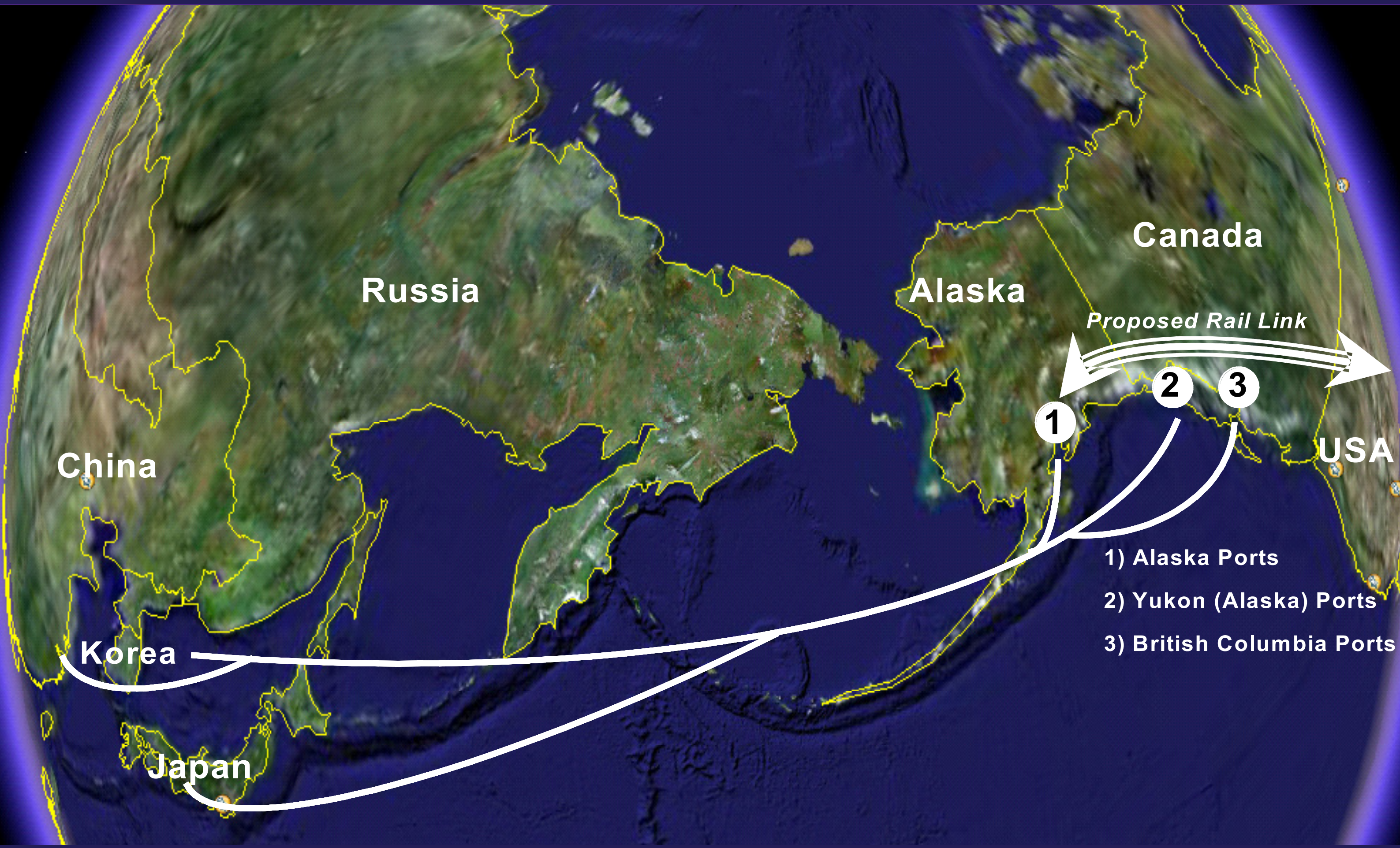
alaska canada rail link

RAILS TO RESOURCES TO PORTS

The Alaska Canada Rail Link Project
Phase 1 Feasibility Study



Executive Report

alaska
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rail link

March 2007

RAILS TO RESOURCES TO PORTS

The Alaska Canada Rail Link Project
Phase 1 Feasibility Study

Executive Report

Prepared for:
The Yukon Government
and
The State of Alaska

Prepared by:
ALCAN RaiLink Inc.
Whitehorse, Yukon

Executive Report Summary

This is a report on the results of the Alaska Canada Rail Link Project Phase 1 Feasibility Study. It provides a quantitative outlook on the potential for a rail connection through Alaska, Yukon and Northern British Columbia, linking North Pacific Rim markets in the shortest trade corridor between North Asia and North America - through a U.S. port.

Mutually dependent economics of large scale northern resource and railway development are compelling.

Drastic changes in global demand driven by Asian markets have sharply raised the value of mineral resources in northwestern Canada and Alaska. The Alaska Canada Rail Link can most efficiently move those resources from remote development sites to tidewater export position.

Rail infrastructure investment would dramatically improve economic productivity, development and sustainability in this region as:

- Larger projects e.g., iron ore and coal mines, cannot be developed without heavy haul rail capacity;
- Smaller projects e.g., mid-size base metal mines, may not survive price cycles with high cost trucking;
- Remote resource exploration and development will be more affordable with low cost rail access.

A rail connection through Canada would also enhance the economic security of Alaska and the lower 48 United States by providing both essential supply route redundancy as well as west coast congestion relief – with a new Alaska sea/rail port gateway on U.S. soil.

This North Pacific Rim Trade Corridor may be well positioned to complement bulk transport of mineral resources for export to Asia, with container import traffic from Asia. Asia is the focal point for the realization of the full export and import potential of this project.



Results of the study research and analysis are reported in a preliminary outlook on the (a) *market,* (b) *technical,* (c) *economic,* and (d) *environmental* feasibility of connecting the Alaska Railroad to the Canadian National Railway. These results are summarized below:

(a) Market Research forecasts rail traffic that can build incrementally:

- *With a low level forecast of 9 million tons per year of Alaska & Yukon Inbound Resupply and Yukon Coal & Concentrate Exports (exceeds current Alaska Railroad traffic);*
- *With a mid level forecast of 14 million tons per year that adds Container Bridge Traffic between North Asia and Mid-America (exceeds former B.C. Rail traffic levels);*
- *With a high level forecast of some 50 million tons/$1 billion revenues annually, that includes iron ore exports (equivalent to Canadian Pacific Railway U.S. subsidiary Soo Line).*

(b) Technical Route Research and Engineering Estimates set out working scenarios:

- *For a full route connection between Canadian National Railway and the Alaska Railroad paralleling the Cassiar, Robert Campbell and Alaska Highways;*
- *For optional phasing of initial resource railway segments radiating from Carmacks, Yukon to Prince Rupert Port, Cook Inlet Ports or Skagway/Haines;*
- *For full route construction costing $7 billion (baseline conceptual estimate raised to $11 billion with allowances and contingencies) or an initial phase at less than half full investment cost.*

(c) Business Case Assessment predicts financial capacity to recover full system cost:

- *With a five percent discount rate, net commercial revenues from shippers recover 74 percent, and net economic benefits to the public exceed 100 percent, of total investment;*
- *With discounted commercial net revenues, plus public net benefits, there is a combined business case value of almost $20 billion for a public-private partnership;*
- *With a phased investment option, resource revenues can cover both capital and operating costs of an initial ports access segment to closest tidewater that maximizes mineral export potential.*

(d) Strategic Environmental Assessment previews policy level sustainability impacts:

- *Bio-Physical impact mitigation will be critical, however trade-offs may favor rail over road in more wilderness routings and away from existing transportation corridors;*
- *Socio-cultural impacts pose largely positive, but some negative, aspects of increased prosperity; and where most Yukon First Nation land claims are settled, more expeditious project approval may be achieved;*
- *Economic Impacts combined for Alaska and Canada comprise 50 year life-cycle additional economic output (GDP) of US $170 billion and over 25,000 new jobs.*

Completion of this Feasibility Study marks the start of a new stage for the Alaska Canada Rail Link Project. The project is now well positioned to attract a multi-lateral combination of railway, supply chain and strategic interests that can collaboratively move this joint Yukon/Alaska initiative forward.

White Pass & Yukon Route Yukon Container Train

Alaska Railroad Export Coal Train



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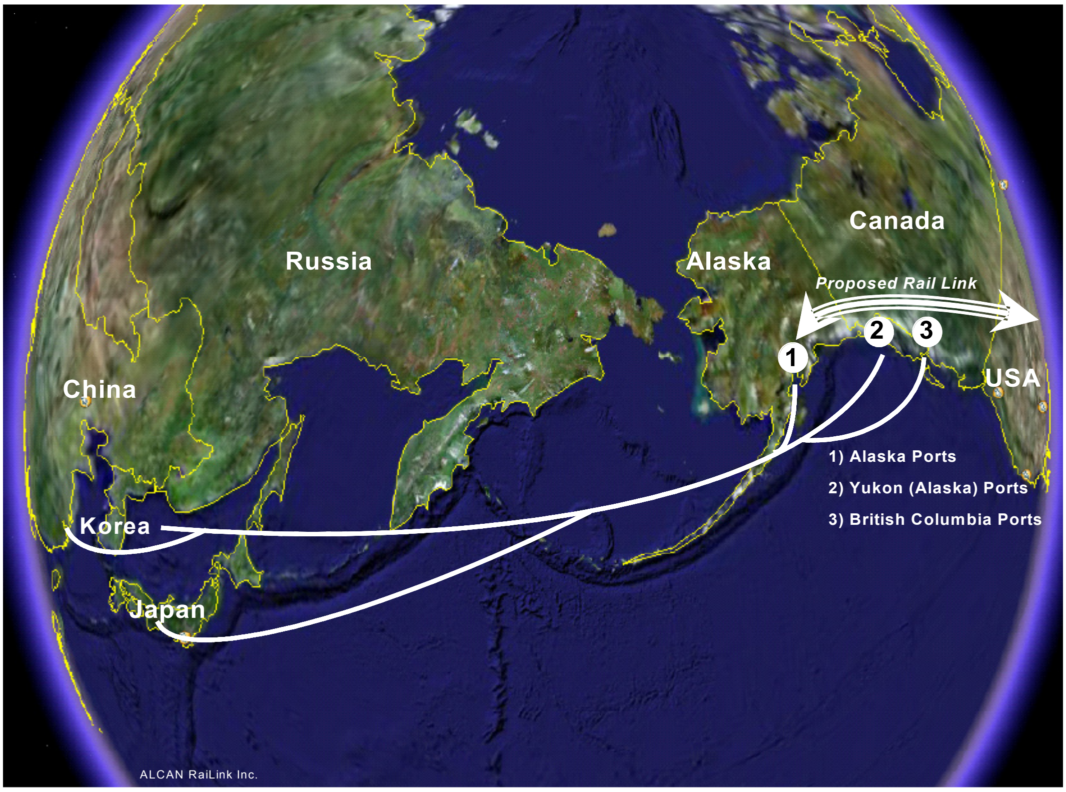
North Pacific Rim Trade Corridor for Resource Exports and Asian Imports





1. Introduction

The Alaska Canada Rail Link (ACRL) Project is part of an emerging North Pacific Rim Trade Corridor. In the broadest sense, the scope of this project is set by the market, technical, environmental and financial assessment of a rail route for both resource exports to North Asia and intermodal imports to Mid-America.

1.1 Study Purpose and Reporting

The purpose of the Stage 1 Feasibility Study is to objectively determine the nature and extent of a business case for investment in the ACRL. The project spans a long range planning horizon that allows evolutionary, market-based, business case refinement as specific demand firms up over time:

- In the long term, for a North Pacific Rim sea/rail trade route bridging both resource and container traffic between North Asia and North America through Alaska ports;
- In the mid term, for an Alaska Railroad extension to Canadian National Railway for mining, oil and gas development - and to support North American economic security;
- In the short term, for a resource railway linking Yukon and B.C. mine sites to closest tidewater export position at Alaska or Northern B.C. ports.

The feasibility of the ACRL is continuing to evolve. This is a preliminary feasibility outlook on the project. It reports on completed research and analysis to date. The Study and this report should not be viewed as a decision document, but rather as documentation for ongoing decision-making.

The completed research is comprised of the Market and Technical Research that was conducted during the first stage of the Study. The first stage of the study was undertaken in September 2005 and completed in June 2006.

The second stage analysis is comprised of a Strategic Environmental Assessment and Business Case Assessment. This stage of the study was undertaken in April 2006 and completed in October 2006.

This Executive Report is a summary of the market, technical, financial and environmental results. The full results of the research and analysis, with supporting consultant reports, are separately compiled in a geographic information system data base.

Multi-Lateral Project Governance

Joint ACRL Advisory Committee/Management Working Group meeting with Alaska Railroad – March 2006



1.2 Background of the Study

A rail link from Alaska to the rest of the North American rail system has been under consideration since the Alaska Railroad was started in 1914. Today, a renewed interest in resource deposits in Alaska, Yukon, and British Columbia, as well as changing world markets, global trade dynamics and supply chains, has rekindled interest in that link.

In 2000, the U.S. Congress passed "Rails to Resources" legislation that authorized the expenditure of $6 million for an international commission to study the feasibility of a rail link from northern British Columbia to the Alaska Railroad. Subsequently, Alaska and Yukon agreed to work on a joint approach that would initiate the study.

In 2005, Alaska Governor Frank Murkowski and Yukon Premier Dennis Fentie signed a Memorandum of Understanding to start the Alaska Canada Rail Link Feasibility Study. The Study got underway on July 1, 2005 with the opening of a project office in Whitehorse, Yukon.

1.3 Organization of the Study

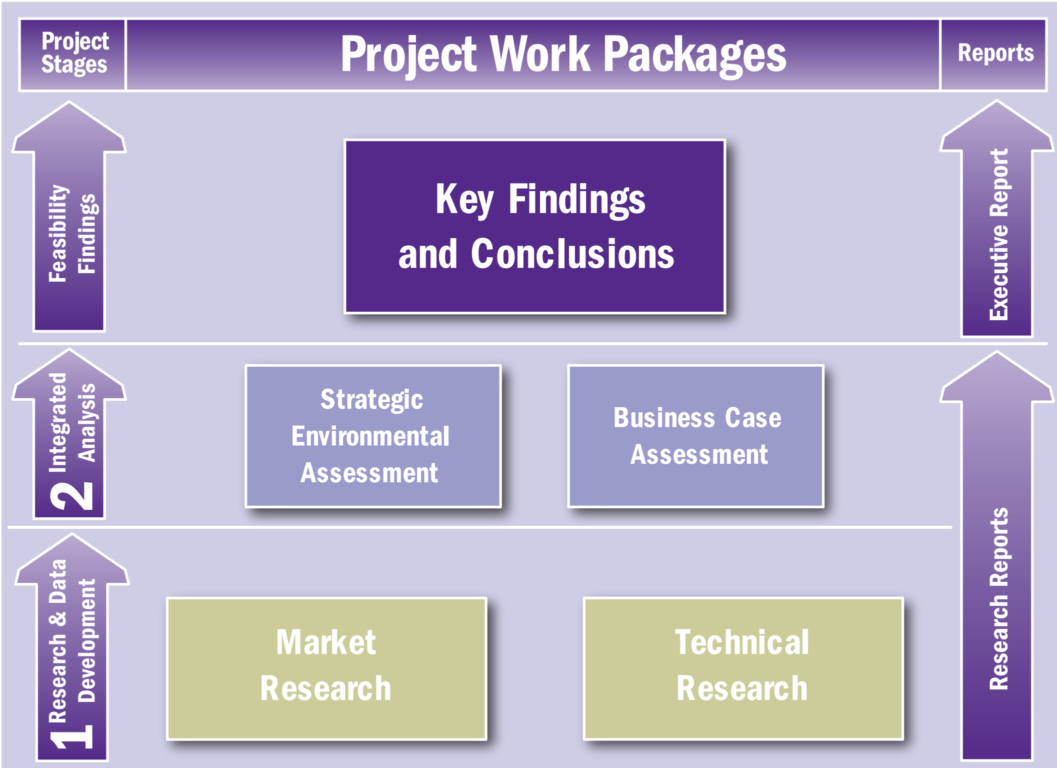
Project oversight was provided with representation from Alaska, Yukon, British Columbia, Canada, Yukon First Nations, Alaska Native Corporations and industry at two levels of governance:

- A Bi-Lateral Advisory Committee, co-chaired by Alaska and Yukon, provided general oversight to the Management Working Group;
- A Multi-Lateral Management Working Group, chaired by Yukon, carried out the study and reported to the Advisory Committee.

A project manager was retained to conduct the study from the Whitehorse Project Office. The Study research and analysis was primarily carried out by contracted consultants, with support from the University of Alaska Fairbanks (UAF).

The Study was divided into two stages:

- In Stage One, expert consultants on shipper markets and railway engineering, maintenance, and operations gathered data on potential traffic and costs for the proposed railway. At this stage, several potential routes were evaluated;
- In Stage Two, the most promising route segments were further assessed in terms of financial viability, regulatory issues, and public interests including bio-physical, social and economic impacts.



Stage One and Stage Two Teams Research Integration Workshop – April 2006



The work of Stage One was divided among two teams researching the proposed routes:

- The *market team* researched resource, resupply, pipeline construction and intermodal container traffic potential to forecast competitive revenue streams;
- The *technical team* researched rail construction, operations and port capacity requirements to estimate capital and operating costs for the project.

