# HAINES RAIL ACCESS REPORT

APRIL 2014

ALCAN Railink Inc

PROLOG Canada Inc

April 18, 2014

# HAINES RAIL ACCESS REPORT

Prepared for:

The Borough of Haines
and
The State of Alaska

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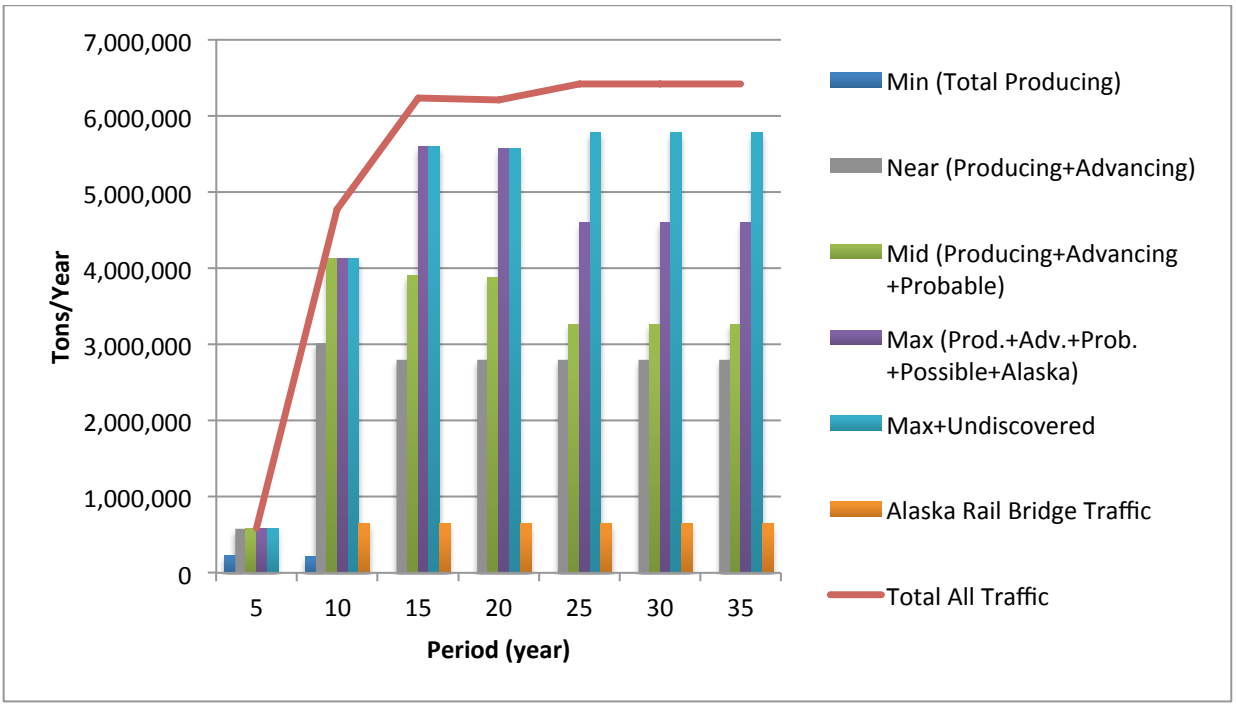
## EXECUTIVE SUMMARY

This report provides a business case assessment for rail access to tidewater at Haines, Alaska for Yukon mineral exports, and to bridge Alaska Railroad traffic from the south. Haines, Alaska is in a regionally unique position of having a well protected, deep water port with substantial back-up lands available to support high volume rail operations that may be required to fully develop Yukon resources. In turn Yukon mineral resources are the principal traffic source available for a Haines railway project.

As summarized in the following chart, this report has updated the full resource development potential, as well as Alaska Railroad bridge traffic, that would support, and be supported by, Haines Rail Access over a 30 year investment life-cycle. Potential Haines Rail Access traffic peaks at over 6 million tons/year excluding Crest Iron Ore traffic, which is 28 million tons/year.

**Haines Rail Access Traffic Forecast**



Four scenarios for Haines Rail Access are analyzed including potential synergies with a proposed Alberta Oil Sands Railway connecting to the Alaska Railroad Northern Extension Project at Delta Junction, Alaska. The four Haines Rail Access scenarios are:

- *Haines-Carmacks Stand Alone Railway*
- *Haines-Delta Junction Rail Connection*
- *Haines/Alberta Oil Sands Railway*
- *Haines-Crest Iron Ore Railway*

Rail route investment is based on the first two scenarios embracing Haines-Carmacks railway construction with an extension to the Alaska Railroad at Delta Junction.

| The Route | Distance | The Investment |
|---|---|---|
| Haines – Carmacks | 284 miles | $3.9 Billion |
| Carmacks – Delta Junction | 413 miles | $3.3 Billion |
| **Total Haines-Delta Junction** | **697 miles** | **$7.2 Billion** |

Rail route investment in the last two scenarios would be provided by others - but can be integrated with Haines rail access operations envisioned in the first two scenarios.

Each of the four Haines Rail Access scenarios is analyzed in terms of the value proposition that can justify varying combinations of public and/or private investment. That is, the value proposition is varied to accommodate the investment viability of each scenario. The result is intended to show how the viability of rail investment may be viewed differently among a range of potential investors: governments, railway companies, mine owners.

Beyond business case financial assessment of each value proposition, less quantifiable, but perhaps even more important, benefits to the public from Haines Rail Access will include:

- *Improved safety with fewer highway accidents;*
- *Smaller environmental footprint;*
- *Reduced greenhouse gas emissions; and*
- *Increased tourist travel attraction.*

## SCENARIO 1: HAINES – CARMACKS STAND ALONE TRUCK/RAIL SYSTEM

***A Haines – Carmacks stand alone truck/rail system amounts to a break-even investment prospect.*** *The value proposition is for Haines Rail Access to shift Yukon mine haul traffic from trucks to trains with a consequent reduction in Yukon and Alaska highway maintenance cost – but no reduction in total transportation cost.*

A public/private partnership flowing from the respective value derived by each partner is shown in the following table with:

- A private railway partner covering operating costs from commercial revenues and profitably financing a 79% share of the investment; and
- A public sector partner financing the 21% balance of capital cost from foregone highway maintenance expenditures.

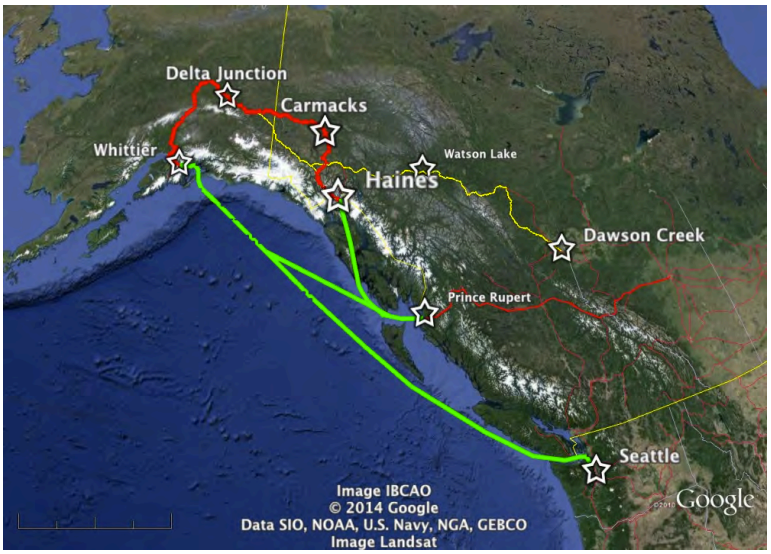
Haines Rail Access will remove up to 300 loaded trucks per day (5.5-6 million tons per year) from the parallel Alaska and Yukon highway system. Road maintenance savings could exceed $1 billion over a 30 year rail life cycle. The extent to which these savings are retained to repay infrastructure investment, or passed through as a mining industry incentive, would be a public policy decision.

| | Value | Investment |
|---|---|---|
| Commercial Value Funding | 79% | $2.76 billion |
| Public Value Funding | 21% | $.72 billion |
| Total | 100% | $3.48 billion |

## SCENARIO 2: HAINES – DELTA JUNCTION RAIL CONNECTION

***A Haines – Delta Junction Rail Connection results in a funding gap exceeding $3 billion.*** *The value proposition is for Haines Rail Access extended to Delta Junction to further reduce Yukon and Alaska highway maintenance cost; and provide a 50% closer Alaska Railroad marine connection to the continental rail system at Prince Rupert – but leaving a $3.3 billion funding gap with no readily quantifiable offsetting economic benefits.*

Government participation, placing a value in excess of $3 billion on the long-term vision for an Alaska Railroad connection to the continental rail system, is key to the viability of an investment scenario that might then see:




- The Alaska Railroad covering rail operating and truck feeder costs with revenues that would warrant funding for over 40% of the investment;
- The Government of Yukon realizing highway maintenance cost savings that would warrant funding for 10% of the investment; and
- The State of Alaska recognizing the interim value of moving closer to a continental rail connection that would warrant funding for almost half of the investment.

Although not quantified as part of the financial analysis, a connection to the Alaska Railroad Northern Extension Project at Delta Junction could also complete a circle tour for cruise ship operators - extending their current tourist train links at cruise ship terminals in South Central Alaska (Seward and Whittier) through Fairbanks to a cruise ship terminal at Haines.

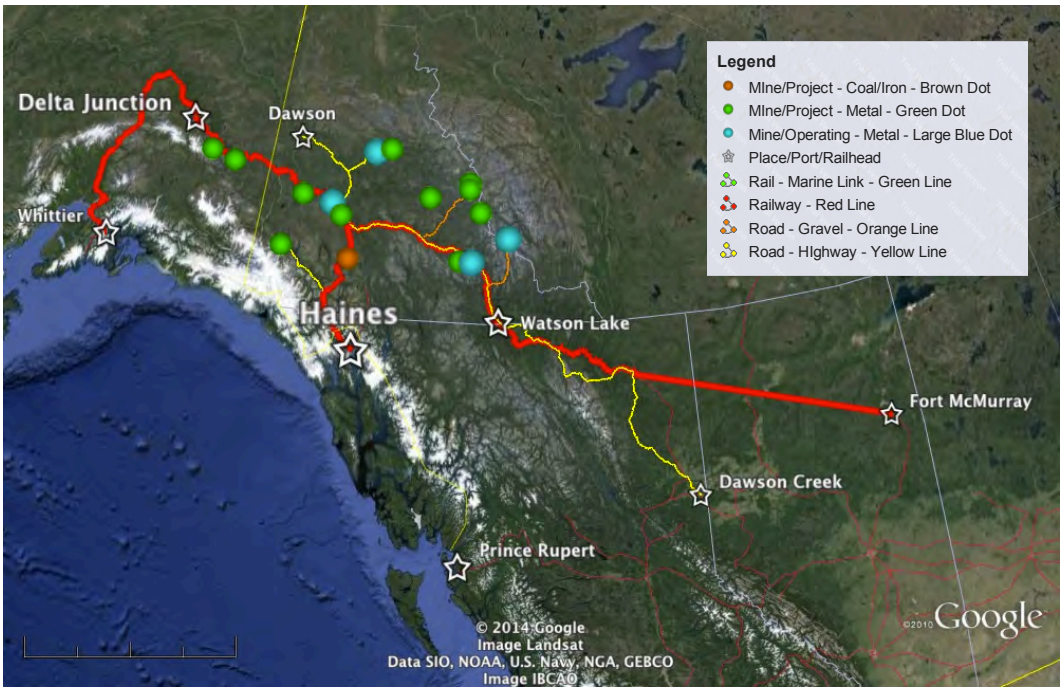
| | Value | Investment |
|---|---|---|
| Commercial Value Funding | 43% | $3.12 billion |
| Public Value Funding | 10% | $.74 billion |
| Funding Gap | 47% | $3.34 billion |
| Total | 100% | $7.2 billion |

## SCENARIO 3: HAINES RAIL ACCESS INTEGRATED WITH AN ALBERTA OIL SANDS RAILWAY

***Haines Rail Access Integrated with an Alberta Oil Sands Railway offers commercial viability without any government participation.*** *The value proposition is for Haines Rail Access integrated with an Alberta Oil Sands Railway to replace Yukon road feeder service with much lower cost rail service to a Carmacks interchange; providing the lowest total cost supply chain to and from tidewater for most Yukon and East Central Alaska resource development projects; and completing a continental rail connection to the Alaska Railroad at Delta Junction.*

Haines Rail Access can be integrated with the "Alberta to Alaska Railway" under study by the Government of Alberta. The Alberta to Alaska Railway would move Athabasca oil sands bitumen from Fort McMurray, Alberta to the Alyeska pipeline at Delta Junction, Alaska via Carmacks, Yukon. The proposed Alberta to Alaska Railway would follow the Robert Campbell Highway east of Carmacks, allowing replacement of relatively expensive truck feeder operations with extremely low cost rail connections.

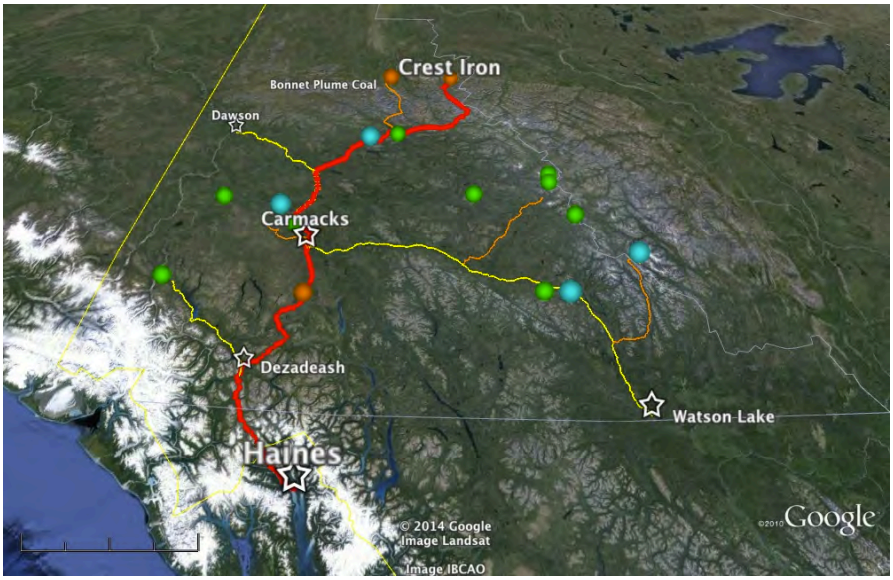
**Haines/Alberta Oil Sands Railway to Alaska**



## SCENARIO 4 - CREST – HAINES IRON ORE RAILWAY

***A Crest – Haines Iron Ore Railway* warrants private sector funding by a major mining company.** *The value proposition is that a Crest Iron Ore project, which would generate cash flow of $2.5 billion/year for more than 50 years with a 7 year payback – can absorb mine infrastructure investment including Haines Rail Access and Port Development.*

The Crest Iron Ore deposit is one of the largest undeveloped iron ore deposits in the world. With the scale of a Crest Iron Ore Project producing 28 million tons/year of mineral traffic, the shear size of this project in itself can justify the construction and operation of a dedicated railroad and a deep-sea port to ship its mineral production.




As a completely private sector investment by mine owners, the railway is viewed as a cost of mineral production that supports project feasibility:

- *The Crest project cannot be developed without a railway;*
- *The scale of Crest iron ore operations supports railway self-sufficiency; and*
- *The viability of other Yukon mines can be enhanced with access to the same railway.*

This report builds on the Alaska Canada Rail Link Project Feasibility Study (ACRL Study) conducted by ALCAN RaiLink on behalf of the State of Alaska and the Government of Yukon. The report includes previously unpublished ACRL engineering route, capital and operating cost assessments for rail access to Haines. These have been applied to better understand the transportation cost dynamics in play for Haines Rail Access.

**Rail availability can leverage resource development,** with increasing tonnage at decreasing transport cost. Operating cost/revenue ton mile (RTM) decreases with increases in traffic density as successive scenarios move from conventional Yukon/Alaska Mining to Alberta Oil Sands to Crest Iron Ore. The declining Cost per RTM, with incremental rail traffic expansion, is shown below.

| **$.039/RTM** | **$.0132/RTM** | **$.0124/RTM** |
|---|---|---|
| Carmacks to Haines<br>*Via Stand Alone Railway* | Carmacks to Tuchitua<br>*Via Alberta Oil Sands Railway* | Carmacks To Crest & Haines<br>*Via Crest Iron Ore Railway* |

This report anticipates that significant reduction in transportation costs could trigger important increases in economic activity associated with the resource industry. Conversely, projects with a lower value concentrate have a high percentage of operating costs allocated to transportation and these projects may never be developed in the absence of cost competitive rail transportation systems.

A broader public perspective on rail investment may be timely. Beyond the purely business case assessment of Haines Rail Access scenarios, larger development policy considerations may be brought into play - using public rail investment as an economic incentive to stimulate resource industry expansion by the private sector.

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# 1 INTRODUCTION

*This report builds on the Alaska Canada Rail Link Project Feasibility Study (ACRL Study) conducted by ALCAN RaiLink on behalf of the State of Alaska and the Government of Yukon. It includes previously unpublished ACRL engineering routing and cost assessments for rail access to Haines. ACRL Study research is updated for recent changes in the long term resource development outlook for Yukon and East Central Alaska; and a preliminary Haines Rail Access business case assessment is presented from both a private and public sector perspective.*

Four scenarios for Haines Rail Access are analyzed including potential synergies with a proposed Alberta Oil Sands Railway connecting to the Alaska Railroad Northern Extension Project at Delta Junction, Alaska:

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Rail route investment is based on the first two scenarios embracing Haines-Carmacks railway construction with an extension to the Alaska Railroad at Delta Junction.

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Rail route investment in the last two scenarios would be provided by others - but can be integrated with Haines rail access operations envisioned in the first two scenarios.

[1] Source: ACRL Work Package B1 (c) - Carmacks, Yukon to Alaska Border; ACRL Work Package B1 (e) - Haines, Alaska to Carmacks, Yukon

Since completion of the Alaska Canada Rail Link Project Feasibility Study in 2007, conditions conducive to Haines – Carmacks rail construction have changed significantly:

1) **Crest Iron Ore Deposit in Northeast Yukon is one of the largest in the world.** The Alaska Canada Rail Link Feasibility Study – Haines Benchmark Analysis - determined that a positive business case could be made for 28 million tonnes/year rail transport to Haines from a pellet plant in Carmacks at global iron ore prices around $34/tonne in 2006. *Current iron ore prices have quadrupled to $120/tonne.*

2) **Alberta Oil Sands hold the 3rd largest reserves in the world (168 billion barrels of oil).** The Alberta Government has funded a $1.8 million feasibility study for an Alberta to Alaska Railway - through Carmacks, Yukon - because the Province is export pipeline constrained at 1.9 million barrels/day of production now. *Oil sands production is projected at 5.2 million barrels/day by 2030.*

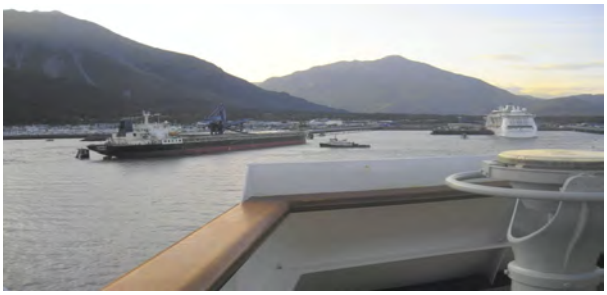
3) **Largest Yukon Mining Projects are near the ACRL route adopted for the Alberta to Alaska Study.** By 2021 these mines may ship up to 7 times currently anticipated 2015 mineral production and mine supply (0.6 million tons/year) that is now transported by truck. From approximately 4 million tons/year by 2021, *total mine haul traffic within range of rail could expand to almost 6 million tons/year by 2026.*

4) **White Pass & Yukon Route (ClubLink) controls Skagway port and rail facilities.** Skagway is the closest, most developed port for Yukon mineral exports. The port and rail facilities were reconstructed to support Cyprus Anvil concentrate exports (500,000 tonnes/year) starting in 1969. Subsequent mine and rail closures forced a refocus on cruise ships and tourist trains. The current low level of concentrate trucking (less than 100,000 tonnes/year) does not yet impact port capacity, highway safety or tourist activity. While that may change *with potential increase to 4 million tonnes/year by 2021 ClubLink has shown limited interest in renewed rail or port handling of mineral exports.*

Haines, Alaska is in the unique position of having a well protected, deep water port with substantial back-up lands available to support high volume rail operations that may be required to fully develop Yukon resources. In turn Yukon mineral resources are the principal traffic source available for a Haines railway project.

**Rail Access to Purpose Built Port Facilities at Haines can provide**:

- ***Tidewater access*** for feeder service from an Alberta to Alaska railway junction at Carmacks;
- ***Terminal acreage*** that Skagway does not have to handle Crest Iron Ore (28 million tons/yr);
- ***Rail alternative to highway*** trucking that now appears to be precluded at Skagway;
- ***Interim truck to rail transfer hub*** at Carmacks for current and future Yukon mines; and
- ***Interim Inside Passage connection*** to CN Rail for the Alaska Railroad (50 per cent shorter transit).



Alaska Railroad Dock and Coal Terminal at Seward Alaska

This report provides a quantified business case analysis of the extent to which outbound mineral and inbound mine supply traffic, as well as potential Alaska Railroad bridge traffic, can cover Haines Rail Access capital and operating cost over a 30 year life cycle.

For each scenario, a viable value proposition is redefined where a commercial business case alone many not warrant private investment. This is intended as a tool for further assessment of the broader public value from resource railway investment.

## 2 ROUTE SCENARIOS

*This section of the report outlines rail and port development scenarios that would incrementally reduce the current requirement for heavy mine haul highway trucking from Yukon to tidewater export position, while building toward an Alaska Railroad connection with the continental rail system. The current heavy haul highway system provides port access for Yukon mines to Skagway and Haines, Alaska; and to Stewart, B.C. (See map below.)*

**Map 1 - Heavy Haul HIghway System**

This heavy mine haul highway system allows extra-legal loads up to 77,100 kg (170,000 lb) under the Yukon Bulk Permitting Program. The program was implemented to help overcome the high cost of port access following suspension of White Pass & Yukon Route freight rail operations between Whitehorse and Skagway in 1982. Today the program still helps lower logistics costs in Yukon and would provide the critical road feeder access to a Carmacks railhead reload facility.

