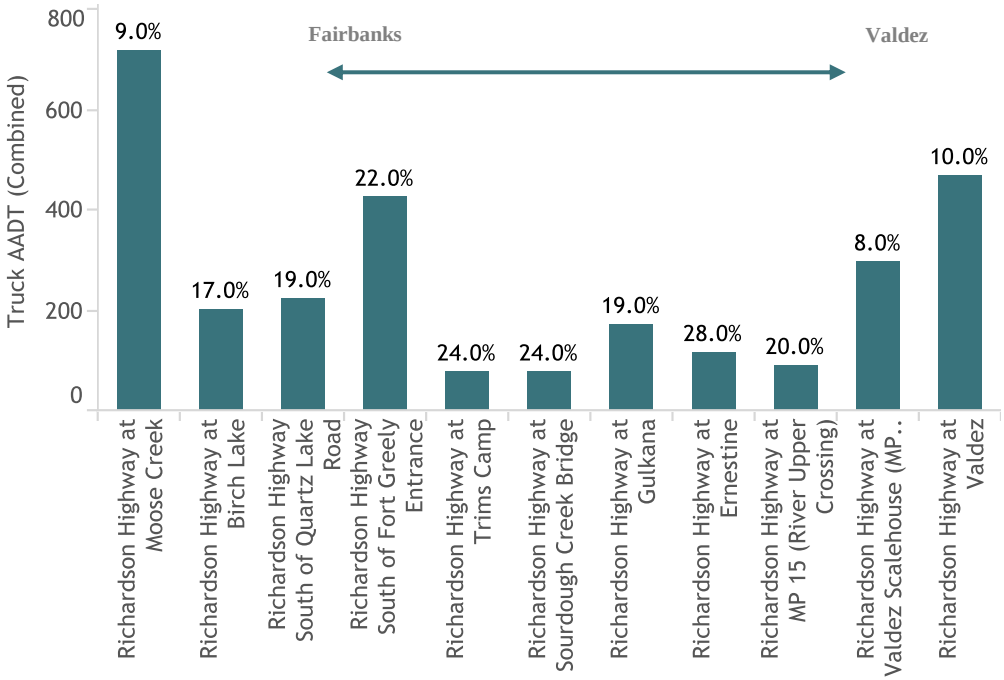
Source: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-4: Truck AADT and Percentages (Both Directions), Parks Hwy Above Denali, 2012



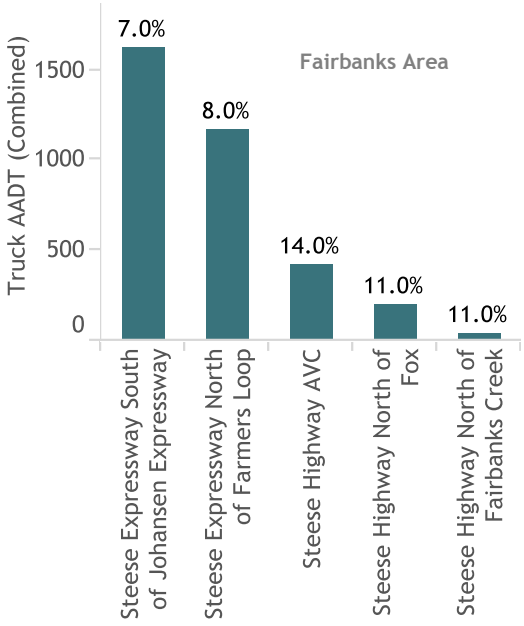
Source: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-5: Truck AADT and Percentages (Both Directions), Richardson Hwy, 2012



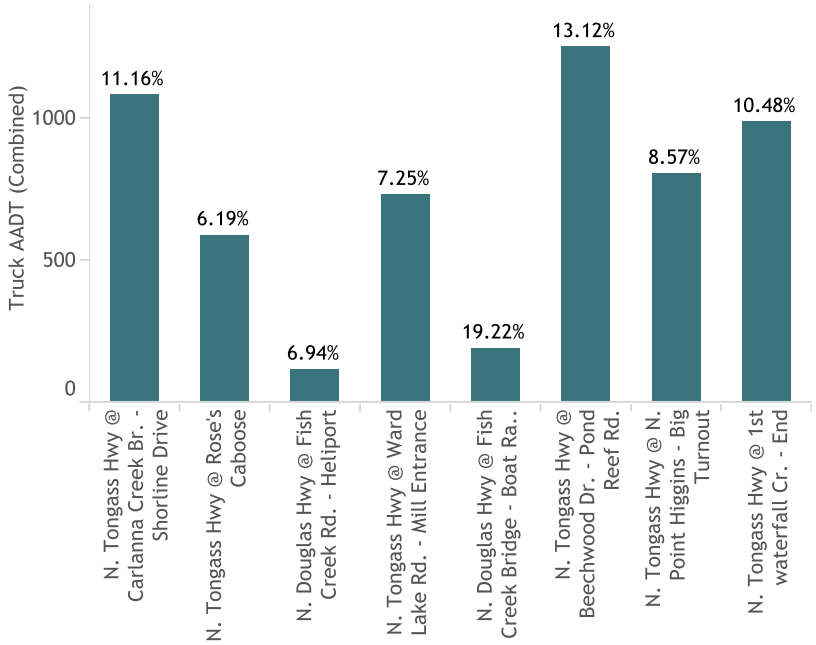
Source: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-6: Truck AADT and Percentages (Both Directions), Steese Expressway, 2012