A primary purpose of the Stage One research was to provide a baseline for the Stage Two Business Case Assessment and Strategic Environmental Assessment. Work on both of these Stage Two assessments was conducted in a collaborative effort among several firms comprising two additional teams:

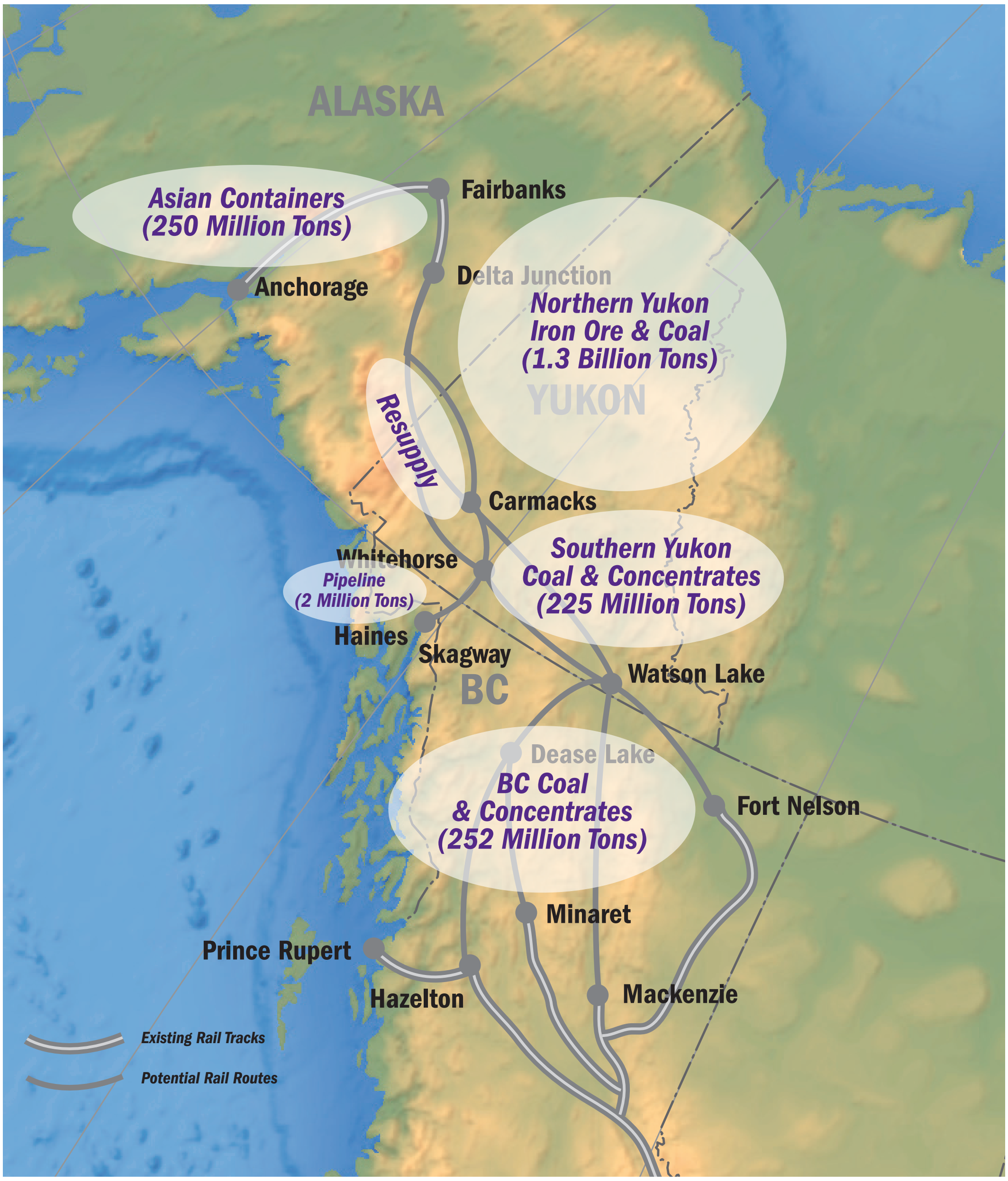
- The *financial advisory team* analyzed potential commercial revenues and extended public benefits from both a private and public investment coverage perspective;
- The *strategic impacts team* analyzed long range environmental issues and incremental economic activity potentially affecting the balance of project sustainability.

In order to achieve ambitious study time lines, the teams overlapped and worked in parallel with each other, requiring ongoing reconciliation of interdependent pre-requisite assumptions.

A full list of the project contractor teams is provided in the Appendix. The results of their work provide a unique northern logistics body of knowledge that is now available to other researchers who may wish to further pursue related resource, transportation or economic development initiatives in the future.

This report uses U.S. units of measure (dollars, miles, tons) unless otherwise specified.

Long Range Markets and Route Options



Fifty year life-cycle sourcing for traffic geographically oriented to route options connecting the Alaska Railroad at Delta Junction to Skagway in Southeast Alaska and to the Canadian National Railway in Northern B.C.

2.
Market Research Results

This chapter summarizes market analysis targeting the following traffic segments over a 50 year project life-cycle. These traffic segments can build incrementally into full system volume and revenue potential for:

- *2 million tons/project ($50 million) of one time pipeline logistics traffic;*
- *9 million tons/year ($250 million) Alaska/Yukon resupply & initial mineral exports;*
- *5 million tons/year ($350 million) Asian sea/rail container imports via Alaska;*
- *38 million tons/year ($345 million) British Columbia coal & Yukon Iron Ore exports;*
- *50 million tons/year full traffic potential generating revenue of almost $1 billion/year.*

Railways need volume to be viable. After an influx of one-time pipeline logistics traffic, ongoing Alaska and Yukon resupply as well as initial coal and concentrate exports are anticipated to increase up to 9 million tons per year – a level that approximates current Alaska Railroad freight traffic.

Further market development within an emerging North Pacific Rim trade corridor may attract Asian sea/rail container imports to Mid-America through Alaska, as well as British Columbia coal and Yukon iron ore exports to Asia. These market segments would increase traffic by 43 million tons per year, for a full system total potentially reaching 50 million tons per year, and generating almost $1 billion in annual revenue – a level commensurate with the SOO Line U.S. subsidiary of Canadian Pacific Railway.

2.1. Life Cycle Traffic Forecasts

A 50 year ACRL Project life cycle has been set for this study as the appropriate market planning horizon for fixed transportation infrastructure investment of this sort. Life cycle market research was conducted by Gartner Lee Ltd. (mineral markets) and Vector Research (community resupply) in Yukon and by QGI Consulting Inc. (consolidated rail market) in Alberta. From these Market Research reports, sequential traffic and revenue build-up is incrementally projected in the following table:

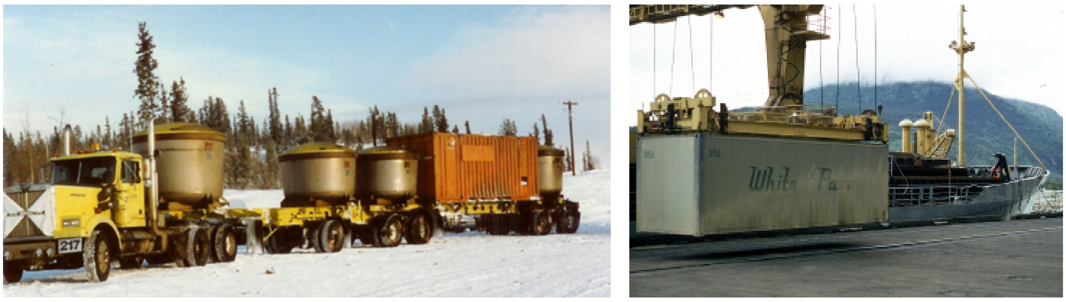
Project Life Cycle Traffic and Revenues

Traffic Segments In Order of Certainty Over 50 Year Project Life Cycle

Major Traffic Segments	% Tons	Total Traffic		Total Revenues		% Revs
Arctic Gas Pipeline Logistics	0.1%	2	million tons	$0.05	billion revs	0.2%
Alaska & Yukon Resupply/Mineral Exports*	11%	225	million tons	$7	billion revs	20%
Asian Intermodal Container Imports	13%	250	million tons	$15	billion revs	43%
Alaska,Yukon & Asian Traffic	24%	477	million tons	$22	billion revs	63%
British Columbia Coal Exports	13%	252	million tons	$2	billion revs	6%
Yukon Iron Ore Exports	63%	1,260	million tons	$11	billion revs	31%
Total Traffic Potential	100%	1,989	million tons	$35	billion revs	100%

** includes 53 million tons new discovery traffic x $20/ton = $1 Billion Revs*

Major Market Traffic Segments



Inbound Resupply/Mineral Exports - Former Faro Mine Haul and White Pass Intermodal Resupply

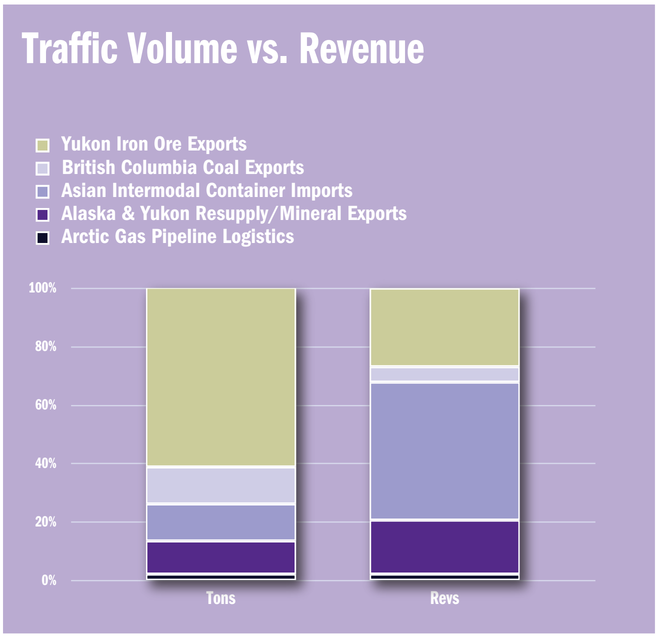
Potential Asian Container Import Traffic - New Yangshan Container Port at Shanghai

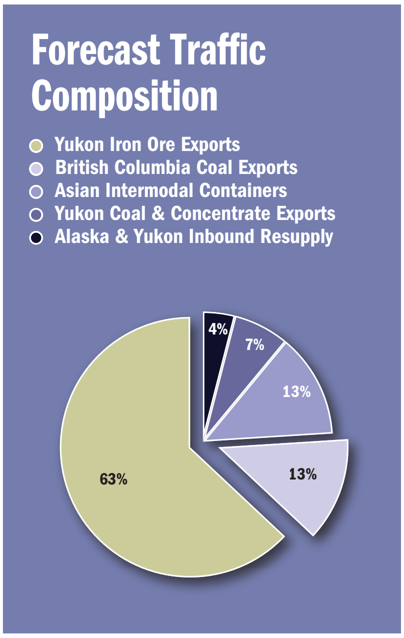
Coal and Iron Ore Export Traffic - Current Alaska Railroad Coal Unit Train at Seward

Traffic segments are presented in sequence of potential timing, volume and revenue associated with each. A relatively high degree of confidence is assumed for potential pipeline, resupply and mineral export traffic. Asian container traffic is assumed somewhat more speculative. B.C. coal and Yukon iron ore exports have huge potential identified in early stage exploration drilling, but are subject to further feasibility programs.

As shown in the following figure, B.C. coal and Yukon iron ore account for more than three quarters of total 50 million tons per year potential volume. Less than one quarter of the total volume is the balance of Alaska, Yukon and Asian traffic.

While the volume of potential mineral traffic is huge, revenue potential is not necessarily commensurate with that volume. Lower volume but higher value intermodal traffic can provide a disproportionate share of revenue. A wide variance in analysis of volume versus revenue for each traffic segment is identified in the following figure.

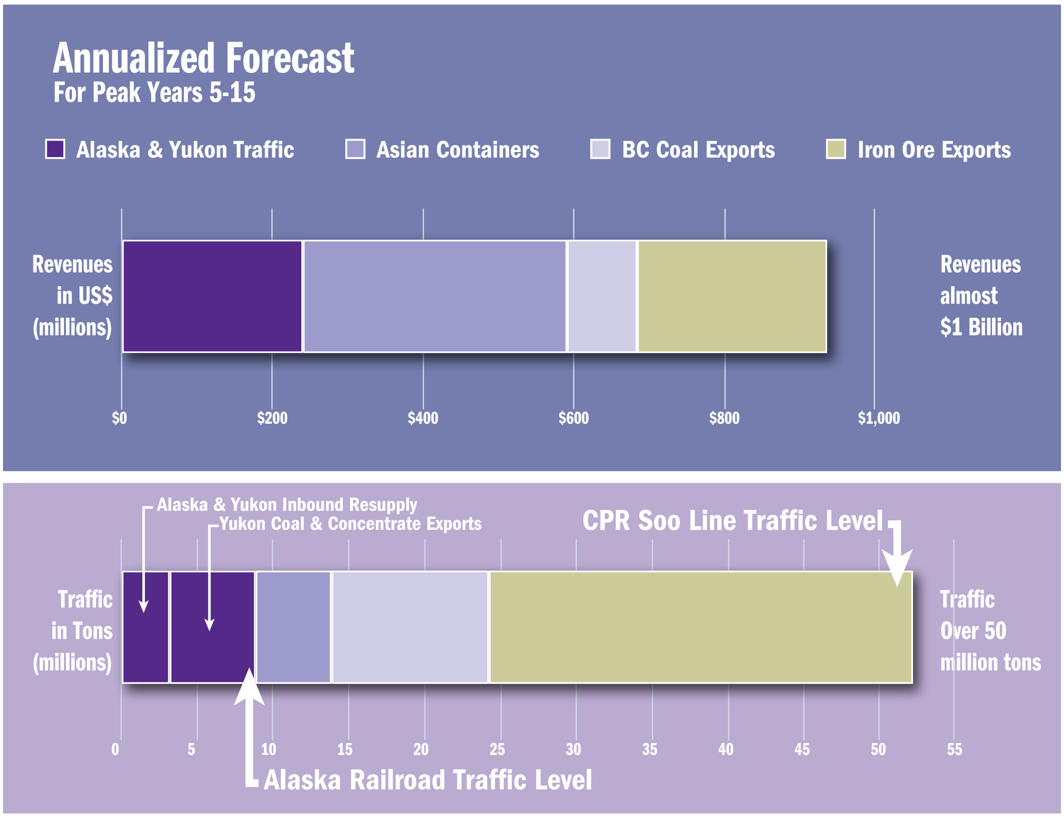




Annualized Traffic and Revenue Forecasts

(Year 10 Forecast within Peak Years 5 to 15)

Forecast Traffic Scenarios	Tons (millions)	Revs (millions)
Alaska & Yukon Inbound Resupply	3.2	
Yukon Coal & Concentrate Exports	5.7	
Subtotal Alaska & Yukon Traffic	8.9	$240
Asian Intermodal Containers	5.0	$350
Subtotal with Land Bridge Taffic	13.9	$590
British Columbia Coal Exports	10.4	$93
Alaska, Yukon & BC Traffic	24.3	$683
Yukon Iron Ore Exports	28.0	$252
Total Traffic Potential	52.3	$935





2.2 Annualized Traffic Scenarios

At the peak period of Years Five to 15, annualized traffic flows are forecast in the facing figure for 10 years after completion of railway construction. By Year 10, it is assumed that the one-time influx of pipeline traffic will be replaced by increasing Yukon coal and concentrate exports, as well as ongoing Alaska and Yukon resupply traffic. Approaching nine million tons per year, *this level exceeds current Alaska Railroad traffic.*

Sea/rail capture of some Asian intermodal container traffic via an Alaska gateway is also assumed within 10 years of railway construction. In combination with conventional Alaska and Yukon traffic, the result is almost 14 million tons per year generating almost $600 million in rail revenues annually. *This level of traffic exceeds former BC Rail traffic prior to takeover by Canadian National Railway.*

Although somewhat less certain, the build up of B.C. coal traffic to over 10 million tons per year and of Yukon iron ore traffic up to 28 million tons per year, would raise the total system volume to over 52 million tons per year, generating almost $1 billion in annual revenues. *This level of traffic is equivalent to the SOO Line Railroad (a U.S. subsidiary of Canadian Pacific Railway).*

The following table benchmarks the full traffic potential of the ACRL against Soo Line Railroad operating statistics for 2005 with comparable results.

Benchmark Comparison At Full Traffic Potential		
Benchmarking	Soo Line Railroad (CPR)	Alaska Canada Rail Link
Track Owned/Leased	1,700 miles	1,600 miles
Freight Traffic Tons	52 million tons	53 million tons
Freight Traffic Revenues	$1billion (approx.)	$1billion (approx.)

The full traffic potential identified to date places the ACRL in a comparatively strong revenue position in a North American industry context.

Rails and Trucks to Resources

Concentrate truck hauls to Skagway and Stewart/Hyder

Continuous rotary rail car dumper and coal transfer at Prince Rupert



2.3 Resource Railway Revenues

The economic viability of heavy haul resource railways and mega resource developments are mutually dependent. There is a traffic threshold above which rail becomes the only practical transport for very large base metal, iron ore or coal mines - and below which rail cannot afford to operate competitively.

This significance of resource revenues for shippers and carriers has been separately analyzed in a scenario application of the mineral market research.

In order to more closely relate mine traffic revenue and the investment it requires, a resource railway scenario has been incorporated in an ACRL database application developed by the project office that considers the minimum track to tidewater export position that can attract the maximum resource traffic. For Yukon base metal concentrates, Ross River, Yukon is assumed as a common origination point with Skagway, Alaska as the closest port option. For iron ore, Carmacks, Yukon is assumed as a pellet plant location for rail loading to Haines, Alaska as the closest port with adequate capacity expansion potential (see technical research results in the next chapter).

In the following table, total revenue is forecast from the data base application of a resource railway scenario with separately determined competitive rates extended over project life-cycle Revenue Ton Miles (RTM).

Alaska Inside Passage Port Access
Competitive Rate Extension to Life Cycle Revenues

	$/Ton	Miles	$/RTM	RTM	Total Revenue
Iron Ore Pellets (Carmacks to Haines)	$15.75	297	$0.053	415,800,000,000	$22,050,000,000.00
Other Minerals (Ross River to Skagway)	$34.60	346	$0.100	22,069,350,000	$2,206,935,000.00
Weighted Average	$16.59	299	$0.055	437,869,350,000	$24,256,935,000.00

Iron ore is by far the largest volume (95%), but a very low value commodity for rail haul. The mutual dependence of an iron ore and rail link project will require transportation pricing that keeps the iron ore mines competitive in the marketplace (most likely Asia). Separate market projection and mine production studies[1] have been applied to determine that after an allowance for mining, pelletizing and ocean freight, the final market can bear no more than $15.75 per ton ($.05/RTM) for rail transportation.

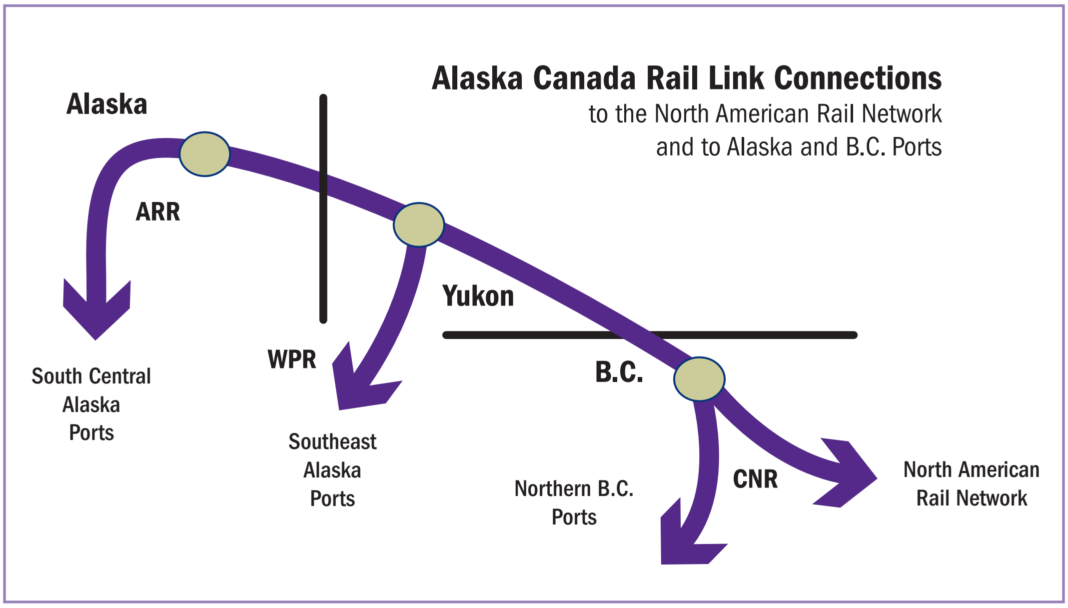
Base metal concentrates, on the other hand, are a much lower volume (5%) but have a much higher value and can afford to pay more for transportation. At the peak of price cycles and when the traffic volume is small enough, truck hauls can be viable for base metal mines. During price declines, however, higher cost truck transport may squeeze long term profitability. Accordingly, a one third reduction of truck rates to Skagway has been applied as the rail rate ($.10/RTM) considered attractive for base metal concentrates.