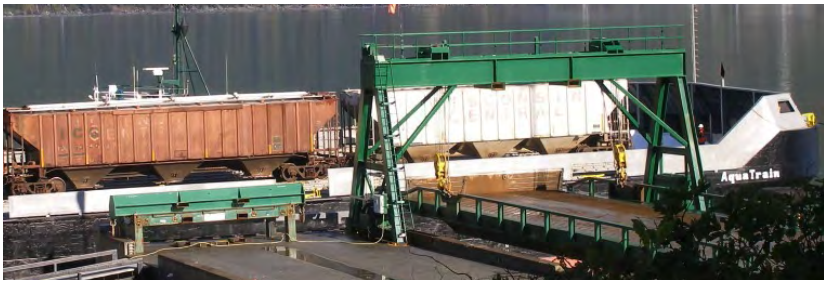
## 2.1 Haines-Carmacks Stand Alone Railway

Haines rail access from a Carmacks road feeder reload extends a rail/road logistics system to remote Yukon mineral properties using:

- Campbell Highway/Nahanni Range Road (Wolverine, Kudz Ze Kayah, Cantung, Selwyn)
- Campbell Highway/North Canol Road (Mactung, Tom & Jason, Andrew)
- North Klondike Highway (Minto, Keno Hill, Marg)
- Freegold Road and Freegold Road planned extension (Casino). Between Carmacks and Haines direct rail access would be available near Braeburn (Division Mountain) and Dezadeash Lake with a reload from the Alaska/Haines Highway (Wellgreen). The following map shows how the existing heavy haul highway system would feed into a Haines-Carmacks Stand Alone Railway.

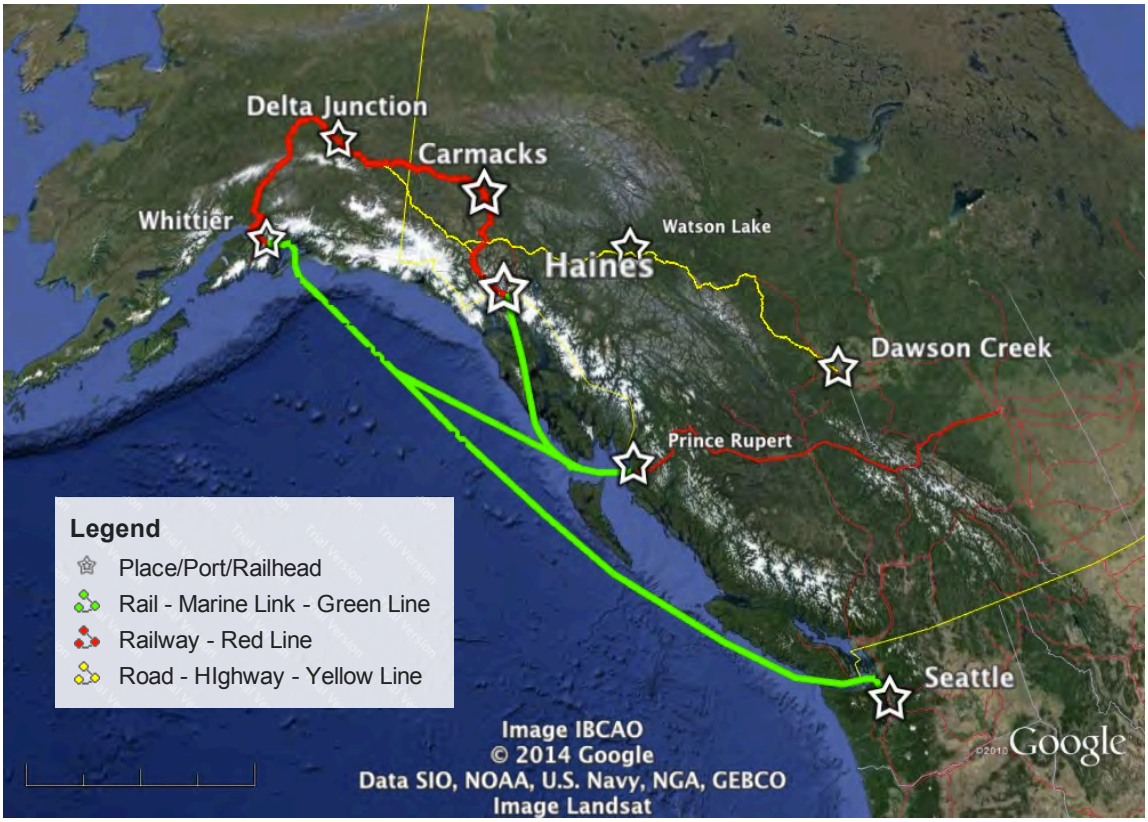
**Map 2 Haines - Carmacks Stand-Alone Railway and Road Feeder System**

## 2.2 HAINES – DELTA JUNCTION RAIL CONNECTION




Extending Haines rail access from Carmacks to the Alaska Railroad Northern Extension Project at Delta Junction allows a much closer rail/marine link to the continental rail system at Prince Rupert. This scenario sees a repositioned CN Aquatrain railcar/container marine connection between Prince Rupert and Haines complementing continued Alaska Railbelt Marine service between Seattle and Whittier. (See map below.)

**Map 3 – Marine Links To Continental Rail System**



Haines rail access offers a shortcut to Prince Rupert that cuts the current railcar/container barge transit to Whittier approximately in half, effectively doubling marine equipment capacity while reducing railcar shipment time. It would also open a new, much closer than Seattle/Tacoma, Alaska gateway for international marine transport via the extensive liner services calling Prince Rupert Fairview Container Terminal (Cosco, Hanjin, K-Line, Yang Ming).

Fairview Container Terminal at Prince Rupert CN Railhead

That combination should attract both rail and container shipments destined to Fairbanks and Alaska North Slope oilfields. It would not, however, attract Anchorage shipments for which current routing over Whittier remains shorter. Assuming a repositioned CN Aquatrain terminating at Haines, a likely shift in traffic allocation could see most Anchorage traffic moved on Alaska Railbelt Marine and most Fairbanks/North Slope traffic moved on Aquatrain.

Rail extension from Carmacks to Delta Junction could also capture some portion of Alaska Highway truck traffic with an overnight trailer-on-flatcar service to Fairbanks providing a less expensive alternative for long haul trucking operators with drivers typically resting overnight in Whitehorse.

Finally, the Haines-Delta Junction connection would also complete an Alaska cruise and rail loop between Seward/Whittier and Skagway/Haines cruise ship terminals. Cruise ship operators (Holland America/Princess) already run their own tourist train equipment as far as Fairbanks and transfer to airplanes and busses for the balance of the trip to reconnect with cruise ships at Skagway.

Alaska Railroad Seward Cruise Ship Terminal

The following map shows how the extension of Haines Rail Access to Delta Junction would allow rail access to mineral properties west of Carmacks in both Yukon (Casino) and East Central Alaska (Tetlin-Peak and Delta projects).

**Map 4 – Haines – Delta junction Extension and Road Feeder System**

## 2.3 HAINES/ALBERTA OIL SANDS RAILWAY

Haines Rail Access can be integrated with the "Alberta to Alaska Railway" under study by the Government of Alberta. The Alberta to Alaska Railway would move Athabasca oil sands bitumen from Fort McMurray, Alberta to the Alyeska pipeline at Delta Junction, Alaska via Carmacks, Yukon. Although this is intended as a purpose built railway dedicated to very large-scale single commodity movements, it is a reasonable assumption that permit conditions for construction and operations providing additional capacity for Yukon mineral traffic would be agreed.

The proposed Alberta to Alaska Railway would follow the Robert Campbell Highway east of Carmacks, allowing replacement of relatively expensive truck feeder operations with extremely low cost rail connections. See following map.

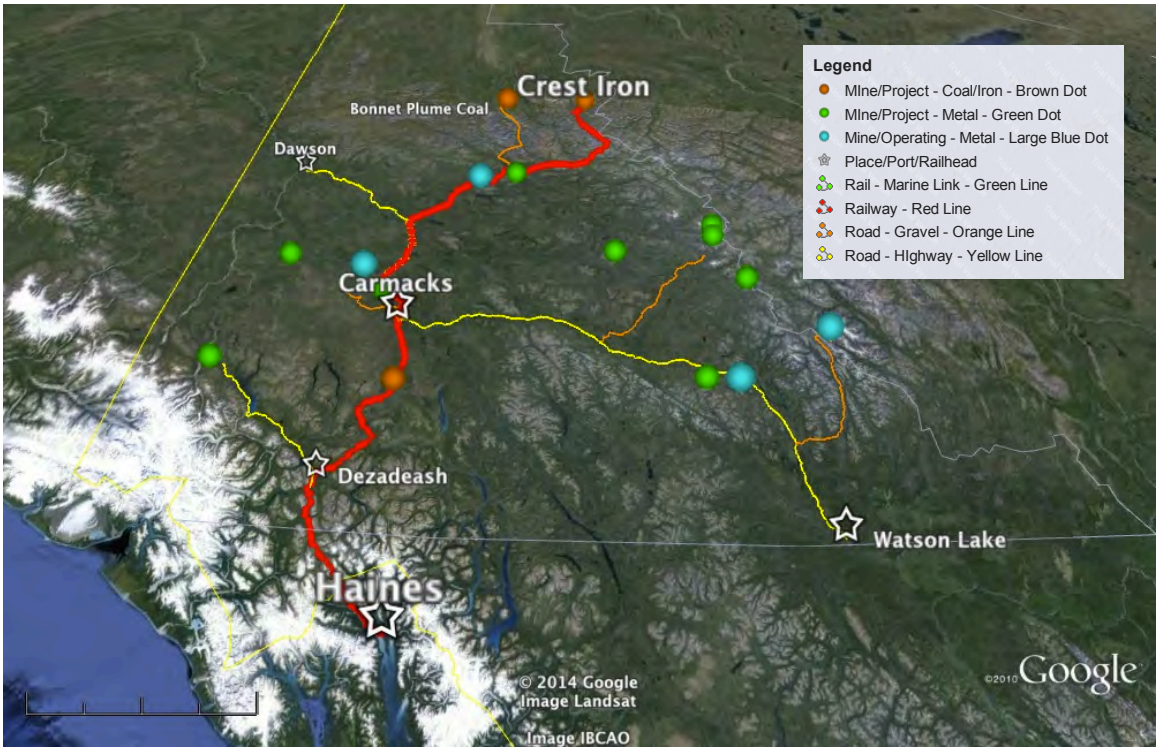
**Map 5 - Haines/Alberta Oil Sands Railway to Alaska**

## 2.4 HAINES-CREST IRON ORE RAILWAY

Development of the Crest Iron Ore deposit in Northeast Yukon cannot occur without rail access and Haines is the tidewater location in closest proximity with adequate uplands for the extensive marine terminal construction required to accommodate some 28 million tons of iron ore pellets per year.

It is anticipated that the project would incorporate port and rail investment within the financing envelope for full mine development. The Crest Iron Ore Railway would pass through Carmacks enroute to Haines, allowing for rail reload integration with a road feeder system. See following map.

**Map 6 - Crest-Haines Railway and Road Feeder System**



## 2.5 HAINES PORT DEVELOPMENT

Each Haines Rail Access scenario warrants progressive levels of investment in the following Haines port development scenario:

- General cargo and fuel handling facilities improvement at Lutak City Dock for inbound mine supply, diesel fuel and LNG (in containers).
- A Handy-Max bulk ship dock, concentrate and container terminal at the former Chilkoot Lumber Dock Site or the former army tank farm site for initial mine traffic from Yukon (5-6 million tons/year)
- A rail barge transfer facility at the Schaeffer property or former army tank farm site for Alaska Railroad bridge traffic
- A Cape-Size bulk ship dock and uplands iron ore terminal at the former Army tank farm site for Crest iron ore traffic (28 million tons/year)

Rail access to these port terminals is conceptually laid out in the following picture.

**Figure 1 - Haine Rail Access and Port Development**

## 3 MARKET RESEARCH

*This section of the report reviews research that has been completed to update resource development activity that can both support, and be supported by, Haines Rail Access. Mining industry based rail freight forecasts in this section reflect the prominence of that sector in the Yukon economy. This section also reviews the potential for Haines Rail Access to Bridge Traffic to the Alaska Railroad. Although not quantified here, emerging oil and gas prospects and liquefied natural gas transportation projects could add to future freight traffic as well.*

Transportation of mineral products to ports and resupply to mines generates the preponderance of Yukon's heavy bulk haul trucking operations. Currently that includes outbound shipment of mineral concentrate to smelters via ports located in Alaska (Skagway) and British Columbia (Stewart), and inbound shipment of fuel and consumables for mining operations and mineral processing activities.

Inbound freight originates from various locations depending on the type of supply, location of suppliers and freight costs. Major locations include Edmonton and Calgary in Alberta; as far as Saskatoon in Saskatchewan; and Vancouver or Prince Rupert in British Columbia. Supplies are also shipped through the port of Skagway in Alaska to Whitehorse for redistribution.

All Yukon mining freight is transported to the mines, and from the mines to the ports, via the Yukon heavy haul highway system. A Yukon bulk haul permit program allows extra legal loads up to

77,000 kg gross vehicle weight compared to 63,500 kg legal loads, with a penny per tonne kilometre charge on the overload. This system is extended across the border to Skagway with an Alaska Industrial Use Highway that also charges a toll.

Transportation is a major component of the cost structure of a mining operation. Truck transportation costs for mineral concentrates are determined by the mine distance from the nearest port, the cost structure of the freight carrier (equipment, wages and fuel) and the quality (and availability) of the road network. Concentrate transportation costs by truck can be prohibitive, hampering the viability of mining projects. In addition to precluding mine start-up, high trucking costs can contribute to premature shut-downs of existing operations that have difficulty absorbing fluctuations in metal prices.

On a per ton basis and under current market conditions, concentrate transportation costs for mines and projects located in Yukon can be as low as 2 per cent and as high as 25 per cent of the operating costs of the mines. Above 15 per cent, a project or a mine may be viable when metal prices are high but will have great difficulty maintaining operations when commodity prices fluctuate downward.

The following chart shows the distribution of projects by the main commodity mined versus the truck transportation costs (as a percentage of operating costs). The chart shows that mines and projects with a higher value concentrate (copper, nickel, silver, tungsten) have transportation costs representing less than 10 per cent of the operating costs while projects with lower value concentrate (lead-zinc and iron) have transportation costs representing 10 to 25 per cent of the operating costs.

Not shown on the graph, the Division Mountain project (coal) has truck transportation costs exceeding 50 per cent of the operating costs and is not viable under current market conditions.

In comparison, the Crest Iron ore project as shown on the chart has rail transportation cost representing 15 per cent of operating costs. If truck transportation was used instead of rail, the cost of transportation would exceed the value of the iron ore concentrate and the project would not be viable.

**Figure 2 – Truck* Transportation Costs Distribution by Main Commodity Mined (% of Operating Costs)**

* *The transportation costs for Crest Iron Ore Project on this chart are based on rail transportation*

In Canada, the mining industry is the largest customer of the transportation Industry. Mineral products transportation represents up to half of all freight-rail revenues.[2] Mines located in southern Canada have benefited, and continue to benefit from access to a low cost railway system. Having access to a lower cost, more efficient bulk freight transportation system may

[2] Mining Association of Canada - Facts And Figures 2013.

allow for many new mining projects in the north to be built; and for existing operations to expand and keep operating under less favourable market conditions.

For this study, the mineral freight forecast for Haines Rail Access has been estimated with the help of a Mine Evaluation and Forecasting Model (MEF Model) based on a modified evaluation model initially developed by Dye Management Group Inc.[3] for the Alaska Department of Transportation and Public Facilities (NSR Model - 2012).

The Dye Model uses mine costing equations from United State Geological Survey (USGS) Information Circular 9298. These equations allow calculation of operating and milling costs for underground and surface operations.

To the original Dye model, PROLOG added a financial evaluation model allowing for calculation of the project Internal Rate of Return (IRR) and additional modeling capacity to derive transportation costs; construction tonnage and bulk resupply quantities.

The MEF model was calibrated using publicly available information obtained from recent feasibility studies and from responses provided to the PROLOG Mine Logistics Survey by mining and exploration companies.

[3] Model used and modified under permission of Peter Mills, Dye Management Group Inc.

## 3.1 MINERAL FREIGHT MARKET

A total of 30 mines or projects with a defined mineral resource were considered and 19 are included in the study after review (See Appendix A). The majority of excluded projects are projects producing precious metals or producing a small tonnage of mineral concentrate or projects that would not benefit from rail transportation because of their location. Of these projects the following table presents priority projects selected for evaluation.

**Table 1 - Priority Projects Reviewed and Included in the Haines Access Study**

| Area | Mine or Mining Project | Proponent | Commodity | Report |
|---|---|---|---|---|
| Alaska | Delta | Agnico Eagle | Cu, Pb, Zn, Au, Ag | 2011 |
| | Tetlin - Peak | Contango Core | Au, Ag, Cu | 2013 |
| NWT | Cantung Mine | North American Tungsten | $WO_3$ | 2011 |
| Yukon | Andrew Project | Overland Resources | Pb, Zn | 2012 |
| | Bonnet Plume Coal Project | Anderson Exploration | Coal | 1979 |
| | Carmacks Copper Project | Copper North | Cu | 2012 |
| | Casino Project | Western Copper and Gold | Cu, Au, Mo | 2013 |
| | Crest Iron Project | Chevron Resources Canada | Fe (hematite) | 2006 |
| | Division Mountain Project | Pitchblack Resources | Coal | 2008 |
| | Keno Hill District Project | Alexco Resources | Ag, Pb, Zn | 2013 |
| | Kudz Ze Kayah Project | Teck Resources | Pb, Zn, Ag, Au | 2000 |
| | Mactung Project | North American Tungsten | $WO_3$ | 2009 |
| | MARG Project | Redtail Metals | Cu, Pb, Zn, Ag, Au | 2011 |
| | Minto Mine | Capstone Mining | Cu, Au, Ag | 2013 |
| | Selwyn Project | Selwyn Chihong Mining | Pb, Zn | 2007 |
| | Tom and Jason Project | Hudbay Minerals Inc. | Pb, Zn, Ag | 2007 |
| | Wellgreen Project | Prophecy Platinum | PGM, Ni, Cu | 2012 |
| | Whitehorse Tailings Project | Eagle Industrial | Fe (magnetite) | 2011 |
| | Wolverine Mine | Yukon Zinc Inc. | Zn, Pb, Ag | 2007 |

Priority mines or projects include those with a 5 year minimum mine life and producing mineral concentrate, coal or iron ore pellets. Two are located in Alaska, one is located in the Northwest Territory (but accessed from Yukon) and 16 are located in Yukon.

Most projects included in the priority list have been the subject of recent exploration work or engineering and economic studies, with exception of the Bonnet Plume Coal project. Technical studies that meet the 43-101 Canadian Standard of Disclosure for mineral resources, and/or economic evaluations are available for all except the Andrew, Crest, Bonnet Plume and Kudz Ze Kayah projects.

Almost all projects reviewed are road accessible or are located within 100 miles of the public road system. Notable exceptions include the Crest and Bonnet Plume projects. The following map presents the selected projects.

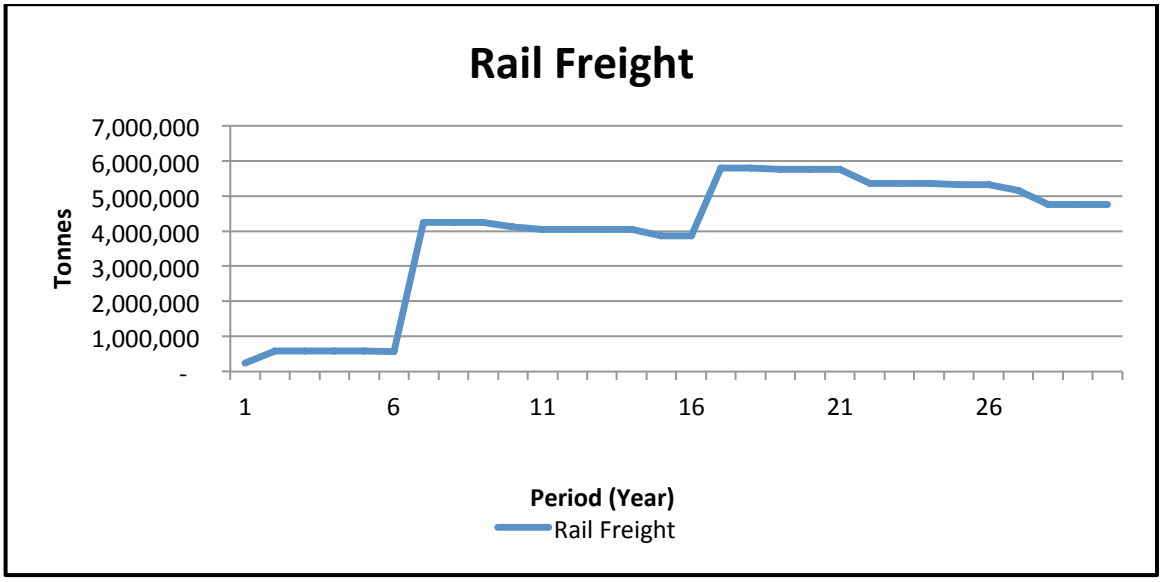
**Map 7 - Selected Priority Mines and Projects with Road Feeder Network**

The nineteen priority mines and projects selected have been evaluated with the MEF Model. The methodology followed for project review is described in Appendix A. Because of its size

and unique location, the Crest Iron Ore project is analyzed separately, while only outbound potential rail tonnage is provided for the Bonnet Plume Coal deposit.

In aggregate and over 30+ years the 17 projects analyzed (excluding Crest and Bonnet Plume) could generate up to 5 million tonnes of concentrate per year. Adding inbound bulk supplies to support the mining operations, an annual total of some 6 million tonnes of rail traffic is generated by the reviewed projects in peak years. The figure below shows the distribution of the rail freight traffic over a 30 year period.

**Figure 3 - Rail Freight from 17 Projects over a 30 Year Period**




The table following summarizes the forecasted tonnes/year of mineral market traffic from existing mining operations, from selected new mining projects and from additional traffic resulting from potential mineral deposit discoveries.

