Benefit-Cost Assessment of the Port MacKenzie Rail Extension

Final Report

prepared for
Matanuska-Susitna Borough

prepared by
Steve Colt
Nick Szymoniak

Institute of Social and Economic Research
University of Alaska Anchorage

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Contact:
Steve Colt
907-786-1753
steve.colt@uaa.alaska.edu

or:
Nick Szymoniak
907-786-5452
nick.szymoniak@uaa.alaska.edu

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Executive Summary

Costs

We assume that the Port MacKenzie rail extension would cost $275 million to construct.[1] This is a conservative estimate based on a range of between $200 million and $300 million for different route options. The time horizon runs 50 years from 2012 to 2061. O&M costs are assumed to be $1.5 million per year, with a net present value of $26.1 million. The net present value of all costs using a 5% real discount rate[2] and a base year of 2010 is $301.1 million.

Benefits

The rail extension would provide two distinct types of benefits: 1) It reduces the cost of rail transportation; and 2) It is likely to stimulate significant new mines and other major development. These benefits come from a diverse mix of potential projects – thus a strength of the rail extension is that its economic viability does not depend on any one project.

Reduced transportation costs

Relative to Seward, using the extension would save 140.7 miles per one-way trip.[3] Assuming an average cost savings of 6 cents per ton-mile and a 5.0% real discount rate, we estimate that using the extension would save $572 million in avoided rail costs, avoided port costs, and avoided railroad and road upgrades. These savings are shown in the table and figure on the following page.

In addition to the above, we estimate that about 22,000 train crossings of Pittman Road and other roads would be avoided by the extension, saving motorists up to 64,000 vehicle-hours of travel time delay between now and 2061.

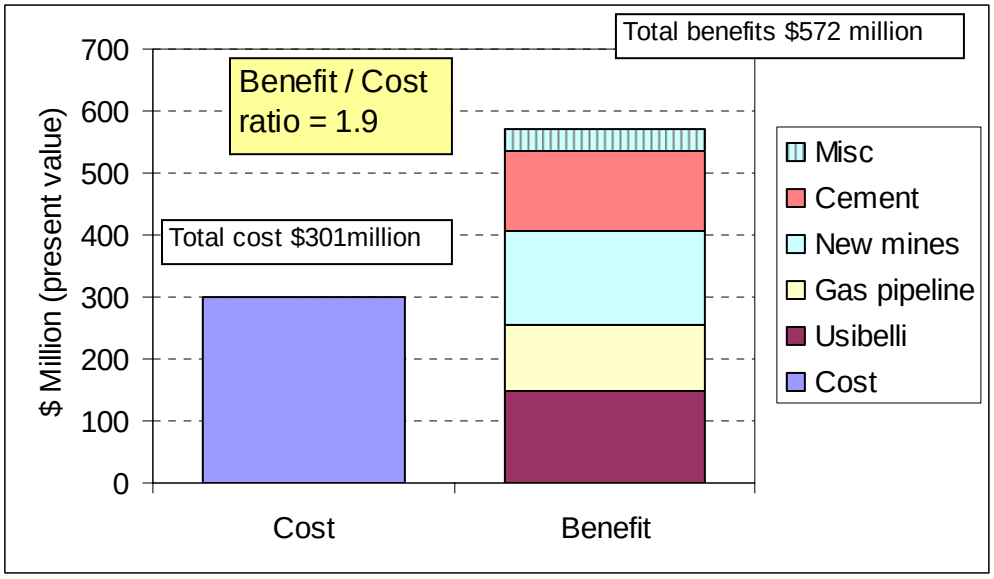
[1] AK Railroad submission to Federal Surface Transportation Board requesting license to build rail extension. January 2008.
[2] "real discount rate" means adjusted for inflation. This rate is based on the real rate of return from the Alaska Permanent Fund.
[3] Paul Metz, Economic Analysis of Rail Link Port MacKenzie to Willow, Alaska. February 2007

Benefits of Port MacKenzie rail extension from reduced transportation costs

(Present value in year 2010 @ 5.0%; does not include motorist time savings)

	Tons per year	Years of operation		Benefits from reduced rail and port cost NPV at 5%	Notes
Usibelli Coal	1,000,000	2012 - 2061	$	148,711,175	
Gas pipeline materials	N/A	2013 - 2015	$	105,838,887	1
Ore from new mines	1,879,750	2017 - 2056	$	151,038,111	2
Cement plant	1,095,000	2020 - 2061	$	130,031,810	3
Misc commodities	250,000	2012 - 2061	$	36,694,410	4
Total benefits			**$**	**572,314,393**	
Construction cost			$	275,000,000	
O&M cost (NPV of $1.5 million/yr)			$	26,079,894	
Total cost			**$**	**301,079,894**	
Benefit / Cost ratio from transportation savings				**1.9**	

Notes: 1. Gas pipeline savings includes $82 million NPV of avoided rail and road upgrade costs
2. Mines would commence operation in various years; the tonnage number in this table is peak production reached after 2037. The analysis of benefits is based on the actual time profile of tonnage produced.
3. Assumes 3,000 tons per day output shipped to tidewater for export.
4. Assumes a combination of gravel, wood chips, additional fuel imports to meet growing demand, and other miscellaneous bulk commodities.



Direct fiscal return to State of Alaska

Because much of the savings from reduced rail transportation costs would flow through to increased taxable income, we estimate that direct annual fiscal returns to the State of Alaska

would have a present value of between $107 million (tied to rail cost savings) and $4.4 billion (including all mineral revenues from new mines). These break down as follows:

- Between $1 million and $3 million per year in additional corporate income taxes, with a present value of $32.7 million
- About $7 million per year in additional oil and gas revenue due to lower pipeline construction cost reflected in lower pipeline tariffs, with a present value of $33 million.
- A direct saving to the state of $41.2 million from avoided railroad and road upgrades[4]
- Assuming new mineral development and attributing it to the rail extension, $42 million per year increasing to $602 million per year from mining license taxes, royalties, and corporate income taxes. The present value of all these mineral revenues is $4.3 billion.