Total resource railway scenario revenue of $24.3 billion over the life-cycle of the project results from a differential pricing structure that competitively positions lower value minerals in the marketplace, while improving the long run market viability of higher value minerals.

[1] *ACRL Project Office commissioned Raw Materials Group of Sweden and Hatch Consulting to forecast iron ore market prices and production costs respectively.*

Port Access Rail Connections

Ridley Island Coal Terminal, Prince Rupert, B.C.



Full ACRL Connection Conceptual System Map



3.
Technical Research Results

This chapter summarizes the technical analysis and engineering estimates that have been completed for:

- *Phased Multi-Modal Port Access rail route segments; along*
- *A Full North American Rail Route connection to the Alaska Railroad; with*
- *A $7 billion baseline construction cost estimate ($11 billion with allowances); or*
- *An Alternative First Phase Resource Rail/Port investment of under $5 Billion.*

Phased route segments will support Alaskan and Canadian resource development as market demand evolves. Ultimately, a full phase North American rail system connection will allow Alaska to attract an expanding market for intermodal resupply from — and Asian marine containers to — the lower 48 United States.

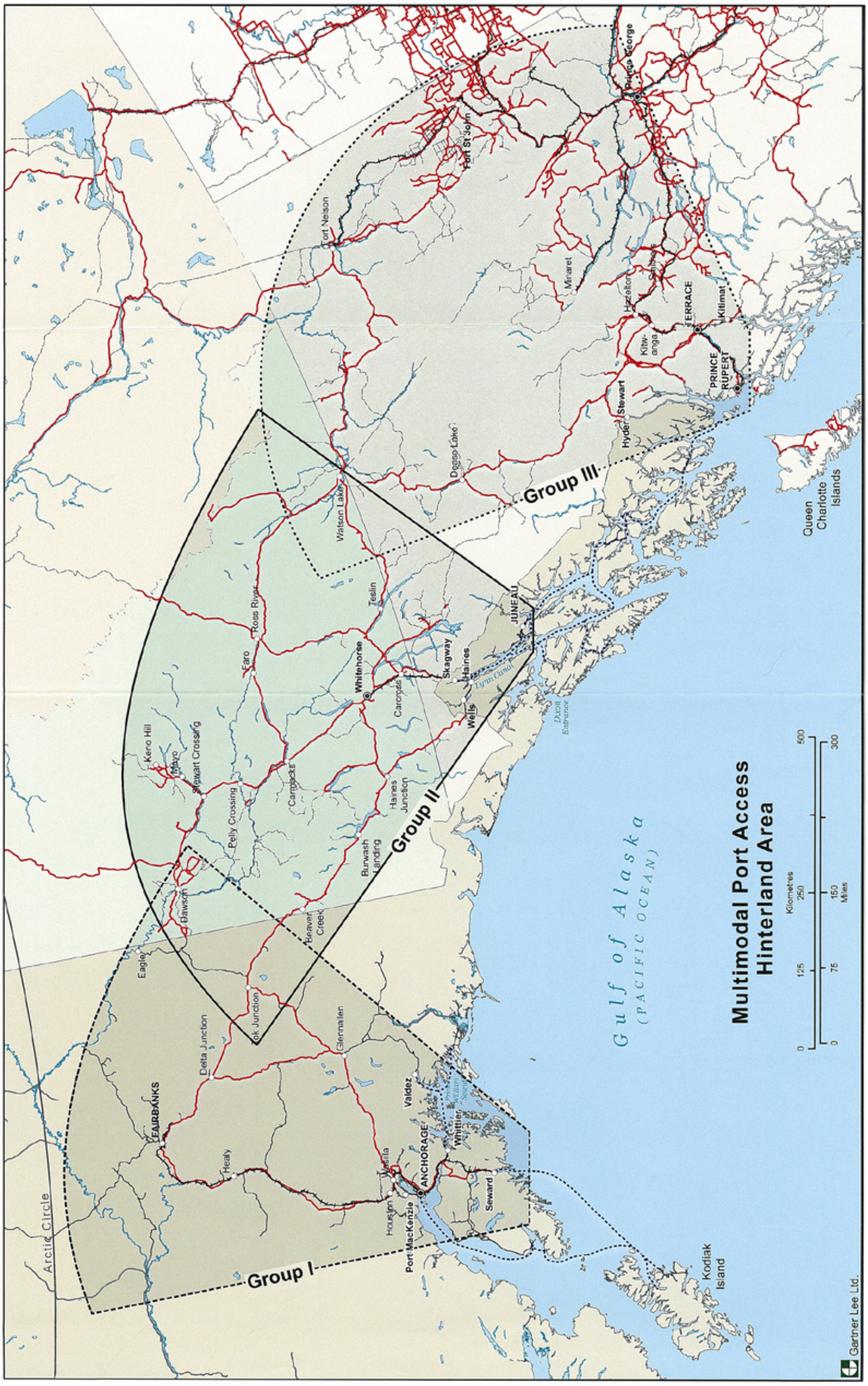
3.1 Port Access and Rail Connections

A major purpose of the ACRL will be to connect the Alaska Railroad through Yukon to the Canadian National Railway. However, a mutually supportive goal is to ensure tidewater access for Yukon and B.C mineral exports. How both those goals can be met is illustrated in the adjacent conceptual system map.

Full system investment can integrate some or all port access segments along an extension of the North American rail system from the Canadian National Railway at New Hazelton, B.C. to the Alaska Railroad at Delta Junction, Alaska. Initial phased investment route segment options extend from Carmacks, Yukon to:

- South Central Alaska (Cook Inlet Ports of Anchorage and Port MacKenzie);
- Southeast Alaska (Inside Passage Ports of Skagway and Haines); or
- Northern B.C. (Ports of Prince Rupert and Kitimat).

Logical export access routes, up to the limit of current marine terminal capacities, radiate from each port group (see following map). Although currently, most mine planning includes export access via closer, smaller outports (e.g., Skagway or Stewart), later and/or larger shippers can be redirected with lower cost rail transport to more distant but larger capacity ports (e.g., Port MacKenzie or Prince Rupert). This in turn reinforces a full continental rail system connection between Alaska and B.C. with the potential to bridge import container traffic from Asia, as well as resource exports to Asia.


Multimodal Port Access
Hinterland Area
Kilometres
0
125
250
500
Miles
0
75
150
300
Group I
Group II
Group III
Gulf of Alaska
(PACIFIC OCEAN)
Queen Charlotte Islands
Kodiak Island
Arctic Circle
FAIRBANKS
ANCHORAGE
JUNEAU
TERRACE
PRINCE RUPERT
Whitehorse
Prince George
Fort St John
Fort Nelson
Watson Lake
Dease Lake
Stewart
Hyder
Kitimat
Hazelton
Kitwanga
Minaret
Teslin
Ross River
Faro
Carcross
Skagway
Haines
Wells
Haines Junction
Burwash Landing
Beaver Creek
Carmacks
Pelly Crossing
Stewart Crossing
Mayo
Keno Hill
Dawson
Eagle
Tok Junction
Glennallen
Delta Junction
Valdez
Whittier
Seward
Healy
Wasilla
Houston
Port MacKenzie
Lynn Canal
Dixon Entrance
Gartner Lee Ltd.

3.1.1 Port Access Alternatives

Yukon Engineering Services in association with CH2MHill/Banjar Management Consultants conducted a comprehensive multi-modal assessment of the ports interface for this project. All port access options from Northern British Columbia to South Central Alaska were screened for marine terminal capability and potential development of efficient sea/rail operations. The ports screened were Seward, Whittier, Valdez, Anchorage and Port Mackenzie accessing South Central/Interior Alaska (Port Group I in map opposite); Skagway and Haines accessing Interior Alaska and Yukon (Port Group II in map opposite); and Kitimat, Prince Rupert and Stewart/Hyder[2] accessing Northern British Columbia and Southern Yukon (Port Group III in map opposite).

Port access options have been qualitatively ranked according to the following cargo handling capabilities at major marine terminals:

Cargo Handling Capabilities

Rank	Port/Terminal	Min Draft	Berth Face	#	Vessel Capability*	Site Area	Access
SOUTH CENTRAL ALASKA PORTS:							
1	Port of Anchorage	35 feet	2223 feet	3	HandyMax/RoRo/Cntr	130 acres	Road/Rail
1	Port MacKenzie	60 feet	1200 feet		Panamax (Capesize^)	8960 acres	Road/Rail ‡
2	Seward Coal Term	58 feet	900 feet		Capesize Coal	34 acres	Road/Rail
3	Seward Freight Term	33 feet	640 feet		Handysize/Cntr Barge	3 acres	Road/Rail
3	Port of Whittier	30 feet	1525 feet	2	Handysize/Rail Barge	Limited	Road/Rail
3	Port of Valdez	50 feet	1200 feet		Post Panamx/Capesize	21 acres+	Road only
ALASKA INSIDE PASSAGE PORTS							
1	Port of Skagway	36 feet	2400 feet	3	Handymax/Cntr Barge	80 acres	Road/Rail
1	Port of Haines	36 feet	1000 feet		Handymax/Cntr Barge	120 acres	Road only
NORTHERN BRITISH COLUMBIA PORTS							
1	Ridley Terminals	72 feet	1065 feet		Capesize Coal	2500 acres	Road/Rail
1	Fairview Terminal	51 feet	1300 feet	2	12,000 TEU Cntr	58 acres	Road/Rail
2	Kitimat/Eurocan	45 feet	900 feet	2	Handymax Lumber	142 acres+	Road/Rail
3	Stewart Bulk Term	40 feet	89 feet		Handymax Bulk Ores	12 acres+	Road only
3	*Hyder Proposal*	*45 feet*	*1200 feet*		*Handymax/Cape/Cntr*	*125 acres*	*Proposed*

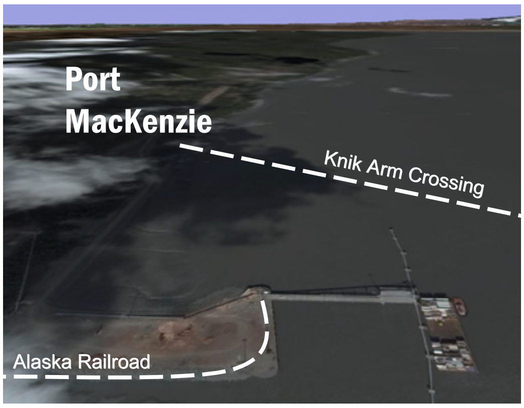
^ Knik shoal tidal restrictions currently limit vessel capability   + potential to access additional non-contiguous land area   ‡ rail spur programmed

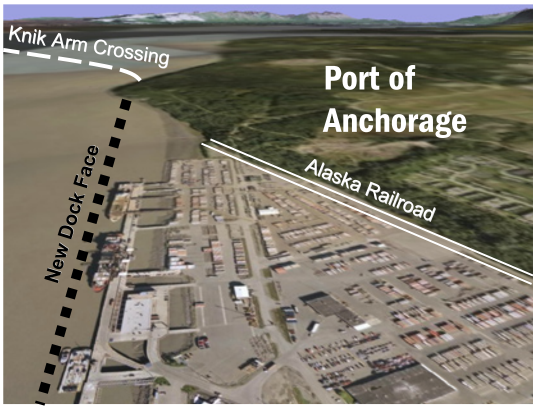
* Bulk Ship Size	Handysize	Handymax	Panamax	PostPanamax/Capesize
Deadweight Tons	20,000-35,000 DWT	35,000-50,000 DWT	50,000-80,000 DWT	80,000-200,000 DWT
Nominal Draft	30 Feet (9 meters)	35 Feet (11 meters)	45 feet (14 meters)	50 feet (15 meters)

[2] *Hyder, Alaska borders Stewart, B.C. and interior access is only through British Columbia.*

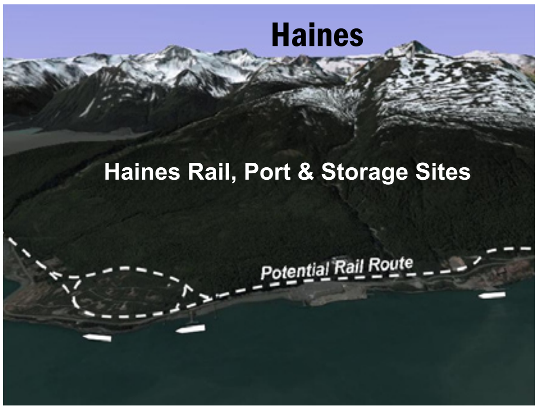
Port/Terminal Working Scenarios

South Central Alaska Ports

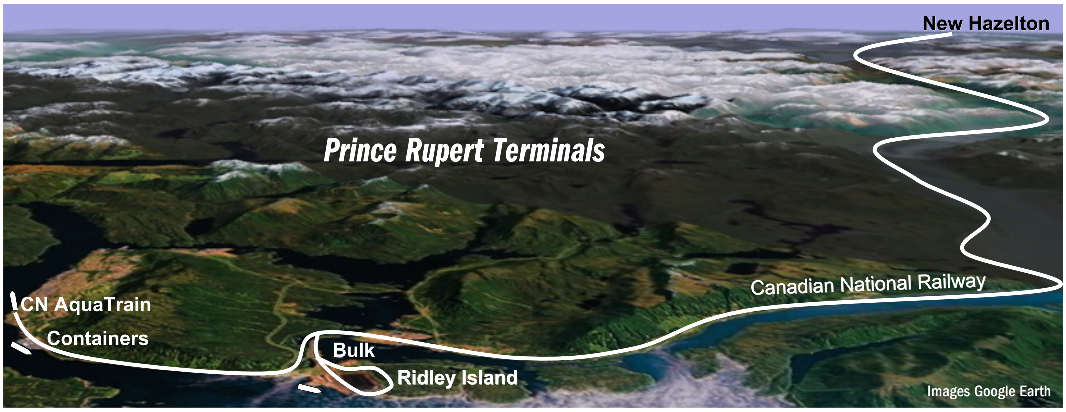




Southeast Alaska Ports



Northern British Columbia Ports





South Central Alaska Ports, with the exception of Valdez, and Northern B.C. Ports with the exception of Stewart/Hyder, are currently accessed by existing freight railways. Among these, Ridley Island and Fairview Terminals at Prince Rupert and the Cook Inlet port pair of Anchorage and Port MacKenzie have the current infrastructure, land base and port access best positioned to expand sea/rail gateway operations for both containers and bulk cargos.

Between the two Southeast Alaska Inside Passage Ports, Skagway has the existing marine terminal and rail infrastructure that has traditionally provided tidewater access for Yukon and some northern B.C., mines.[3] However, the constraints imposed by cruise ship berthing, tourist train operations and limited land availability restrict the scale of bulk cargo handling that can be undertaken at Skagway. Although Haines is currently much less developed and has no rail access, suitable land for large scale bulk port development is more readily available.

The research concludes that Anchorage/Port MacKenzie, Skagway/Haines, and Prince Rupert Port have the greatest potential to handle bulk resource shipments. (See opposite port/terminal overviews.)

3.1.2 Rail Route Alternatives

A number of alternative routes connecting the Alaska Railroad and Canadian National Railway have been considered. All routes researched for the Feasibility Study are shown in the following map, with the working scenario route highlighted in black.

Yukon and British Columbia route options converge at Watson Lake, Yukon. From Watson Lake south, four options connect to Canadian National rail heads in British Columbia at Fort Nelson, Mackenzie, Minaret or New Hazelton.

From Watson Lake to Alaska, there is a southern route option along the Alaska Highway, or a northern route option along the Robert Campbell Highway and through the Tintina Trench. Both of these alternative Yukon routes converge near the Canada/U.S. border and continue along the Alaska Highway to connect with the Alaska Railroad at Delta Junction in Alaska. Both of these routes are also connected through Carmacks and/or Whitehorse to the Southeast Alaska Inside Passage Ports of Skagway and/or Haines.

Yukon Engineering Services Inc., in association with EBA Engineering Consultants Ltd., have developed preliminary engineering data for these routes from previously conducted highway and pipeline survey work.

[3] *Tri-White Corporation, through several wholly owned subsidiaries operating as White Pass & Yukon Route, controls three major docks for cruise ship and cargo berthing in Skagway as well as the connecting rail services currently operated only with summer tourist trains. The largest (easternmost) Railroad Dock is a freehold property, while the original Ore Dock and more recent adjacent Broadway Dock are situated on city property and operate under long-term lease that expires in 2023.*

Working Rail Route Scenario



While ongoing market, engineering, operations and environmental evaluation will determine final route selection, the working route scenario for current planning purposes generally follows:

- The Cassiar Highway in Northern British Columbia;
- The Robert Campbell Highway in Yukon; and
- The Alaska Highway in Alaska.

This working route scenario has been selected based on current engineering evaluation in the following section - and market identification in the preceding chapter.

Final route selection may include further consideration of:

(1) Full Alaska Rail Connection

- A Yukon northern route via Nisling River to Beaver Creek (to avoid Ladue River);
- A Yukon southern route via Whitehorse (to Watson Lake and/or Dease Lake); and
- A B.C. route via Grande Prairie, Alberta to Fort Nelson (to avoid CN North Line); or
- Via Rocky Mountain Trench/Williston Reservoir (to minimize grades and curves); or
- Via Dease Lake Extension (to use existing partially completed right-of-way/grade).

(2) Phased Resource Rail/Port Access

- Skagway port access build out (to optimize limited bulk port capacity); and/or
- Haines new high capacity port access (for Yukon iron ore and other large mines);
- Skagway bypass to new Katzehin terminal (with Juneau Access road/rail synergies);
- Stewart/Hyder new port access (to avoid CN bottleneck to Kitimat/Prince Rupert).

The most significant demand-driven shift in routing scenarios would be the development of large scale iron ore operations (28 million tons handled in 15 loaded and empty train movements per day). Staging, berthing and shiploading capabilities owned or controlled by the White Pass & Yukon Route would be overly strained at Skagway. A separate analysis of alternative export routes for large mines has considered the undeveloped port potential at Haines to address White Pass concerns with conflicting cargo and cruise ship/tour train operations at Skagway (also presenting the prospect of alternative inland tour train access from Haines for cruise ship operators).

3.1.3 Phased Resource Railway Options

As an initial phase of the full Alaska rail connection, there are several resource railway alternatives. First phase resource railway segments would focus on the following port access options:

- Carmacks to Inside Passage Ports (Skagway/Haines);
- Carmacks to Cook Inlet Ports (Port Mackenzie via Delta Junction);
- Carmacks to Northern B.C. Ports (Prince Rupert via New Hazelton).

Each of these segments is consistent with full investment in an Alaska rail connection. Selection of any initial resource railway segment would amount to pre-building a portion of the full connection.

A first phase resource railway segment from Carmacks to Skagway or Haines is the most direct for Yukon mine exports/resupply and would provide the regional port access anticipated as part of a full Alaska rail connection. Beyond practical port limitations at Skagway, nominally capped at two to three million tons per year, Haines could provide a high capacity export alternative for larger Yukon mines.