## Table 2 - Resource Development Production Traffic Forecast

**Resource Development Production Traffic Forecast (Tons/Year)**

| | Mine | Concentrate | Tons | 2015-20 | 2021-25 | 2026-30 | 2031-35 | 2036-40 | 2041-45 | 2046-50 |
|---|---|---|---|---|---|---|---|---|---|---|
| MIN CURRENT PRODUCING | CanTung | Magnesium | Outbound | 5,535 | | | | | | |
| | | | Supply | 4,762 | | | | | | |
| | | | Fuel | 3,285 | | | | | | |
| | Minto (2007-17+) | Copper/Gold | Outbound | 53,805 | 53,805 | | | | | |
| | | | Supply | 15,065 | 15,065 | | | | | |
| | | | Fuel | 9,930 | 9,930 | | | | | |
| | Wolverine (2012-2021+) | Lead/Zinc | Outbound | 88,371 | 88,371 | | | | | |
| | | | Supply | 20,893 | 20,893 | | | | | |
| | | | Fuel | 13,275 | 13,275 | | | | | |
| | Keno Hill | Silver/Zinc | Outbound | 15,200 | 15,200 | | | | | |
| | | | Supply | 2,600 | 2,600 | | | | | |
| | | | Fuel | 170 | 170 | | | | | |
| | | **MIN (Total Producing)** | | **232,891** | **219,309** | | | | | |
| NEAR TERM ADVANCING | Eagle Mins (2015-2020) | Magnetite | Outbound | 346,500 | | | | | | |
| | | | Supply | 2,645 | | | | | | |
| | | | Fuel | 790 | | | | | | |
| | Selwyn (2020-2028+) | Lead/Zinc | Outbound | | 1,481,827 | 1,481,827 | 1,481,827 | 1,481,827 | 1,481,827 | 1,481,827 |
| | | | Supply | | 77,058 | 77,058 | 77,058 | 77,058 | 77,058 | 77,058 |
| | | | Fuel | | 329,534 | 329,534 | 329,534 | 329,534 | 329,534 | 329,534 |
| | Casino (2020-2040+) | Copper/Gold | Outbound | | 449,315 | 449,315 | 449,315 | 449,315 | 449,315 | 449,315 |
| | | | Supply | | 255,100 | 255,100 | 255,100 | 255,100 | 255,100 | 255,100 |
| | | | Fuel | | 205,162 | 205,162 | 205,162 | 205,162 | 205,162 | 205,162 |
| | | **NEAR (Producing+Advancing)** | | **582,826** | **3,017,305** | **2,797,996** | **2,797,996** | **2,797,996** | **2,797,996** | 2,797,996 |
| MID TERM PROBABLE | Carmacks | CathodicCopper | Outbound | | 13,200 | 13,200 | | | | |
| | | | Supply | | 11,000 | 5,000 | | | | |
| | | | Fuel | | 8,000 | 7,000 | | | | |
| | MacTung (2020-2032) | Magnesium | Outbound | | 11,042 | 11,042 | 11,042 | | | |
| | | | Supply | | 8,222 | 8,222 | 8,222 | | | |
| | | | Fuel | | 6,477 | 6,477 | 6,477 | | | |
| | Andrew (2020-2028) | Lead/Zinc | Outbound | | 135,317 | 135,317 | 135,317 | | | |
| | | | Supply | | 11,896 | 11,896 | 11,896 | | | |
| | | | Fuel | | 41,774 | 41,774 | 41,774 | | | |
| | Tom&Jason (2020-2035) | Lead/Zinc | Outbound | | 368,264 | 368,264 | 368,264 | | | |
| | | | Supply | | 10,062 | 10,062 | 10,062 | | | |
| | | | Fuel | | 19,172 | 19,172 | 19,172 | | | |
| | Wellgreen (2020-2057) | Nickle/Platinum | Outbound | | 328,005 | 328,005 | 328,005 | 328,005 | 328,005 | 328,005 |
| | | | Supply | | 43,103 | 43,103 | 43,103 | 43,103 | 43,103 | 43,103 |
| | | | Fuel | | 96,469 | 96,469 | 96,469 | 96,469 | 96,469 | 96,469 |
| | | **MID (Producing+Advancing+Probable)** | | **582,826** | **4,129,308** | **3,902,999** | **3,877,799** | **3,265,573** | **3,265,573** | **3,265,573** |
| LONG TERM POSSIBLE | KudZeKyah | Lead/Zinc | Outbound | | | 165,418 | 165,418 | | | |
| | | | Supply | | | 6,800 | 6,800 | | | |
| | | | Fuel | | | 15,424 | 15,424 | | | |
| | Marg | Lead/Zinc | Outbound | | | 148,555 | 148,555 | | | |
| | | | Supply | | | 7,100 | 7,100 | | | |
| | | | Fuel | | | 16,400 | 16,400 | | | |
| | Division Mt. (2020-2045) | Coal | Outbound | | | 1,270,000 | 1,270,000 | 1,270,000 | 1,270,000 | 1,270,000 |
| | | | Supply | | | 15,343 | 15,343 | 15,343 | 15,343 | 15,343 |
| | | | Fuel | | | 47,067 | 47,067 | 47,067 | 47,067 | 47,067 |
| | **MAX (Prod+Advancing+Probable+Possible)** | | | **582,826** | **4,129,308** | **5,595,106** | **5,569,906** | **4,597,983** | **4,597,983** | **4,597,983** |
| **Undiscovered Minerals (Yukon Geological Survey)** | | | | | | | | | | |
| | extrapolated to 640 ACRL miles in Yukon | | | | | | | 911,945 | 911,945 | 911,945 |
| | and extended to 190 ACRL miles in Alaska | | | | | | | 270,734 | 270,734 | 270,734 |
| | **Max Known + Undiscovered** | | | **582,826** | **4,129,308** | **5,595,106** | **5,569,906** | **5,780,662** | **5,780,662** | **5,780,662** |
| **Very Large Long Range Projects** | | | | | | | | | | |
| | Illtyd-Bonnet Plume Coal | | | | | | | 6,570,000 | 6,570,000 | 6,570,000 |
| | Chevron-Crest Iron Ore (2020-2048) | | | | | | | 28,000,00 | 28,000,00 | 28,000,00 |

## 3.2 IRON ORE FREIGHT MARKET

The undeveloped Crest Iron Ore Project has the potential to produce 28 million tons per year of iron ore pellets which will both support and require a dedicated railroad.

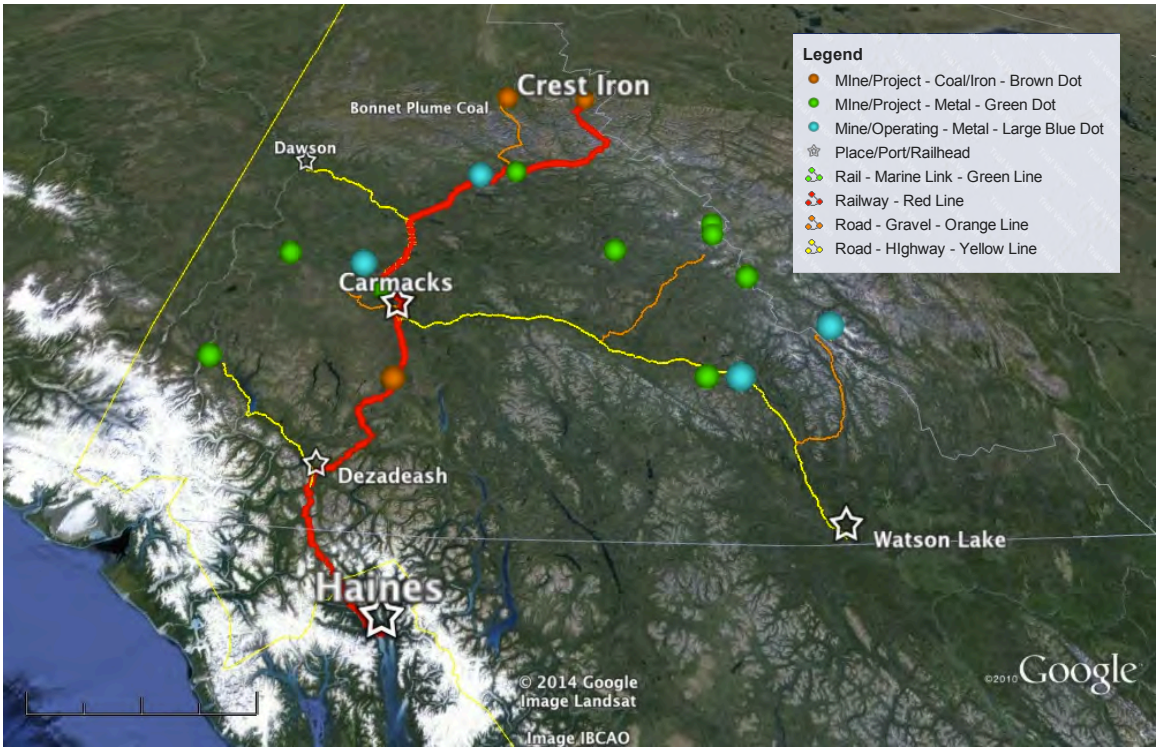
The Crest Iron Ore project was discovered by Chevron in the 1960's and was the object of significant exploration work and engineering and transportation studies. The deposit is one of the largest undeveloped iron ore deposits in the world with an estimated historical resource of between 20 to 30 billion tons of iron ore grading 44 per cent Fe.

A first feasibility study was completed in 1965. The "ore reserve" calculated then for an initial open-pit operation was in excess of 6 billion tonnes at 44 per cent Fe with a low stripping ratio of less than one ton of waste for each ton of ore. Previously, in 1962, a study was commissioned by Chevron's predecessor - California Standard Oil Company and by the Government of Canada to evaluate the feasibility of establishing a railroad between Crest and Skagway or Haines. Canadian National Railway completed the study for the parties. The map below presents the railroad routes studied by CNR (1965).

**Map 8 - Railway proposed for the Crest Iron Ore - CNR 1965**

The map below shows the Crest Rail Route to Carmacks and the Carmacks to Haines Rail Route via Champagne. The Crest – Haines Rail route originates from the Crest property at the top of the Map and connects to Haines at the bottom of the Map.

**Map 9 - Crest Iron Ore Project - Rail Access Route**




To the west of the Crest Rail route, the route for the Bonnet Plume Coal project is shown in lighter orange. This route follows the Wind River Trail, an existing winter access trail, from the Bonnet Plume project to Elsa where the Wind River route connects to the Crest-Haines Rail route. The railway section from the Crest property to Carmacks follows Route "A" identified by the CNR study (1965) (see map 8 above). The railway section from Carmacks to Haines follows the Champagne route from the Alaska-Canada Rail Link Study (2007).

## BULK RAIL FREIGHT – INBOUND AND OUTBOUND

Annual iron ore pellet shipment and bulk resupply tonnage for the Crest project is huge, generating approximately 30 million tonnes of combined inbound and outbound rail traffic.

**Table 3 - Crest Inbound and Outbound Bulk Shipment**

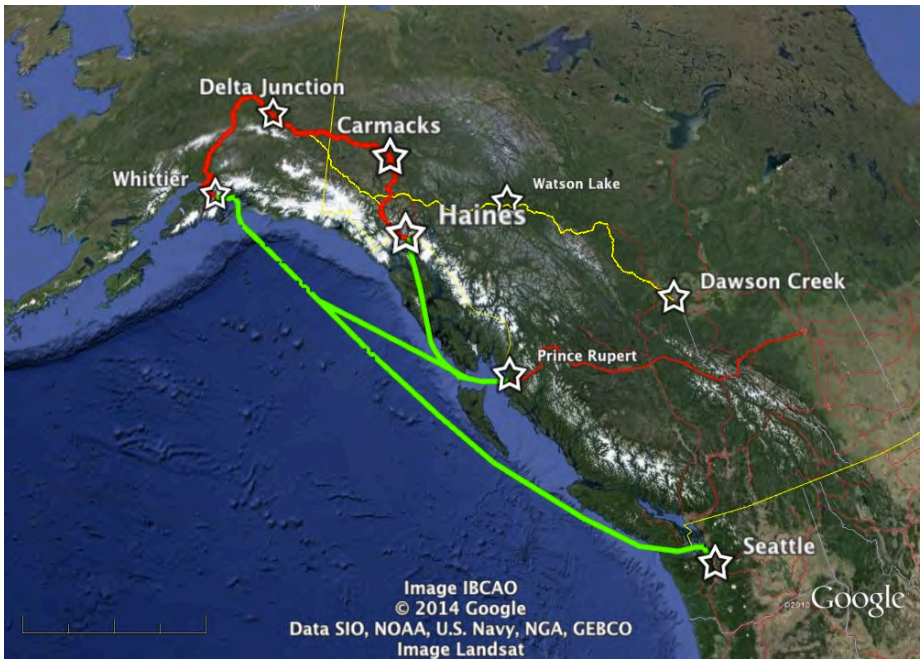
| **Shipment** | **Tonnes per year** |
|---|---|
| Outbound | |
| Pellets | 28,000,000 |
| Inbound | |
| Bulk Fuel – Equipment | 372,764 |
| Bulk Fuel – Power Generation | 90,040 |
| Other Mine Supply | 1,482,130 |
| Total Inbound | 1,944,935 |
| **Total shipment** | 29,944,935 |

**Ship Loader and Rotary Car Dumper, Ridley Island Terminal, British Columbia**

## 3.3 BRIDGE TRAFFIC

*This section of the report* addresses the extent to which connecting the Alaska Railroad Northern Extension Project at Delta Junction with Haines Rail Access to a marine railcar/container link with CN Rail at Prince Rupert, can bridge traffic between the two railways.

Currently this is accomplished at Whittier, Alaska, which would remain the connecting point for Anchorage traffic. However for rail and container traffic destined to Fairbanks and the Alaska North Slope oil fields, an approximately 50 per cent shorter marine link should make a shift of that traffic to Haines attractive. As previously noted, not only would shipment time be reduced but marine equipment utilization and corresponding capacity would essentially be doubled.




In addition Fairbanks/North Slope traffic moving on the Alaska Highway may be attracted to rail with a trailer-on-flatcar service for long distance motor carrier operators with drivers typically taking a nights rest in Whitehorse.

The table below shows the portion of the bridge traffic that is assumed to be captured with Haines Rail Access and a connection to the Alaska Railroad.

**Table 4 - Bridge Traffic* – Haines Rail Access to Alaska Railroad/Fairbanks**

| | Tons/Year | Mkt Share | Tons/Year | Miles | Total Rev | Ops Cost |
|---|---|---|---|---|---|---|
| **Over-the-Water Rail Car Interchange** | | | | | | |
| Alaska Rail Belt Marine | 155,000 | 30% | 46,500 | | | |
| CN Rail Aquatrain | 145,000 | 70% | 101,500 | | | |
| Total | 300,000 | | | | | |
| | | | 148,000 | 722 | $5,342,800 | $4,274,240 |
| **Marine Container/Trailer on Flat Car** | | | | | | |
| Totem Ocean Trailer Express | | | | | | |
| Horizon Lines | | | | | | |
| Total | 2,000,000 | 18% | 360,000 | 722 | $12,996,000 | $10,396,800 |
| **Alaska Hwy Truck Trailer On Flat Car** | | | | | | |
| Alaska Marine Lines Trailers | 6,000 | 100% | 6,000 | | | |
| Alaska Hwy Through Trucks | 258,000 | 50% | 129,000 | | | |
| | | | 135,000 | 425 | $2,868,750 | $2,295,000 |
| **Total Alaska Railroad Bridge Traffic** | | | **643,000** | | **$21,207,550** | **$16,966,040** |

Assume Revenue/RTM @ $0.05

Assume Cost/RTM@ $0.04 Alaska Railroad Avg Cost per Rev Ton Mile (circa 2009-2010)

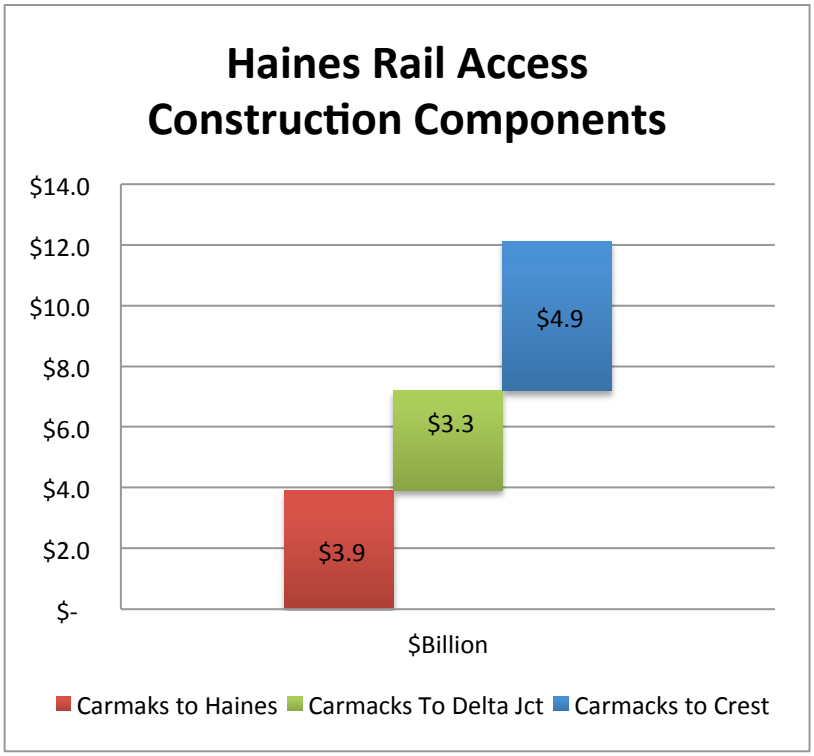
Carmacks-Delta Jct. division of full ops cost based on segment miles = 413

*Note: All tons per Alaska Canada Rail Link Study (2007)

# 4 LIFE CYCLE COST

*This section of the report recaps capital and operating costs previously developed for Haines Rail Access in the Alaska Canada Rail Link Feasibility Study. That baseline engineering and operations analysis has been incrementally updated for changes in train service and life cycle cost assumptions appropriate to the current Haines Rail Access assessment.*

## 4.1 INVESTMENT COST




Engineering evaluation and construction cost estimates for each rail route segment, conducted under contract to ALCAN RaiLink for the Alaska Canada Rail Link Project Feasibility Study[4], are recapped on the following page.

[4] UMA/AECOM Rail Route Evaluation and Cost Estimates for Northern and Southern Yukon Routes (ACRL Work Package B1e); and University of Alaska Fairbanks for the Ladue River route in Alaska (ACRL Work Package B1c)

## Table 5 - Construction Costs Estimates

| Between<br>And<br>Via<br>Miles | Haines<br>Dezadeash<br>Haines Hwy<br>124.1 | Desadeash<br>Carmacks<br>Champagne<br>159.9 | HAINES<br>CARMACKS<br>SUBTOTAL<br>284 | Carmacks<br>Border<br>Ladue River<br>223 | Border<br>Delta Jct<br>Ladue River<br>190 | CARMACKS<br>BORDER<br>SUBTOTAL<br>413 | Haines<br>Delta Jct<br>TOTAL<br>697 |
|---|---|---|---|---|---|---|---|
| *QUANTITIES* | | | | | | | |
| MAIN TRACK | | | | | | | |
| Track (miles) | 124.1 | 159.9 | 284 | 223 | 190 | 413 | 697 |
| Sidings (nbr) | 3 | 4 | 7 | 6 | 10 | 16 | 23 |
| Bridges (ft) | 45,359 | 27,083 | 72,442 (8) | 38,393 | 9460 (4) | 47,853 | 120,295 |
| Tunnels(ft) | | 2,640 | 2,640 | | | | 2,640 |
| FACILITIES | | | | | | | |
| Comm/Pwr(mile) | 124.1 | 159.9 | 284 | 223 | | 223 | 507 |
| Detectors (nbr) | 2 | 2 | 4 | 3 | | 3 | 7 |
| Terminals(nbr) | 3 | 3 | 6 | 3 | 3 | 6 | 12 |
| CONTINGENCY | 25% | 25% | 25% | 25% | 20% | | |
| ENVIRO/PERMIT | 5% | 5% | 5% | 5% | | | |
| ENGR/ProjMgmt | 15% | 15% | 15% | 15% | 15%+ | | |
| *COSTS* | | | | | | | |
| MAIN TRACK | | | | | | | |
| Track | $566,951,000 | $656,533,000 | $1,223,484,000 | $842,872,000 | $464,029,906 | $1,306,901,906 | $2,530,385,906 |
| Sidings | $11,157,000 | $16,229,000 | $27,386,000 | $24,343,000 | | $24,343,000 | $51,729,000 |
| Bridges | $602,922,000 | $361,221,000 | $964,143,000 | $372,555,000 | $161,447,377 | $534,002,377 | $1,498,145,377 |
| Tunnels | | $21,542,000 | $21,542,000 | | | | $21,542,000 |
| SUBTOTAL | $1,181,030,000 | $1,055,525,000 | $2,236,555,000 | $1,239,770,000 | $625,477,283 | $1,865,247,283 | $4,101,802,283 |
| FACILITIES | | | | | | | |
| Comm/Pwr | $22,046,000 | $30,989,000 | $53,035,000 | $43,217,000 | | $43,217,000 | $96,252,000 |
| Detectors | $449,000 | $490,000 | $939,000 | $734,000 | | $734,000 | $1,673,000 |
| Terminals | $50,698,000 | $55,306,000 | $106,004,000 | $55,306,000 | | $55,306,000 | $161,310,000 |
| SUBTOTAL | $73,193,000 | $86,785,000 | $159,978,000 | $99,257,000 | $5,100,000 | $104,357,000 | $264,335,000 |
| CONTINGENCY | $313,556,000 | $285,578,000 | $599,134,000 | $334,757,000 | $126,115,457 | $460,872,457 | $1,060,006,457 |
| ENVIRO/PERMIT | $79,330,000 | $72,251,000 | $151,581,000 | $84,694,000 | $25,500,000 | $110,194,000 | $261,775,000 |
| ENGR/ProjMgmt | $239,870,000 | $218,467,000 | $458,337,000 | $256,089,000 | $265,460,486 | $521,549,486 | $979,886,486 |
| TOTAL | $1,886,979,000 | $1,718,606,000 | $3,605,585,000 | $2,014,567,000 | $1,047,653,226 | $3,062,220,226 | $6,667,805,226 |
| Escalation | | | 7% | | | 8% | |
| 2014 Costs | | | $3,857,975,950 | | | $3,322,202,723 | $7,180,178,673 |
| 273 mile Haines Stand-Alone Adjustment* | | | $3,480,420,000 | | | | |

*As adjusted in UMA/AECOM Work Package B1(e) scope change Eval Haines to Carmacks for initial construction to rail reload terminal adjacent to proposed Freegold Road By-Pass that eliminates Yukon river crossing and 11 miles of circuitous trackwork to reach a junction with the ACRL Ladue River Route to Delta Junction.