Economic development from new mineral activity

According to a detailed analysis by Paul Metz (Metz, 2007a), the rail extension would provide a significant stimulus to new mineral developments within a 120-mile wide corridor surrounding the existing railroad. Metz projects likely minerals development with a cumulative gross metal value of $173 billion. This value would generate taxes and royalties to the State of Alaska starting at $42 million per year (in 2017) and increasing to $543 million per year in 2027 and to $602 million per year beginning in 2037. In addition these developments could generate up to $3 billion per year in additional economic activity in Railbelt communities.

Conclusion

This project provides a benefit/cost ratio ranging from 1.9 (based only on transportation cost savings) up to about 40 (assuming that additional mineral activity is attributable to the rail extension). In addition, there will be community benefits -- jobs and income -- that we have not explicitly considered here. These are extraordinarily good returns on an infrastructure investment in Alaska.[5]

[4] We have assumed that the state would pay half of these upgrades and pipeline builders would pay half.
[5] By comparison, the Bradley Lake hydroelectric project now appears to have a B/C ratio of less than 1.5, even when based on high and rising natural gas prices. Most public projects in Alaska have not been subjected to formal cost-benefit analysis.

1. Introduction

The purpose of this study is to assess the economic costs and benefits of the proposed extension of the Alaska Railroad to Port MacKenzie. We have generally relied on previous recent studies of the components of costs and benefits as the basis for our assessment. In this analysis we have synthesized this previous work and we provide new estimates of the benefit amounts for several types of benefits.

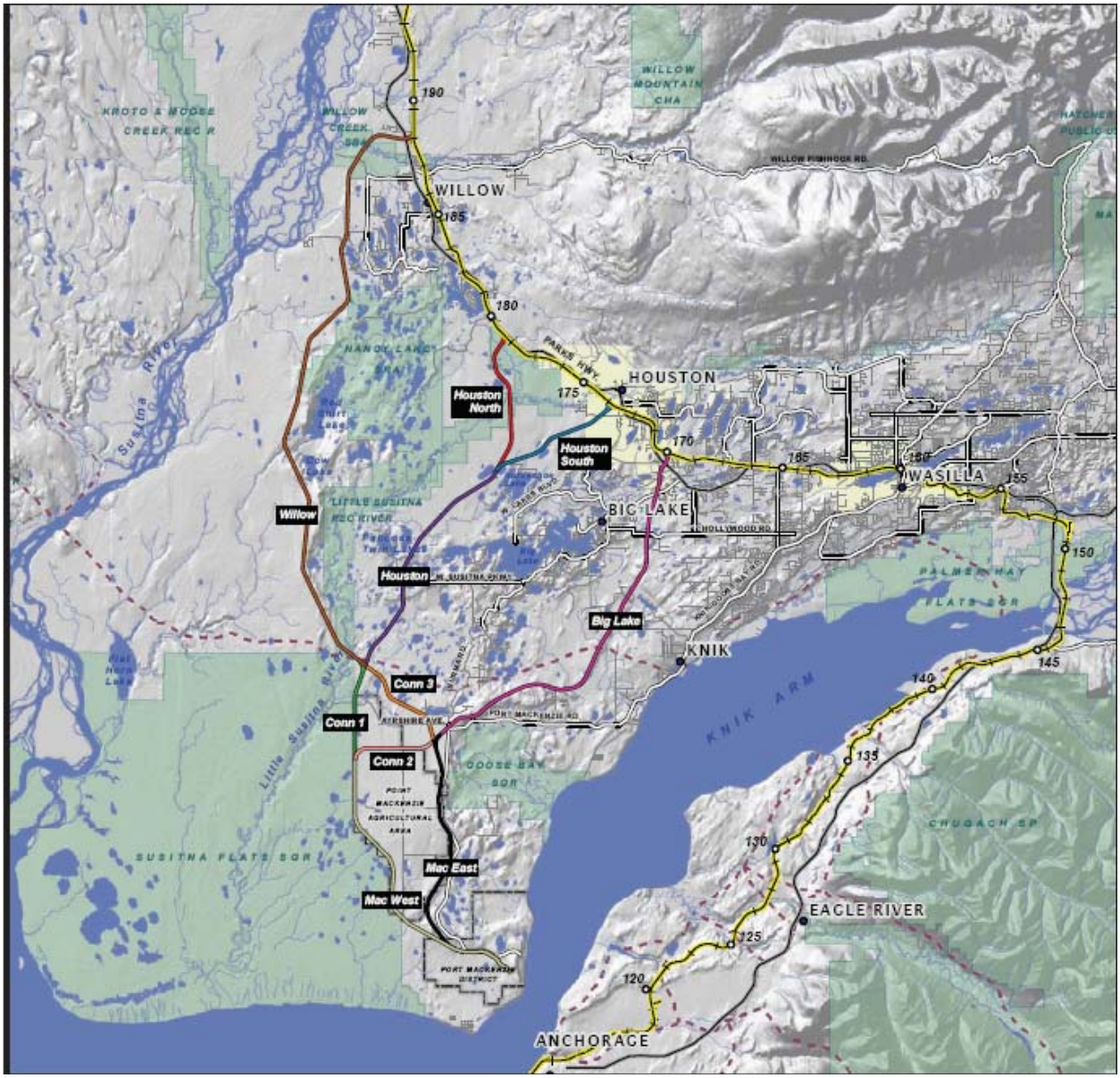
Project description and cost

The proposed project consists of a railroad extension beginning at the Alaska Railroad mainline at a point to be determined between Willow and Big Lake and running south to Port MacKenzie. Figure 1 shows the general location of the project.