A first phase resource railway segment from Carmacks to Cook Inlet Ports in South Central Alaska, while considerably longer than to Haines, would complete approximately one third of the full Alaska rail connection to the Canadian National Railway. This route would access existing Cook Inlet port facilities in the Anchorage area as well as at Seward or Whittier. Further development of high-capacity bulk terminals and rail access is anticipated for Port MacKenzie across the Knik Arm of Cook Inlet from the Port of Anchorage[4]. In addition to high volume resource exports from Canada, this route could also support inbound mine supply and pipeline construction staging in eastern Alaska and central Yukon.

A first phase resource railway segment from Carmacks to Northern B.C. Ports, while much longer than to Haines and considerably further than to Anchorage, would complete approximately two thirds of the full Alaska rail connection to the Canadian National Railway at New Hazelton, B.C. This segment could provide Yukon mines with the capacity to handle all potential concentrate, coal and iron ore exports through Ridley Island high-capacity, deep-water bulk terminal facilities at Prince Rupert. As well, Northern B.C. mines could save some 600 miles of rail transport that would otherwise be required east to Prince George via the alternative Dease Lake Extension and back to Prince Rupert. This route would also allow for inbound mining resupply and pipeline construction materials staging via port facilities at Kitimat and Prince Rupert or via eastern CN Rail connections.

[4] *The Port of Anchorage and Port MacKenzie will also be connected by a new bridge currently being tendered as a Public Private Partnership by the Knik Arm Bridge and Toll Authority.*



3.2 Full Alaska Rail Connection Costs

Technical engineering evaluation and estimates for alternative B.C. and Yukon routes were prepared by UMA Engineering Ltd. Class 4 Track Standards (60 mph freight train speeds) and 10 million revenue tons per year rail plant capacity were assumed. UMA applied engineering design criteria limiting gradients to 1 percent, curves to 3 degrees (with some exceptions to a maximum of 6 degrees), and car load weight-on-rail to 286,000 pounds.

UMA ranked nine routes from the perspective of constructability and operating profiles based on physical characteristics including mileage, curvature, grade, transit time, track/train dynamics, and seismic risks. Initial planning assumed a B.C. railhead at either Fort Nelson or Minaret on the uncompleted Dease Lake Extension. Subsequent evaluation determined that both New Hazelton and Mackenzie, B.C. railheads were more attractive than the substantially more difficult construction and operations anticipated for a Dease Lake Extension.

Although a Mackenzie, B.C. railhead ranked highest according to constructability and operating profile, New Hazelton was more attractive because it cuts off nearly 600 miles distance to tidewater compared to all other B.C. rail routes connecting via Prince George. As well, for eastbound mainline traffic it is essentially no further (+ 20 miles).

In Yukon, operating profiles and constructability favored a Watson Lake - Carmacks - Ladue River Valley route continuing to an Alaska Railroad connection along the Alaska Highway at Delta Junction (see Yukon Route Operating Profiles in the Appendix).

The UMA rankings are (1 is best):

Segment	Miles	Ranking
B.C. Routes:		
Mackenzie(B.C.) to Watson Lake	435	1
New Hazelton to Watson Lake	497	2
Fort Nelson to Watson Lake	336	3
Minaret to Watson Lake	392	5
Yukon Routes:		
Watson Lake to Carmacks	403	1
Carmacks to Ladue River/Border	223	1
Watson Lake to Whitehorse	314	2
Carmacks to Beaver Creek/Border	233	3
Whitehorse to Beaver Creek/Border	328	3

Rails or Trucks to Ports

Current intermodal container and Roll-on/Roll-off resupply via Anchorage, Alaska

Past and present container resupply via Skagway, Alaska

In Canada, based primarily on UMA ranking of constructability and operating profiles, a working route scenario was selected:	New Hazelton–Watson Lake	497 miles
	Watson Lake–Carmacks	403 miles
	Carmacks–Ladue Border	223 miles
	Total in Canada	1,123 miles
In Alaska, route research by the University of Alaska Fairbanks was essentially along the Alaska Highway for a distance of:		190 miles
	Total including Alaska	1,313 miles
From Skagway, HDR Engineering and Pacific Contract Company researched the White Pass & Yukon Route with an extension to Carmacks:		217 miles
	Total Baseline System	1,530 miles
Subsequent addition of an Iron Ore Scenario required consideration of Haines as an alternate to Skagway for rail/port access at an incremental distance[5] of:		80 miles
	Total Alternate System	1,610 miles

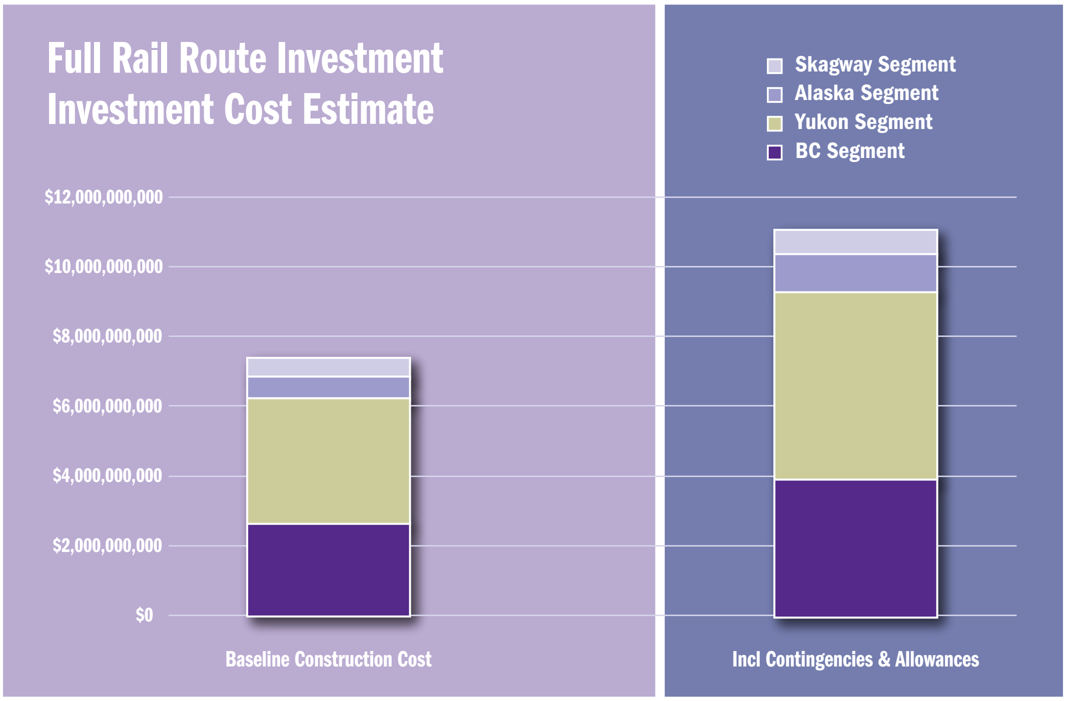
For full investment in the working route scenario running parallel to the Cassiar Highway from New Hazelton, B.C., along the Robert Campbell Highway through Yukon, and following the Alaska Highway to Delta Junction in Alaska, engineering estimates of initial track construction costs and ongoing operations costs have been developed.

3.2.1 Full Connection Construction Estimates

UMA completed the estimate for rail construction in Canada and UAF completed the estimate for rail construction in Alaska. A potential port access segment, upgrading and extending the White Pass Route from Skagway to Carmacks, has been evaluated by Pacific Contract Company/HDR Engineering.

Conceptual cost estimates based on engineering evaluation of construction terrain have determined that the baseline track system construction cost is $7.3 billion. This is a "desk-top" engineering pre-feasibility estimate. Adding contingency allowances for: (a) unknown estimating factors, (b) environmental planning and mitigation, and (c) owner oversight, project engineering and management – the appropriate total project cost estimate for business case analysis is $10.9 billion.

[5] *Incremental distance from Whitehorse to Haines is 190 miles–110 miles to Skagway= 80 miles*


Full Rail Route Investment
Investment Cost Estimate
Skagway Segment
Alaska Segment
Yukon Segment
BC Segment
$12,000,000,000
$10,000,000,000
$8,000,000,000
$6,000,000,000
$4,000,000,000
$2,000,000,000
$0
Baseline Construction Cost
Incl Contingencies & Allowances



Construction costs along the main route through Canada (New Hazelton to Ladue) are between $8 and $9 million per mile in generally mountainous terrain. Alaska construction costs (Ladue to Delta) are substantially lower at $5.5 million per mile through the broad and generally flat Tanana Valley. White Pass Route construction costs (Skagway to Carmacks) are the lowest at $3.1 million per mile for upgrade and extension of an existing rail line[6].

Full Rail Route Investment
Infrastructure Cost Estimates (US$)

Between	And	Miles	Baseline Rail Route Construction Cost*	Contingencies and Environmental Mitigation	Environment, Engineering and Owner/Project Mgmt	Total Project Cost for Business Case Analysis	$mm Mile
Hazelton	Watson	497	**$2,627,211,000**	$722,483,000	$602,945,000	**$3,952,639,497**	$8.0
Watson	Carmacks	403	**$2,194,548,000**	$603,501,000	$503,648,000	**$3,301,697,403**	$8.2
Carmacks	Ladue	223	**$1,339,027,000**	$368,233,000	$307,307,000	**$2,014,567,223**	$9.0
			$6,160,786,000			**$9,268,904,123**	
Ladue	Delta	192	**$630,377,283**	151,615,457	265,460,486	**$1,047,453,226**	$5.5
			$6,791,163,283			**$10,316,357,349**	
Carmacks	Skagway	217	**$538,339,921**	$53,833,992	$88,826,087	**$681,000,000**	$3.1
Full System Cost			**$7,329,503,204**			**$10,997,357,349**	

*Main Track, Terminals, Detectors, Communications and Power

Source: Canada Route Costs - UMA Engineering; Alaska Route Costs - University of Alaska Fairbanks; White Pass Route Costs - PCC/HDR Engineering

3.2.2 Full Connection Operations Analysis

Railway operations and costs have been simulated for each track and traffic segment of the full Alaska rail connection by Innovative Scheduling Inc. Rail traffic operations between Anchorage, Alaska and New Hazelton, B.C. are projected for through intermodal and carload freight trains as follows:

Intermodal and Carload Freight Train Operations

Locomotives	Horsepower	Cars (Containers)	Average Speed
SD70M-2 (3)	3 x 4300hp = 12,900hp	110 cars (220 cntrs)	40-60 mph

[6] *The lead time for regulatory permits and approvals should be relatively short for construction in the most sensitive portion of this route between Skagway and Whitehorse where the railway is already in place.*

Anticipated train operations for northern route track segments along the Robert Campbell Highway and through the Tintina Trench are projected to be less expensive on both a capital and operating cost basis than a southern Alaska Highway route. The Innovative Scheduling railway operations model forecasts over $1 per ton in operating cost savings and over $4 per ton in fully allocated cost savings[7] for a northern route through Yukon. This confirms the UMA Engineering assessment ranking a Watson Lake to Ladue River northern route above a Watson Lake to Beaver Creek southern route for both constructability and operating profile.

For Skagway port access to the full Alaska rail connection at Carmacks in Yukon, Innovative Scheduling has determined that when lower capital costs are added to higher operating costs for narrow gage upgrade and extension, the total costs are virtually the same as for standard gage. However, beyond the regional resource traffic base for isolated export operations, narrow gage integration with a full standard gage connection to the Alaska Railroad is unlikely to be practical, efficient or economic.

In the following table, the Innovative Scheduling railway operations model predicts incremental shipment costs for a northern route scenario, including Skagway port access, with:

(a) intermodal, carload and mineral traffic average costs on the full rail connection between Delta Junction, Alaska and New Hazelton, B.C.; and

(b) mineral traffic covering the Skagway segment from Carmacks, Yukon with either a standard or narrow gage (b') upgrade and extension.

Incremental costs per Revenue Ton Mile (RTM) are extended to shipment costs per ton, and for Carmacks-Skagway, Mineral Traffic costs are shown both for Standard Gage (SG) and Narrow Gage (NG) operations.

Alaska Rail Connection Operations Analysis

Incremental Shipment Costs

	(a) Average All Traffic	(b) SG Mineral Traffic	(b') NG Mineral Traffic
	Delta Jct-New Hazelton	Carmacks–Skagway	Carmacks–Skagway
Total Miles	1700 (1292 on line)	217 (Standard Gage)	217 (Narrow Gage)
Capital Cost	$.05/RTM ($64.60/Ton)	$.13/RTM ($28.21/Ton)	$.12/RTM ($26.04/Ton)
Operating Cost	$.02/RTM ($25.80/Ton)	$.03/RTM ($6.51/Ton)	$.04/RTM ($8.68/Ton)
Total Cost	$.07/RTM ($(90.40/Ton)	$.16/RTM ($34.72/Ton)	$.16/RTM ($34.72/Ton)

[7] *Average saving of $.002/RTM and $.007/RTM respectively under high traffic conditions in year 10 for comparative route costs of trains operating on the full rail connection (excludes potential iron ore traffic).*



The operations analysis provides a context for shipper pricing which will fall within the range of incremental costs. Carload shipments between Delta Junction and New Hazelton would pay between \$25.80/ton operating costs and \$90.40/ton fully allocated costs. Intermodal containers to or from Alaska averaging 7.5 tons per load would pay between \$193.50 operating costs/container and \$678/container fully allocated costs. Bulk mineral shipments from interior Yukon to tidewater export position at Skagway would pay between \$6.51/ton operating costs and fully allocated costs of \$34.72 per ton. (Actual pricing will depend on whether railway investment motivation is to maximize profit for the shipper or for the carrier.).

The Skagway track segment requires upgrading and extension of the existing White Pass & Yukon Route narrow gage railway. Whether that is a standard gage or narrow gage upgrade, total costs (\$.16/RTM) are about the same as for trucking over this relatively short route. Operating costs, however, at \$.03-\$.04/RTM are much lower than truck.

The White Pass & Yukon route narrow gage railway currently provides summer-only tourist train service between Skagway, Alaska and Carcross, Yukon. Track is in place but not in service between Carcross and Whitehorse, Yukon. Resumption of freight service is reported to be acceptable to current White Pass management as long as there is no interference with highly successful passenger service. For half of each day in summer and all through the winter when there are no passenger trains, freight operations should be welcome.

However, operational interference with passenger service is not acceptable to White Pass management during the tourist train season for approximately half of each day from mid-May through mid-September. As well, marketing interference with the historical appeal of a narrow gage railway, perceived from proposed upgrading to a dual narrow and standard gage, is also not acceptable to White Pass management.

Regardless of standard or narrow gage options, train operating practices for Skagway port access will be constrained by the last 40 miles of harsh terrain to tidewater. The following table compares Skagway options to anticipated operating characteristics for much more distant Northern B.C. or Anchorage area port access options.

Railway Operations - Power and Gage

Standard gage Alaska Railroad 4300 horsepower locomotives


Current White Pass & Yukon Route 1200 horsepower locomotives on narrow gage portion of dual gage tracks at Skagway



Bulk Resource Train Operations to Tidewater Export Position			
	Port MacKenzie or Prince Rupert	**Skagway Port Standard Gage**	**Skagway Port Narrow Gage**
Locomotives	SD70M-2 (3 units)	SD70M-2 (6 units)	NG-GE (6 units)
Horsepower	4300 (12,900 total)	4300 (25,800 total)	3000 (18,000 total)
Train Length	110 cars/train	60 cars/train	48 cars/train
Net Tons/Car	110 tons/car	110 tons/car	70 tons/car
Tare Tons/Car	23 tons/car	23 tons/car	18 tons/car
Trailing Tons	14,630 tons	7,980 tons	4,224 tons
Avg Speed	Up to 40 mph	Up to 20 mph	Up to 20 mph

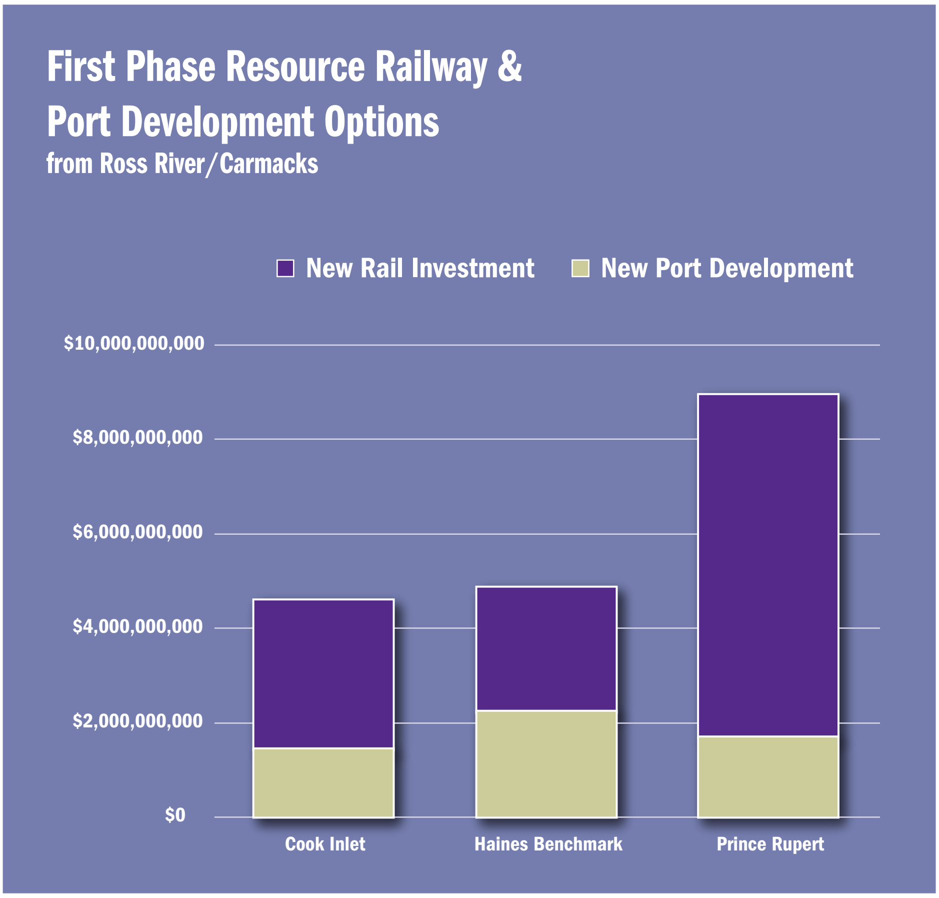
From the table above, the trade-off in rail operating requirements for bulk resource port access options is seen to be dramatic. Operating practices may be developed to accommodate the ruling constraints over a short segment of the White Pass Route between Carcross, Yukon and Skagway, Alaska. However, in combination with port capacity constraints at Skagway, beyond a relatively moderate tonnage limit (2-3 million tons per year), other port access options will be required. These are addressed separately in the following assessment of Phased Resource Railway Costs.

3.3 Phased Resource Railway Costs

An initial resource railway investment phase for large scale bulk train operations will require ports access where capacity expansion is relatively unconstrained. Without the addition of iron ore traffic and to the extent that larger coal or base metal mines do not go into production, it is possible that port capacity at Skagway may be adequate for Yukon mineral exports – at least in the near to mid term.

Upgrading the White Pass Route along the existing right-of-way as far as Whitehorse and with an extension to Carmacks/Ross River would make this the least capital intensive segment of a full system investment – but with a port capacity limitation on future expansion.