The Crest Iron Ore Railway would extend an additional 372 miles from Carmacks to Crest and 284 miles to Haines for a total of 656 miles. The cost to build the Crest to Haines railway is estimated at a total of $8.74 billion. The table below shows how the capital costs are factored for the full Crest to Haines Rail construction estimate.

**Table 6 - Crest – Haines Railway Capital Costs Estimate**

| **ACRL Construction Cost - Haines Carmacks** | **Miles** | **$M/mi** | **$M** |
|---|---|---|---|
| Haines to Dezadeash | 124 | 15.21 | $1,887 |
| Dezadeash to Carmacks | 160 | 10.75 | $1,719 |
| Haines to Carmacks (weighted average) | 284 | 12.70 | $3,606 |
| *$2013 (7% inflation)* | *284* | *13.584* | *$3,858* |
| **Estimate Crest – Carmacks** | **Miles** | **$M/mi** | **$M** |
| Carmacks to Elsa | 171 | 10.75 | $1,838 |
| Elsa to Goz Pass | 126 | 15.21 | $1,916 |
| Goz Pass to Crest | 75 | 10.75 | $806 |
| Carmacks to Crest (weighted average) | 372 | 12.26 | $4,560 |
| *$2013 (7% inflation)* | *372* | *13.116* | *$4,879* |
| **Crest – Haines Railway** | **656** | | **$8,737** |

## 4.2 OPERATING COST

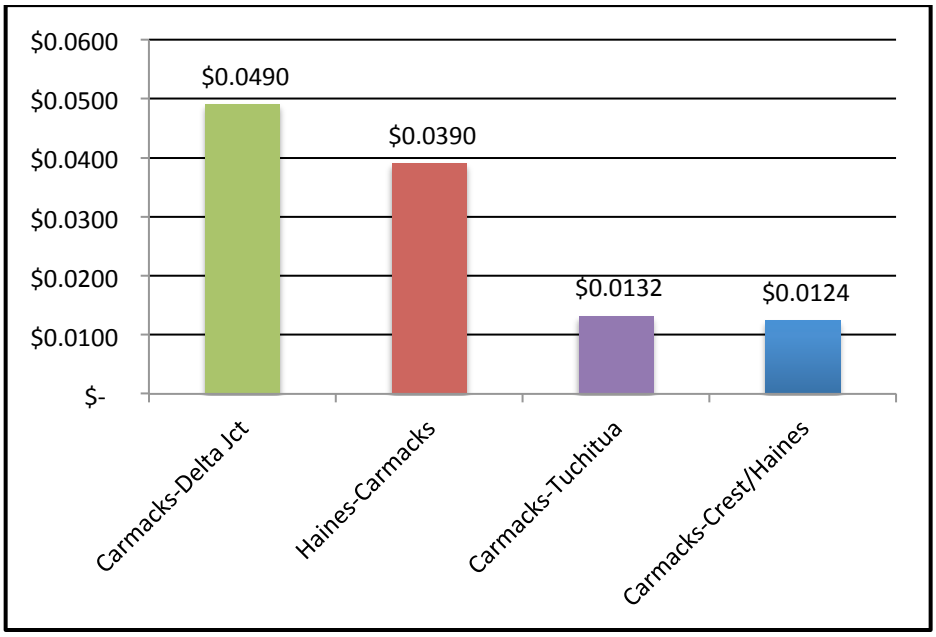
Segment specific railway operations and cost models provided under contract to ALCAN RaiLink for the Alaska Canada Rail Link Project Feasibility Study[5] have been recalibrated for current traffic and operating scenarios.

Haines-Carmacks stand-alone railway operations assume:

| | | | |
|---|---|---|---|
| 24 hour trip cycle | 110 x 100 ton car trains | 3 x 4400hp LNG locos | 1 man crew |

Resultant rail operating costs are summarized and presented in the chart below and are detailed on the following page. Railway Operating Costs in the following chart are expressed in $ per Revenue Ton Mile ($/RTM). A $/RTM represents the railway operating costs of moving one ton of revenue generating freight over one mile.

**Figure 4 - Railway Operating Costs ($/RTM)**




[5] Innovative Scheduling, Gainesville, Florida

These costs are Total Operating Costs inclusive of equipment amortization for locomotives and maintenance of way equipment. Car rents cover lease fleet costs. Fixed rail infrastructure is not included and is separately addressed with rail investment financial analysis in the following section.

Operating cost per revenue ton-mile decrease with increases in traffic density as successive scenarios move from conventional Yukon/Alaska Mining to Alberta Oil Sands to Crest Iron Ore. The declining cost per ton, with increasing rail traffic expansion, is shown in the following table.

**Table 7 - Rail Operating Costs by Segment**

Haines Rail Access
Rail Operating Costs

| Rail Segment | Between | And | Miles | $/RTM | $/Ton (2006) | $/Ton (2013) |
|---|---|---|---|---|---|---|
| Carmacks South | Haines | Carmacks | 273 | $0.039 | $10.62 | $11.36 |
| Via Haines | | Division Mt | 223 | $0.039 | $8.67 | $9.28 |
| Stand Alone Railway | | Dezdeash | 124.1 | $0.039 | $4.83 | $5.17 |
| Carmacks East | Carmacks | Ross River | 162.7 | $0.013 | $2.15 | $2.30 |
| Via Alberta Oil Sands | | Wolverine | 265.4 | $0.013 | $3.50 | $3.75 |
| To Alaska Railway | | Tuchitua | 332.1 | $0.013 | $4.38 | $4.69 |
| Carmacks West | Carmacks | Minto | *61* | $0.013 | $0.81 | $0.86 |
| Via Alberta Oil Sands | | Casino | *137* | $0.013 | $1.81 | $1.93 |
| To Alaska Railway | | Tok | 296 | $0.013 | $3.91 | $4.18 |
| Iron Ore Railway | Haines | Crest | 656 | $0.012 | $8.13 | $8.70 |
| Bridge Traffic | Haines | Delta Jct | 722 | $0.049 | $35.38 | $37.85 |

Notes:

7% escalation from 2006 cost levels

$0.039 /RTM rail unit cost for Haines Rail Access Stand Alone (see Appendix)

$0.012 /RTM rail unit cost for Crest Iron Ore Railway to Haines (see Appendix)

$0.007 /RTM for Alberta Oil Sands to Alaska Rail (see Appendix); assume interline rate division at 200% $0.0132 /RTM

$0.049 /RTM for Alaska Railroad Bridge Traffic based on Alaska Railroad Avg Cost per Rev Ton Mile (circa 2009-2010)

Above operating costs per application of Innovative Scheduling Rail Cost Model provided under ALCAN RaiLink contract.

11 miles added to points east and west of Carmacks account Carmacks Transfer is 11 miles from Carmacks Junction.

Minto and Casino rail distance to Carmacks estimated from counterpart highway distance.

For Outbound Mineral Shipments, Inbound Mine Supply and Inbound Mine Fuel, the following system cost tables consolidate truck and rail costing analysis documented in Appendix B.

In these tables:

- Current truck cost calculations have been increased by 25 per cent to reflect limited future supply of equipment and drivers within sharply expanding demand anticipated to force up trucking rates under tight market conditions; and
- A rail rate cap is assumed at 20 per cent shipper savings reduction from truck rates as a competitive market incentive to shift mine haul traffic from trucks to trains.

*Note that the 20 per cent shipper savings Rail Rate Cap identified in the following tables cannot be effectively in all business case scenarios considered in the next section of this report.*

**Table 8 - Outbound Mineral Traffic**

| | Rail and/or Truck Operating Cost ($/ton) Outbound Mineral Traffic | | | | | | |
|---|---|---|---|---|---|---|---|
| Truck/Rail Station | All Trk Miles | Trk/Rail Miles | Truck to/ from Rail | Haines Rail | Haines Truck/Rail | Skagway All Truck | Rail Rate Cap |
| ***Carmacks South*** | | | | | | | |
| Carmacks (Copper North,Bellekeno, Marg) | 220 | 273 | $1.60 | $11.31 | $12.91 | $46.78 | $37.42 |
| Division Mountain* | 173 | 223 | $1.60 | $9.24 | $10.84 | $66.45 | $53.16 |
| Dezadeash (Wellgreen)* | 125 | 124 | $1.60 | $5.14 | $6.74 | $30.17 | $24.14 |
| ***Carmacks East*** | | | | | | | |
| Ross River(Mactung,Andrew,Tom&Jason) | 364 | 417 | $34.96 | $11.31 | $46.27 | $88.42 | $70.73 |
| Kudz Ze Kayah | 479 | 495 | $53.48 | $11.31 | $64.79 | $98.51 | $78.80 |
| Wolverine | 447 | 527 | $58.54 | $11.31 | $69.85 | $94.74 | $75.79 |
| Tuchitua (Cantung, Selwyn) | 388 | 570 | $63.71 | $11.31 | $75.02 | $88.42 | $70.73 |
| ***Carmacks West*** | | | | | | | |
| Minto | 277 | 337 | $21.15 | $11.31 | $32.46 | $74.82 | $59.86 |
| Casino | 338 | 396 | $32.88 | $11.31 | $44.19 | $75.69 | $60.55 |
| ***All Points Average*** | | | | | | | |
| Undiscovered Mineral Locations | | | $44.12 | $11.31 | $55.43 | $76.47 | $61.18 |

* All truck cost via Haines

Truck to/from rail includes reload estimated @ $1.60

Future Market Uplift on 2014 Truck Cost Levels 25%

Rail Rate Cap Reduced from Truck Rate by 20%

## Table 9 - Inbound Bulk Supplies

| Truck/Rail Station | All Trk Miles | Trk/Rail Miles | Truck to/ from Rail | Haines Rail | Haines Truck/Rail | Skagway All Truck | Rail Rate Cap |
|---|---|---|---|---|---|---|---|
| | Rail and/or Truck Operating Cost ($/ton) Inbound Bulks Supply | | | | | | |
| ***Carmacks South*** | | | | | | | |
| Carmacks (Copper North,Bellekeno, Marg) | 220 | 273 | $1.60 | $11.31 | $12.91 | $51.25 | $41.00 |
| Division Mountain* | 173 | 223 | $1.60 | $9.24 | $10.84 | $75.29 | $60.24 |
| Dezadeash (Wellgreen)* | 125 | 124 | $1.60 | $5.14 | $6.74 | $31.60 | $25.28 |
| ***Carmacks East*** | | | | | | | |
| Ross River(Mactung,Andrew,Tom&Jason) | 364 | 417 | $36.99 | $11.31 | $48.30 | $80.90 | $64.72 |
| Kudz Ze Kayah | 479 | 495 | $58.77 | $11.31 | $70.08 | $106.42 | $85.13 |
| Wolverine | 447 | 527 | $66.39 | $11.31 | $77.70 | $102.34 | $81.87 |
| Tuchitua (Cantung, Selwyn) | 388 | 570 | $68.41 | $11.31 | $79.72 | $95.22 | $76.18 |
| ***Carmacks West*** | | | | | | | |
| Minto | 277 | 337 | $21.63 | $11.31 | $32.94 | $77.45 | $61.96 |
| Casino | 338 | 396 | $35.36 | $11.31 | $46.67 | $83.39 | $66.71 |

* All truck cost via Haines

Truck to/from rail includes reload estimated @ $1.60

Future Market Uplift on 2014 Truck Cost Levels 25%

Rail Rate Cap Reduced from Truck Rate by 20%

## Table 10 - Inbound Fuel Supply

| Truck/Rail Station | All Trk Miles | Trk/Rail Miles | Truck to/ from Rail | Haines Rail | Haines Truck/Rail | Skagway All Truck | Rail Rate Cap |
|---|---|---|---|---|---|---|---|
| | Rail and/or Truck Operating Cost ($/ton) Inbound Fuel Supply | | | | | | |
| ***Carmacks South*** | | | | | | | |
| Carmacks (Copper North,Bellekeno, Marg) | 220 | 273 | $1.60 | $11.31 | $12.91 | $55.61 | $44.49 |
| Division Mountain* | 173 | 223 | $1.60 | $9.24 | $10.84 | $79.06 | $63.25 |
| Dezadeash (Wellgreen)* | 125 | 124 | $1.60 | $5.14 | $6.74 | $33.41 | $26.72 |
| ***Carmacks East*** | | | | | | | |
| Ross River(Mactung,Andrew,Tom&Jason) | 364 | 417 | $37.28 | $11.31 | $48.59 | $85.52 | $68.42 |
| Kudz Ze Kayah | 479 | 495 | $61.70 | $11.31 | $73.01 | $112.63 | $90.10 |
| Wolverine | 447 | 527 | $68.67 | $11.31 | $79.98 | $112.63 | $90.10 |
| Tuchitua (Cantung, Selwyn) | 388 | 570 | $74.62 | $11.31 | $85.93 | $100.67 | $80.53 |
| ***Carmacks West*** | | | | | | | |
| Minto | 277 | 337 | $25.52 | $11.31 | $36.83 | $85.71 | $68.57 |
| Casino | 338 | 396 | $35.48 | $11.31 | $46.79 | $92.08 | $73.67 |

* All truck cost via Haines

Truck to/from rail includes reload estimated @ $1.60

Future Market Uplift on 2014 Truck Cost Levels 25%

Rail Rate Cap Reduced from Truck Rate by 20%

## 5 BUSINESS CASE ANALYSIS

*This section of the report provides an objective financial assessment of the business case for Haines Rail Access. Each of the four Haines Rail Access scenarios is analyzed in terms of the value proposition that can justify varying combinations of public and/or private investment.*

That is, the value proposition is varied to accommodate the investment viability of each scenario. The result is intended to show how the viability of rail investment may be viewed differently among a range of potential investors: governments, railway companies, mine owners.

**Haines Rail Access Scenarios: 1- Haines-Carmacks Stand-Alone; 2- Haines-Delta Junction Connection; 3- Haines/Alberta Oil Sands Railway; Haines-Crest Iron Ore Railway**

## 5.1 HAINES-CARMACKS PUBLIC/PRIVATE PARTNERSHIP

This scenario relies on public sector value to supplement private sector funding. Financial analysis of Haines-Carmacks Stand-Alone Rail Access indicated that this scenario is not commercially viable. From a private sector perspective, after covering operating costs the balance of revenue remaining is not enough to pay back the investment over a 30 year life-cycle.

However, from a public sector perspective the investment can have an additional value with reduction of heavy mine haul trucks on the highway system. Up to 6 million tons/year of in and outbound mine traffic will generate some 300 truckloads per day to and from tidewater ports.

It is estimated that consequent road surface degradation requires $.02/per ton mile of additional highway maintenance in Yukon. (Alaska currently charges approximately that amount as an industrial road user fee for the portion of the Klondike Highway between the U.S./Canada border and Skagway, Alaska.)

As shown in the following discounted cash flow analysis, the additional value of foregone highway maintenance expenditures in combination with commercial revenues that cover truck feeder and rail line haul costs yield an essentially breakeven investment. At a 5 per cent discount rate there is a negligible, net present value and a 5 per cent internal rate of return that barely pays back the investment within its 30 years lifecycle (29 years)[6].

[6] Note that in this and subsequent financial analysis, project years are placed in a scenario context with nominal calendar years keyed to production scenarios which may take place sooner or later or not at all.

### Table 11 – Financial Analysis for Haines Rail Access from Carmacks Catchment Area – with Yukon Road Feeder to Carmacks Reload (per year values)

**With Carmacks Railhead Connection for Campbell Highway Truck Traffic**

| Project Years | Scenario Years | Total Tons | System Revenue | Hwy Maint Savings | Truck Connecting Cost | Rail Operating Cost | Net Rail Value* |
|---|---|---|---|---|---|---|---|
| -2 | 2018 | | | | | | -$1,160,000,000 |
| -1 | 2019 | | | ($3.48 billion investment over 3 construction years) | | | -$1,160,000,000 |
| 0 | 2020 | | | | | | -$1,160,000,000 |
| 1-5 | 2021-25 | 4,122,308 | $348,523,603 | $33,736,969 | $184,960,592 | $46,623,223 | $150,676,756 |
| 6-10 | 2026-30 | 5,595,106 | $357,744,185 | $45,790,348 | $185,953,926 | $63,280,540 | $172,970,375 |
| 11-15 | 2031-35 | 5,569,906 | $415,888,185 | $45,584,111 | $185,953,926 | $62,995,528 | $263,953,369 |
| 16-20 | 2036-40 | 5,509,928 | $431,497,473 | $45,093,251 | $207,370,077 | $52,003,098 | $296,067,520 |
| 21-25 | 2041-50 | 5,509,928 | $431,497,473 | $45,093,251 | $207,370,077 | $52,003,098 | $322,350,843 |
| 26-30 | 2046-50 | 5,509,928 | $431,497,473 | $45,093,251 | $207,370,077 | $52,003,098 | $348,634,167 |
| | | | | | | **2% Per Year Inflation Adjusted Total Value*** | $7,686,027,306 |
| | | | | | | **5% Discounted Present Value of Rev, Svgs & Cost Cash Flows** | **$3,573,267,541** |
| | | | | | | **Railroad Investment (3 year construction period)** | -$3,480,000,000 |
| | | | | | | **Net Present Value of Railroad Investment** | **$1,640,186** |
| | | | | | | **Net Rev&Svgs Benefit to Capital Cost** | **103%** |
| | | | | | | **Internal Rate of Return** | **5%** |
| | | | | | | **Pay Back (years)** | 29 |

Notes: All pre-tax values

Truck and rail operating costs inclusive of equipment depreciation.

$0.02 /ton mile x rail tons x 220 truck miles between Carmacks and Skagway = Hwy Maint Savings.

*Adjusted Total Value based on escalation applied separately to each year within five year brackets.

In the financial analysis for this scenario, shipper savings have been set at zero (i.e., the rail rate is equal to all-truck cost) to allow what amounts to a break-even investment prospect. The quantified savings accrue to the public sector in the form of reduced highway maintenance expenditures.

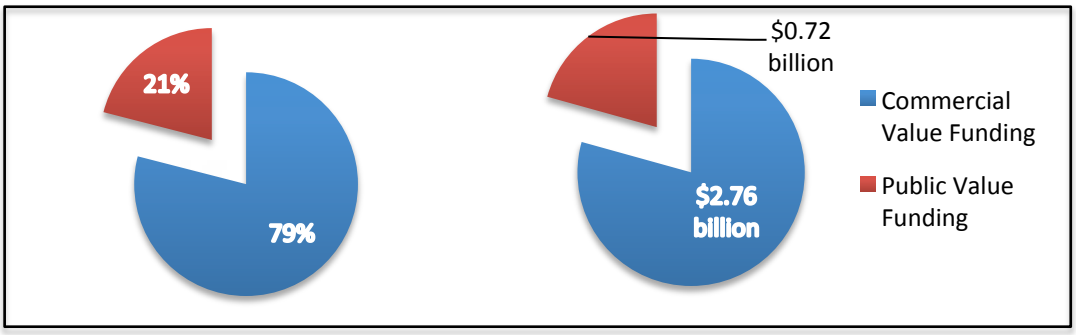
***The viable value proposition is for Haines Rail Access to shift Yukon mine haul traffic from trucks to trains with a consequent reduction in Yukon highway maintenance cost – but no reduction in total transportation cost.***

A public/private partnership for this scenario, flowing from the value derived by each partner, as shown in following chart, would invest a total of $3.48 billion and should see:

- A private railway partner covering operating costs from commercial revenues and profitably financing $2.76 billion for a 79 per cent share of the investment.
- A public sector partner financing $720 million for the 21 per cent balance of capital cost from foregone highway maintenance expenditures.

**Figure 5 - Haines Rail Access Public-Private Partners Contribution**

**(per cent of total $3.48 billion investment)**




While the total, combined investment for both partners is a break-even proposition from a purely financial perspective, the public sector partner may perceive equally tangible but less quantifiable rail investment benefits that include:

- Increased public highway safety
- Reduced tourist travel impacts
- Reduced CO2 emissions

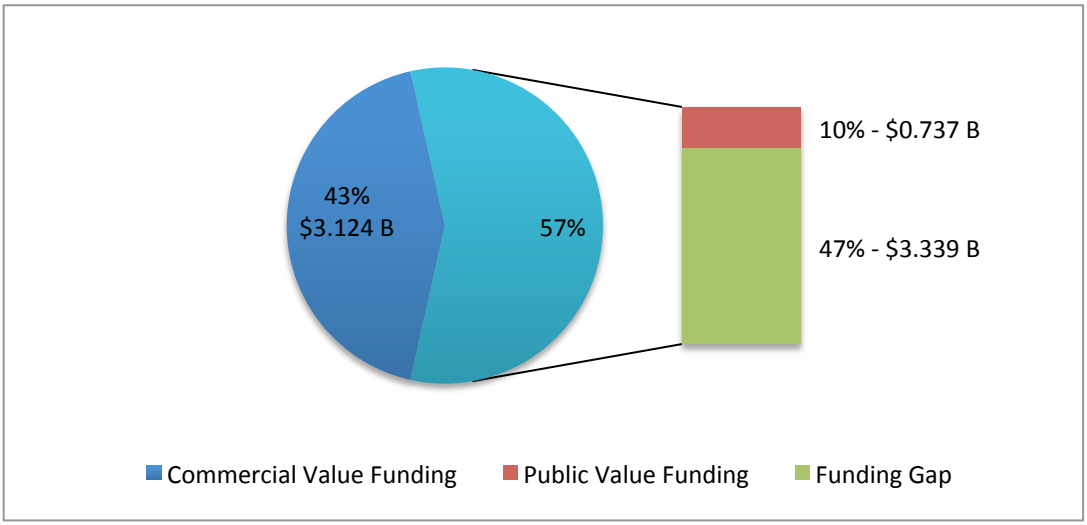
To the extent that governments perceive these additional rail benefits, the value of the investment increases to the public sector partner.

## 5.2 HAINES-DELTA JUNCTION GOVERNMENT INVESTMENT

The total investment value of $7.2 billion for this scenario would require multiple levels of government support including the State owned Alaska Railroad, the Government of Yukon, the State of Alaska and/or respective Federal Governments.

Financial analysis of Haines Rail Access extended to Delta Junction results in a funding gap exceeding $3.3 billion. That is, under the same investment conditions that previously yielded a break-even prospect for public sector financing of Haines Rail Access, there is now a $3.3 billion shortfall for which there is no quantifiable offsetting cash benefit. As shown in the following chart with $3.124 billion funding based on the proportion of commercial value (revenues less truck and rail costs) and public value funding from highway maintenance savings received of $737 million, there remains a funding gap of $3.3 billion equal to the negative NPV.