For this analysis, we assume an up-front cost of $275 million for construction of the rail extension. This is a conservative estimate based on a range of estimates between $200 million and $300 million for different route options.[6] The time horizon runs 50 years from 2012 to 2061. Operations and maintenance (O&M) costs are assumed to be $1.5 million per year in real year 2007 dollars. The net present value of these O&M costs using a 5% real discount rate[7] is $26.1 million. The net present value of all costs over the 50 year period – construction plus O&M -- is therefore $301.1 million ($275 million + $26.1 million). This is the "cost" number that we use when computing benefit-cost ratios. The 5% discount rate is based on the real rate of return from the Alaska Permanent Fund and is used for both benefits and costs. All future costs and benefits are discounted back to year 2010, because we assume that the construction cost is incurred beginning in that year.

[6] AK Railroad submission to Federal Surface Transportation Board requesting license to build rail extension. January 2008.
[7] "real discount rate" means adjusted for inflation.

Figure 1. Preliminary alternative rail extension routes



source: http://www.portmacrail.com/documents/alt_map_11-05-07.pdf

Benefits considered

In this analysis we quantify two distinct types of benefits over the 50 year time horizon from 2012 through 2061[8] First, we consider **reduced transportation costs**. The rail extension would reduce the cost of rail transportation for several important commodities, including coal, materials for the North Slope gas pipeline, ore from new mines, and cement from a proposed new plant. Second, we consider **benefits from new mines and other major development** likely

[8] The 50-year time horizon begins in year 2012 because that is the estimated first year of rail extension operation.

to be stimulated by the rail extension (Metz 2007a, 2007b). We have calculated the portion of these benefits that would accrue directly to the State of Alaska because the state may be contributing significant resources to the project. Both types of benefits come from a diverse mix of potential projects – thus an important aspect of the rail extension is that its economic viability does not depend on any one project.

It is also important to remember that we have **not** calculated benefits – or costs – to communities or individuals due to additional economic activity and/or additional people stemming from new development related to the rail extension. For example, we have included the reduced rail transportation costs of a cement plant, relative to rail transport to Seward. However, we have not included explicit consideration of the jobs, income, and other economic impacts of the cement plant itself. These impacts, while undoubtedly significant, are beyond the scope of this analysis.

2. Benefits from Reduced Transportation Costs

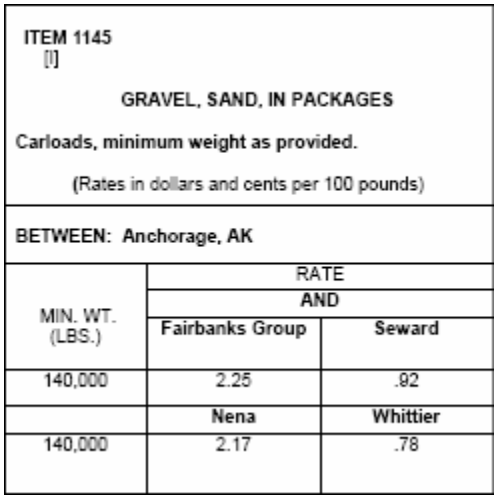
2.1 Avoided cost assumptions

Avoided rail costs

With the proposed extension in place, the rail distance from Interior Alaska to Port MacKenzie will be 26.4 miles shorter than the rail distance to the Port of Anchorage and 140.7 miles shorter than the rail distance to the Port of Seward (Northern Economics 2008). This difference results in lower rail transportation costs because trains burn less fuel and crews work fewer hours. The shorter distance may also allow for fewer crew changes, further lowering costs.

The Alaska Railroad does not charge for freight shipments by the mile. Instead, each different combination of origin and destination has a different rate for each different type of material being shipped. For example, Figure 2 shows the Alaska Railroad Corporation freight tariff for gravel and sand in packages. To ship a minimum 140,000 pounds of packaged sand from Anchorage to Fairbanks would cost $2.25 for every 100 pounds. The same packaged sand would cost $0.92 to ship to Seward.

Figure 2. Example of ARRC freight tariff[9]



ITEM 1145
[I]

GRAVEL, SAND, IN PACKAGES

Carloads, minimum weight as provided.

(Rates in dollars and cents per 100 pounds)

BETWEEN: Anchorage, AK

MIN. WT. (LBS.)	RATE AND	
	Fairbanks Group	Seward
140,000	2.25	.92
	Nena	Whittier
140,000	2.17	.78

source: Alaska Railroad Corporation. 2007. Freight Tariff ARR 3016-S. December 12, 2007. Available at http://www.akrr.com/arrc321.html.

Due to the current lack of rail access to Port MacKenzie there are no existing tariff rates for shipping goods there. Therefore, for this analysis we rely on the analysis of Alaska Railroad freight tariffs by Paul Metz (Metz 2007b). Metz determined that a rate of $0.06 per ton-mile is the most appropriate proxy to use for future rail rates to Port MacKenzie, Anchorage, and Seward. Therefore, we assume that all commodities cost $0.06 per ton-mile to transport on the Alaska Railroad, regardless of the type of good or the destination. Using this cost of rail transportation, Table 1 shows that rail costs are $1.58 higher per ton when using the Port of Anchorage and $8.44 higher per ton when using the Port of Seward instead of Port MacKenzie.

Table 1. Avoided rail costs per ton of transporting to Port MacKenzie

Alternative port		Unit cost ($ per ton-mile)	Avoided rail distance (miles)	Avoided rail cost ($ per ton)
Port of Anchorage	$	0.06	26.4	1.58
Port of Seward	$	0.06	140.7	8.44

[9] Alaska Railroad Corporation. Freight Tariff ARR 3016-S. December 12, 2007. Available at http://www.akrr.com/arrc321.html.