Technical screening of large scale rail and port operations, in conjunction with what would appear to be the most attractive route to tidewater from large scale iron ore, coal and major base metal mines, positions Haines as the port access benchmark for the full potential of Yukon resource development. The distance to alternative marine terminal sites at Port MacKenzie and Prince Rupert is much greater and without some offset could well price exports out of the market.



First Phase Resource Railway & Port Development Options
from Ross River/Carmacks
New Rail Investment
New Port Development
$10,000,000,000
$8,000,000,000
$6,000,000,000
$4,000,000,000
$2,000,000,000
$0
Cook Inlet
Haines Benchmark
Prince Rupert



However, to the extent that this huge traffic segment would reinforce the economics of a full connection between the Alaska Railroad and Canadian National Railway, a water competitive Haines or Skagway mineral export rate could be equalized to more distant but better developed ports (e.g., Port MacKenzie or Prince Rupert) - without actually constructing new Haines facilities or upgrading existing Skagway facilities.[8]

For the full ACRL, stand-alone rail capital cost estimates are appropriate to guide investment decisions. However, for Phased Resource Railway Segments incrementing into a full rail route system, knowledge of port infrastructure costs will also be required.

Capital and operating costs for three initial, high capacity, resource railway investment alternatives are estimated in the following subsections. Incremental marine terminal investment is included for a comprehensive comparison of total capital cost to implement a first phase resource railway that can facilitate large scale mineral development scenarios (e.g., for iron ore exports).

3.3.1 Phased Rail/Port Access Capital Cost Estimates

Within the full rail route system, three port access segments radiating from Carmacks, Yukon have been identified for Phased Investment Analysis:

- Carmacks to Cook Inlet;
- Carmacks to Haines; and
- Carmacks to Prince Rupert.

Carmacks is close to the mid-point between Port MacKenzie and Prince Rupert[9]. Haines, with the lowest total rail investment, becomes the benchmark for comparison with the other two resource railway port access alternatives. Combined rail and port investment outcomes are summarized in the following table.[10]

Phased Resource Railway & Port Access Investment

From Ross River/Carmacks To:	Cook Inlet Ports	Haines Benchmark	Northern BC Ports
Initial Phase Rail Investment	$3,062,020,449	$2,644,000,000	$7,254,336,900
Port Terminal Development	$1,434,000,000	$2,222,000,000	$1,687,000,000
Total Infrastructure Investment	**$4,496,020,449**	**$4,866,000,000**	**$8,941,336,900**

8 *Precedent for this in the U.S. was a series of coal slurry pipeline proposals in the Ohio Valley which were cancelled when railways provided slurry competitive unit train rates.*

9 *The actual mid-point falls between Ross River and Faro.*

10 *Cost data developed by Yukon Engineering Services in association with CH2MHill/Banjar Management*

Port Access Operations

Cook Inlet Port of Anchorage Intermodal Terminal

Prince Rupert Port Ridley Island Bulk Terminals



For Yukon mineral exports, the Alaska Inside Passage port of Haines is much closer. However, Port Mackenzie marine and rail infrastructure investment can save over $4 billion compared to Prince Rupert and the investment is at least no greater compared to Haines – while extending the full rail link as well as the market reach of both the Alaska Railroad and Anchorage Area Ports.

The existing Cook Inlet port pair of Anchorage and Port MacKenzie, linked by the proposed Knik Arm Bridge and/or Alaska Railroad spur, offers a lower investment alternative compared to equivalent general cargo and bulk marine terminal investment that would be required at Haines. In conjunction with the relative engineering ease of rail constructability through the Tanana Valley for a Carmacks-Delta Junction segment compared to a Carmacks-Haines segment, and with less than half the new track investment compared to a Carmacks-New Hazelton segment, Port MacKenzie is most attractive from a capital cost perspective.

However, from an operating cost perspective, in order to reinforce the economics of an Alaska connection, it will be necessary to equalize Port MacKenzie rates with Haines rates for Yukon mineral exports. Otherwise the most cost-effective export positioning for the Yukon mining industry will remain via the Inside Passage Port of Haines for large scale mining operations (or via Skagway for smaller mines).

3.3.2 Phased Rail/Port Access Operations Analysis

The following range of potential resource railway operating characteristics has been developed by Innovative Scheduling:

Resource Railway Operating Characteristics			
	Mgmt Strategy 1	Mgmt Strategy 2	Mgmt Strategy 3
Locomotive Type	SD70M-2	SD70M-2	CW44AC
Horsepower	4300 hp	4300 hp	4400 hp
Locomotives/Train	3	4	3
Cars/train	110	100	90
Max Speed	40	45	50

Management Strategy 1 yields the lowest costs for initial resource railway operations and has been selected for the current analysis. Subsequent integration with full Alaska rail connection intermodal and carload freight train operations may require a shift to higher speed bulk resource trains (Management Strategy 2 or 3).

Resource railway track and traffic scenarios apply segmented data from UMA Engineering estimates and Innovative Scheduling simulations within the project data base model to analyze alternative port access outcomes. Haines, Alaska - the closest port access option for large scale mineral exports from Yukon - is the benchmark for comparison with Cook Inlet Ports (Anchorage and Port MacKenzie) and Northern B.C. Ports (Prince Rupert).

The following incremental costs per revenue ton mile (RTM) and shipment costs per ton for first phase resource railway options have been analyzed with the project data base model developed by the ACRL Project Office.

Resource Export Shipment Costs
For Phased Rail and Port Investment Operations

Carmacks To: Distance Miles	Haines Benchmark 297 miles	Cook Inlet Ports 836 miles (413 Online)	Prince Rupert Port 1080 miles (900 Online)
Rail Investment Cost $/RTM	$0.023	$0.019	$0.015
+15% Capacity Uplift $/RTM	$0.026	$0.022	$0.017
Port Investment Cost $/RTM	$0.014	$0.006	$0.003
Rail & Port Capital Cost $/RTM	$0.040	$0.028	$0.020
Rail & Port Capital Cost $/Ton	$11.88	$11.56	$18.00
$.014/RTM Rail Ops Cost $/Ton	$4.16	$5.78	$12.60
Connecting Rail Cost $/Ton		$10.58	$4.50
Shipment Cost $/Ton	**$16.04**	**$27.92**	**$35.10**

In these initial resource railway scenarios, exclusively heavy haul bulk train operations are anticipated without track access competition from local switching moves or higher speed intermodal freight service. Nevertheless, a 15 percent capacity uplift has been applied to accommodate any incremental investment that may be required for the addition of iron ore traffic.

Compared to the Haines Benchmark, Cook Inlet and Prince Rupert Port results show the full impact of connecting rail charges and port investment as well as ACRL capital and operating costs. Total shipment cost includes order of magnitude connecting rail charges to reach Cook Inlet from an Alaska Railroad connection at Delta Junction and to reach Prince Rupert from a New Hazelton connection with Canadian National.



For Cook Inlet Ports, results of this scenario analysis show the trade-off in capital vs. operating costs:

- Cook Inlet Ports and rail capital costs marginally less than Haines ($.32/ton less);
- But with a substantially higher operating cost ($1.62/ton greater);
- Plus connecting Alaska Railroad cost ($10.58/ton).

For Prince Rupert Port, from a common origin point at Carmacks, *total* shipment costs:

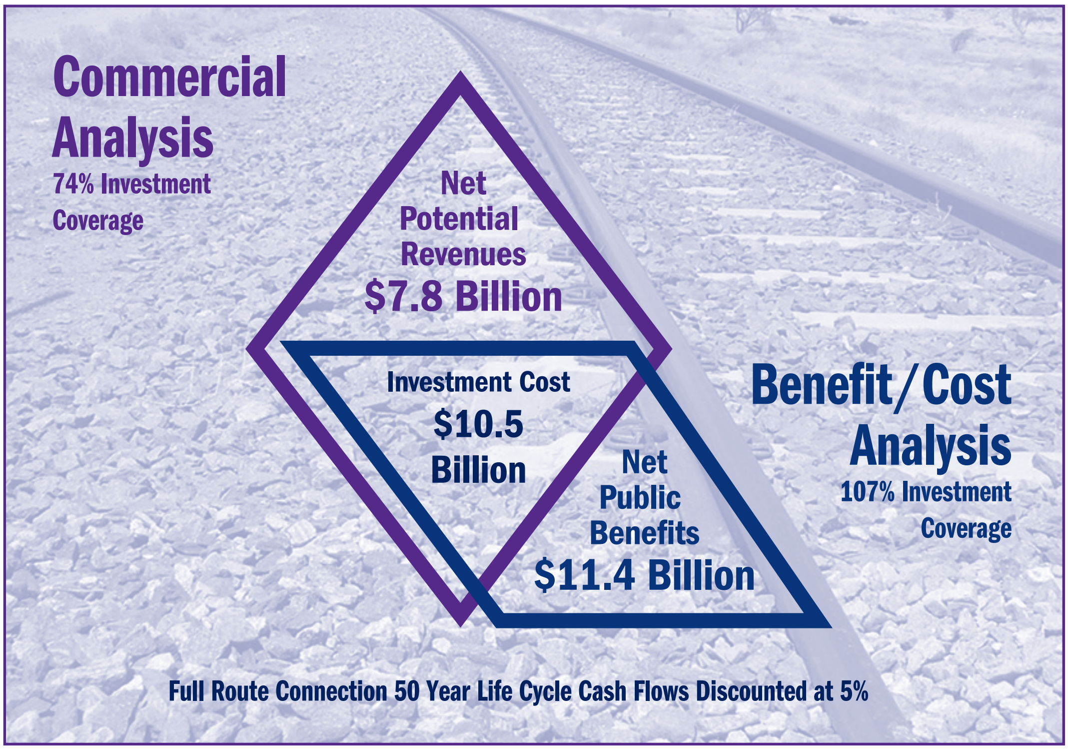
- Exceed two times the Haines Benchmark ($19.06/ton greater);
- And exceed Cook Inlet total costs by 25 percent ($7.18/ton greater);
- But compared to Skagway[11] total costs are approximately equal ($35/ton).

Comparing these rail operations and port access alternatives, it is apparent that route selection based on capital contribution requirements (that vary widely with traffic volume and infrastructure investment) is quite different from route selection based on operating costs (that vary directly with distance). In particular, compared to the Haines Benchmark, investment in Cook Inlet rail/port access from Yukon costs less – but operating trains over the much longer track costs more.

Both capital and operating costs will have to be carefully considered along with the broader opportunity costs which may accompany each alternative resource railway segment as an initial investment phase option.

[11] *$34.72/ton per previous full investment operations analysis that excludes any capital cost for Skagway port improvements.*

ACRL Business Case



Business Case Assessment		
(US$ billions discounted at 5% over 50 year project life cycle)		
	Commercial Revenue Analysis	Public Benefit/Cost Analysis
Nominal US$11 Billion Initial Investment	$10.5	$10.6
Total Commercial Revenues & Public Benefits	$11.7	$14.0
Ongoing Capital, Operating & Maintenance Costs*	$3.9	$2.6
Net Commercial Revenues	$7.8	
Net Public Benefits		$11.4
Investment Coverage	74%	107%
*different methodologies with marginally different results		



4.
Business Case Assessment

This chapter sets out a preliminary, high level business case for private and/or public ACRL investment. The Business Case Assessment provides a financial forecast of the capacity for project revenues and benefits, net of operating costs, to recover total rail system investment over the project life cycle. It provides the best visualization of what the ACRL business case could look like based on the Feasibility Study research conducted to date. At a five percent discount rate:

- *Net commercial revenue from all shippers can recover 74 percent of full investment;*
- *Net economic benefits to the public can exceed 100 percent of full investment; and*
- *Resource revenues can cover 100 percent of an initial phased rail investment.*

A Combined Business Case Analysis quantifies the potential for a Public-Private Partnership with discounted commercial net revenues plus public sector net benefits of almost $20 billion. As well, benchmark analysis of phased investment options for an initial resource export railway from Yukon, indicate that revenues can cover all capital and operating costs for a shorter rail route to tidewater.

4.1 Combined Business Case

A collaborative Business Case Assessment was conducted for the project by Ernst & Young Orenda, Macquarie North America and Partnerships B.C. The following summary presentation of that Business Case Assessment has been combined with results of a benefit/cost analysis conducted separately by HDR/HLB Decision Economics under direction of the University of Alaska Fairbanks.

4.1.1 Commercial Business Case

This part of the business case seeks to recover ACRL investment from discounted free cash flow available after revenues have been reduced by ongoing expenditures. Life cycle cash flows discounted at five percent provide, at present value, $7.8 billion to cover 74 percent of the $10.5 billion investment.

At rates of return for standard railway investors – which in many parts of the world, and Alaska[12], are quasi-government corporations - a five percent discount rate is considered appropriate. In particular, for full investment in an Alaska connection, there will be potential access to preferential Alaska Railroad bond rates currently less than 5 percent.

It is apparent from the commercial component of the business case analysis that potential free cash flow may not be adequate to completely cover required investment in the full Alaska rail connection. A shortfall in revenues may require supplemental financing from alternative funding sources.

[12] *An anomaly within the otherwise private sector North American freight rail industry is the Alaska Railroad which is wholly owned by the State of Alaska.*

4.1.2 Public Sector Business Case

This part of the business case tests the extent to which supplemental public investment may be covered by the value of benefits from that investment. At a five percent discount rate assumed appropriate for an economically less developed region, a net benefits present value of $11.4 billion exceeds total costs of construction, operations and maintenance with a surplus of $.8 billion[13].

It is apparent from the public component of the business case analysis that a surplus in the value of benefits may warrant alternatives to private financing for a portion of the full Alaska rail connection investment.

The Combined Business Case demonstrates capacity of project revenues and benefits, net of operating costs, to recover capital investment. There is corresponding potential to negotiate a Public-Private Partnership within a combined business case value of $19.2 billion from discounted commercial net revenues of $7.8 billion plus net economic benefits of $11.4 billion.

4.2 Commercial Revenue Analysis

Commercial business case analysis has assumed a long range outlook that, with the exception of iron ore exports,[14] captures all potential revenues. This is appropriate for preliminary business case assessment. As the project moves forward, a more focused financial analysis will subject each traffic segment to a rigorous bankability assessment of timing, volume and revenue before the balance of risk and return can be fully weighed.

In the following sections an initial screening of the full potential for commercial revenues sets the scope for future financial/bankability analysis.

[13] *For consistency between business case assessments, results of the University of Alaska Fairbanks Cost Benefit Analysis Alternate Case #2 at 5 percent discount rate have been restated to reflect total investment costs. The UAF Cost Benefit Analysis assumes public investment at 85 percent of capital investment cost and a corresponding $2.2 billion net benefits surplus.*

[14] *Iron ore exports more than double the traffic from all other sources and accordingly have been isolated for separate consideration as part of the phased resource railway analysis in this report.*



4.2.1 Life-Cycle Traffic Screening

A summary of 50 year life-cycle traffic projections – potential revenue streams and a qualitative assessment of timing, volume and rates – is provided in the following table.

Traffic	Tons/yr	Rev/yr	Volume	Timing	Rates
Pipeline Logistics	1 million	$25 million	**Low Risk** quantities are known	**High Risk** must build rail link before pipeline	**Low Risk** rates less critical than hwy impact
Inbound Resupply	3 million	$100 million	**Low Risk** quantities are known	**Low Risk** existing traffic moving now	**High Risk** rates must be water competitive
Resource Development	16 million	$200 million	**Moderate Risk** shippable volume may change	**Moderate Risk** mine startups are uncertain	**Moderate Risk** rates must better truck alternatives
Iron Ore	28 million	$250 million	**Moderate Risk** shippable volume may change	**High Risk** depends on market confidence	**Moderate Risk** rates linked to iron ore prices
Land Bridge	5 million	$350 million	**Moderate Risk** depends on overflow from other ports	**Moderate Risk** depends on increasing west coast congestion	**High Risk** rates must be alternate port competitive

Initial screening of these traffic projections provides the following preliminary risk assessments of commercial revenue certainty:

1 **Pipeline Logistics** - A low risk of certainty in volume and rates is associated with Alaska Highway Pipeline Traffic which although it is only a one-time revenue boost and a relatively small traffic segment overall (1%-2%), is disproportionately important as it provides strong revenue certainty in the early years of the project where other traffic potential is most at risk. The only uncertainty with this traffic is that pipeline construction must go ahead, but only after completion of rail construction.

2 **Inbound Resupply** - A low risk of certainty in timing and volume, but high risk for rates, is associated with Inbound Resupply Traffic (including intermodal and industrial products) based on the comparative cost and service analysis conducted during the Stage One Market Research. In view of the competitive response anticipated by marine operators, this traffic has already been discounted by 50 percent and given that this traffic is moving now, risk to the associated revenue stream is relatively low.

3 **Resource Development** - A moderate risk of certainty in timing, volume and rates is associated with Resource Development Traffic (excluding iron ore) which has been confirmed and supplemented by a Second Tier Traffic Analysis.[15] Although it is considered likely that the base metal and coal mines will be developed, timing of mine development is not certain and somewhat increases the risk associated with that revenue stream. Rates will be capped by mineral prices and must be better than truck alternatives.

4 **Iron Ore** - A higher risk of certainty in timing, volume and rates remains associated with Yukon iron ore exports, pending further validation of mine production and transportation economics. However, this is one of the larger iron ore resources in the world. Development at some point appears inevitable and the magnitude of iron ore export logistics is so great that it cannot be developed without bulk rail transport to a high capacity, deep water marine terminal.

5 **Land Bridge** - A higher risk of certainty in timing, volume and rates is also associated with the speculative nature of Alaska land bridge traffic, potentially diverting container ships from congested U.S. West Coast gateways to a new North Pacific Rim sea/rail route between Asia and Mid-America via Anchorage area ports. A relatively small local market and a longer rail distance are offset by the prospect of lower ocean freight rates, rapid port clearance and expedited inland rail haul without congestion from more intensely developed market areas in the south.

Market risks and opportunities associated with large scale resource exports to Asia, and container imports from Asia, require further focus for consideration of these critical revenue streams. The Project Office has commissioned special risk/opportunity studies to assess long range ACRL competitiveness. In particular, these studies address the huge iron ore component (28 million tons per year) of resource development traffic totalling $250 million per year revenue, and $350 million per year revenue (.5 million TEUs or twenty-foot equivalent units) anticipated from Asian container land bridge traffic.

4.2.2 Container Revenue Analysis

An Alaska Canada land bridge for Asian container traffic may provide a strategic opportunity to exploit rail economies by building traffic density with overhead traffic that neither originates nor terminates on-line. As well, a north/west bound backhaul would be uniquely attractive for both Alaska consignees and fishery exports to Asian markets. This traffic, however, is dependent upon long term future overflow from prolonged congestion at West Coast ports – and shippers strategic supply chain adjustments.

For land bridge traffic, GHK International (Canada) Ltd. has developed long term traffic and cost projections for Asian container trades with the U.S.; and Boston Consulting Group has provided a shippers perspective on future supply chain adjustments within those trades.

[15] *Second Tier Analysis conducted by Yukon Economic Development confirms 2.7 to 3.5 million tons/year of base metals in B.C. and Yukon. The Tier II analysis also projects 12.5 million tons of mostly B.C. coal production.*



West Coast container traffic has grown by almost 50 percent between 2000 and 2005. Ship owners, cargo owners and port operators are seeking relief from continuing West Coast congestion:

- Port operators seek improved West Coast terminal productivity and inland access;
- Ship owners seek under capacity East Coast ports via the Panama (or Suez) Canal;
- Cargo owners seek to balance total cost/time/reliability of alternative port gateways.