**Figure 7 – Haines – Delta Junction Public-Private Funding and Funding Gap**




As shown in the discounted cash flow financial analysis on the following page and as summarised in the above chart, there is a negative $3.3 billion Net Present Value, zero per cent

Internal Rate of Return and a 60 year payback over a 30 year life-cycle. The negative Net Present Value is equivalent to a $3.3 billion funding gap that could be filled by a government placing an equal or greater value on its vision for moving forward (southward) an Alaska connection with the continental rail system – but otherwise the investment is not financially viable.

**Table 12 - Financial Analysis for Haines Rail Access with Extension to Delta Junction – and Yukon Road Feeder to Carmacks Reload (per year values)**

| Project Year | Scenario Year | Total Tons | System Revenue | Hwy Maint Savings | Truck & Rail Connecting Cost | Carmacks-Haines Rail Operating Cost | Net Rail Value* |
|---|---|---|---|---|---|---|---|
| -2 | 2018 | | | | | | -$2,400,000,000 |
| -1 | 2019 | | | $7.2 billion investment over 3 construction years | | | -$2,400,000,000 |
| 0 | 2020 | | | | | | -$2,400,000,000 |
| 1-5 | 2021-25 | 4,765,308 | $354,483,766 | $24,374,550 | $162,233,948 | $51,250,686 | $165,373,682 |
| 5-10 | 2026-30 | 6,480,389 | $385,915,996 | $41,647,898 | $167,599,304 | $67,966,342 | $206,398,118 |
| 11-15 | 2031-35 | 6,455,189 | $441,516,282 | $41,519,000 | $167,599,304 | $67,679,992 | $284,919,385 |
| 16-20 | 2036-40 | 6,423,662 | $433,827,653 | $46,009,295 | $191,067,475 | $67,321,748 | $271,273,464 |
| 21-25 | 2041-45 | 6,423,662 | $433,827,653 | $46,009,295 | $191,067,475 | $67,321,748 | $287,882,043 |
| 26-30 | 2046-50 | 6,423,662 | $433,827,653 | $46,009,295 | $191,067,475 | $67,321,748 | $304,490,623 |

| | |
|---|---|
| **2% *Per Year Inflation Adjusted Total Value** | $7,491,002,433 |
| **5% Discounted Present Value of Rev, Svgs & Cost Cash Flows** | **$3,627,314,438** |
| **Railroad Investment (3 year construction period)** | **-$7,200,000,000** |
| **Net Present Value of Railroad Investment** | **-$3,338,869,684** |
| **Net Rev&Svgs Benefit to Capital Cost** | **50%** |
| **Internal Rate of Return** | **0%** |
| **Pay Back (years)** | 60 |

Notes: All pre-tax values

Truck and rail operating costs inclusive of equipment depreciation

$0.02 /ton mile x rail tons x 220 truck miles between Carmacks and Skagway = Hwy Maint Savings

* Adjusted Total Value based on inflation factor applied separately to each year within 5 year brackets

***The viable value proposition is for Haines Rail Access Extended to Delta Junction to provide:***

- ***Significantly reduced Yukon highway maintenance cost; and***
- ***a 50 per cent closer Alaska Railroad connection to the continental rail system at Prince Rupert – but with a $3.3 billion funding gap.***

Government participation, placing a value in excess of $3 billion on the long-term vision for an Alaska Railroad connection to the continental rail system, is key to the viability of an investment scenario that might then see:

- The Alaska Railroad covering rail operating and truck feeder costs with revenues that would warrant funding for over 40 per cent of the investment;
- The Government of Yukon realizing highway maintenance cost savings that would warrant funding for 10 per cent of the investment; and
- The State of Alaska recognizing the interim value of moving closer to a continental rail connection that would warrant funding for almost half of the investment.

Although not quantified as part of the financial analysis, a connection to the Alaska Railroad Northern Extension Project at Delta Junction could also complete a circle tour for cruise ship operators - extending their current tourist train links at cruise ship terminals in South Central Alaska (Seward and Whittier) through Fairbanks to a cruise ship terminal at Haines.

## 5.3 ALBERTA OIL SANDS INTEGRATED RAIL INVESTOR

This scenario sees a modestly attractive private sector integrated rail operations investment. Financial Analysis of Haines Rail Access integrated with an Alberta Oil Sands Railway to Alaska indicates commercial viability without any government participation. Projection of a dramatic reduction in rail operating cost ($.0066/RTM) is driven by extreme heavy haul, high traffic density on a purpose built super railroad.

Substituting this super railroad for Yukon truck feeder service along parallel roads is the key to profitable private sector investment in Haines Rail Access to tidewater from a junction with the Alberta to Alaska Railway at Carmacks. To place this business case firmly in the private sector, financial analysis assumptions were adjusted to reflect more realistic market conditions, without the benefit of government intervention:

- a 200 per cent uplift ($.013/RTM) is applied on Alaska to Alberta rail costs as a rate division to Carmacks interchange; and Haines Rail Access from Carmacks remains at $.039/RTM;
- a 20 per cent shipper savings reduction in rail rates is set to provide a compelling incentive for shifting mine haul traffic from trucks to trains in a competitive market;
- a large scale project (Division Mountain Coal) is assumed to be more economic as a mine mouth power plant and 1.3 million tons of rail traffic is removed from the revenue base;
- an exclusively private sector financial assessment removes the prospect of public funding and correspondingly eliminates public highway maintenance savings from total rail value.

As shown in the discounted cash flow financial analysis following, Net Present Value approaches $1 billion, there is a modest 7 per cent Internal Rate of Return and investment pay back within 23 years. Without any public funding, this scenario can provide a utility level rate of return with cash flows between one quarter and one half billion dollars per year that could be attractive to an integrated railway company.

### Table 13 - Financial Analysis for Haines Rail Access integrated with Alberta Oil Sands to Alaska Rail System – with Carmacks Interchange to Haines (per year values)

| Project Years | Scenario Years | Total Tons | System Revenue | Hwy Maint Savings | Alta to Ak Rail Connecting Cost | Carmacks-Haines Rail Operating Cost | Net Rail Value |
|---|---|---|---|---|---|---|---|
| -2 | 2018 | | | | | | -$1,287,000,000 |
| -1 | 2019 | | $3.86 billion investment over 3 construction years | | | | -$1,287,000,000 |
| 0 | 2020 | | | | | | -$1,287,000,000 |
| 1-5 | 2021-25 | 4,765,308 | $303,213,074 | | $23,205,124 | $51,011,197 | $228,996,753 |
| 6-10 | 2026-30 | 6,480,389 | $329,771,774 | | $24,732,097 | $67,648,742 | $237,390,935 |
| 11-15 | 2031-35 | 6,455,189 | $376,581,420 | | $24,732,097 | $67,363,730 | $284,485,592 |
| 16-20 | 2036-40 | 6,423,662 | $370,167,429 | | $25,531,450 | $67,007,161 | $277,628,818 |
| 21-25 | 2041-45 | 6,423,662 | $370,167,429 | | $25,531,450 | $67,007,161 | $277,628,818 |
| 26-30 | 2046-50 | 6,423,662 | $370,167,429 | | $25,531,450 | $67,007,161 | $277,628,818 |

| | | |
|---|---|---|
| 2% | **Per Year Inflation Adjusted Total Value** | $10,377,516,604 |
| 5% | **Discounted Present Value of Rev, Svgs & Cost Cash Flows** | **$4,952,884,078** |
| | **Railroad Investment (3 year construction period)** | **-$3,857,000,000** |
| | **Net Present Value of Railroad Investment** | **$868,744,355** |
| | **Net Rev&Svgs Benefit to Capital Cost** | **128%** |
| | **Internal Rate of Return** | **7%** |
| | **Pay Back (years)** | 23 |

Notes: All pre-tax values

Rail operating costs inclusive of equipment depreciation

***The viable value proposition for an Integrated Rail Investor which financial analysis of a Haines/Alberta Oil Sands Railway scenario supports includes:***

- ***Haines Rail Access integrated with an Alberta to Alaska Oil Sands Railway to replace Yukon road feeder service with much lower cost rail service to a Carmacks interchange.***
- ***20 per cent Haines Rail Access rate reductions below counterpart trucking costs to Skagway as a competitive incentive for mine companies to shift from trucks to trains.***
- ***The lowest total cost supply chain to and from tidewater for most Yukon and East Central Alaska resource development projects.***

This scenario also completes a continental rail connection to the Alaska Railroad Northern Extension Project at Delta Junction.

## 5.4 HAINES-CREST IRON ORE MINE OWNED RAILWAY

This scenario warrants private sector funding by a major mining company. With the scale of a Crest Iron Ore Project producing 28 million tons/year of mineral traffic, rail as well as port infrastructure is assumed to be incorporated within the total investment envelope for mine development. As a completely private sector investment by mine owners, the railway is viewed as a cost of mineral production that supports project feasibility.

Financial analysis of full project investment in rail and port infrastructure, as well as mine, mill and pellet plant, indicates an attractive return, over a long mine life, with consistent multi-billion dollar annual cash flows. In turn, this project could support Haines Rail Access for other Yukon mines without the infrastructure investment funding otherwise required.

### CREST IRON ORE EVALUATION

The Crest Iron Ore project[7] was evaluated with the Mine Evaluation and Forecasting Model (MEF Model) as a stand-alone project separate from the evaluation provided for the other priority projects.

[7] *The model used to support conclusions in this section is based on the premise that the Crest Project can be developed and permitted in the Yukon and that transportation and power infrastructure can concurrently be developed and permitted in the Yukon and in Alaska. The model relies on mineral resources estimates and engineering studies that pre-date modern technological development in ore processing and disclosure standards for mineral resources. The model only provides an indication of the potential feasibility to develop the Crest Iron Deposit. Neither the model nor the model analysis is intended to guide investment or policy decision-making; its only purpose is to identify potential rail tonnage for the proposed Haines Rail Access project.*

Because of its sheer size, the Crest project in itself can justify the construction and operation of a dedicated railroad and a deep-sea port to ship its mineral production.

Using the PROLOG MEF Model, the Crest project was evaluated for its capacity to support the construction of:

- a mine and concentrator at the Crest location;
- a railroad from Crest through Carmacks to Haines;
- a pellet plant at Carmacks; and
- a deep-sea port at Haines.

Capital costs for the Crest project where estimated in 2006 by Hatch for the Alaska-Canada Rail Link Project. Costs for rail construction and operation where also estimated at that time, as was the capital cost for a new port facility located at Haines.

These 2006 costs are escalated for inflation and are used as input in the Mine Evaluation and Forecasting Model.

## CREST MODEL INPUT – CAPITAL

The 2006 Hatch study calls for the construction of a mine and of an iron ore, concentrator at the Crest mine site and the construction of an iron ore pellet plant at Carmacks for export markets.

The Mine will produce 28 million tonnes per year of iron ore concentrate shipped by rail to Carmacks for processing into pellets. The pellets are loaded on rail cars and transported to a port built at Haines for shipment overseas.

Capital costs for the mine and the pellet plant are from the Hatch study (2006) adjusted for inflation. The capital costs for the Railway to Carmacks and from Carmacks to Haines are from the Alaska Canada Rail Link Study (2007) also adjusted for inflation (see section 4.1). Capital costs for the Pellet Export Terminal at Haines are from a similar greenfield port development scoped for the Lake Otelnuk Iron Ore project in Northern Quebec, Canada (Met-Chem, 2011). Large capital items for the Crest Iron Ore project are presented below.

**Table 14 - Crest Iron Ore Project 28 MTPY Pellet - Capital Costs**

| **Capital Cost - 28 Million Metric Tonnes/Year Pellets** | **$Million** |
|---|---|
| Mine | $2,247 |
| Pellet Plant | $1,819 |
| Rail Crest Property to Carmacks via Elsa (372 miles) | $5,050 |
| Rail Carmacks to Haines (284 miles) | $3,857 |
| Port Facility (Cost from Lake Otelnuk) | $703 |
| **Total Capital** | **$13,676** |

The capital costs, the mineral resource parameters, the transportation costs and other cost inputs for the Crest Project are input to the MEF Model.

**Table 15 - Input Parameters - Metal Price and Transportation Rates**

| **Metal Price and Transportation Rates Input Parameters** | | | |
|---|---|---|---|
| Pellet Price ($US) | Metal | $ Unit | $mt |
| Iron (Fe) Fine 62% Fe FOB China | Fe | mt | $120 |
| Pellet Premium $40 mt | (less $20/mt shipping) | mt | $20 |
| Pellet @ 65% Fe FOB China | | mt | $146 |
| **Transportation Costs** | **Transfer point** | **Distance mi** | **$t/mi** |
| Crest – Rail | Carmacks | 372 | $0.0124 |
| Carmacks – Rail | Haines, AK | 284 | $0.0124 |

## FINANCIAL RESULTS

Results derived from the MEF Model for the Crest Iron Ore project are presented below.

**Table 16 - Financial Analysis - Crest Project - for 25 and 50 years of operations**

| Financial | Total $M | Total $M | Typical Yr $M | Pellet $/mt |
|---|---|---|---|---|
| **Year of Production** | 50 | 25 | 4 | |
| Pellet Mmt@65% Fe (mty) | 1,382 | 677 | 28 | 28 |
| **Capital Costs** | | | | |
| Mine | $2,833 | $2,247 | | |
| Pellet Plant | $2,294 | $1,819 | | |
| Rail Crest to Carmacks | $5,050 | $5,050 | | |
| Rail Carmacks to Haines | $3,857 | $3,857 | | |
| Port Facility – Haines | $703 | $703 | | |
| **Total Capital Costs** | **$14,737** | **$13,675** | | |
| **Revenue $M** | **$229,323** | **$112,322** | **$4,116** | **$146** |
| **Operating Costs** | | | | |
| Mining Costs $M | $45,386 | $21,818 | $909 | $32 |
| Pelletization Costs (off-site) $M | $20,757 | $10,167 | $424 | $15 |
| Rail Costs to Carmacks $M | $7,156 | $3,505 | $146 | $5 |
| Rail Costs to Haines $M | $2,855 | $1,399 | $117 | $2 |
| Port Handling and Storage $M | $1,389 | $680 | $28 | $1 |
| **Total Operating Costs $M** | **$80,399** | **$38,967** | **$1,624** | **$56** |
| Operating Income $M | $117,446 | $59,806 | $2,492 | $88 |
| Net Operating Cashflow $M | $102,710 | $46,131 | $2,492 | $68 |
| **Internal Rate of Return (IRR)** | **13.82%** | **13.35%** | | |

The Crest project generates a strong cash flow of $2.5 billion dollars per year with a 7 year payback. The Crest project can support significant initial capital costs, which are estimated at $13.7 billion. The internal rate of return (IRR) is positive at 14 per cent but is particularly sensitive to the initial capital outlay and to a lesser degree to the market price for Iron pellets.

## MODEL BENCHMARKING AND CREST ANALYSIS CONCLUSION

To benchmark the capital and operating costs PROLOG searched for similar projects in the north. The Lake Otelnuk project, a project similar to Crest Iron Ore was identified in the Labrador Trough. The Labrador Trough is a geological formation that contains a very large iron belt and is located at the border between the Province of Quebec and the Labrador region of the Province of Newfoundland. All the iron ore produced in Canada comes from that northern region of the country.

The Lake Otelnuk project (Adriana Resources and WISCO) is a 26 billion ton iron ore deposit. The project includes the development of a mine, concentrator, pellet plant, an 815 km (562 mi) railway to a deep-sea port, with a shipping capacity of 50 million tonnes per year of pellets mainly for the Chinese market. The Lake Otelnuk and the Crest Iron Ore project as presented by the following table shows a number of similar parameters including the development of a railway, and of greenfield port facilities.

**Table 17 - Lake Otelnuk and Crest Project Comparable**

| | **Lake Otelnuk Project** | **Crest Project** |
|---|---|---|
| **Location** | Nunavik, QC 165 km NW of Schefferville | 602 km northeast of Carmacks, YT |
| **Railroad (mi) to Port** | 562 miles to Sept-Iles | 656 miles to Haines |
| **Port (greenfield)** | Sept-Iles | Haines |
| **Pellet Production (tpy)** | 50 | 28 |
| **Capital Cost** | $12.9 billion | $13.6 billion |
| **Mine Life** | 50+ | 50+ |
| **IRR** | **20%** | **14%** |

The 2011 preliminary economic assessment study (Met-Chem 2011) provides capital costs for the project as showed on the following table.

**Table 18 - Lake Otelnuk 50 MTPY Mine and Pellet Plant; Capital Costs, Met-Chem 2011**

| **Lake Otelnuk - Capital Costs 2011** | **$Million** |
|---|---|
| Project Costs | |
| Mine Infrastructure & Equipment | $4,043 |
| Transportation System – Railroad | $3,173 |
| Pellet Plant | $4,991 |
| Port Installation | $703 |
| **Total Project Cost** | **$12,910** |

The capital outlay for the port facility for Lake Otelnuk is estimated at $703 million and is designed for iron ore shipment with large vessels from Panamax (70,000 dwt) up to Chinamax capacity (400,000 dwt). A similar capital cost is used for the port facility at Haines for the Crest Iron Ore project.

The capital costs of Lake Otelnuk and the Crest project are very similar with the exception of the rail costs, which are higher for the Crest project. This may be a function of the terrain conditions which are more difficult in Yukon-Alaska. It also provides comfort that the capital costs estimated for the Crest-Haines railway are conservative and could be improved-upon.

Operating costs at Lake Otelnuk are at $31 per tonne of pellet compared to $56 estimated for the Crest Project. This is a function of higher throughput for the Lake Otelnuk project and a much lower cost of electricity than what is estimated for Crest. The more conservative estimate for Crest leaves opportunities for project optimization for throughput and for alternate energy sources to reduce operating costs.

The Crest Iron Ore Project compares favourably to similar projects under study in northern Canada. The project can support a large capital investment including a stand-alone railroad and port facility.

# 6 ECONOMIC IMPACT ASSESSMENT

*This section of the report provides an approximation of the level of economic activity that can be expected from investment in Haines Rail Access, as well as public benefits that would accompany the project. It also summarizes the cumulative economic activity that rail investment will support in the mining industry.*

## 6.1 HAINES RAIL ACCESS ECONOMIC ACTIVITY

**Figure 8 – Employment, Economic Activity – Haines Rail Access**

## RAILWAY CONSTRUCTION AND OPERATION IMPACTS

The level of economic activity as measured by both initial capital investment and ongoing operating expenditures is shown in the following table.

| **Haines – Carmacks Stand-Alone Railway Scenario** | | | |
|---|---|---|---|
| | ***3 Year Construction Period*** (Total Investment) | (Average/ Year) | ***Ongoing Operations*** (Average/Year) |
| Direct Impact | $3.5 billion | $1.2 billion | $55 million |
| Indirect & Induced | $.77 billion | $.2 billion | $12 million |
| **Total Economic Impact** | **$1.3 billion** | **$1.4 billion** | **$67 million** |

Including indirect and induced spin-off activity, the Haines Rail Access Stand-Alone Scenario economic impact is $1.4 billion/year during construction, followed by an average $67 million/year generated by ongoing rail operations.

## RAILWAY OPERATIONS EMPLOYMENT

Direct employment is calculated at 460 for the operation of the 284 miles Haines-Carmacks segment for Yukon mineral traffic. A 1.22 multiplier has been applied to direct employment to add the spin- off effect of indirect and induced employment – in both Alaska and Yukon for a total employment of 560.

The following table provides the detail of direct and indirect rail employment.

**Table 19 - Haines-Carmacks Rail Employment**

| **Haines-Carmacks Rail Employment** | **Employees** |
|---|---|

| Employee Count by Department | |
|---|---|
| Maintenance of Way | 378 |
| Maintenance of Equipment | 11 |
| Transportation | 47 |
| General and Administrative | 24 |
| **Total Direct Employment** | **460** |
| Indirect and Induced Employment | 100 |
| **Total Employment Impact** | **560** |

Extended to the Crest Iron Ore Property, preliminary direct employment estimates for the full 656 miles of Crest-Haines Railway operations are 500 employees.

Port operations are estimated to require an additional 200 employees, for a total of 700 transportation employees.

## 6.2 MINING OPERATIONS ECONOMIC ACTIVITY

Mine construction and mine operations direct employment will increase from approximately 1,000 employees in 2015 to a peak of 7,000 employees in 2028. Including Crest, the workforce will stabilize around 4,000 to 4,500 employees after 2030.

Excluding Crest, project mine life varies from 5 to 37 years for an average mine life of 14 years. Over 30 years, capital investment for mine construction could total $9.5 billion and will create thousands of additional construction jobs. Crest construction would add $13.6 billion in capital investment during the period. Cumulative mining operation expenditures over the same period can be expected to exceed a total of $150 billion.

**Table 20 - Forecasted Mine Life, CAPEX, OPEX, Workforce**

| Project | Project start | Mine Life (Years) | CAPEX M$ | OPEX M$/y | Workforce |
|---|---|---|---|---|---|
| Cantung Mine (2006) | 2013 | 5 | 100 | 45 | 130 |
| Keno Hill District Mines (2010) | 2013 | 6 | 45 | 59 | 150 |
| Minto Mine (2007) | 2013 | 10 | 56 | 49 | 350 |
| Wolverine Mine (2011) | 2013 | 9 | 150 | 108 | 350 |
| Casino | 2020 | 23 | 2,456 | 575 | 700 |
| Selwyn | 2020 | 28 | 1,600 | 677 | 570 |
| Whitehorse Tailings | 2015 | 5 | 20 | 23 | 28 |
| Andrew | 2020 | 8 | 300 | 68 | 250 |
| Mactung | 2020 | 12 | 450 | 80 | 175 |
| Camacks Copper | 2020 | 7 | 178 | 42 | 220 |
| Tom and Jason | 2020 | 15 | 500 | 168 | 200 |
| Wellgreen | 2020 | 37 | 1,000 | 365 | 350 |
| Delta VMS | 2030 | 11 | 700 | 111 | 320 |
| Division Mountain | 2030 | 25 | 200 | 92 | 260 |
| Kudz Ze Kayah | 2030 | 11 | 600 | 95 | 175 |
| MARG | 2030 | 10 | 600 | 90 | 177 |
| Peak – Tetlin | 2030 | 8 | 500 | 45 | 190 |
| Total/Average | | 14 | $9,455 | | 4,595 |
| Crest Iron Ore | 2035 | 50+ | 13,675 | 2,492 | 1,850 |
| **Grand Total** | | | **$23,130** | | **6,445** |

The workforce for the Crest project is estimated at approximately 1,850 workers between the mining operation (900), the pellet plant (350), the railway (500), and the port (100).