Avoided port costs – wharfage and dockage

Wharfage tariffs are charged for the loading or unloading of goods from a ship or barge at a port. Wharfage rates are different for different commodities and are usually charged on a dollars per ton basis. The specific values that we have assumed for wharfage rates are discussed below in the sections dealing with each different commodity.

Dockage charges relate to the vessel. Dockage charges are usually determined by the length of the vessel being docked and the number of days docked. We assume that a handymax class ship with a length of 650 feet and a cargo capacity of 55,000 dead weight tons (dwt) is to be used to transport all goods. Handymax class ships are the most common cargo ship in the Pacific Ocean and it is reasonable to assume that they would be used to transport cement from Alaska. A 650 foot ship would pay a daily dockage tariff of $332 at the Port of Seward,[10] $2,969 at the Port of Anchorage,[11] and $780 at Port MacKenzie.[12] The length of time a ship is at dock is a function of how fast it can be loaded. We have assumed that all ports have the ability to load all goods onto ships at the rate of 1,000 tons per hour (tph).

2.2 New mines

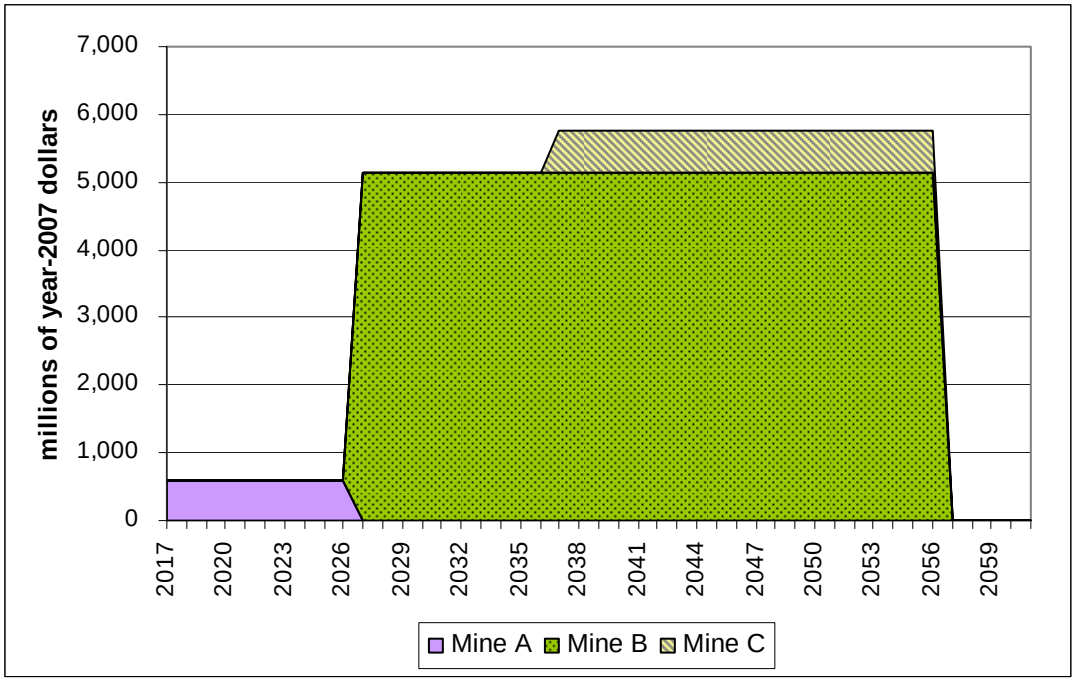
According to Metz (2007b), at least three new mines within a 120 mile wide corridor would be developed in response to the rail extension to Port MacKenzie. Based on Metz's analysis we assume the development of three new mines with the first mine beginning production in 2017. The total gross metal value of these three mines is estimated to be $173 billion. These mines are projected to export a cumulative total of 58.0 million tons of mineral concentrate over the course of their lives. Table 2 shows a summary of the characteristics of these three mines. Figure 3 shows the annual gross mineral value generated. In order to be consistent with Metz's scenario, we have only assumed production through year 2056, although it is certainly plausible that these or other mines would continue to produce after that year.

[10] City of Seward. *Seward Small Boat Harbor Rates and Charges*. Available at http://www.cityofseward.net/harbor/page20.html.
[11] Municipality of Anchorage. *Port of Anchorage Tariff No. 6*. December 2005. Available at http://www.muni.org/iceimages/port/terminaltariffno.6r.pdf.
[12] Matanuska-Susitna Borough. *Port MacKenzie Terminal Tariff No. 1*. April 2006. Available at http://www.matsugov.us/Port/PDF/Tariff.pdf.

Table 2. Description of new mines

	Mine A	Mine B	Mine C
First year of mine production	2017	2027	2037
Mine life (years)	10	30	20
Mineral concentrate (tons)			
Annual	365,000	1,679,000	200,750
Total	3,650,000	50,370,000	4,015,000
Gross metal value (millions)			
Annual	$ 580	$ 5,153	$ 620
Total	$ 5,800	$ 154,600	$ 12,400

Figure 3. Gross metal value of assumed annual mine production (millions of year-2007 dollars)



source: Metz 2007b

New mines: rail savings

We assume that absent the availability of Port MacKenzie the new mines would otherwise have to ship concentrate to Seward. Based on the $0.06 per ton-mile estimate of avoidable cost, total avoided rail costs will be $8.44 less per ton of mineral concentrate shipped to Port MacKenzie. Table 3 shows the annual amounts of mineral concentrate projected to be exported during the four decades beginning in 2017 and the avoided annual rail costs if this concentrate is shipped out of Port MacKenzie rather than Seward.