Currently Panama Canal expansion is proposed to relieve West Coast port congestion by providing large container ship access to East Coast ports. Comparative container shipment cost and time through to Chicago/Mid America markets are estimated in the following table.

Total Through Container Shipment Time and Cost
From China (Shanghai) to Mid-America (Chicago)

	Transit Time (Days)			Total Through Sea and Rail Cost (per TEU)
	Sea	Rail	Total	
Via Alaska Cook Inlet Ports	10	7	17	$1,856
Via Panama Canal/New York	23	3	26	$1,397
Time/Cost Balance	-13	+4	- 9	+ $459

Comparing Alaska Cook Inlet ports to a Panama Canal/New York East Coast gateway, for an additional cost of $459 per twenty foot container:

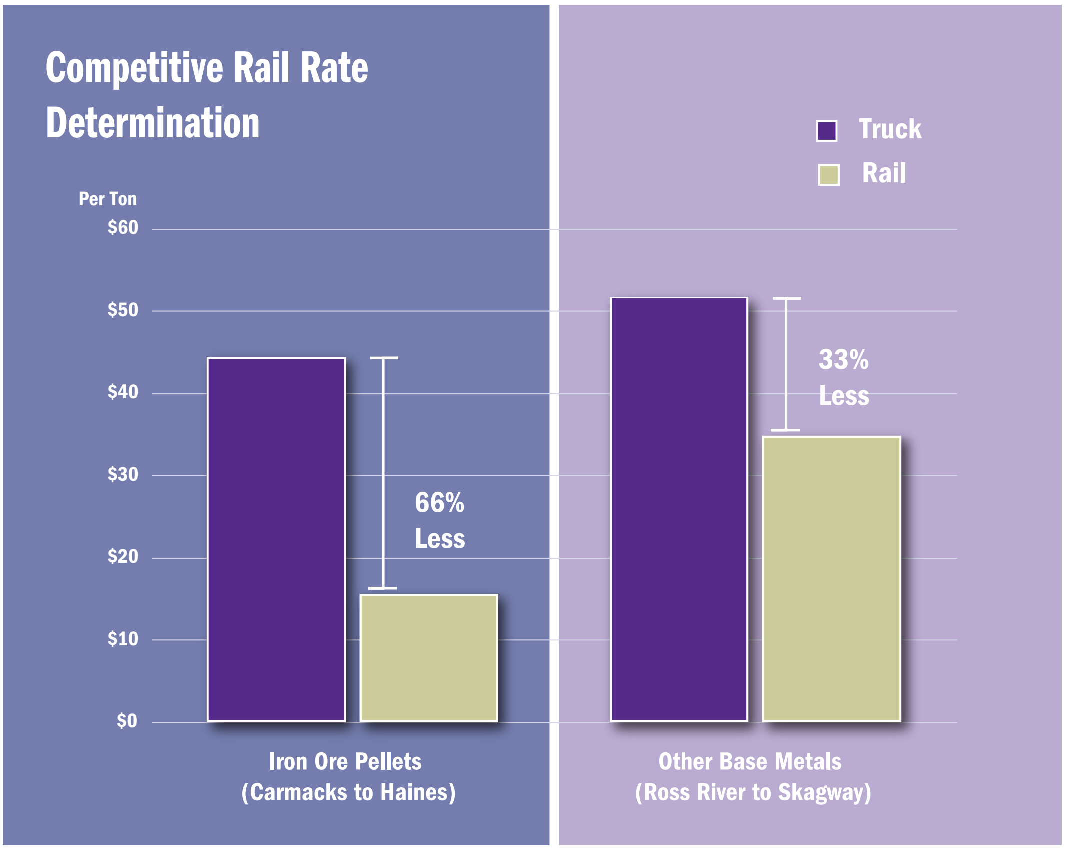
- Cargo owners can cut Asian supply chains saving 9 days transit time; and
- Ship owners can save 13 days of one-way vessel time (26 days per turnaround).

An Alaska sea/rail gateway should become an economical alternative to buy back extra time added to supply chains, and ship schedules, when:

- Panama Canal expansion relieves West Coast congestion with longer transit times; or
- West Coast congestion creates excessive delay time/cost without canal expansion.

Either way, future ship and cargo owners may face a time versus cost trade-off that favours a new North Pacific Rim trade corridor through an Alaska port gateway. The significance of this is further enhanced from a U.S. economic security perspective:

Alaska ports can provide a North American sea/rail gateway that is the closest to Asia – but still on U.S. soil.


Competitive Rail Rate Determination
Truck
Rail
Per Ton
$60
$50
$40
$30
$20
$10
$0
66% Less
33% Less
Iron Ore Pellets (Carmacks to Haines)
Other Base Metals (Ross River to Skagway)



4.2.3 Resource Revenue Analysis

For iron ore, as well as coal and base metals, the Raw Materials Group (Stockholm) has developed long term price projections and Hatch Consulting Ltd. has developed iron ore mine and pellet plant operating costs. Between the competitive world market value of iron ore pellets loaded aboard ship and the cost to mine and process iron ore to produce pellets, $15.75 per ton has been established as the maximum sustainable rate that the market can bear for rail transportation to tidewater export position. For other base metals, current market price projections substantially exceed truck rates, which become the relevant market competition.

The opposite table shows results of differential pricing to final market competition for lower value minerals and to trucking competition for higher value minerals. A realistic competitive cap on rail rates for all resource development traffic regardless of loading port comprises the following combination of:

- A high volume, but relatively low value, $15.75/ton iron ore rate that meets final market competition from other iron ore producers and is 66 percent less than trucking costs to Haines;
- A relatively low volume, but high value, $35/ton base metal concentrates rate that is 33 percent less than the truck competition between Ross River and Skagway.

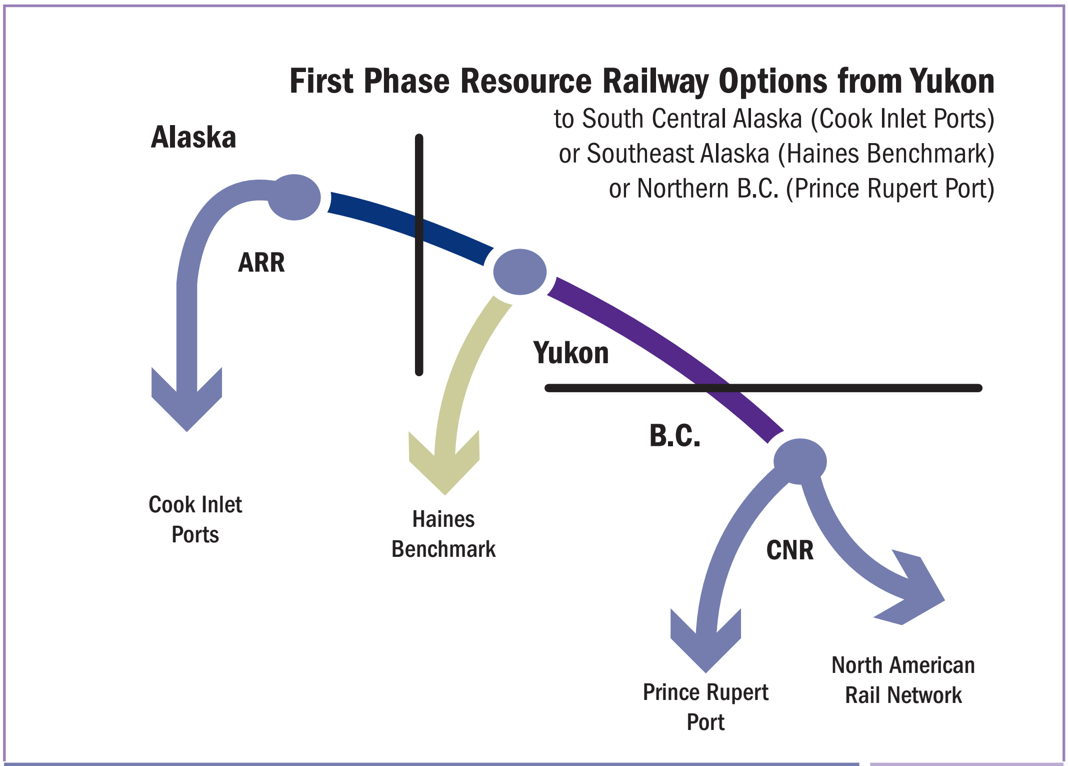
A Skagway rail segment is included in the full Alaska rail investment, but for the smaller volume of traffic that can be handled to Skagway, fully compensatory rail rates are virtually the same as truck rates.

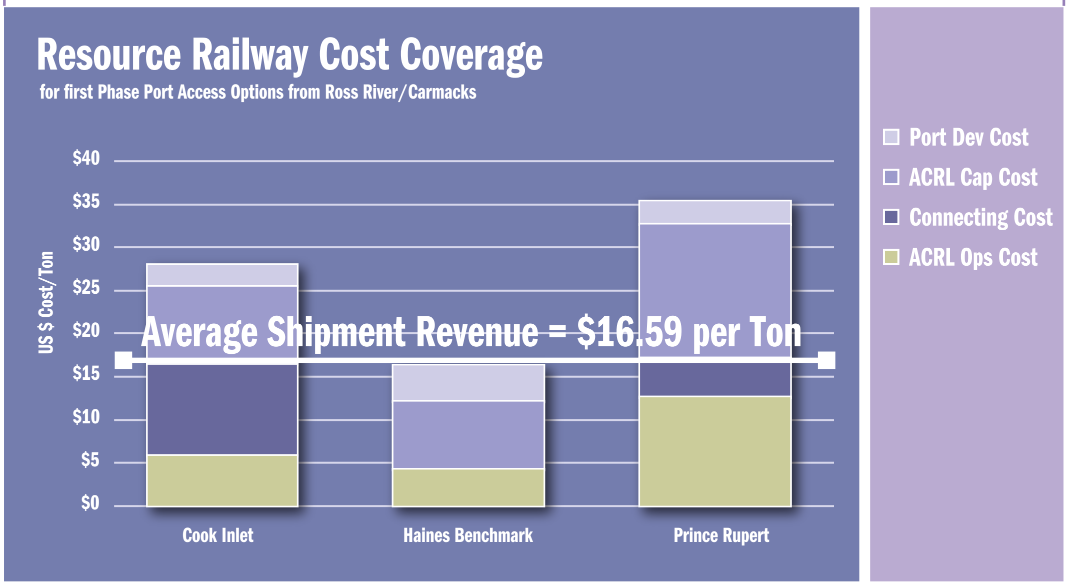
Limited port capacity at Skagway likely precludes the overwhelming volume of iron ore traffic. Iron ore traffic is incorporated in the following phased resource railway economic analysis which includes Haines, but not in analysis of the full Alaska rail connection which includes Skagway.

4.2.4 Phased Resource Railway Economics

Resource railway and mining economics are mutually dependent. As an alternative to large risk capital investment in a full rail connection to Alaska, phased development of a resource railway from Yukon could support maximum mineral exports with minimum track investment. The full ACRL can be segmented to provide three much shorter initial resource railway investment options from the Carmacks/Ross River area to Southeast Alaska, South Central Alaska or Northern B.C. Ports (see following figure).

Railway access to the Inside Passage Ports of Skagway or Haines offers the shortest route for most minerals to tidewater export position. Haines is the closest port with capacity expansion potential to accommodate a phased investment scenario for large scale concentrate, coal and iron ore exports.


First Phase Resource Railway Options from Yukon
to South Central Alaska (Cook Inlet Ports)
or Southeast Alaska (Haines Benchmark)
or Northern B.C. (Prince Rupert Port)
Alaska
ARR
Yukon
B.C.
CNR
Cook Inlet Ports
Haines Benchmark
Prince Rupert Port
North American Rail Network


Resource Railway Cost Coverage
for first Phase Port Access Options from Ross River/Carmacks
US $ Cost/Ton
$40
$35
$30
$25
$20
$15
$10
$5
$0
Average Shipment Revenue = $16.59 per Ton
Cook Inlet
Haines Benchmark
Prince Rupert
Port Dev Cost
ACRL Cap Cost
Connecting Cost
ACRL Ops Cost



The combination of differentially priced iron ore, coal and base metal traffic can cover rail capital and operating costs as well as incremental port investment – but only for the Haines benchmark. This rail/port access option should improve the economics of mines which should help to maximize the volume of ACRL mineral traffic. A differentially priced, weighted average rate of $16.59 per ton has been determined for the potential combination of concentrate, coal and iron ore traffic regardless of loading port (see opposite figure).

Applying this average shipment revenue equally to rail/port access alternatives, provides a cost coverage context for comparative analysis. The following financial results for phased investment scenarios have been analyzed with the project data base model developed by the ACRL Project Office. These results are presented from the mineral sector perspective of Yukon concentrate, coal and iron ore shipments, including cost coverage requirements for Canadian National or Alaska Railroad connections and for incremental port improvements.

First Phase Resource Railway Shipment Cost Coverage
Haines Benchmark Analysis

($/Ton)

Rail & Port Access Via:	Cook Inlet	Haines Benchmark	Prince Rupert
From Ross River/Carmacks	(420 ACRL miles)	(300 ACRL Miles)	(900 ACRL Miles)
Revenue Available	**$16.59**	**$16.59**	**$16.59**
ACRL Operating Cost	$5.78	$4.16	$12.60
Connecting Rail Cost	$10.58	0	$4.50
Revenue Remaining	**$0.23**	**$12.43**	**-$0.51**
ACRL Capital Cost	$9.02	$7.86	$15.53
Port Capital Cost	$2.48	$4.16	$2.70
Net Revenue	**-$11.27**	**$0.41**	**-$18.74**

Based on cost coverage, Haines is the benchmark for phased investment analysis. At full revenue potential, after operating costs, all rail and port capital investment via Haines can be covered with average resource shipment rates determined as competitive with the lower of trucking costs or commodity market prices.

Using the Haines benchmark, other phased resource railway options can be better analyzed from an opportunity cost perspective:

(1) Via Cook Inlet

- Building large cargo export volumes at South Central Alaska ports;
- With total capital investment for Yukon mine traffic determined lower than via Haines;
- But offset by rates just covering operating and connecting Alaska Railroad costs.

(2) Via Prince Rupert

- Accessing existing Ridley Island deep water, high volume marine terminal capacity;
- With a rail connection cutting Prince George routings by some 600 miles;
- But offset by rates just below operating and connecting CN Rail costs.

Maximizing mineral traffic and revenues also means targeting specific mine developers for phased rail segment investment. In Yukon, the target(s) can range from very large iron ore and coal mines to a potential consortium of smaller base metal mines. In Northern B.C., the prospect of significant rail rate savings with a short cut to Prince Rupert should stimulate resource developers to invest in this southern ACRL segment.[16]

These phased resource railway scenarios are consistent with full investment in an ACRL. Selection of any initial investment option would amount to pre-building a portion of the full connection. As mineral traffic and rail revenues build, the risk for subsequent investments in the balance of a full system will be reduced.

Completion of the full connection between Delta Junction and New Hazelton will ultimately position investors to attract higher margin Alaska intermodal and Asian container bridge traffic - as well as locally originating high volume resource traffic.

[16] *The potential short cut to Northern B.C. ports (Kitimat as well as Prince Rupert) is an attractive prospect for Mount Klappan coal and larger base metal deposits near the Cassier Highway Corridor that may warrant consideration as a separate Northern B.C.resource railway pre-build phase of the full Alaska Rail connection.*



4.3 Public Benefits Evaluation

The ACRL will generate extended public benefits in addition to commercial revenues. Under the direction of University of Alaska Fairbanks, HDR/HLB Decision Economics has evaluated the public benefits which will accrue to ACRL investment.

Fifty six percent of benefits has been associated with mining employment and economic activity that will be stimulated by rail access. The ACRL will make full scale mining development, with rail-based bulk export capability, possible.

A further 34 percent of benefits has been associated with reduced transportation costs for inbound resupply. The present value of these two largest benefits contributors, discounted at five percent, results in:

- Mining related employment - $7.8 billion life cycle benefits
- Transportation cost savings - $ 4.7 billion life cycle benefits

The balance of public benefits considered in the UAF benefit/cost assessment have been identified collaboratively by Information Insights Inc. of Fairbanks, Alaska and Informetrica Limited of Ottawa, Canada.

4.3.1 Highway Benefits

From dramatically reducing the requirement for long distance truck transport, resulting public highway transportation benefits include:

- reduced highway maintenance and repair costs in Alaska, Yukon and B.C.;
- improved public safety through a decrease in traffic accidents;
- increased capacity on the regions' highways; and
- decreased diesel fuel consumption.[17]

Maintenance can be reduced on major highways currently used to move goods to Alaska, Yukon and B.C. Savings in Alaska are estimated to be $2 million per year and in Yukon and northern B.C., combined savings of $4 million per year are projected[18].

Public Highways	Yukon/BC	Alaska	Total
Annual Maintenance Savings	$4 million	$2 million	$6 million

[17] *Rail on average uses one quarter of the diesel fuel consumed by trucks to move one ton of freight one mile.*

[18] *Further savings are anticipated on the Parks, Glenn and Seward highways if freight is diverted from Port of Anchorage.*

Rails or Trucks for Pipeline Construction Logistics

Alyeska Project 48 inch diameter/80 foot length pipe haul by Alaska Railroad from Valdez

Alyeska Project 48 inch diameter/80 foot length pipe haul by truck from Fairbanks

Foothills Project 56 inch diameter/80 foot length pipe haul test by White Pass & Yukon Route



4.3.2 Pipeline Benefits

ACRL offers significant benefits for building an Alaska Highway Gas Pipeline that include:

- Pipe and fuel haul transportation operating cost savings by rail versus truck; and
- Post project highway reconstruction savings with rail infrastructure-based logistics.

Of $1.2 billion anticipated in pipeline project related new spending on Alaska highways, bridges and ports, $800 million is estimated for post-construction repair of road damage due mainly to trucks carrying heavy pipe. Rail availability could save $250 to $300 million of that reconstruction cost.

A Rail link would also directly save the pipeline project $37 million on the transportation of pipe and fuel. Pipeline project logistics savings translate into lower tariffs, higher wellhead values and increased revenues and royalties.

Alaska Gas Pipeline	Pipe/Fuel Logistics	Producer Net Back	State Royalties	Highway Reconstruction
Project Life Cycle Savings	$37.1 million	$13 million	$17 million	$250 million

4.3.3 Shipper Savings

ACRL will reduce transportation costs, increase transportation capacity and stimulate transportation service to Alaska and Yukon. By offering a high volume, low cost option, ACRL can:

- Provide existing freight flow savings to northern industry and end-use consumers;
- Encourage new freight flows not previously considered economic;
- Increase affordability for goods and services;
- And stimulate economic growth.

Annual savings on community resupply to Alaska would average $107 million or 25.4 percent of the $422 million spent on resupply transport in the state. Annual savings on general merchandise entering Alaska would average $51.48 per ton or $162 per capita.

Community Resupply	Truck Shippers	Marine Container Shippers	US Rail Barge Shippers	CN Rail Barge Shippers	Average All Shippers
Rail Link Savings	71%	22%	0%	19%	25%

4.3.4 Qualitative Benefits

Qualitative benefits that ACRL would provide, although not conventionally quantifiable, may be perceived by the public to be even greater than commercial benefits.