Operating expenses during the life of the projects will increase gradually to reach $2 billion per year in 2020. Adding Crest, operating expenses will total more than $5 billion per year after 2035. The chart below shows the distribution of the capital investment, of annual operating expenses and workforce growth over the period 2014-2044.

**Figure 9 – Mining OPEX, CAPEX AND Workforce - 2014 to 2044 Period**

## 6.3 Additional Haines Rail Access Economic Benefits

Haines rail access can provide significant transportation cost savings for the mining industry despite shorter all-truck distances to Skagway. This is due to sharply lower rail costs at higher mineral tonnages that can more than absorb higher trucking costs (see chart and table below).

**Figure 10 - Transportation Costs Savings – Rail/Truck to Haines compared to All Truck to Skagway – 3 locations**

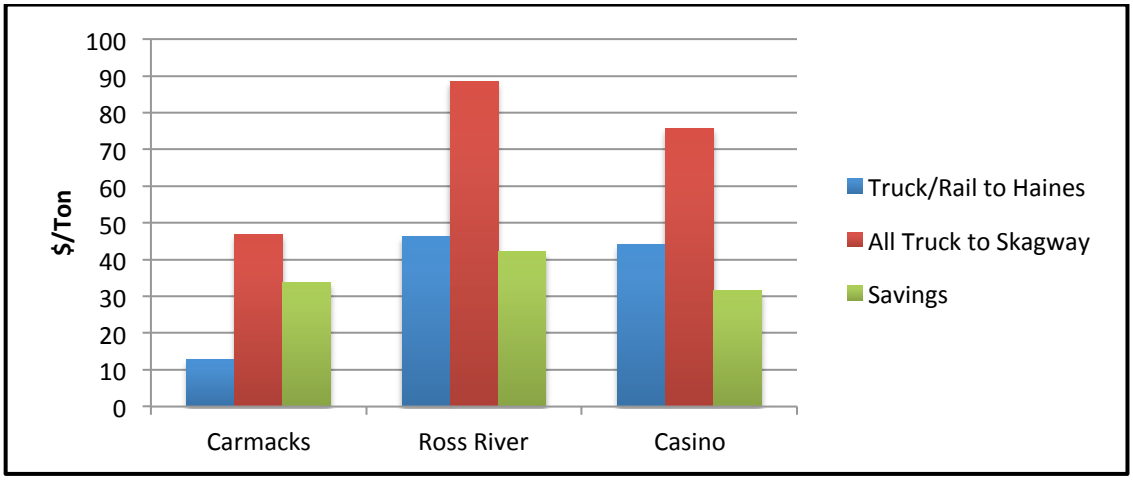



**Table 21 - Rail Transportation Cost Savings**

| Truck/Rail Station | All Trk Miles | Trk/Rail Miles | Rail and/or Truck Operating Cost ($/ton) Outbound Mineral Traffic: Truck to/ from Rail | Haines Rail | Haines Truck/Rail | Skagway All Truck | **Haines Savings** |
|---|---|---|---|---|---|---|---|
| ***Carmacks South*** | | | | | | | |
| Carmacks (Copper North,Bellekeno, Marg) | 220 | 273 | $1.60 | $11.31 | $12.91 | $46.78 | **$33.87** |
| Division Mountain* | 173 | 223 | $1.60 | $9.24 | $10.84 | $66.45 | **$55.61** |
| Dezadeash (Wellgreen)* | 125 | 124 | $1.60 | $5.14 | $6.74 | $30.17 | **$23.43** |
| ***Carmacks East*** | | | | | | | |
| Ross River(Mactung,Andrew,Tom&Jason) | 364 | 417 | $34.96 | $11.31 | $46.27 | $88.42 | **$42.15** |
| Kudz Ze Kayah | 479 | 495 | $53.48 | $11.31 | $64.79 | $98.51 | **$33.72** |
| Wolverine | 447 | 527 | $58.54 | $11.31 | $69.85 | $94.74 | **$24.89** |
| Tuchitua (Cantung, Selwyn) | 388 | 570 | $63.71 | $11.31 | $75.02 | $88.42 | **$13.39** |
| ***Carmacks West*** | | | | | | | |
| Minto | 277 | 337 | $21.15 | $11.31 | $32.46 | $74.82 | **$42.37** |
| Casino | 338 | 396 | $32.88 | $11.31 | $44.19 | $75.69 | **$31.50** |
| ***All Points Average*** | | | | | | | |
| Undiscovered Mineral Locations | | | $44.12 | $11.31 | $55.43 | $76.47 | **$21.04** |

* All truck cost via Haines

Truck to/from rail includes reload estimated @ $1.60

Future Market Uplift on 2014 Truck Cost Levels 25%

Rail Rate Cap Reduced from Truck Rate by 20%

However, the extent to which these savings are retained to repay infrastructure investment, or passed through to shippers, varies with the scenarios in the previous business case assessment section of this report.

The allocation of transportation cost savings may be determined by market competition - or by government selection between recouping investment from highway maintenance savings or passing savings through as a shipper incentive - or some combination of the two.

Haines Rail Access will remove up to 300 loaded trucks per day (5.5-6 million tons per year) from the Alaska and Yukon highway system. Road maintenance savings, already considered in the business case assessment, are shown in the side table for the Haines-Carmacks Stand-Alone scenario.

**Highway Maintenance Benefit**

| Calendar Year | Project Year | Total Tons | Hwy Maint Savings |
|---|---|---|---|
| 2021 | 1 | 4,122,308 | $33,736,969 |
| 2022 | 2 | 4,122,308 | $33,736,969 |
| 2023 | 3 | 4,122,308 | $33,736,969 |
| 2024 | 4 | 4,122,308 | $33,736,969 |
| 2025 | 5 | 4,122,308 | $33,736,969 |
| 2026 | 6 | 5,595,106 | $45,790,348 |
| 2027 | 7 | 5,595,106 | $45,790,348 |
| 2028 | 8 | 5,595,106 | $45,790,348 |
| 2029 | 9 | 5,595,106 | $45,790,348 |
| 2030 | 10 | 5,595,106 | $45,790,348 |
| 2031 | 11 | 5,569,906 | $45,584,111 |
| 2032 | 12 | 5,569,906 | $45,584,111 |
| 2033 | 13 | 5,569,906 | $45,584,111 |
| 2034 | 14 | 5,569,906 | $45,584,111 |
| 2035 | 15 | 5,569,906 | $45,584,111 |
| 2036 | 16 | 5,509,928 | $45,093,251 |
| 2037 | 17 | 5,509,928 | $45,093,251 |
| 2038 | 18 | 5,509,928 | $45,093,251 |
| 2039 | 19 | 5,509,928 | $45,093,251 |
| 2040 | 20 | 5,509,928 | $45,093,251 |
| 2041 | 21 | 5,509,928 | $45,093,251 |
| 2042 | 22 | 5,509,928 | $45,093,251 |
| 2043 | 23 | 5,509,928 | $45,093,251 |
| 2044 | 24 | 5,509,928 | $45,093,251 |
| 2045 | 25 | 5,509,928 | $45,093,251 |
| 2046 | 26 | 5,509,928 | $45,093,251 |
| 2047 | 27 | 5,509,928 | $45,093,251 |
| 2048 | 28 | 5,509,928 | $45,093,251 |
| 2049 | 29 | 5,509,928 | $45,093,251 |
| 2050 | 30 | 5,509,928 | $45,093,251 |
| | | | $1,301,955,896 |

The highway maintenance cost impact of heavy mine haul trucking has been estimated at $.02/GrossTonMile for the trucking distance from Carmacks to Skagway that would be avoided with Haines Rail Access from Carmacks. (Note that the net truck load tons shown in the accompanying table are increased by a factor of 1.55 to account for the tare weight of heavy mine haul trucking equipment.)

Haines Rail Access will inevitably stimulate additional mining activity once the tracks are in place. The assumed extent of such induced development of presently undiscovered mineral prospects, already considered in the business case assessment, is shown in the table below.

**Table 22 - Induced Resource Development**

| Undiscovered Minerals[9] | Tons/Year |
|---|---|
| Extrapolated to 640 ACRL miles in Yukon | 911,945 |
| Extended to 190 miles in Alaska | 270,734 |
| **Total** | **1,182,679** |

Less quantifiable, but perhaps even more important, benefits to the public from Haines Rail Access will include:

- Improved safety with fewer highway accidents
- Smaller environmental footprint
- Reduced greenhouse gas emissions
- Increased tourist travel attraction

[9] Alaska Rail Link Study (2007), Estimate by Yukon Geological Survey

## 7 HAINES RAIL ACCESS FEASIBILITY CONCLUSIONS

*As summarized in the following table, this report has updated the full resource development potential, as well as Alaska Railroad bridge traffic, that would support, and be supported by, Haines Rail Access over a 30 year investment life-cycle. Potential Haines Rail Access traffic peaks at over 6 million tons/year excluding Crest Iron Ore traffic, which is 28 million tons/year.*

**Table 23 - Resource Development Rail Traffic Forecast (ton/year)**

| Period (years) | 1 - 5 | 6 - 10 | 11 - 15 | 15 - 20 | 20 - 25 | 26 - 30 | 31 – 35 |
|---|---|---|---|---|---|---|---|
| **Min (Total Producing)** | 232,891 | 219,309 | - | - | - | - | - |
| **Near (Producing+Advancing)** | 582,826 | 3,017,305 | 2,797,996 | 2,797,996 | 2,797,996 | 2,797,996 | 2,797,996 |
| **Mid (Producing+Advancing+Probable)** | 582,826 | 4,129,308 | 3,902,999 | 3,877,799 | 3,265,573 | 3,265,573 | 3,265,573 |
| **Max (Prod.+Adv.+Prob.+Possible+Alaska)** | 582,826 | 4,129,308 | 5,595,106 | 5,569,906 | 4,597,983 | 4,597,983 | 4,597,983 |
| **Max + Undiscovered** | **582,826** | **4,129,308** | **5,595,106** | **5,569,906** | **5,780,662** | **5,780,662** | **5,780,662** |
| **Alaska Rail Bridge Traffic** | - | 643,000 | 643,000 | 643,000 | 643,000 | 643,000 | 643,000 |
| **Total All Traffic** | **582,826** | **4,772,308** | **6,238,106** | **6,212,906** | **6,423,662** | **6,423,662** | **6,423,662** |
| **Long Range Bonnet Plume Coal** | - | - | - | - | 6,570,000 | 6,570,000 | 6,570,000 |
| **Long Range Crest Iron** | - | - | - | - | 28,000,000 | 28,000,000 | 28,000,000 |

This report has identified four scenario combinations of commercial and public investments in Haines Rail Access that vary the value proposition viability:

- *A Haines-Carmacks Public/Private Partnership ($3.5 billion)*
- *A Haines-Delta Junction Government Investment ($7.2 billion)*
- *A Haines/Alberta Oil Sands Integrated Rail Investment ($3.9 billion)*
- *A Haines-Crest Iron Ore Mine Owned Railway Investment ($8.9 billion)*

This report concludes that:

- *With supplementary public sector investment funding there is a viable value proposition for Haines Rail Access from Carmacks to shift Yukon mine haul traffic from trucks to trains with a consequent reduction in highway maintenance cost – but no reduction in total transportation cost.*

- *Haines Rail Access Extended to Delta Junction further reduces Yukon and Alaska highway maintenance cost; and brings a marine connection with the continental rail system at Prince Rupert 50 per cent closer to the Alaska Railroad – but leaves a $3.3 billion funding gap with no readily quantifiable offsetting economic benefits.*

- *Financial analysis of a Haines/Alberta Oil Sands Railway scenario supports a private sector integrated rail investment offering:*
    - *The lowest total cost supply chain to and from tidewater for most Yukon and East Central Alaska resource development projects.*
    - *Haines Rail Access integrated with an Alberta Oil Sands Railway to Alaska replacing Yukon road feeder service with much lower cost rail service to Carmacks interchange.*
    - *20 per cent Haines Rail Access rate reductions below counterpart trucking costs to Skagway as a competitive incentive for mine companies to shift from trucks to trains.*
    - *A continental rail connection completed to the Alaska Railroad Northern Extension Project at Delta Junction.*

- *A Crest Iron Ore project, which would generate cash flow of $2.5 billion/year for more than 50 years with a 7 year payback – can absorb mine infrastructure investment including Haines Rail Access and Port Development at approximately $10 billion capital cost.*

This report anticipates that significant reduction in transportation costs could trigger important increases in economic activity associated with the resource industry. Rail availability can leverage resource development, with increasing tonnage at decreasing transport cost. It is anticipated that a sizable reduction in transportation costs could trigger significant increases in economic activity from the resource industry.

Conversely, projects with a lower value concentrate have a high percentage of operating costs allocated to transportation and these projects may never be developed in the absence of cost competitive rail transportation systems.

A broader public perspective on rail investment may be timely. Incenting private sector economic activity with public sector rail investment would:

- Increase and/or accelerate investment in productive capital assets in the region;
- Increase private sector employment and operating expenditures in the region:
- Reduce commodity prices for residents and businesses of the region; and
- Increase income tax, royalty and user fee revenues at all levels of government.

This report provides business case assessment for Haines Rail Access under value propositions that vary with alternative combinations of railway company, mine owner and government investment. However, beyond the purely business case assessment of Haines Rail Access scenarios, broader development policy considerations may be brought into play - using public rail investment as an economic stimulus for resource sector expansion.

## APPENDIXES

A - MINERAL MARKET RESEARCH

B - CAPITAL AND OPERATING COST DETAIL

## APPENDIX A - MINERAL MARKET RESEARCH

### PRIORITY PROJECTS REVIEWED LIST

| Area | Project | Proponent | Included | Report |
|---|---|---|---|---|
| AK | Tetlin | Contango Core | X | 2013 |
| | Delta | Agnico Eagle | X | 2011 |
| BC | Tuslequah Chief | Chieftain Metals | | 2012 |
| | Silver Tip | JDS Silver | | 2012 |
| NWT | Cantung Mine | North American Tungsten | X | 2011 |
| YT | Andrew Project | Overland Resources | X | 2012 |
| | Bonnet Plume Coal Project | Anderson Exploration | X | 1979 |
| | Brewery Creek Project | Golden Predator | | 2013 |
| | Carmacks Copper Project | Copper North | X | 2012 |
| | Casino Project | Western Copper and Gold | X | 2013 |
| | Coffee Creek Project | Kaminak Resources | | 2013 |
| | Crest Iron Project | Chevron Resources Canada | X | 2006 |
| | Division Mountain Project | Pitchblack Resources | X | 2008 |
| | Eagle Gold Project | Victoria Gold | | 2012 |
| | Whitehorse Tailings Project | Eagle Industrial | X | 2011 |
| | Keno Hill District Project | Alexco Resources | X | 2013 |
| | Ketza Project | Yukon Nevada Gold Corp. | | 2011 |
| | Kudz Ze Kayah Project | Teck Resources | X | 2000 |
| | Mactung Project | North American Tungsten | X | 2009 |
| | MARG Project | Redtail Metals | X | 2011 |
| | Minto Mine | Capstone Mining | X | 2013 |
| | Northern Dancer Project | Largo Resources | | 2011 |
| | Rackla Gold Project | ATAC Resources | | 2011 |
| | Red Mountain Project | Tintina Mines Ltd. | | NA |
| | Selwyn Project | Selwyn Chihong Mining | X | 2007 |
| | Skukum Project | New Pacific Metals Corp | | 2012 |
| | Tom and Jason Project | Hudbay Minerals Inc. | X | 2007 |
| | Wellgreen Project | Prophecy Platinum | X | 2012 |
| | White Gold Project | Kinross Gold Corp | | 2012 |
| | Wolverine Mine | Yukon Zinc Inc. | X | 2007 |
| | | **Projects Included** | **19** | |

## ROAD DISTANCE TO THE PORT OF SKAGWAY AND TO THE PORT OF HAINES

| Area | Project | Road Distance to Skagway (mi) | Road Distance to Haines (mi) |
|---|---|---|---|
| AK | Tetlin Project | - | 454 |
| | Delta Project | - | 492 |
| NWT | Cantung Mine | 499 | 693 |
| YT | Andrew Project | 458 | 576 |
| | Bonnet Plume Coal Project | 517 | 636 |
| | Casino Project | 338 | 456 |
| | Crest Iron Project | 580 | 698 |
| | Division Mountain Project | 173 | 289 |
| | Whitehorse Tailings Project | 107 | 244 |
| | Keno Hill District Project | 382 | 500 |
| | Kudz Ze Kayah Project | 447 | 567 |
| | Mactung Project | 521 | 761 |
| | MARG Project | 412 | 533 |
| | Minto Mine | 277 | 395 |
| | Northern Dancer Project | 256 | 393 |
| | Selwyn Project | 536 | 730 |
| | Tom and Jason Project | 479 | 598 |
| | Wellgreen Project | 300 | 248 |
| | Wolverine Mine (via Carmacks) | 464 | 589 |
| | Wolverine Mine (via Watson Lake) | 447 | 583 |

## FORECASTED INBOUND AND OUTBOUND RAIL FREIGHT FOR 17 PRIORITY PROJECTS

| Cat. | Project | Production/Probability | Outbound | Inbound | Total |
|---|---|---|---|---|---|
| 1 | Cantung Mine | Producing | 5,540 | 8,050 | 13,590 |
| 1 | Keno Hill District Mines | Producing (Sus.) | 15,000 | 2,800 | 17,800 |
| 1 | Minto Mine | Producing | 54,000 | 25,000 | 79,000 |
| 1 | Wolverine Mine | Producing (Red.) | 88,000 | 34,000 | 122,000 |
| 2 | Casino | NT Advancing | 450,000 | 460,000 | 910,000 |
| 2 | Selwyn | NT Advancing | 1,482,000 | 407,000 | 1,889,000 |
| 2 | Whitehorse Tailings | NT Advancing | 346,500 | 3,500 | 350,000 |
| 3 | Andrew | MT Probable | 135,300 | 53,670 | 188,970 |
| 3 | Mactung | MT Probable | 11,000 | 15,000 | 26,000 |
| 3 | Carmacks Copper | MT Probable | 13,200 | 11,000 | 24,200 |
| 3 | Tom and Jason | MT Probable | 368,000 | 29,000 | 397,000 |
| 3 | Wellgreen | MT Probable | 328,000 | 140,000 | 468,000 |
| 4 | Delta VMS | LT Possible | 160,000 | 43,600 | 203,600 |
| 4 | Division Mountain | LT Possible | 1,270,000 | 62,400 | 1,332,400 |
| 4 | Kudz Ze Kayah | LT Possible | 165,000 | 22,225 | 187,225 |
| 4 | MARG | LT Possible | 148,555 | 23,500 | 172,055 |
| 4 | Peak - Tetlin | LT Possible | 12,250 | 26,350 | 38,600 |
| | **Total (Annual)** | | **5,078,550** | **1,366,870** | **6,445,420** |

## MINING TRAFFIC VOLUMES FORECAST METHODOLOGY

The methodology used to forecast the mining tonnage includes the following steps:

1. Development and distribution of a "PROLOG 2013 Mining Logistics Survey" to selected mining companies with operations in Alaska, Yukon, and Northern British Columbia. (See survey questionnaire in Appendix)
2. Establishment of a list of priority projects for the Haines Rail Access Study. The list includes all projects producing a mineral concentrate, coal or a similar type of bulk tonnage output and having established sufficient mineral resources or reserves for a minimum of 5 years mine life.
3. Review of mining projects identified in the Alaska Canada Rail Link Study (2007) for potential sources of rail tonnage for the Haines Rail Access Study.
4. Review of potential new undiscovered mineral deposits identified in the Alaska Canada Rail Link Study (2007) and located within 150km on each side of the ALCAN rail alignment.
5. Review of results of new exploration programs and technical studies report undertaken by exploration and mining companies since 2007.
6. Development and calibration of a mine evaluation and forecasting model based on the NSR Model (2012) developed by Dye Management Group Inc. for the Alaska Department of Transportation and Public Facilities.
7. Input of individual project data into the Mine Evaluation and Forecasting Model to: generate the outbound and inbound mine tonnage by project and to generate the economic metrics of the project.
8. Projection of inbound and outbound mine tonnage for years 0 to 30 for the priority projects.
9. A stand-alone forecast including the production of an economic analysis of the Crest project.
10. Projection of new mine tonnage from undiscovered deposits for the years 30 to 50.

## PROLOG MINE EVALUATION AND FORECASTING MODEL

The development and calibration of a mine evaluation and forecasting model is based on the NSR Model (2012) developed by Dye Management Group Inc.[10] for the Alaska Department of Transportation and Public Facilities.

To the original model PROLOG added a financial evaluation model allowing for the calculation of the project IRR and additional modeling capacity to derive transportation costs, construction tonnage and bulk resupply quantities. The modified model was calibrated using information obtained from recent feasibility studies and from the responses provided by companies to the PROLOG Mine Logistics Survey 2013.

Each selected priority project was evaluated using the "Mine Evaluation and Forecasting Model". Care was taken to use as much as possible the feasibility parameters provided for the production of concentrates and other cost inputs when available. Capital costs and sustainable capital costs obtained from feasibility reports are used for each individual project or are estimated when unavailable. Other important inputs to the Mine Model are commodity prices. Prices are presented in the table below.

### Commodity Prices

| Commodity | Price |
|---|---|
| Copper (Cu) US$/lb | $3.24 |
| Zinc (Zn) US$/lb | $0.91 |
| Lead (Pb) US$/lb | $0.96 |
| Molybdenum (Mo) US$/lb | $9.63 |
| Tungsten ($WO_3$) US$ mtu | $350.00 |
| Nickel (Ni) US$/lb | $6.58 |
| Gold (Au) US$/oz | $1,200.00 |
| PGE (Platinum Group Elements) US$/oz | $1,200.00 |
| Silver (Ag) US$/oz | $20.00 |
| Iron Ore Pellets (65% Fe) US$/tonne (US$/tonne Fines @62% Fe: $120.00) | $146.00 |
| Thermal Coal US$/ton | $60.00 |

[10] Model used and modified under permission of Dye Management Group Inc.