Table 3. Avoided annual rail costs of exporting mineral concentrate through Port MacKenzie rather than Seward

(real year-2007 dollars)

Decade of Production	Mines in production	Annual mineral concentrate (tons)	Avoided rail cost per ton	**Annual Avoided Rail Costs**
2017 - 2026	A	365,000	$ 8.44	**$ 3,081,330**
2027 - 2036	B	1,679,000	$ 8.44	**$ 14,174,118**
2037 - 2046	B C	1,879,750	$ 8.44	**$ 15,868,850**
2047 - 2056	B C	1,879,750	$ 8.44	**$ 15,868,850**

New mines: port savings

The Port of Seward does not have a wharfage rate for mineral concentrate. According to personal communication with the Port of Seward (March 18, 2008) mineral concentrates would be charged the non-specific goods rate of $3.15 per ton. Mineral concentrate exported through Port MacKenzie would be charged a rate of $1.25 per ton, the wharfage for bulk commodities. The mineral concentrate will be loaded into a 600 foot handymax ship at 1,000 tons per hour. As noted above, the daily dockage rate for a 600 foot ship is $332 at the Port of Seward and $780 at Port MacKenzie.

Based on these parameters, annual port costs are $686,679 lower at Port MacKenzie than at the Port of Seward for the first ten years of mineral concentrate export. The port cost savings increase to $3.5 million (real year 2007 dollars) annually for the last twenty years of production while the two larger mines are producing. Table 4 summarizes these port costs and savings.

Table 4. Avoided port costs of exporting mineral concentrate (real year-2007 dollars)

	2017 - 2026		2027-2036	
	Seward	Port MacKenzie	Seward	Port MacKenzie
Wharfage				
Wharfage (per ton)	$ 3.15	$ 1.25	$ 3.15	$ 1.25
Annual tons of concentrate	365,000	365,000	1,679,000	1,679,000
Annual wharfage cost	$ 1,149,750	$ 456,250	$ 5,288,850	$ 2,098,750
Dockage				
Ship length (feet)	650	650	650	650
Ship tonnage (dwt)	55,000	55,000	55,000	55,000
Loading rate (tph)	1,000	1,000	1,000	1,000
Annual loading days	15	15	70	70
Dockage per day	$ 332	$ 780	$ 332	$ 780
Annual dockage cost	$ 5,042	$ 11,863	$ 23,191	$ 54,568
Total costs	$ 1,154,792	$ 468,113	$ 5,312,041	$ 2,153,318
Annual net benefit of Port MacKenzie		***$ 686,679***		***$ 3,158,724***

	2037-2046		2047-2056	
	Seward	Port MacKenzie	Seward	Port MacKenzie
Wharfage				
Wharfage (per ton)	$ 3.15	$ 1.25	$ 3.15	$ 1.25
Annual tons of concentrate	1,879,750	1,879,750	1,879,750	1,879,750
Annual wharfage cost	$ 5,921,213	$ 2,349,688	$ 5,921,213	$ 2,349,688
Dockage				
Ship length (feet)	650	650	650	650
Ship tonnage (dwt)	55,000	55,000	55,000	55,000
Loading rate (tph)	1,000	1,000	1,000	1,000
Annual loading days	78	78	78	78
Dockage per day	$ 332	$ 780	$ 332	$ 780
Annual dockage cost	$ 25,964	$ 61,092	$ 25,964	$ 61,092
Total costs	$ 5,947,177	$ 2,410,779	$ 5,947,177	$ 2,410,779
Annual net benefit of Port MacKenzie		***$ 3,536,397***		***$ 3,536,397***

2.3 North Slope gas pipeline construction support

Northern Economics (2008) estimated the cost savings from use of the Port MacKenzie rail extension to support the construction of a North Slope gas pipeline. They estimated these savings to be $122 million when compared to shipping through the Port of Seward and $165 million compared to the Port of Valdez. Northern Economics also estimated the costs of a pipe treatment plant in Valdez, but we do not consider that scenario in this analysis.

Northern Economics identified three types of cost savings associated with using Port MacKenzie: 1) land transportation costs, 2) marine transportation costs, and 3) infrastructure improvement costs. For each category of cost, they reported total amounts. For example, there was no breakdown in their report of the rail cost savings into tons and cost per ton-mile.

Land transportation

Northern Economics compared the land transportation cost of five options: 1) rail from Seward; 2) rail from Port MacKenzie; 3) truck from Valdez; 4) rail from Anchorage; and 5) rail from Whittier. They estimated that moving pipeline material using Port MacKenzie would cost $29 million less than using the Port of Seward and $57 million less than using the Port of Valdez.

Marine transportation

The marine transportation costs include marine shipping costs, wharfage costs, and dockage costs. Northern Economics estimated the marine shipping costs from Unimak Pass, the point of entry for marine freight coming to Alaska from Asia. The wharfage and dockage costs were reported as lump sum amounts. We have included all of these marine transportation costs in our analysis.

Infrastructure

Using a rail extension to Port MacKenzie would avoid infrastructure improvements and repairs that would otherwise be necessary if using the ports of Seward, Valdez, Anchorage, or Whittier. Road and bridge improvements costing $110 million would be needed if the Port of Valdez is used. Use of the ports of Seward, Anchorage, or Whittier would require $93 million of investment: $73 million for an at-grade rail crossing at Knik-Goose Bay Road in Wasilla, plus $20 million of road and bridge improvements to the Parks Highway. These costs are avoided if the rail extension is built because the increased rail traffic caused by shipping pipeline material would simply bypass the Anchorage-to-Wasilla congested portion of the railroad.

The gas pipeline construction cost savings from using Port MacKenzie instead of the other ports are summarized in Table 5. For the cost-benefit analysis we have used the savings compared to the Port of Seward.