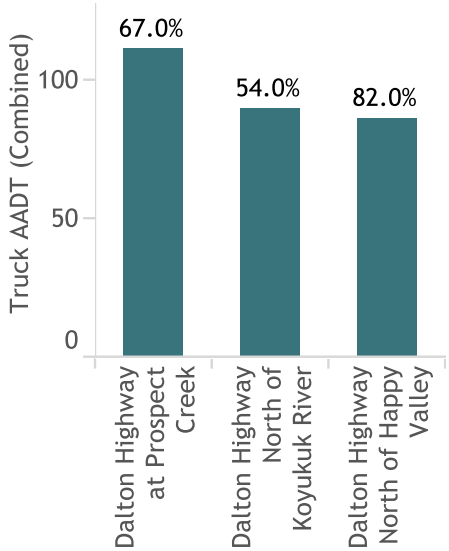
Source: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-7: Truck AADT Percentages (Both Directions), Tongass Highway 2004 - 2010



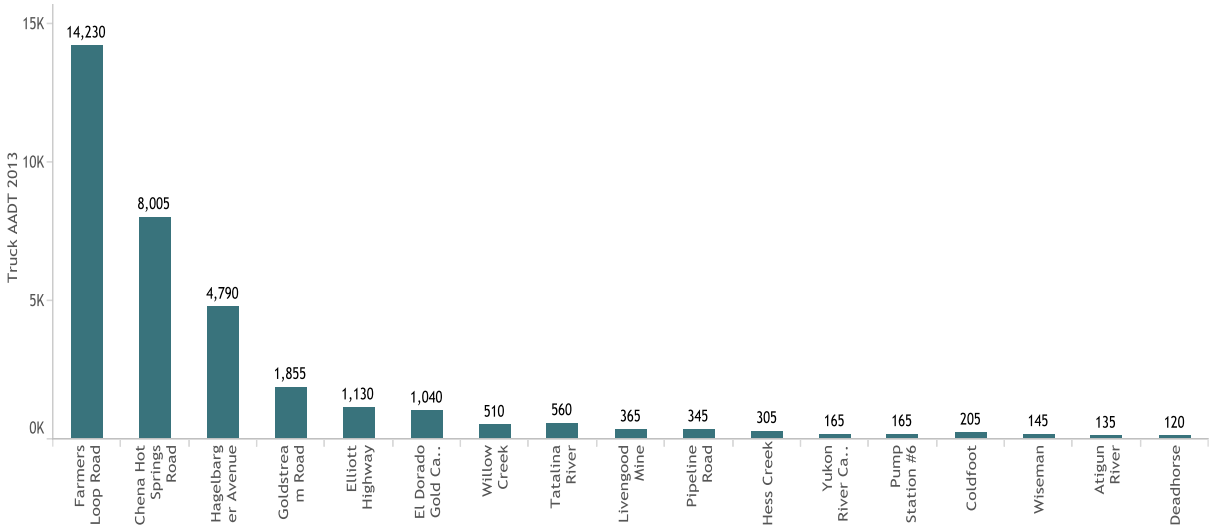
Source: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-8: Truck AADT and Percentages (Both Directions), Dalton Highway, 2012



Source: Annual Traffic Volume Reports, Alaska DOT&PF

Exhibit A-9: AADT (All Vehicles), Dalton Highway, 2013



Source: Dalton Highway Traffic Forecast Study, Kittelson and Associates, September 2014

Exhibit A-10: Other Highways Important to Trucking

Region	Count Station	Avg. Truck %	Truck AADT
C	Minnesota Drive, Anchorage - North of Dimond Boulevard (WIM)	6.0%	2,294
C	Glenn Highway - At Eklutna Flats	6.0%	1,797
SE	Egan Drive @ Sunny Pt. – Yandukin	5.7%	1,773
C	Minnesota Drive, Anchorage - At Chester Creek	4.0%	1,366
SE	Halibut Pt. Road @ Harbor Mt. Rd - Cascade Cr. Rd.	13.3%	1,325
SE	Zimovia Hwy. @ Pat Creek – End	57.8%	1,156
SE	Egan Drive @ McNugget – Yandukin	3.7%	1,093
SE	Sawmill Ck. Road @ Lake - Jeff Davis	11.8%	1,060
SE	Nordic Dr. @ Sing Lee Alley - Ferry Term	15.1%	1,051
C	Tudor Road, Anchorage - West of Patterson Street	4.0%	1,049
C	Ocean Dock Road, Anchorage - Port of Anchorage (WIM)	48.0%	942
SE	S. Tongass Hwy @ Shoenbar - Water St.	5.1%	929
SE	Halibut Pt. Road @ Granite Creek. - Harbor Mountain Rd.	8.0%	876
SE	S. Tongass Hwy @ Grant St. - Mission St.	6.6%	852
SE	Sawmill Ck. Road @ Thimbleberry Creek – Mill	9.3%	834
C	Knik Goose Bay Road, Wasilla - Between Hollywood/Vine & Settlers Bay Dr.	7.0%	797
C	Old Seward Highway, Anchorage - Between Hamilton Dr. & Brandon St	8.0%	790
C	Dimond Boulevard, Anchorage - West of Arctic Blvd	3.0%	788
C	Int'l Airport Road, Anchorage - West of Fairbanks St	5.0%	779
N	Airport Way between Lathrop Street and Wilbur Street	4.0%	760
C	Kenai Spur Road - West of Beaver Loop Rd	8.0%	740
N	Airport Way between Steese Expressway and Noble Street	4.0%	720