## APPENDIX B – CAPITAL AND OPERATING COSTS DETAILS

### HAINES RAIL ACCESS CONSTRUCTION COSTS

| | | | | |
|---|---|---|---|---|
| Ladue Route Border to Delta Jct. | | | | |
| Mainline Ladue | | | | |
| | | | | |
| | | | | |
| | Unit | Quantity | Price | Amount ($US) |
| Clearing & Grubbing | Acre | 3,682 | 5500 | 20251721 |
| Hand Clearing | Acre | 921 | 6000 | 5523197 |
| Unclassified Excavation | Cu Yd | 4,388,157 | 6 | 24134861 |
| Rock Excavation | Cu Yd | 1,000,000 | 3 | 3000000 |
| Borrow | Ton | 22,414,556 | 5 | 112072778 |
| Select Material | Ton | 4,643,221 | 5 | 23216104 |
| Sub Ballast | Ton | 1,979,478 | 10 | 19794783 |
| Ballast | Ton | 816,535 | 40 | 32661392 |
| Concrete Ties | Each | 676,905 | 100 | 67690494 |
| 141 Lb Rail | LF | 2,199,420 | 35 | 76979713 |
| 36" Pipe | LF | 438,816 | 40 | 17552626 |
| 24" Pipe | LF | 438,816 | 30 | 13164470 |
| Geotextile | Sq Yd | 1,336,614 | 2 | 2673227 |
| Hwy Undercrossing | Each | 1 | 2336000 | 2336000 |
| Construction Survey | Lump Sum | 4 | 500000 | 2000000 |
| Tunnel | LF | 0 | 20000 | 0 |
| Erosion/Sedment Control | Lump Sum | 4 | 150000 | 600000 |
| Insulation | Sq yd | 445,538 | 5 | 2227689 |
| Switches | Each | 30 | 50000 | 1500000 |
| Train Control System | Lump Sum | 1 | 500000 | 500000 |
| Seeding Landscaping | Lump Sum | 1 | 1000000 | 1000000 |
| Mob Demob | Lump Sum | 4 | 300000 | 1200000 |
| Sidings | LF | 97,250 | 349 | 33950852 |
| Bridges | | 1 | 161447377 | 161,447,377 |
| Facilities | | | | 5100000 |
| Sub Total | | | | 630,577,283 |
| +20% Contingencies | | | | 126,115,457 |
| +15% Construction Eng | | | | 94,586,592 |
| Total | | | | 851,279,332 |
| Design Engineering | | | 170,873,894 | |
| Right of Way | | | 500,000 | |
| Environmental/Permitting | | | 25,000,000 | |
| | | | | 196,373,894 |
| | | | 30-Mar-06 | **$1,047,653,226** |

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**ALCAN Rail Link Construction Cost:** Haines to Dezadeash
**In 2006 US$ converted from Cdn$ at the following exchange rate.**

| Exchange Rate: | Cdn$1.00 = US$0.85 | | 124.1 | Route Miles | |
|---|---|---|---|---|---|
| | BC South Unit Cost | | 1.10 | BC North Cost Factor | |
| | Units | US$/Unit | Quantity | Total Cost - Million US$ | |
| **Track - 136# CWR w/ Hardwood or Concrete Ties** | | | | | **$132.278 M** |
| Track Construction - material & labour | mile | $969,000 | 124.1 | $132.278 M | |
| **Embankment Grade & Sub-ballast** | | | | | **$368.533 M** |
| Average | mile | $789,000 | 2.2 | $1.909 M | |
| Heavy | mile | $1,269,000 | 31.6 | $44.110 M | |
| Very Heavy | mile | $3,087,000 | 36.1 | $122.585 M | |
| Rock cuts | mile | $3,454,000 | 50.8 | $193.010 M | |
| Organics | mile | $1,850,000 | 3.4 | $6.919 M | |
| Permafrost | mile | $1,177,000 | 0.0 | | |
| **Tunnel Construction** | | | | | **$0.000 M** |
| Rock - Unlined < 2 miles each | feet | $6,800 | 0 | | |
| Rock - > 5 miles each | feet | $9,563 | 0 | | |
| **Embankment Protection Structures** | | | | | **$56.730 M** |
| Rip Rap Protection - 3 ft wide. | mile | $936,000 | 3.22 | $3.315 M | |
| Tied Back Retaining Walls | feet | $2,550 | 8,131 | $22.807 M | |
| Flumes, Rock/Snow sheds | feet | $3,400 | 8,184 | $30.608 M | |
| **Railway Bridge Structures Over Water/Debris** | | | | | **$602.922 M** |
| Steel Bridges/Trestles | | | | | |
| Less than 50 ft high | feet | $8,500 | 4,707 | $44.010 M | |
| 50 to 100 ft high | feet | $11,050 | 4,854 | $59.000 M | |
| 100 to 200 ft high | feet | $12,750 | 3,903 | $54.740 M | |
| 200 to 300 ft high | feet | $14,450 | 6,265 | $99.582 M | |
| More than 300 ft high | feet | $16,150 | | | |
| Bridge over Major River | feet | $23,800 | 12,497 | $327.171 M | |
| Bridge Pipes (multiplates) | feet | $1,275 | 13,133 | $18.419 M | |
| **Highway-Railway Intersections** | | | | | **$9.410 M** |
| Grade Separation Structures | | | | | |
| Railway Bridge <50'H Over Hwy | feet | $8,500 | 984 | $9.200 M | |
| Railway Bridge >50'H Over Hwy | feet | $11,050 | | | |
| 2-Lane Hwy Bridge Over Rwy | feet | $9,180 | | | |
| 4-Lane Hwy Bridge Over Rwy | feet | $15,300 | | | |
| Highway/Railway Conflict - Relocation | mile | $10,200,000 | | | |
| Grade Crossings & Signals | No. | $191,250 | 1 | $0.210 M | |
| Main Track Construction Cost - Jct to Jct per Manual Drawing | | $9.427 M | 124.1 Mi | $1,169.873 M | |
| Mileage Adjustment | | 0.00% | 0.0 Mi | 0.000 M | included above |
| **Main Track Construction Cost - Jct to Jct per Computer Drawing** | | | **124.1 Mi** | **$1,169.873 M** | **$1,169.873 M** |
| **Add Portion of Route on Other Segment** | | $5.761 M | **0.0 Mi** | 0.000 M | **$0.000 M** |
| **Total Route Main Track Costs** | | | **124.1 Mi** | **$1,169.873 M** | **$1,169.873 M** |
| **Communications, Power, & Detectors** | | | | | **$22.495 M** |
| Communication & power | mile | $161,500 | 124.1 | $22.046 M | |
| Hot Box & Dragging Equipment Detectors | No. | $204,000 | 2 | $0.449 M | |
| **Sidings and Terminals** | | | | | **$61.855 M** |
| Mainline sidings & back tracks | No. | $3,381,000 | 3 | $11.157 M | |
| Home Terminal & facilities | LS | $33,957,000 | 1 | $37.353 M | |
| Fuelling facilities | LS | $2,550,000 | 1 | $2.805 M | |
| Inter. Terminal & facilities | LS | $9,582,000 | 1 | $10.540 M | |
| **Total Route Construction Costs** | | | | | **$1,254.223 M** |
| **Contingencies & Environmental Mitigation** | | | | | **$344.912 M** |
| Contingencies | 25% | | | $313.556 M | |
| Environmental Mitigation | 2% | Costs + Contingencies | | $31.356 M | |
| **Sub Total** | | | | | **$1,599.135 M** |
| **Engineering & Environmental Studies** | | | | | **$287.844 M** |
| Eng. Environmental Study & Approval | 3% | | | $47.974 M | |
| Owner Overview Costs | 3% | | | $47.974 M | |
| Engineering & Project Mgmt | 12% | | | $191.896 M | |
| **Total Estimated Route Cost** | | | | | **$1,886.979 M** |
| **Average Cost per Mile** | | | | **$15.205 M** | |

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UMA | AECOM

| ALCAN Rail Link Construction Cost: In 2006 US$ converted from Cdn$ at the following exchange rate. | | | | Dezadeash to Carmacks via Champagne | | |
|---|---|---|---|---|---|---|
| Exchange Rate: | Cdn$1.00 | = US$0.85 | | 159.9 | Route Miles | |
| | BC South Unit Cost | | | 1.20 | Yukon Cost Factor | |
| | Units | US$/Unit | | Quantity | Total Cost - Million US$ | |
| **Track - 136# CWR w/ Hardwood or Concrete Ties** | | | | | | **$185.932 M** |
| Track Construction - material & labour | mile | $969,000 | | 159.9 | $185.932 M | |
| **Embankment Grade & Sub-ballast** | | | | | | **$411.602 M** |
| Average | mile | $789,000 | | 14.2 | $13.445 M | |
| Heavy | mile | $1,269,000 | | 63.1 | $96.089 M | |
| Very Heavy | mile | $3,087,000 | | 76.8 | $284.498 M | |
| Rock cuts | mile | $3,454,000 | | 2.9 | $12.020 M | |
| Organics | mile | $1,850,000 | | 2.5 | $5.550 M | |
| Permafrost | mile | $1,177,000 | | 0.0 | | |
| **Tunnel Construction** | | | | | | **$21.542 M** |
| Rock - Unlined < 2 miles each | feet | $6,800 | | 2,640 | $21.542 M | |
| Rock - > 5 miles each | feet | $9,563 | | 0 | | |
| **Embankment Protection Structures** | | | | | | **$51.160 M** |
| Rip Rap Protection - 3 ft wide. | mile | $936,000 | | 0.6 | $0.674 M | |
| Tied Back Retaining Walls | feet | $2,550 | | 0 | | |
| Flumes, Rock/Snow sheds | feet | $3,400 | | 12,374 | $50.486 M | |
| **Railway Bridge Structures Over Water/Debris** | | | | | | **$361.221 M** |
| Steel Bridges/Trestles | | | | | | |
| Less than 50 ft high | feet | $8,500 | | 14,416 | $147.043 M | |
| 50 to 100 ft high | feet | $11,050 | | 2,624 | $34.794 M | |
| 100 to 200 ft high | feet | $12,750 | | 0 | | |
| 200 to 300 ft high | feet | $14,450 | | | | |
| More than 300 ft high | feet | $16,150 | | | | |
| Bridge over Major River | feet | $23,800 | | 6,068 | $173.302 M | |
| Bridge Pipes (multiplates) | feet | $1,275 | | 3,975 | $6.082 M | |
| **Highway-Railway Intersections** | | | | | | **$7.839 M** |
| Grade Separation Structures | | | | | | |
| Railway Bridge <50'H Over Hwy | feet | $8,500 | | 656 | $6.691 M | |
| Railway Bridge >50'H Over Hwy | feet | $11,050 | | | | |
| 2-Lane Hwy Bridge Over Rwy | feet | $9,180 | | | | |
| 4-Lane Hwy Bridge Over Rwy | feet | $15,300 | | | | |
| Highway/Railway Conflict - Relocation | mile | $10,200,000 | | | | |
| Grade Crossings & Signals | No. | $191,250 | | 5 | $1.148 M | |
| Main Track Construction Cost - Jct to Jct per Manual Drawing | | | $6.496 M | 160.0 Mi | $1,039.296 M | |
| Mileage Adjustment | | | 0.00% | 0.0 Mi | 0.000 M | included above |
| **Main Track Construction Cost - Jct to Jct per Computer Drawing** | | | | **160.0 Mi** | $1,039.296 M | **$1,039.296 M** |
| **Add Portion of Route on Other Segment** | | | $5.761 M | **0.0 Mi** | 0.000 M | **$0.000 M** |
| **Total Route Main Track Costs** | | | | **160.0 Mi** | $1,039.296 M | **$1,039.296 M** |
| **Communications, Power, & Detectors** | | | | | | **$31.479 M** |
| Communication & power | mile | $161,500 | | 159.9 | $30.989 M | |
| Hot Box & Dragging Equipment Detectors | No. | $204,000 | | 2 | $0.490 M | |
| **Sidings and Terminals** | | | | | | **$71.535 M** |
| Mainline sidings & back tracks | No. | $3,381,000 | | 4 | $16.229 M | |
| Home Terminal & facilities | LS | $33,957,000 | | 1 | $40.748 M | |
| Fuelling facilities | LS | $2,550,000 | | 1 | $3.060 M | |
| Inter. Terminal & facilities | LS | $9,582,000 | | 1 | $11.498 M | |
| **Total Route Construction Costs** | | | | | | **$1,142.310 M** |
| **Contingencies & Environmental Mitigation** | | | | | | **$314.136 M** |
| Contingencies | **25%** | | | | $285.578 M | |
| Environmental Mitigation | **2%** | Costs + Contingencies | | | $28.558 M | |
| **Sub Total** | | | | | | **$1,456.446 M** |
| **Engineering & Environmental Studies** | | | | | | **$262.160 M** |
| Eng. Environmental Study & Approval | 3% | | | | $43.693 M | |
| Owner Overview Costs | 3% | | | | $43.693 M | |
| Engineering & Project Mgmt | 12% | | | | $174.774 M | |
| **Total Estimated Route Cost** | | | | | | **$1,718.606 M** |
| **Average Cost per Mile** | | | | | **$10.748 M** | |

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## Table 4: Cost Estimate for Carmacks to Alaska Border at Ladue River

**ALCAN Rail Link Construction Cost**
**In 2006 US$ converted from Cdn$**
**at the following exchange rate.**

| Exchange Rate: | Cdn$1.00 | = US$0.85 |
|---|---|---|
| | BC South Unit Cost | |
| | Units | US$/Unit |

| Carmacks to Ladue border | |
|---|---|
| 223 | Route Miles |
| 1.20 | Yukon Cost Factor |
| Quantity | Total Cost - Million US$ |

| | Units | US$/Unit | Quantity | Total Cost - Million US$ | |
|---|---|---|---|---|---|
| **Track - 136# CWR w/ Hardwood or Concrete Ties** | | | | | **$259.305 M** |
| Track Construction - material & labour | mile | $969,000 | 223.5 | $259.886 M | |
| **Embankment Grade & Sub-ballast** | | | | | **$509.749 M** |
| Average | mile | $789,000 | 79.6 | $75.365 M | |
| Heavy | mile | $1,269,000 | 39.5 | $60.151 M | |
| Very Heavy | mile | $3,087,000 | 83.0 | $307.465 M | |
| Rock cuts | mile | $3,454,000 | 10.6 | $43.935 M | |
| Organics | mile | $1,850,000 | 10.8 | $23.976 M | |
| Permafrost | mile | $1,177,000 | 0.0 | | |
| **Tunnel Construction** | | | | | **$0.000 M** |
| Rock - Unlined < 2 miles each | feet | $6,800 | 0 | | |
| Rock - Unlined > 2 miles each | feet | $6,375 | 0 | | |
| **Embankment Protection Structures** | | | | | **$71.504 M** |
| Rip Rap Protection - 3 ft wide. | mile | $936,000 | 48.46 | $54.430 M | |
| Tied Back Retaining Walls | feet | $2,550 | | | |
| Flumes, Rock/Snow sheds | feet | $3,400 | 4,224 | $17.234 M | |
| **Railway Bridge Structures Over Water/Debris** | | | | | **$372.555 M** |
| Steel Bridges/Trestles | | | | | |
| Less than 50 ft high | feet | $8,500 | 14,009 | $142.892 M | |
| 50 to 100 ft high | feet | $11,050 | 821 | $10.886 M | |
| 100 to 200 ft high | feet | $12,750 | | | |
| 200 to 300 ft high | feet | $14,450 | | | |
| More than 300 ft high | feet | $16,150 | | | |
| Bridge over Major River | feet | $23,800 | 6,791 | $193.951 M | |
| Bridge Pipes (multiplates) | feet | $1,275 | 16,772 | $25.661 M | |
| **Highway-Railway Intersections** | | | | | **$2.314 M** |
| Grade Separation Structures | | | | | |
| Railway Bridge <50'H Over Hwy | feet | $8,500 | | | |
| Railway Bridge >50'H Over Hwy | feet | $11,050 | | | |
| 2-Lane Hwy Bridge Over Rwy | feet | $9,180 | 148 | $1.630 M | |
| 4-Lane Hwy Bridge Over Rwy | feet | $15,300 | | | |
| Highway/Railway Conflict - Relocation | mile | $10,200,000 | | | |
| Grade Crossings & Signals | No. | $191,250 | 3 | $0.689 M | |

| | | | | |
|---|---|---|---|---|
| Main Track Construction Cost - Jct to Jct per Manual Drawing | $5.450 M | 223.5 Mi | $1,218.151 M | |
| Mileage Adjustment | -0.22% | -0.5 Mi | -2.725 M | included above |
| **Main Track Construction Cost - Jct to Jct per Computer Drawing** | | **223.0 Mi** | **$1,215.426 M** | **$1,215.427 M** |
| **Add Portion of Route on Other Segment** | | | | |
| **Total Route Main Track Costs** | | **223.0 Mi** | **$1,215.426 M** | **$1,215.427 M** |

| | Units | US$/Unit | Quantity | Total Cost - Million US$ | |
|---|---|---|---|---|---|
| **Communications, Power, & Detectors** | | | | | **$43.951 M** |
| Communication & power | mile | $161,500 | 223 | $43.217 M | |
| Hot Box & Dragging Equipment Detectors | No. | $204,000 | 3 | $0.734 M | |
| **Sidings and Terminals** | | | | | **$79.649 M** |
| Mainline sidings & back tracks | No. | $3,381,000 | 6 | $24.343 M | |
| Home Terminal & facilities | LS | $33,957,000 | 1 | $40.748 M | |
| Fueling facilities | LS | $2,550,000 | 1 | $3.060 M | |
| Inter. Terminal & facilities | LS | $9,582,000 | 1 | $11.498 M | |

| | | | | | |
|---|---|---|---|---|---|
| **Total Route Construction Costs** | | | | | **$1,339.027 M** |
| **Contigencies & Environmental Mitigation** | | | | | **$368.233 M** |
| Contingencies | 25% | | | $334.757 M | |
| Environmental Mitigation | 2% | Costs + Contingencies | | $33.476 M | |
| **Sub Total** | | | | | **$1,707.260 M** |
| **Engineering & Environmental Studies** | | | | | **$307.307 M** |
| Eng. Environmental Study & Approval | 3% | | | $51.218 M | |
| Owner Overview Costs | 3% | | | $51.218 M | |
| Engineering & Project Mgnt | 12% | | | $204.871 M | |
| **Total Estimated Route Cost** | | | | | **$2,014.567 M** |
| **Average Cost per Mile** | | | | **$9.034 M** | |

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## YUKON MINE HAUL TRUCKING COSTS

### Yukon Mine Haul Trucking Costs

14-Mar-14

| Between | And | Via | OW kms | Avg Kph | RT hrs | RT Miles | Outbound Ore Haul (77,100 kg GCW-50 mt net) | Inbound Mine Supply (63,500 kg GCW) | Inbound Diesel (63,500 kg GCW) |
|---|---|---|---|---|---|---|---|---|---|
| **Skagway** | **Minto** | *Klondike Hwy* | *454* | 57 | 16.9 | 564.2 | **$59.62 /tonne** | **$61.72 /tonne** | **$68.30 /tonne** |
| | **Casino** | *Freegold Road* | *554* | 70 | 16.8 | 689 | **$60.32 /tonne** | **$66.45 /tonne** | **$73.38 /tonne** |
| | **Carmacks** | *Klondike Hwy* | 355 | 85 | 9.4 | 441 | **$37.28 /tonne** | **$40.84 /tonne** | **$44.31 /tonne** |
| | **Ross River** | *Carmacks* | 586 | 85 | 14.8 | 728 | **$59.77 /tonne** | **$64.47 /tonne** | **$68.15 /tonne** |
| | **Ross River** | *South Canol* | 425 | 65 | 14.1 | 528 | **$49.23 /tonne** | **$52.73 /tonne** | **$58.52 /tonne** |
| | **Wolverine** | *Watson Lake* | *733* | 80 | 19.3 | 911 | **$75.49 /tonne** | **$81.55 /tonne** | **$89.75 /tonne** |
| | **Tuchitua** | *Watson Lake* | 686 | 85 | 17.1 | 853 | **$70.46 /tonne** | **$75.88 /tonne** | **$80.22 /tonne** |
| | **Wellgreen** | *Quill Creek* | *492* | 80 | 13.3 | 611 | **$52.22 /tonne** | **$56.14 /tonne** | **$62.08 /tonne** |
| | **Selwyn** | *Watson Lake* | 879 | 75 | ***24.4*** | 1092 | **$92.28 /tonne** | **$99.78 /tonne** | **$105.52 /tonne** |
| | **Division Mt** | *Braeburn* | 763 | 80 | 20.1 | 948 | **$35.18 /tonne** | **$36.82 /tonne** | **$38.84 /tonne** |
| | **KudZeKayah** | *Watson Lake* | 771 | 80 | 20.3 | 388 | **$78.50 /tonne** | **$84.80 /tonne** | **$84.74 /tonne** |
| | **Average** | | | | | | **$60.94 /tonne** | | |
| **Haines** | Minto | *Klondike Hwy* | *648* | 60 | 22.6 | 805 | **$82.69 /tonne** | **$84.31 /tonne** | **$91.17 /tonne** |
| | Casino | *Freegold Road* | *748* | 75 | 20.9 | 930 | **$95.31 /tonne** | **$85.53 /tonne** | **$97.20 /tonne** |
| | Carmacks | *Klondike Hwy* | 591 | 85 | 14.9 | 734 | **$57.26 /tonne** | **$64.94 /tonne** | **$67.83 /tonne** |
| | Division Mt | *Haines Hwy* | 541 | 85 | 13.7 | 672 | **$52.95 /tonne** | **$60.00 /tonne** | **$63.00 /tonne** |
| | Ross River | *Carmacks* | *778* | 85 | 19.3 | 967 | **$77.79 /tonne** | **$84.60 /tonne** | **$88.95 /tonne** |
| | Ross River | *South Canol* | *747* | 75 | 20.9 | 928 | **$79.13 /tonne** | **$85.43 /tonne** | **$90.35 /tonne** |
| | Tuchitua | *Watson Lake* | *940* | 85 | 23.1 | 1168 | **$91.34 /tonne** | **$100.72 /tonne** | **$106.47 /tonne** |
| | Wellgreen | *Quill Creek* | *406* | 80 | 11.2 | 505 | **$44.01 /tonne** | **$47.19 /tonne** | **$49.90 /tonne** |
| | Deazdeash | *Haines Hwy* | 200 | 80 | 6.0 | 250 | **$24.04 /tonne** | **$25.18 /tonne** | **$26.62 /tonne** |
| **Carmacks** | Minto | *Mine Rd.* | 102 | 65 | 4.1 | 127 | **$15.58 /tonne** | **$15.96 /tonne** | **$19.06 /tonne** |
| | Casino | *Freegold Rd.* | 202 | 70 | 6.8 | 251 | **$24.93 /tonne** | **$26.90 /tonne** | **$27.00 /tonne** |
| | Ross River | *Campbell Hwy* | 232 | 85 | 6.5 | 288 | **$26.58 /tonne** | **$28.20 /tonne** | **$28.43 /tonne** |
| | Wolverine | *Campbell Hwy* | 409 | 75 | 11.9 | 508 | **$45.37 /tonne** | **$51.63 /tonne** | **$53.45 /tonne** |
| | KudZeKayah | *Campbell Hwy* | 379 | 80 | 10.5 | 471 | **$41.34 /tonne** | **$45.56 /tonne** | **$47.89 /tonne** |
| | Tuchitua | *Campbell Hwy* | 477 | 85 | 12.2 | 593 | **$49.50 /tonne** | **$53.24 /tonne** | **$58.19 /tonne** |
| | Average | | | | | | **$33.88 /tonne** | | |
| **Stewart** | Ross River | *Watson Lake* | 1006 | 85 | 24.7 | 1250 | **$99.04 /tonne** | | |
| | Tuchitua | *Watson Lake* | 759 | 85 | 19.9 | 943 | **$79.77 /tonne** | | |
| | Wolverine | *Watson Lake* | 868 | 80 | 23.7 | 1079 | **$92.36 /tonne** | | |
| **Wellgreen** | **Dezadeash** | *Haines Hwy 3* | 205 | 75 | 6.5 | 255 | **$24.02 /tonne** | | |
| **Crest** | Carmacks | *Wind River Road* | 600 | 65 | 19.5 | 746 | **$67.78 /tonne** | | |
| **Fairbanks** | Wellgreen | *Hwy 1* | 638 | 83 | 16.4 | 793 | | | Inbound LNG |
| | Whitehorse | *Hwy 1* | 980 | 85 | 24.1 | 1218 | | | (77,100 kg. GCW-95.3 m3) |
| | Haines | *Hwy 1 & 3* | 1076 | 85 | 26.3 | 1337 | | | |
| | Carmacks | *Hwy 1 & 2* | 1147 | 85 | 28.0 | 1425 | | | |
| | **Casino** | *Hwy 1 & 2* | 1279 | 80 | 33.0 | 1590 | | | **$149.44 /tonne** |
| | | | | | | | | If Rig Split at Border | **$197.06 /tonne** |
| | Minto | *Hwy 1 & 2* | 1249 | 80 | 32.2 | 1552 | | | |
| | Ross River | *Hwy 1, 2 & 4* | 1378 | 85 | 33.4 | 1713 | | | |
| | Ross River | *Hwy 1 & 6* | 1331 | 85 | 32.3 | 1654 | | | |
| | Wolverine | *Hwy 1 & 4* | 1612 | 82 | 40.3 | 2003 | | | |
| | **Tuchitua** | *Hwy 1 & 4* | 1530 | 85 | 37.0 | 1901 | | | **$172.46 /tonne** |
| | | | | | | | | If Rig Split at Border | **$220.08 /tonne** |
| | Watson Lake | *Hwy 1* | 1422 | 85 | 34.5 | 1767 | | | |