Table 5. Net benefits of using Port MacKenzie for gas pipeline construction (real year-2007 dollars)

	Port MacKenzie	Port of Seward	Port of Valdez	Port of Anchorage	Port of Whitter
Land transportion					
Rail Cost	$ 172,000,000	$ 201,000,000	$ -	$ 183,000,000	$ 192,000,000
Truck Cost	$ -	$ -	$ 229,000,000	$ -	$ -
Marine transportion					
Shipping from Unimak	$ 11,250,827	$ 8,776,875	$ 9,182,042	$ 11,250,827	$ 7,644,988
Wharfage	$ 240,394	$ 1,078,582	$ 458,734	$ 1,199,680	$ 280,600
Dockage	$ 4,871,835	$ 6,041,532	$ 5,213,841	$ 6,514,354	$ 6,041,532
Infastructure improvement	$ -	$ 93,000,000	$ 110,000,000	$ 93,000,000	$ 93,000,000
Total	$ 188,363,056	$ 309,896,989	$ 353,854,617	$ 294,964,861	$ 298,967,120
Net benefits of using Port MacKenzie		***$ 121,533,933***	***$ 165,491,561***	***$ 106,601,805***	***$ 110,604,064***

note: these costs are not discounted. Discounting is applied at a later stage of our analysis.
source: Northern Economics (2008).

2.4. Usibelli coal

An extension of the rail line to Port MacKenzie would likely result in increased export of coal from the Usibelli mine. Usibelli currently exports coal from the Port of Seward.[13] We assume that existing coal shipments this coal continues to be shipped from Seward but that additional coal production would be exported through Port MacKenzie due to favorable economics. It is, of course, conceivable that current shipments might switch to Port MacKenzie given the favorable cost difference assumed here.

The Alaska Railroad reported[14] that it would cost $9 million per year to ship an additional one million tons of coal out of Seward using existing capital infrastructure. The same coal could be shipped out of the Port of Anchorage for $5 million per year. This $5 million per year number includes the capital cost of building a coal terminal at the Port of Anchorage.

For this analysis we assume that the *port costs* of exporting coal from Port MacKenzie would be the same as exporting from the Port of Anchorage. This is a conservative estimate as Port MacKenzie has room to build and use a three mile loop to quickly unload coal and the Port of Anchorage does not. The actual port costs of transporting coal through Port MacKenzie are likely to be less than those used here.

[13] Current shipments run between about 400,000 and about 800,000 tons per year through the Port of Seward.
[14] National Energy Technology Laboratory, US Department of Energy. Beluga Coal gasification feasibility study. Phase I final report for subtask 41817.333.01.01. July 2006.

The cost of transporting coal on the railroad is assumed to be $0.06 per ton mile. Therefore, as shown in Table 1, above, each ton of material shipped to Port MacKenzie costs $1.48 less than if shipped to the Port of Anchorage. It would therefore cost $1.48 million less to ship one million tons of coal to Port MacKenzie than to the Port of Anchorage. Using the total cost figure (from above) of $5 million to transport one million tons to and through the Port of Anchorage, and also assuming that the port costs are the same for both, we estimate that it would cost $3.52 million[15] to ship one million tons of coal through Port Mackenzie. Table 6 shows that shipping an additional one million tons of coal through Port MacKenzie will cost $1.5 million less than shipping through the Port of Anchorage and $5.5 million less than shipping through the Port of Seward.

Table 6. Annual net benefits of shipping additional Usibelli coal

	Port MacKenzie	Port of Anchorage	Port of Seward
Tons of coal per year	1,000,000	1,000,000	1,000,000
Annual cost	$ 3,524,000	$ 5,000,000	$ 9,000,000
Cost per ton	$ 3.52	$ 5.00	$ 9.00
Annual net benefits from Port MacKenzie		***$ 1,476,000***	***$ 5,476,000***

2.5 Cement

Based on personal communication with Metz,[16] we assume that a cement plant will be constructed in the Interior (possibly north of Fairbanks, near a major world-class limestone deposit), exporting 3,000 tons of cement per day (1,095,000 tons per year) by 2020. This cement export operation is expected to remain in production throughout the study period (2061).

If the rail extension is constructed we assume that cement would be shipped south via rail from the cement plant to Port Mackenzie. We assume that in the absence of the rail extension the cement export industry would still be developed and the Port of Seward would be used. While it is not unreasonable to assume that the development of a cement export industry is dependent on a rail extension to Port MacKenzie, our evaluation of benefits is limited to these avoided costs of rail transportation, relative to Seward.

[15] $3.52 million = $5.0 million Anchorage total cost - $1.476 million Port MacKenzie rail savings.
[16] Metz, Paul. Personal Communication, March 6, 2008.

Avoided rail costs

Using the same parameters for avoided distance (140.7 miles) and avoided cost per ton-mile ($.06 per ton-mile), Table 7 shows that if 1,095,000 tons of cement are exported annually through Port MacKenzie, the total avoided rail costs are $9.2 million per year.

Table 7. Avoided rail costs of exporting cement

Tons of cement per day		3,000
Tons of cement per year		1,095,000
Avoided rail cost per ton	$	8.44
Avoided annual rail costs	**$**	**9,243,990**

Avoided port costs

The Port of Seward does not have a wharfage rate for cement, so we assume that cement export would be charged wharfage of $3.15 per ton, the rate for non-specific goods.[17] The Port MacKenzie wharfage for cement is $1.00 per ton.[18] The annual wharfage cost of exporting 1,095,000 tons of cement is $3.4 million for the Port of Seward and $1.1 million for Port MacKenzie. The annual dockage cost for the same handymax ship being loaded at 1,000 tons per hour would be $35,588 at Port MacKenzie and $15,125 at the Port of Seward. Table 8 shows that due primarily to the significantly lower wharfage costs the annual port costs of shipping cement through Port MacKenzie are $2.3 million less than the costs of shipping through the Port of Seward.