ACRL qualitative benefits from rail substitution include:

- Improved highway safety and reduced environmental impacts; and
- Increased tourism without losing control of where tourists go.

Perhaps most significant from a qualitative perspective, ACRL will integrate Alaska with the North American rail network adding northern transportation redundancy, reliability and affordability that will improve the overall economic security for Alaska, Canada and the Lower 48 United States.

4.4 Investment Participation Profiles

Alternative investor types have been identified for the ACRL project by Macquarie North America. Financial criteria in terms of investment return and leverage requirements applied in the business case assessment are provided for the following investor types:

- Supply chain investors (e.g., Rio Tinto Mining or Mittal Steel);
- Integrated rail owner and operating investors (e.g., CN Rail or BNSF Rail);
- Non-integrated Track Company, Operating Company, or Rolling Stock Investors.

Significantly, there may also be strategic investors with a longer term perspective on global security of resource supply and regional economic security or other national interests, that supersede conventional financial evaluation criteria. These include multinational firms and corporations in countries that may view ACRL railway investment as integral to long range priorities for resource availability and intercontinental commerce.

4.4.1 Integrated Rail Investors

With the exception of strategic investors seeking security of supply, the scale and complexity of the Alaska Canada Rail Link Project makes it problematic for a single investor to conventionally finance the entire project. The paradox of the profitable, private sector, vertically integrated North American railway industry is that it cannot generally self-finance major network expansion.



Integrated railway investors include the seven Class 1 long haul carriers in North America: Canadian National, Canadian Pacific, Union Pacific, Burlington Northern Santa Fe, Kansas City Southern, Norfolk Southern and CSX Railroad. Large scale infrastructure investment for these companies is generally focused on existing network and market optimization opportunities. However, UP and BNSF have built their own "rails to resources" in Wyoming's Powder River Coal Basin and Kansas City Southern has acquired and upgraded rail assets in both Mexico and Panama.

Financial characteristics of Class I railways:

- Moderate gearing levels of 40 percent debt;
- Credit ratings in the BBB range which generally translate to;
- A margin of 2.5 percent above rates on government debt.

Integrated rail investors could also include the Class II regional railway companies spawned by branch line spin-offs from Class I carriers during the last two decades of railway deregulation. Many of these regional railway companies have expanding portfolios of often non-contiguous railways that can include systems on other continents.

Although they typically do not have the financial strength of the Class I carriers, Dakota, Minnesota and Eastern for example, is a Class II regional railway currently proposing a 260 mile, multi-billion dollar extension to the Powder River Basin coal fields.[19]

The Alaska Railroad is also a regional railway, but with unique incentive for ACRL investment and a special tax free bonding facility to finance economic development infrastructure investment – currently at rates below five percent and without geographical limitation[20].

4.4.2 Supply Chain Investors

Supply chain investors are shippers requiring the railway to optimize logistics links between resources and markets. They most likely would be part of the metal making supply chain embracing mines, smelters and mills. Potential ACRL supply chain investors could include owners of large iron ore and metallurgical coal deposits or a consortium of other base metal mining interests.

While railway investment, as a stand alone business, is made more attractive (profitable) to the extent that rail savings can be kept from shippers; supply chain investors, as railway owners, can retain rail savings to maximize their final market advantage. For supply chain investors, ACRL is a production cost cutting investment that allows lower value, larger volume mines to more competitively meet world

[19] *DM&E is proposing to access the U.S. Federal Railroad Administration Railroad Rehabilitation and Improvement Financing loan program.*

[20] *As an example, the Alaska Railroad has been authorized to issue up to $17 billion in tax free conduit bond financing for the proposed Alaska Highway Gas Pipeline Project through Canada.*

commodity market prices; and higher value mines to more profitably weather price cycles - without dependence on high cost trucking. Although some mines may go into production with truck based transportation, it is likely that the sustainability of Yukon and Northern B.C. mines is limited without rail transportation.

A supply chain investment incentive scenario is shown in the following table for resource railway shipper savings, without which mine developers would be forced to high cost trucking – or to forego mining altogether[21].

Major Yukon and BC Resource Shipper Savings			
Mining Sector Life Cycle Savings Excluding Iron Ore			
	Savings/RTM	Total RTMs	Total Savings
Yukon Minerals (truck vs. rail cost saved*)	$0.050	22,069,350,000	$1,103,500,000
BC Coal (600 CN Miles Saved**)	$0.027	51,870,000,000	$1,400,500,000
Major Yukon and BC Shipper Savings (excluding iron ore)			$2,504,000,000
Shipper Investment Incentive at 50%			$1,252,000,000
* $.15/RTM Truck Cost - $.10/RTM Rail Cost			
** Dease Lake extension at 2006 CN rate levels)			
Life Cycle Iron Ore Shipment Savings			
Equivalent to (truck vs. rail costs***) $.10/RTM x 415.8 Billion RTMs = $42 billion Incentive for Market Competitive Mine Production - and Railway Investment			
*** $.15/RTM truck cost - $.053/RTM final market competitive rail rate			

This scenario shows that with cumulative potential savings exceeding $2.5 billion, supply chain investors should be willing to invest at least half of that to obtain those savings; and that without railway investment they will forego $42 billion in iron ore shipment savings.

Companies providing resources for steel making or manufacturers of steel, such as BHP, Rio Tinto, Mitsubishi, Minmetals or Mittal Steel, are potential Supply Chain Investors.
Financial characteristics of these supply chain investors:

- Typical leverage of approximately 35 percent debt; and
- Highly rated giving them a low cost of debt.

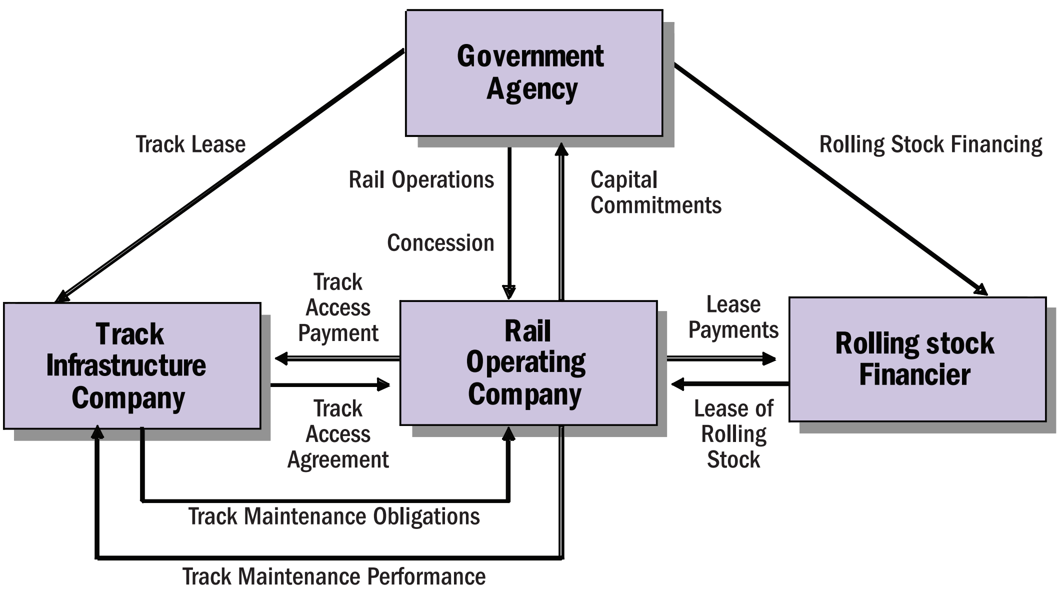
[21] *Chart and savings projections extracted from Tier II Analysis "Projected Yukon and B.C. Mining Sector Activity", Yukon Economic Development, August 2006.*

Equity returns for this category of companies are very high due to the current commodities boom. For the purpose of this analysis it is assumed that Supply Chain Investors would accept a lower equity return due to long range sustainability of production cost savings and market access benefits from the rail investment.

4.4.3 Public-Private Partnerships

Public-private partnerships combine the business case from both a private and public investment perspective, where there is mutual benefit. ACRL Business Case Assessment at this preliminary study stage may not completely support full private sector investment from either an integrated railway industry investor or a resource supply chain investor. A public-private partnership, however, may be negotiable within the *combined* business case value estimated at almost $20 billion.

In much of the rest of the world, separation of infrastructure investment from above rail operations significantly broadens financing options for public-private partnerships. ACRL financial viability may well depend on creativity in vertical dis-integration of rail investment and repackaging into multiple business lines that can be separately financed at different risk tolerances.



Investment structures that follow from vertical dis-integration opportunities include:

- Separate ownership and investment in the Tracks, the Trains and the Operations;
- Separate franchises for Bulk, Container or Passenger Service Markets; and,
- Separate investment segments for Land Bridge or Resource Railways.

These structures are becoming more common as they can provide optimal results and flexibility for financing and utilization of the railroad.

The preceding diagram shows the relationships between private companies and a government agency. These structures are often used in Australia under government policy requiring the *track company* and the *operating company* to be separated for regulatory reasons.

The *track company* is responsible for the track. It owns the track or leases it under a long term contract from the government and is responsible for the maintenance of the railway.

Financial characteristics of the *track company* consistent with investors having a low cost of capital:

- Small variability in operating costs (actual traffic volumes do not have a large impact on operating costs); and,
- Stable predictable cash flows due to long term usage contracts, allowing a much greater percentage of debt to be injected into the project.

The *operating company* is responsible for running the railway. This is often done by the conventional Class 1 railways or short line operators. The *operating company* will have a *track access agreement* with the *track company* to ensure access to the track and pay regular access payments to the *track company*.

Financial characteristics of the *operating company*:

- Typical leverage of approximately 80 percent debt; and,
- With high debt, private financing is highly sensitive to early year revenues.

Increasingly, *operating companies* lease locomotives and other equipment from a *rolling stock company.*

4.4.4 Government Facilitation

Economic security, resource development, environmental protection and other public policy initiatives can be facilitated by governments and put into practice by an Alaska Canada Rail Connection. Government facilitation scenarios include the following:

- Governments could require (or at least strongly encourage) use of rail as a condition of resource development permitting to mitigate impacts on public highways (maintenance/safety/tourism) and the environment (green house gas emissions);



- In the U.S., public financial support may be provided through *Railroad Rehabilitation and Improvement Financing* (RRIF)*, the Transportation Infrastructure Finance Innovation Act* (TIFIA), *and the Safe, Accountable and Efficient Transportation Equity Act – A Legacy for Users* (SafeTEA-LU);
- In Canada, funding may be available through regional programs like the Pacific Gateway Initiative. As well, the level of government collecting royalties on sustainable mine production made possible by rail access might reallocate those royalties as a user-pay funding source for railway construction and/or operations;
- Access may be allowed to government debt instruments, such as low cost tax exempt bonding available through the Alaska Railroad or other Port Authority/Municipal Bonding capabilities available in Alaska;
- Using Revenue Shortfall Guarantees, governments can recognize the longer run commercial revenue potential of speculative traffic that will be stimulated by new rail construction, but that by definition is not immediately bankable.

Alaska is uniquely positioned to materially facilitate financing for ACRL construction and operations – through state ownership of the Alaska Railroad. The amount of leverage this provides to realize project viability cannot be overstated and includes the following:

- Placing the Alaska Railroad in a concession package to maximize rail connection synergies and private investment appetite for the Alaska Canada Rail Link Project;
- Providing tax free conduit bond financing at preferential interest rates to finance ACRL investment as economic development infrastructure for Alaska;
- Using control of interchange points and rail barge contracts to shift traffic to a full Rail Link System or to an interim port/rail segment (e.g., Prince Rupert-Skagway-Delta Junction);
- Initiating a common user regime to provide cost based track access allowing multiple franchises for train operations (e.g., for mining operators to run their own trains);
- Allowing incentive haulage agreements or running (trackage) rights to stimulate speculative resource traffic development.

Governments should consider the critical role of public investment in northern development infrastructure for rail tracks (as opposed to train operations on them), as well as for roads, air and sea ports. British Columbia previously built, currently owns and has profitably concessioned (to CN Rail) the BC Rail system. The Alaska Railroad was built by the U.S. Federal Government and is now owned by the State of Alaska.

With these contemporary public facilitation precedents for the Alaska Railroad and the BC Rail system, it would be an anomaly to have a connecting rail link through Yukon without some investment participation or facilitation by the public sector - an investment that with subsequent concessioning or privatization, as with BC Rail, could well be profitably returned.

Rails or Roads for Sustainable Development

Tintina Trench Access

Inland Tourism Management



5.
Strategic Environmental Assessment

This chapter sets out a Strategic Environmental Assessment to provide both public and private stakeholders with a high level, but across-the-board, preview of potential project impacts. Highlights include the following:

- Bio-Physical impact mitigation will be critical but trade-offs may favor rail over road in more wilderness routings away from existing transportation corridors;
- Socio-Cultural impacts pose largely positive, but some negative, aspects of increased prosperity, especially where settled land claims may accommodate project approval;
- Economic Impacts combined for Alaska and Canada comprise life-cycle additional economic output (GDP) of US $170 billion and over 25,000 new, permanent jobs.

Protection against, and mitigation of, any negative environmental, cultural or economic impacts will be critical. On balance, however, the net impact of the project should be overwhelmingly positive. It is anticipated that economic impacts will extend well beyond the rail link and stimulate a new round of sustainable mining activity.

This Strategic Environmental Assessment provides the context for a community consultation process once project proponents have finalized route segment selection within a full rail system connection to Alaska.

5.1 Environmental Impacts Assessment

Both Bio-Physical and Socio-Cultural impacts are part of the human, as well as natural environment issues which this project will embrace. These in turn must be balanced against sustainable economic development opportunities posed by the project. The Macleod Institute at the University of Calgary has integrated a strategic long range scoping of potential environmental and economic impacts for the ACRL project.

5.1.1 Bio-Physical Impacts

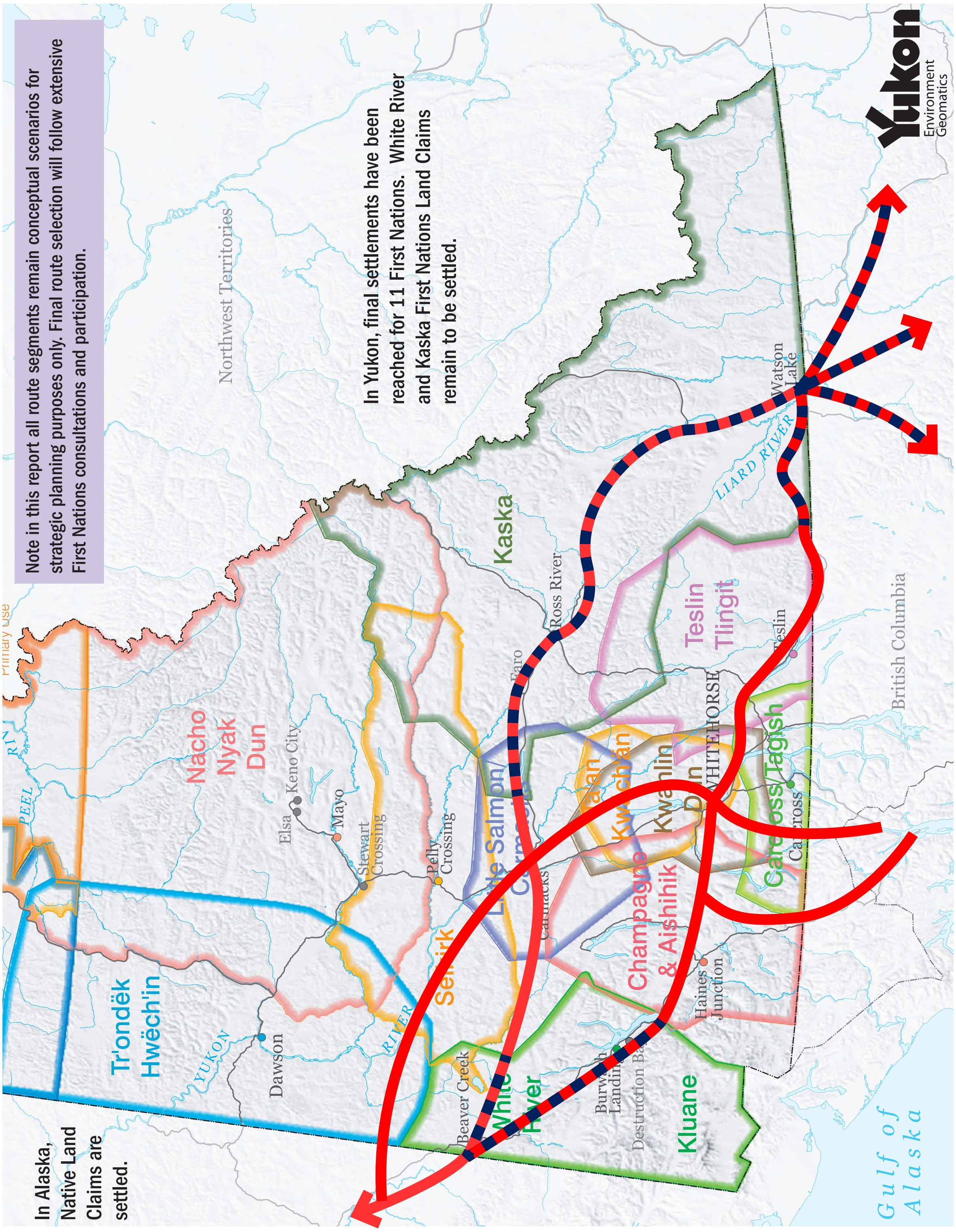
Railway development is considered more environmentally favorable than highway expansion, especially to the extent it can displace future or current trucking operations. Proposed rail routes largely parallel road corridors through wilderness areas that have seen little development and where substitution of trains for trucks should be attractive.

Construction along all route segments will face seismic and permafrost issues, as well as a substantial number of river crossings. In terms of environmental protection, there are issues with wildlife, endangered species and extensive bodies of water throughout the region. Specifically, with regard to the

Traditional Territories of Southern Yukon First Nations

ACRL Route Options through First Nations Final Settlement Areas

ACRL Route Options through unsettled First Nations Land Claims





full Alaska rail connection, bio-physical trade-offs may favor a more wilderness routing away from an Alaska Highway corridor which, for example, could encroach on Kluane National Park.

An environmental assessment constraint at this stage is the lack of detailed data along most of the rail routing options. More work needs to be done before there will be sufficient data to differentiate quantitatively between routes in terms of management and mitigation of bio-physical impacts.

5.1.2 Socio-Cultural Impacts

The ACRL will stimulate attractive business and employment opportunities for Canadian First Nations, Alaska Native Corporations and other community interests throughout the region. Although these may be accompanied by some negative community impacts that can come with increasing prosperity, rail is a much more attractive economic development option than roads in terms of environmental impact, protection of cultural and wilderness values, and improved highway safety.

There is a significant Canadian First Nations and Alaska Native Corporations interest in lands along the entire rail connection corridor. The status of land claims negotiations range from essentially settled in Alaska and northern Yukon to just beginning in some parts of southern Yukon and northern B.C.