Note: Ore haul includes Yukon Bulk Haul Permit fee @ $.01/TonneKm on 13.6 tonne overload and Alaska overload fees estimated per payload tonne @ $0.88

## HAINES-CARMACKS STAND ALONE RAIL OPERATING COSTS

Haines-Carmacks Stand Alone Rail operating costs projected per the table below at $.039/RTM compare with Alaska Railroad estimated operating costs of $.049/RTM (circa 2009-2010) for similar annual tonnage over not dissimilar line haul distance.

**Alaska Canada Rail Link**
**Income Statement**
**Minerals Income**
Haines
Management Strategy Other
Navigate Workbook

Haines
Management Strategy Other

| | Year 8 | Year 9 | Year 10 | Year 11 | Year 12 | Year 13 | Year 14 | Year 15 |
|---|---|---|---|---|---|---|---|---|
| **Tons** | 5,595,106 | 5,595,106 | 5,595,106 | 5,595,106 | 5,595,106 | 5,569,906 | 5,569,906 | 5,569,906 |
| **Carloads** | 50,865 | 50,865 | 50,865 | 50,865 | 50,865 | 50,636 | 50,636 | 50,636 |
| **Income:** | | | | | | | | |
| **Cost of Operations:** | | | | | | | | |
| ***Maintenance of Way*** | | | | | | | | |
| Payroll & Fringes | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 |
| Parts & Supplies | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 |
| Track Material | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 |
| Derailment Expense | 1,344,057 | 1,344,057 | 1,344,057 | 1,344,057 | 1,344,057 | 1,344,057 | 1,344,057 | 1,344,057 |
| Purchased Services | 1,304,910 | 1,304,910 | 1,304,910 | 1,304,910 | 1,304,910 | 1,304,910 | 1,304,910 | 1,304,910 |
| Other | 1,384,379 | 1,384,379 | 1,384,379 | 1,384,379 | 1,384,379 | 1,384,379 | 1,384,379 | 1,384,379 |
| ***Total*** | $ 47,530,346 | $ 47,530,346 | $ 47,530,346 | $ 47,530,346 | $ 47,530,346 | $ 47,530,346 | $ 47,530,346 | $ 47,530,346 |
| ***Maintenance of Equipment*** | | | | | | | | |
| Payroll & Fringes | $ 963,633 | $ 963,633 | $ 963,633 | $ 963,633 | $ 963,633 | $ 962,011 | $ 962,011 | $ 962,011 |
| Parts & Supplies - Locomotive | 90,000 | 90,000 | 90,000 | 90,000 | 90,000 | 90,000 | 90,000 | 90,000 |
| Parts & Supplies - Freight Car | 424,412 | 424,412 | 424,412 | 424,412 | 424,412 | 422,500 | 422,500 | 422,500 |
| Car Repair Credits | (784,495) | (784,495) | (784,495) | (784,495) | (784,495) | (780,962) | (780,962) | (780,962) |
| Other | 6,024 | 6,024 | 6,024 | 6,024 | 6,024 | 6,024 | 6,024 | 6,024 |
| ***Total*** | $ 699,574 | $ 699,574 | $ 699,574 | $ 699,574 | $ 699,574 | $ 699,574 | $ 699,574 | $ 699,574 |
| ***Transportation*** | | | | | | | | |
| Payroll & Fringes | $ 3,469,500 | $ 3,469,500 | $ 3,469,500 | $ 3,469,500 | $ 3,469,500 | $ 3,469,500 | $ 3,469,500 | $ 3,469,500 |
| Car Hire | 1,897,173 | 1,897,173 | 1,897,173 | 1,897,173 | 1,897,173 | 1,888,629 | 1,888,629 | 1,888,629 |
| Fuel & Lubricants | 1,978,341 | 1,978,341 | 1,978,341 | 1,978,341 | 1,978,341 | 1,969,431 | 1,969,431 | 1,969,431 |
| Parts & Supplies | 104,085 | 104,085 | 104,085 | 104,085 | 104,085 | 104,085 | 104,085 | 104,085 |
| Other | 223,473 | 223,473 | 223,473 | 223,473 | 223,473 | 222,949 | 222,949 | 222,949 |
| ***Total*** | $ 7,672,573 | $ 7,672,573 | $ 7,672,573 | $ 7,672,573 | $ 7,672,573 | $ 7,654,594 | $ 7,654,594 | $ 7,654,594 |
| ***General & Administrative*** | | | | | | | | |
| Payroll & Fringes | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 |
| Travel, Meals & Entertainment | 88,913 | 88,913 | 88,913 | 88,913 | 88,913 | 88,912 | 88,912 | 88,912 |
| Liability and Property Insurance | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 |
| Office Supplies & Maintenance | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 |
| Telephone | 1,396,157 | 1,396,157 | 1,396,157 | 1,396,157 | 1,396,157 | 1,396,076 | 1,396,076 | 1,396,076 |
| Utilities | 133,370 | 133,370 | 133,370 | 133,370 | 133,370 | 133,367 | 133,367 | 133,367 |
| Professional Services | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 |
| Property Taxes | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| Other | 133,854 | 133,854 | 133,854 | 133,854 | 133,854 | 133,852 | 133,852 | 133,852 |
| ***Total*** | $ 4,667,944 | $ 4,667,944 | $ 4,667,944 | $ 4,667,944 | $ 4,667,944 | $ 4,667,856 | $ 4,667,856 | $ 4,667,856 |
| **Total Cost of Operations** | $ 60,570,437 | $ 60,570,437 | $ 60,570,437 | $ 60,570,437 | $ 60,570,437 | $ 60,552,371 | $ 60,552,371 | $ 60,552,371 |
| **Amortized Capital Spending** | 4,024,502 | 4,024,502 | 4,024,502 | 4,024,502 | 4,024,502 | 4,024,502 | 4,024,502 | 4,024,502 |
| **Op Exp $/Revenue Load** | $ 1,191 | $ 1,191 | $ 1,191 | $ 1,191 | $ 1,191 | $ 1,196 | $ 1,196 | $ 1,196 |
| **Total Cost / Revenue Load** | $ 1,270 | $ 1,270 | $ 1,270 | $ 1,270 | $ 1,270 | $ 1,275 | $ 1,275 | $ 1,275 |
| **Op Exp $/Revenue Ton-Mile** | $0.036 | $0.036 | $0.036 | $0.036 | $0.036 | $0.037 | $0.037 | $0.037 |
| **Total Cost/Revenue Ton-Mile** | **$0.039** | **$0.039** | **$0.039** | **$0.039** | **$0.039** | **$0.039** | **$0.039** | **$0.039** |

## ALBERTA TO ALASKA OIL SANDS RAILWAY OPERATING COSTS

Alberta to Alaska Oil Sands Railway operating costs projected at $.0066/RTM per the model results below are well under the $.010-$.015/RTM typical for Class 1 U.S. railroads. However this single commodity, very high volume, long distance, purpose built bitumen delivery system would be expected to achieve the maximum economies of scale that the rail mode can offer.

**Alaska Canada Rail Link**
**Income Statement**
**Minerals Income**
McKenzie-Ladue River
Management Strategy Other
Navigate Workbook

McKenzie-Ladue River
Management Strategy Other

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 |
|---|---|---|---|---|---|---|---|---|
| **Tons** | - | - | 170,000,000 | 170,000,000 | 170,000,000 | 170,000,000 | 170,000,000 | 170,000,000 |
| **Carloads** | - | - | 1,036,585 | 1,036,585 | 1,036,585 | 1,036,585 | 1,036,585 | 1,036,585 |
| **Cost of Operations:** | | | | | | | | |
| ***Maintenance of Way*** | | | | | | | | |
| Payroll & Fringes | $ - | $ - | $ (27,479,250) | $ (27,479,250) | $ (27,479,250) | $ (27,479,250) | $ (27,479,250) | $ (27,479,250) |
| Parts & Supplies | - | - | (6,869,813) | (6,869,813) | (6,869,813) | (6,869,813) | (6,869,813) | (6,869,813) |
| Track Material | - | - | (20,609,438) | (20,609,438) | (20,609,438) | (20,609,438) | (20,609,438) | (20,609,438) |
| Derailment Expense | - | - | (1,764,168) | (1,764,168) | (1,764,168) | (1,764,168) | (1,764,168) | (1,764,168) |
| Purchased Services | - | - | (3,847,095) | (3,847,095) | (3,847,095) | (3,847,095) | (3,847,095) | (3,847,095) |
| Other | - | - | (4,239,883) | (4,239,883) | (4,239,883) | (4,239,883) | (4,239,883) | (4,239,883) |
| ***Total*** | $ - | $ - | $ (64,809,646) | $ (64,809,646) | $ (64,809,646) | $ (64,809,646) | $ (64,809,646) | $ (64,809,646) |
| ***Maintenance of Equipment*** | | | | | | | | |
| Payroll & Fringes | $ - | $ - | $ 39,220,832 | $ 39,220,832 | $ 39,220,832 | $ 39,220,832 | $ 39,220,832 | $ 39,220,832 |
| Parts & Supplies - Locomotive | - | - | 11,150,000 | 11,150,000 | 11,150,000 | 11,150,000 | 11,150,000 | 11,150,000 |
| Parts & Supplies - Freight Car | - | - | 29,771,362 | 29,771,362 | 29,771,362 | 29,771,362 | 29,771,362 | 29,771,362 |
| Car Repair Credits | - | - | (55,030,244) | (55,030,244) | (55,030,244) | (55,030,244) | (55,030,244) | (55,030,244) |
| Other | - | - | 1,723,344 | 1,723,344 | 1,723,344 | 1,723,344 | 1,723,344 | 1,723,344 |
| ***Total*** | $ - | $ - | $ 26,835,294 | $ 26,835,294 | $ 26,835,294 | $ 26,835,294 | $ 26,835,294 | $ 26,835,294 |
| ***Transportation*** | | | | | | | | |
| Payroll & Fringes | $ - | $ - | $ 27,267,917 | $ 27,267,917 | $ 27,267,917 | $ 27,267,917 | $ 27,267,917 | $ 27,267,917 |
| Car Hire | - | - | 69,926,033 | 69,926,033 | 69,926,033 | 69,926,033 | 69,926,033 | 69,926,033 |
| Fuel & Lubricants | - | - | 710,904,930 | 710,904,930 | 710,904,930 | 710,904,930 | 710,904,930 | 710,904,930 |
| Parts & Supplies | - | - | 1,908,754 | 1,908,754 | 1,908,754 | 1,908,754 | 1,908,754 | 1,908,754 |
| Other | - | - | 56,700,534 | 56,700,534 | 56,700,534 | 56,700,534 | 56,700,534 | 56,700,534 |
| ***Total*** | $ - | $ - | $ 866,708,168 | $ 866,708,168 | $ 866,708,168 | $ 866,708,168 | $ 866,708,168 | $ 866,708,168 |
| ***General & Administrative*** | | | | | | | | |
| Payroll & Fringes | $ - | $ - | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 |
| Travel, Meals & Entertainment | - | - | 106,208 | 106,208 | 106,208 | 106,208 | 106,208 | 106,208 |
| Liability and Property Insurance | - | - | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 |
| Office Supplies & Maintenance | - | - | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 |
| Telephone | - | - | 2,037,550 | 2,037,550 | 2,037,550 | 2,037,550 | 2,037,550 | 2,037,550 |
| Utilities | - | - | 159,313 | 159,313 | 159,313 | 159,313 | 159,313 | 159,313 |
| Professional Services | - | - | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 |
| Property Taxes | - | - | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| Other | - | - | 357,224 | 357,224 | 357,224 | 357,224 | 357,224 | 357,224 |
| ***Total*** | $ - | $ - | $ 5,575,945 | $ 5,575,945 | $ 5,575,945 | $ 5,575,945 | $ 5,575,945 | $ 5,575,945 |
| **Total Cost of Operations** | $ - | $ - | $ 834,309,761 | $ 834,309,761 | $ 834,309,761 | $ 834,309,761 | $ 834,309,761 | $ 834,309,761 |
| **Amortized Capital Spending** | - | - | 94,664,274 | 94,664,274 | 94,664,274 | 94,664,274 | 94,664,274 | 94,664,274 |
| **Op Exp $/Revenue Load** | $ - | $ - | $ 805 | $ 805 | $ 805 | $ 805 | $ 805 | $ 805 |
| **Total Cost / Revenue Load** | $ - | $ - | $ 896 | $ 896 | $ 896 | $ 896 | $ 896 | $ 896 |
| **Op Exp $/Revenue Ton-Mile** | $ - | $ - | $0.006 | $0.006 | $0.006 | $0.006 | $0.006 | $0.006 |
| **Total Cost/Revenue Ton-Mile** | $ - | $ - | **$0.0066** | **$0.0066** | **$0.0066** | **$0.0066** | **$0.0066** | **$0.0066** |

## CREST IRON ORE RAILWAY TO HAINES OPERATING COSTS

A Crest Iron Ore Railway to Haines will achieve only slightly less attractive operating costs than the Albert Oil Sands Railway, with similar very high volume operations but over a shorter distance. Model results below indicate total operating cost of $.0124 comparable to western U.S. Class 1 railroads.

**Alaska Canada Rail Link**
**Income Statement**
**Minerals Income**
Haines
Management Strategy 2
Navigate Workbook

Haines
Management Strategy 2

| | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
|---|---|---|---|---|---|---|---|---|
| **Tons** | 7,000,000 | 7,000,000 | 14,000,000 | 14,000,000 | 21,000,000 | 21,000,000 | 28,000,000 | 28,000,000 |
| **Carloads** | 63,636 | 63,636 | 127,273 | 127,273 | 190,909 | 190,909 | 254,545 | 254,545 |
| **Cost of Operations:** | | | | | | | | |
| ***Maintenance of Way*** | | | | | | | | |
| Payroll & Fringes | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 21,748,500 | $ 23,010,750 | $ 23,010,750 |
| Parts & Supplies | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 | 5,437,125 | 5,752,688 | 5,752,688 |
| Track Material | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 | 16,311,375 | 17,258,063 | 17,258,063 |
| Derailment Expense | 1,370,156 | 1,370,156 | 1,370,156 | 1,370,156 | 1,370,156 | 1,370,156 | 1,449,677 | 1,449,677 |
| Purchased Services | 2,174,850 | 2,174,850 | 2,174,850 | 2,174,850 | 2,174,850 | 2,174,850 | 2,301,075 | 2,301,075 |
| Other | 2,352,100 | 2,352,100 | 2,352,100 | 2,352,100 | 2,352,100 | 2,352,100 | 2,488,613 | 2,488,613 |
| ***Total*** | $ 49,394,106 | $ 49,394,106 | $ 49,394,106 | $ 49,394,106 | $ 49,394,106 | $ 49,394,106 | $ 52,260,865 | $ 52,260,865 |
| ***Maintenance of Equipment*** | | | | | | | | |
| Payroll & Fringes | $ 2,691,912 | $ 2,691,912 | $ 4,793,740 | $ 4,793,740 | $ 6,992,902 | $ 6,992,902 | $ 9,094,730 | $ 9,094,730 |
| Parts & Supplies - Locomotive | 800,000 | 800,000 | 1,520,000 | 1,520,000 | 2,320,000 | 2,320,000 | 3,040,000 | 3,040,000 |
| Parts & Supplies - Freight Car | 1,444,822 | 1,444,822 | 2,889,643 | 2,889,643 | 4,334,465 | 4,334,465 | 5,779,287 | 5,779,287 |
| Car Repair Credits | (2,670,650) | (2,670,650) | (5,341,300) | (5,341,300) | (8,011,951) | (8,011,951) | (10,682,601) | (10,682,601) |
| Other | 88,667 | 88,667 | 168,467 | 168,467 | 257,133 | 257,133 | 336,933 | 336,933 |
| ***Total*** | $ 2,354,750 | $ 2,354,750 | $ 4,030,550 | $ 4,030,550 | $ 5,892,550 | $ 5,892,550 | $ 7,568,350 | $ 7,568,350 |
| ***Transportation*** | | | | | | | | |
| Payroll & Fringes | $ 9,747,000 | $ 9,747,000 | $ 15,761,250 | $ 15,761,250 | $ 21,957,750 | $ 21,957,750 | $ 27,789,750 | $ 27,789,750 |
| Car Hire | 5,694,248 | 5,694,248 | 11,388,496 | 11,388,496 | 17,082,743 | 17,082,743 | 22,776,991 | 22,776,991 |
| Fuel & Lubricants | 25,750,910 | 25,750,910 | 51,501,820 | 51,501,820 | 77,252,729 | 77,252,729 | 103,003,639 | 103,003,639 |
| Parts & Supplies | 487,350 | 487,350 | 788,063 | 788,063 | 1,097,888 | 1,097,888 | 1,389,488 | 1,389,488 |
| Other | 2,083,975 | 2,083,975 | 3,971,981 | 3,971,981 | 5,869,556 | 5,869,556 | 7,747,993 | 7,747,993 |
| ***Total*** | $ 43,763,483 | $ 43,763,483 | $ 83,411,609 | $ 83,411,609 | $ 123,260,666 | $ 123,260,666 | $ 162,707,861 | $ 162,707,861 |
| ***General & Administrative*** | | | | | | | | |
| Payroll & Fringes | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 | $ 1,741,500 |
| Travel, Meals & Entertainment | 99,104 | 99,104 | 107,626 | 107,626 | 116,441 | 116,441 | 126,097 | 126,097 |
| Liability and Property Insurance | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 | 750,000 |
| Office Supplies & Maintenance | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 | 174,150 |
| Telephone | 1,796,446 | 1,796,446 | 2,202,250 | 2,202,250 | 2,622,033 | 2,622,033 | 3,081,837 | 3,081,837 |
| Utilities | 148,656 | 148,656 | 161,439 | 161,439 | 174,662 | 174,662 | 189,146 | 189,146 |
| Professional Services | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 |
| Property Taxes | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| Other | 243,105 | 243,105 | 263,395 | 263,395 | 284,384 | 284,384 | 307,374 | 307,374 |
| ***Total*** | $ 5,202,960 | $ 5,202,960 | $ 5,650,359 | $ 5,650,359 | $ 6,113,170 | $ 6,113,170 | $ 6,620,104 | $ 6,620,104 |
| **Total Cost of Operations** | $ 100,715,299 | $ 100,715,299 | $ 142,486,624 | $ 142,486,624 | $ 184,660,492 | $ 184,660,492 | $ 229,157,180 | $ 229,157,180 |
| **Amortized Capital Spending** | 24,571,589 | 24,571,589 | 24,571,589 | 24,571,589 | 24,571,589 | 24,571,589 | 24,571,589 | 24,571,589 |
| **Op Exp $/Revenue Load** | $ 1,583 | $ 1,583 | $ 1,120 | $ 1,120 | $ 967 | $ 967 | $ 900 | $ 900 |
| **Total Cost / Revenue Load** | $ 1,969 | $ 1,969 | $ 1,313 | $ 1,313 | $ 1,096 | $ 1,096 | $ 997 | $ 997 |
| **Op Exp $/Revenue Ton-Mile** | $0.0197 | $0.0197 | $0.0140 | $0.0140 | $0.0121 | $0.0121 | $0.0112 | $0.0112 |
| **Total Cost/Revenue Ton-Mile** | $0.0246 | $0.0246 | $0.0164 | $0.0164 | $0.0137 | $0.0137 | **$0.0124** | **$0.0124** |