[17] Port of Seward. Personal Communication March 18, 2008.
[18] Matanuska-Susitna Borough. *Port MacKenzie Terminal Tariff No. 1*. April 2006. Available at http://www.matsugov.us/Port/PDF/Tariff.pdf.

Table 8. Avoided port costs of exporting cement

	Port of Seward	Port MacKenzie
Wharfage		
Wharfage (per ton)	$ 3.15	$ 1.00
Annual tons of cement	1,095,000	1,095,000
Annual wharfage cost	$ 3,449,250	$ 1,095,000
Dockage		
Ship length (feet)	650	650
Ship tonnage (dwt)	55,000	55,000
Loading rate (tph)	1,000	1,000
Annual loading days	45.6	45.6
Dockage per day	$ 332	$ 780
Annual dockage cost	$ 15,125	$ 35,588
Total costs	$ 3,464,375	$ 1,130,588
Net Benefit of using Port MacKenzie		***$ 2,333,787***

2.5 Agrium

We do not assume any shipments of coal to Agrium in this analysis. Therefore there are zero avoided costs associated with such potential shipments.

2.6 Miscellaneous material

It is likely that there will be additional economic development along the Alaska Railbelt that would utilize a rail extension to Port MacKenzie. Possible users of the rail extension include lime exporters, wood chip and round log exporters and producers of modules for the petroleum industry.

For this analysis we assume that there will be an additional 250,000 tons of material per year shipped through Port MacKenzie and over the rail extension. The Port of Seward is the alternative port for the analysis of the cost savings of shipping miscellaneous materials. Table 9 shows a $2.1 million avoided rail cost from using Port MacKenzie rather than Seward to export miscellaneous material. Port costs primarily consist of wharfage. Because we do not know what type of material is passing through the port we have made no attempt to estimate comparative port costs.

Table 9. Annual avoided rail cost of shipping miscellaneous material

Annual tonnage		250,000
Cost per ton mile	$	0.06
Avoided rail distance		140.70
Avoided cost per ton	$	8.44
Annual avoided cost	**$**	**2,110,500**

2.7 Traffic time savings

This section considers the reduced waiting time costs to motorists due to reduced congestion in the Palmer-Wasilla traffic corridor. Trains using a rail extension to Port MacKenzie would bypass this area and therefore would not impede automobile traffic at a number of at-grade crossings within the traffic corridor. Table 10 shows average daily traffic for each at-grade rail crossing in the Palmer-Wasilla corridor that a rail extension would avoid.[19] The Knik-Goose Bay crossing is not considered when computing time savings because we have assumed that absent the rail extension an overpass would be built to alleviate the congestion at that crossing. Put another way, the cost of dealing with future congestion absent the rail extension is borne in two ways: 1) construct an overpass at Knik-Goose Bay Road, and 2) endure longer wait times at the other crossings shown in Table 10.

Table 10. Average daily traffic counts for at-grade rail crossings (years 2004-2005-2006)

	Average Daily Traffic
Pittman Road	4,500
Fairview Loop Rd	1,980
Abby Blvd	1,167
Lake Lucille	463
Mack Dr	1,200
Jude Rd	100
Glenwood Ave	500
Meadow Lake Loop	750
Total	**10,660**

[19] State of Alaska, Department of Transportation. Central region traffic volume report: 2004-2005-2006. Available at http://www.dot.state.ak.us/stwdplng/mapping/trafficmaps/trafficdata_reports_cen/06-ATVR_All_Final.pdf.

The length of a train delay varies depending train length and speed. Table 11 shows high, medium and low estimates of the length of time that traffic is delayed by a single train crossing. Estimates are based on information from the Alaska Railroad Corporation.[20]

Table 11. Traffic delay per train crossing

	High	Med	Low
Train length (feet)	5,300	5,000	4,000
Train speed (mph)	15	25	49
Train speed (feet per sec)	22	37	72
Time gate is down before train	44	44	44
Time it takes for train to cross (sec)	241	136	56
Total time traffic is stopped (sec)	285	180	100
Total time traffic is stopped (hours)	0.08	0.05	0.03

Using the assumptions in Table 11, we estimate that the total amount of motorist time saved by the rail extension ranges from a high of 63,647 vehicle-hours to a low of 7,385 vehicle-hours. These estimates are shown in Table 12.

Table 12. Total trains and traffic time avoided

			Total trains during study period		
	Years of Operation	Trains per year	High	Med	Low
Mines (trains)					
2010-2017	0		-	-	-
2017-2026	10	38	380	380	380
2027-2036	10	350	3,498	3,498	3,498
2037-2046	10	371	3,707	3,707	3,707
2047-2056	10	371	3,707	3,707	3,707
Gas Pipeline (trains)					
Seward	3	95	285	285	0
Other Events (trains)					
Usibelli	50	104	5,208	5,208	5,208
Cement	42	114	4,791	4,791	4,791
Misc	50	26	1,302	1,302	1,302
Total Trains			22,878	22,878	22,593
Total avoided waiting time (vehicle-hours)			***63,647***	***25,225***	***7,385***

[20] Alaska Railroad Corporation. Personal communication. March 15, 2008.

2.8 Summary of avoided transportation costs

Summary of annual avoided costs

Figure 4 shows the annual volume of material assumed to be shipped to and through Port MacKenzie. Figure 5 shows the annual avoided cost of using the rail extension to Port MacKenzie by rail user. The avoided cost figure includes the $93 million avoided infrastructure cost associated with gas pipeline construction support, as discussed above. Otherwise, the two figures are essentially the same in structure. One shows tons and the other converts the tons into dollars savings using the assumed rate of $.06 per ton-mile. However, one key difference between the two figures is that the avoided costs include infrastructure costs avoided in years 2012 and 2013.