To the extent pending settlements could hold up some segments of the full Alaska rail route, other segments may move ahead more expeditiously where a final settlement agreement is in place. In particular, route segments radiating from Carmacks to access Cook Inlet ports in Alaska through the Ladue River Valley, and to access Alaska Inside Passage ports at Skagway or Haines, pass through settlement areas where final agreements are already in place. However, all other southern Yukon and northern B.C. route alternatives pass through First Nation land claims which have not yet been settled.

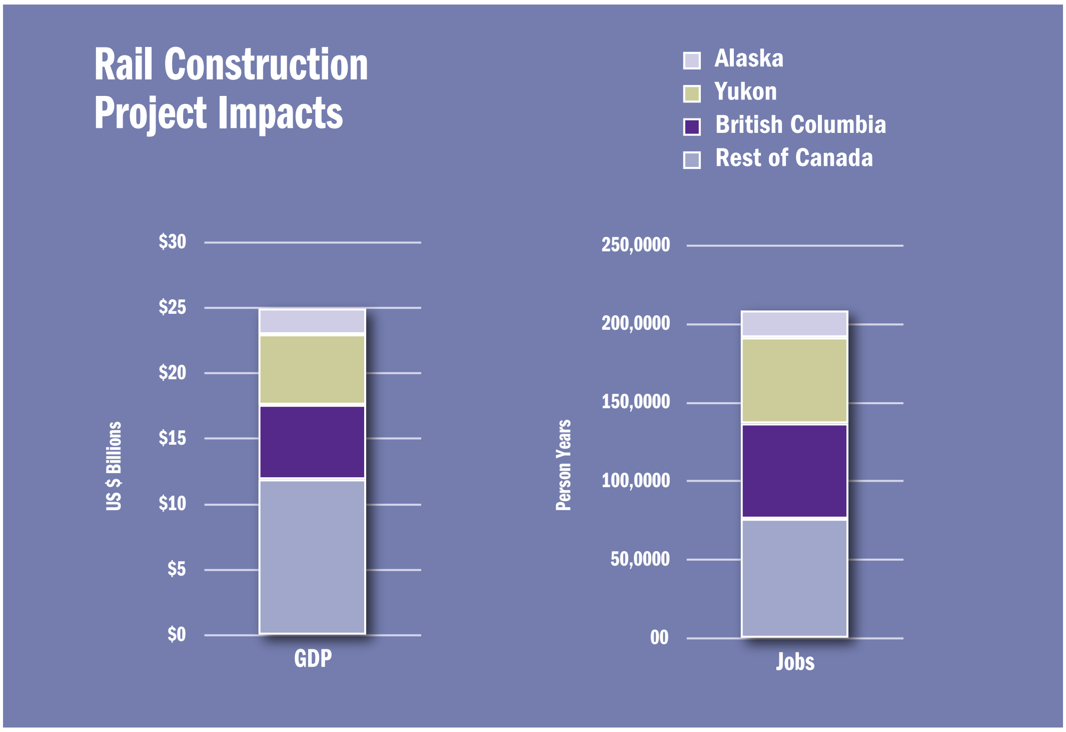
Regardless of the status of land claims, benefits and access agreements will be required. The various Canadian First Nations and Alaska Native Corporations differ considerably in their organizational approach to consultations and negotiations. Facilitating First Nations and community consultations will be an important step in moving this project forward.

5.2 Economic Impacts Assessment

Economic impacts are becoming integral to a comprehensive strategic environmental assessment process. Sustainable economic development is part of the balance that must be achieved with mitigation of other environmental impacts.

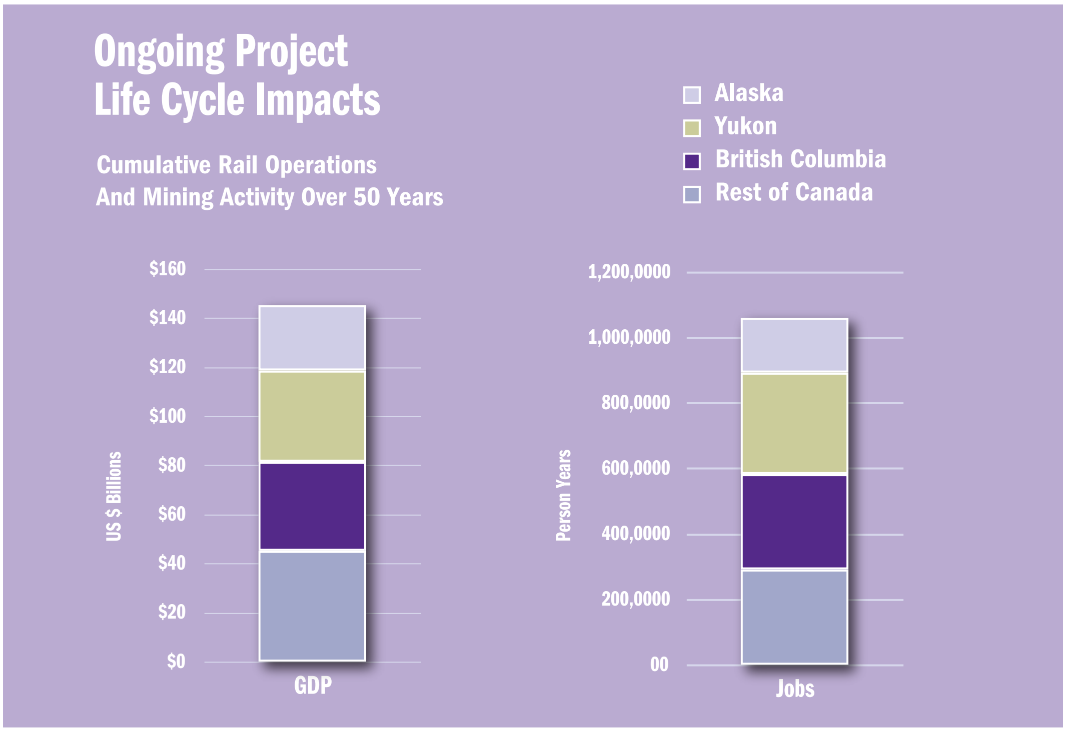
ACRL development will generate economic impacts in the form of new jobs, tax revenues, and increases in economic output (GDP). Short term impacts will be realized through construction-related activities and support for pipeline developments while longer term impacts will arise from ongoing rail operations,

Rail Construction Project Impacts



Ongoing Project Life Cycle Impacts

Cumulative Rail Operations And Mining Activity Over 50 Years





stimulated mining activity and through public sector savings from reduced transportation infrastructure maintenance and upgrading requirements.[22]

Economic impacts of the ACRL have been estimated by Ottawa-based Informetrica Ltd. and Information Insights in Alaska, with support from several commissioned and government studies that examined the implications of rail construction and operations for Alaska and Canada.

In summary, it is projected that ACRL investment over a fifty year life-cycle would generate cumulative impacts of:

- $25 billion in economic activity (GDP) and over 200,000 person years of employment from rail construction in Alaska and Canada;
- $145 billion of economic output (GDP) and 1.1 million person years of employment from related rail operations and stimulated mining activity in Alaska and Canada;
- $48 billion Canadian Federal and $49 billion Yukon/B.C. tax and royalty revenues accumulating from additional economic activity and employment.

5.2.1 Economic Output (GDP)

Economic output arising from ACRL construction amounts to:

- $2 billion for Alaska;
- $5.4 billion for Yukon;
- $5.7 billion for B.C.; and,
- $11.9 billion for the rest of Canada.

Collectively, these total $25 billion of economic output.

It is estimated that ongoing ACRL rail operations would add additional *annual* economic output to Canadian and U.S. economies as follows:

- $52 million to Alaska;
- $342 million to Yukon;
- $415 million to B.C.; and,
- $561 million to the rest of Canada.

Collectively rail operations would contribute an additional $1.6 billion in annual economic output.

[22] *Other industries, such as tourism, fisheries, and agriculture will benefit, however their economic impacts have not been addressed on account of uncertainty as to full significance.*

In Alaska, it has been estimated that at least 8.8 billion tonnes of mineral concentrates could be developed in the rail corridor over a 30-year period, with a gross metal value of $16.9 billion. The value of new economic output (GDP) amounts to $800 million annually in Alaska. Total impact in Alaska over the life of these new mines amounts to $24 billion in economic output.[23]

In Yukon and B.C., a number of new mines would commence operations given access to low-cost rail transportation and port access. It is projected that initial developments will involve known and staked deposits with later developments targeted at unclaimed deposits. In the initial phase, the mining sector is projected to have an annual impact of $780 million on the national economy in Canada of which $391 million will annually accrue to Yukon and $166 million to B.C. The remaining $223 million would accrue to the rest of Canada.[24]

Additional new mining of unclaimed deposits would further support sector growth beyond the first two decades of accessible rail transportation. Projected economic output arising from this activity amounts annually to $404 million in Yukon, $401 million in B.C. and $427 million in the rest of Canada.

5.2.2 New Job Creation

Construction-related development of the full Alaska rail route track and facilities from Delta Junction, Alaska to New Hazelton, B.C. would generate an estimated:

- 17,100 person years employment in Alaska;
- 54,800 person years employment in Yukon;
- 60,700 person years employment in B.C.; and,
- 76,100 person years employment in the rest of Canada.[25]

Collectively these total 208,700 person years of employment during construction.

Ongoing rail operations would lead to additional annual employment of:

- 164 permanent jobs in Alaska;
- 3,460 permanent jobs in Yukon;
- 3,580 permanent jobs in B.C.; and,
- 2,100 permanent jobs in the rest of Canada.

Collectively rail operations would contribute an additional 9,304 permanent jobs.

In Alaska, it is further estimated that:

- 3,000 direct jobs in the mining sector would be generated; and,
- 2,300 additional new jobs would be stimulated in other industries.

Total impact in Alaska over the life of these new mines amounts to 58,700 person years of employment.

[23] *Data developed by University of Alaska Fairbanks.*

[24] *Data developed by Yukon Department of Economic Development.*

[25] *Unless otherwise stated, estimates are for direct, indirect and induced employment.*



In Canada, new mines would account for 7,800 permanent jobs of which:

- 4,000 permanent jobs would be in Yukon;
- More than 2,000 permanent jobs would be in B.C.;
- And the remainder would be in the rest of Canada.

Additional direct and indirect jobs associated with new mining of unclaimed deposits would add:

- 1,893 permanent jobs in Yukon;
- 2,377 permanent jobs in B.C.; and,
- 5,000 permanent jobs in the rest of Canada.

5.2.3 Other Potential Impacts

If rail access is secured to the mammoth Crest iron ore deposit in northeastern Yukon, it is estimated that at least 28 million tons of iron ore pellets could be produced and shipped to offshore markets annually. Projected investment for mining and pelletizing could exceed $3 billion. Additional investment would be required to build spur line access to the ACRL along with additional port investment necessary to handle such large volumes.

The Crest iron ore deposit and major coalfield deposits were addressed separately from the full Alaska rail connection and not incorporated into that business case and related impact assessment due to differences in engineering criteria and the overwhelming disparity in traffic volumes. They remain, however, as key considerations for future analysis and project development.

As well as expanded regional resource development, new opportunities for community residents in both the construction and operational phases of the project will include:

- Job creation and wages spent in communities along the rail routes;
- Improved affordability of goods and services throughout the region;
- Access to larger markets in more regions for local business; and,
- Building regional tourism with the attraction of inland rail cruises.

Additionally, ACRL will benefit the U.S. and Canada with North American transportation system integration, reduced environmental impacts and enhanced economic security.

The public will potentially face, and governments will facilitate solutions, to mitigate any negative impacts along the rail corridor. Protection against environmental, social or cultural impacts will be critical. On balance however, it is anticipated that the net impact of the project will be overwhelmingly positive.

A New North Pacific Rim Trade Corridor

Restructuring the current Alaska Canada rail connection

Canadian National Rail freight moved by CN Aquatrain barge to Whittier, Alaska

Canadian National Rail freight hauled by Alaska Railroad through Whittier Tunnel



6.
Preliminary Feasibility Conclusions

The Alaska/Yukon/Northern B.C. Region is in a geographically advantageous position, potentially linking North Pacific Rim markets with the shortest trade route between North Asia and North America.

Development of rail infrastructure in this region will dramatically increase the resource productivity of Alaska and Canada. Large scale mining can become feasible, and smaller mines can become more competitive, with bulk resource heavy haul rail operations to Alaska and B.C. ports - and on to Asian markets.

A rail connection through Yukon could also improve the economic security of Alaska and the lower 48 United States by providing essential supply route redundancy as well as West Coast congestion relief – with a new Alaska port/rail gateway on U.S. soil.

The Phase 1 Feasibility Study working route scenario is based on the following key findings:

- Market driven route selection, in conjunction with engineering constructability and operational criteria, favors a Tintina Trench Route between Delta Junction, Alaska and New Hazelton, B.C. connecting the most mineral shipping points to Alaska and Northern B.C. ports.
- A Tintina Trench Route through Carmacks supports the shortest Alaska Railroad connection to Canadian National Railway and Northern B.C. Ports and can support Alaska Highway Pipeline logistics from strategic distribution points in Yukon[26].
- While connection to an Alaska Inside Passage port would provide the shortest route to tidewater for much mineral export traffic, combined port and rail considerations suggest that Anchorage area ports might require less capital investment.
- Commercial analysis of all potential revenues supports the Business Case for private-public partnerships to invest in a full Alaska rail connection; and initial investment in a phased resource railway to Haines appears economically viable in the private sector.

As markets firm up specific traffic timing and demand for some or all track segments of the working route scenario, the long term commercial feasibility for a preliminary business case can be better tested for near term bankability.

[26] *Watson Lake, Whitehorse, Beaver Creek (orTetlin Jct.); Also Fort Nelson B.C. railhead and along Alaska Hwy in Alaska.*

The ACRL Project Office has developed a data base application that, together with a financial model developed by Macquarie North America Inc., allows evolutionary scenario evaluation to update the Business Case Assessment. Ongoing evaluation must continue to provide strategic direction that cannot be finalized at the current preliminary phase of feasibility study, including:

- Narrow versus standard gauge rail upgrade for Skagway port access followed, or precluded, by new construction for higher capacity rail/port access at Haines;
- Skagway and/or Haines ports access followed, or precluded, by Cook Inlet ports access with Alaska Railroad extension to Carmacks, Ross River or New Hazelton;
- Northern B.C. ports access via Dease Lake extension from Prince George followed, or precluded, by ACRL shortcut (-600 miles) to a New Hazelton CN Rail connection.

In summary, *A Rails to Resources to Ports* northern infrastructure investment program will:

- Be critical to the long run sustainability of larger mines;
- Allow smaller mines to survive future market downturns;
- Provide lower cost access to more distant high capacity, deep water ports;
- Better integrate Asian manufacturing with resource and finished goods supply chains;
- Insure economic security with a continental rail connection to the Alaska Railroad;
- Provide shipper and government policy incentives for private-public partnerships;
- Offer a socially and environmentally attractive northern logistics solution.

If the full traffic potential identified to date is realized, the Alaska Canada Rail Link Project will show a strong revenue position in the North American rail industry context – and can be an attractive investment from either a strategic economic security or supply chain perspective.

Preliminary economic impact analysis of this investment has estimated that stimulated mining activity, in combination with rail construction and operations over the project life-cycle, would increase economic output (real GDP) in Alaska and Canada by U.S. $170 billion and create more than 25,000 jobs.

The Phase 1 Feasibility Study business case has demonstrated revenue adequacy to cover the capital and operating costs for initial investment in a regional resource railway to tidewater – or for a private-public partnership to complete a continental connection to the Alaska Railroad through Canada.



Appendix

Yukon Route Operating Profiles

Rail Distance Table

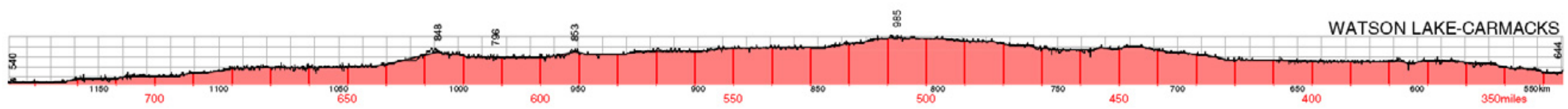
Project Participants

Project Governance

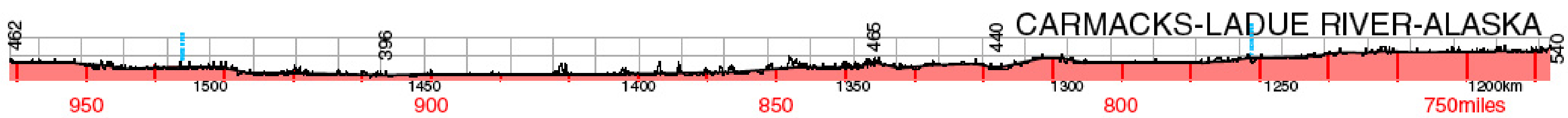
Yukon Route Operating Profiles

Watson Lake to Carmacks connecting with Ladue River Valley versus Nisling River to Alaska Border

MAX. WB GRADE 0.70% COMP.
MAX. EB GRADE 0.70% COMP.
MAX. CURVATURE 6°



MAX. WB GRADE 0.70% COMP.
MAX. EB GRADE 0.70% COMP.
MAX. CURVATURE 6°



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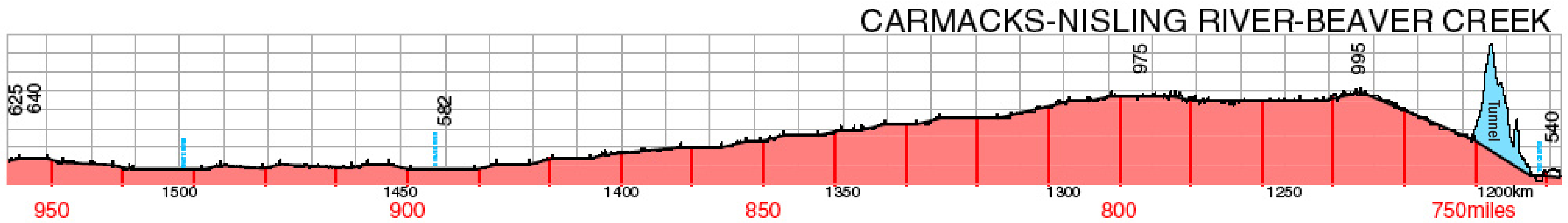
MAX. EB GRADE 0.70% COMP.
MAX. CURVATURE 6°





Rail Distance Table

	Fairbanks		Carmacks		New Hazelton		Prince Rupert		Chicago	
	miles	kms	miles	kms	miles	kms	miles	kms	miles	kms
Port MacKenzie	328	528	850	1368	1750	2816	1930	3106	4173	6716
Delta Junction	108	174	414	666	1314	2115	1494	2404	3734	6009
Skagway	739	1189	217	349	1117	1798	1297	2087	3537	5692
Haines	819	1318	297	478	1197	1926	1377	2216	3617	5821
Watson Lake	925	1489	403	649	497	800	677	1090	2917	4694
New Hazelton	1419	2284	900	1448	–	–	180	290	2423	3899
Prince Rupert	1599	2573	1080	1738	180	290	–	–	2603	4189
Chicago	3842	6183	3320	5343	2423	3899	2603	4189	–	–

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Alaska Legislature – Senate	John Cowdery, Chair of Rules Committee
Alaska Legislature – House	John Coghill, Representative, North Pole
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alaska
canada
rail link