Figure 4. Annual material shipped on rail extension (thousand tons)

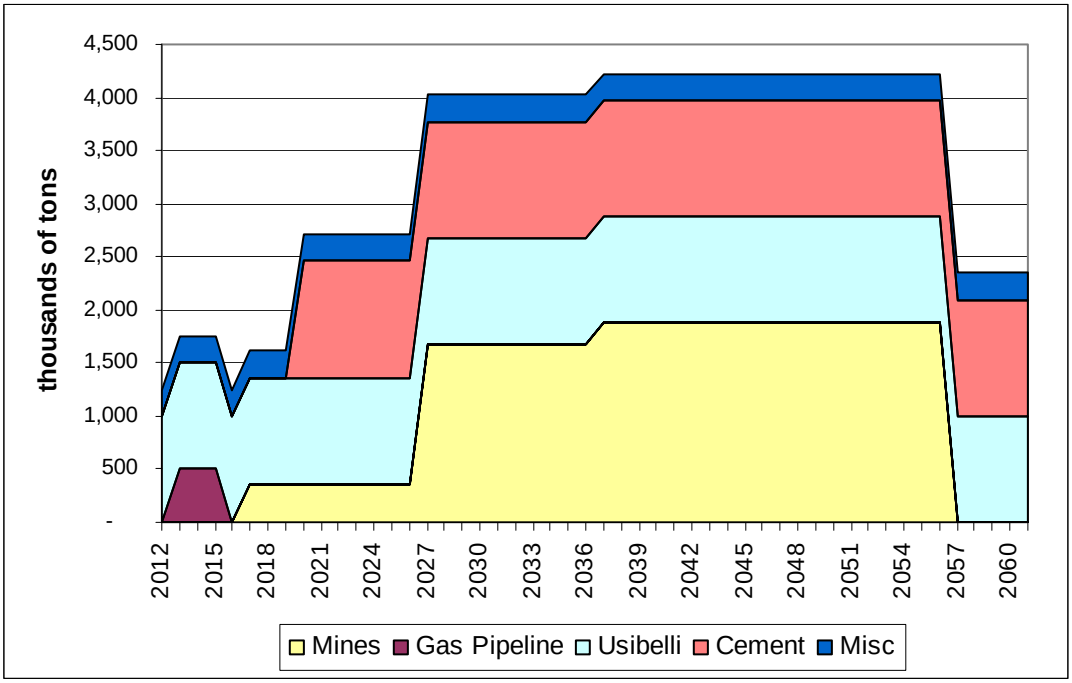
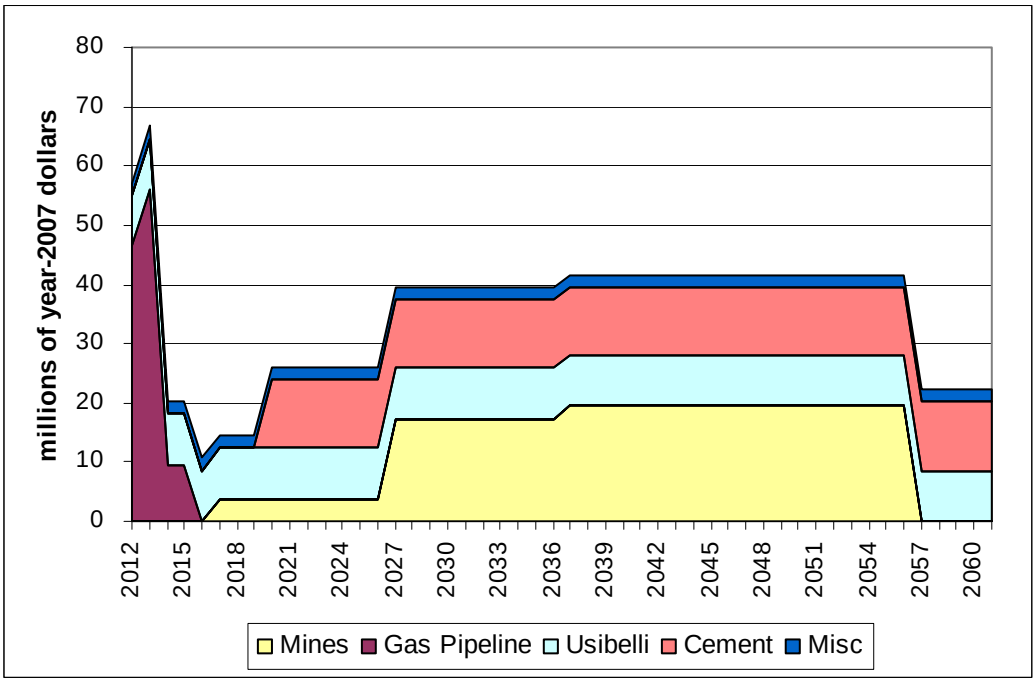


Figure 5. Annual avoided cost by rail user
(millions of year-2007 dollars)



note: The avoided costs shown here include $93 million avoided infrastructure investment during years 2012-2013 associated with gas pipeline construction support.

Benefit to cost ratio

We assume that the Port MacKenzie rail extension would cost $275 million to construct. This is a higher-end estimate for construction costs, which will vary based upon the rail route selected. The estimates cover a range from $200 million to $300 million for construction costs, depending on the route chosen. The time horizon runs 50 years from 2012 to 2061. O&M costs are assumed to be $1.5 million per year. In order to compare future benefits to up-front costs, we use a real (meaning, adjusted for inflation) discount rate of 5.0%. This rate is consistent with the average historical rate of return on the Alaska Permanent Fund portfolio. For the purpose of discounting, all construction occurs in year 2010 and this year is designated as the base year for discounting. Under these assumptions the net present value of all costs is $301.1 million. This total consists of $275 million for construction plus an additional $26.1 million of discounted O&M costs.

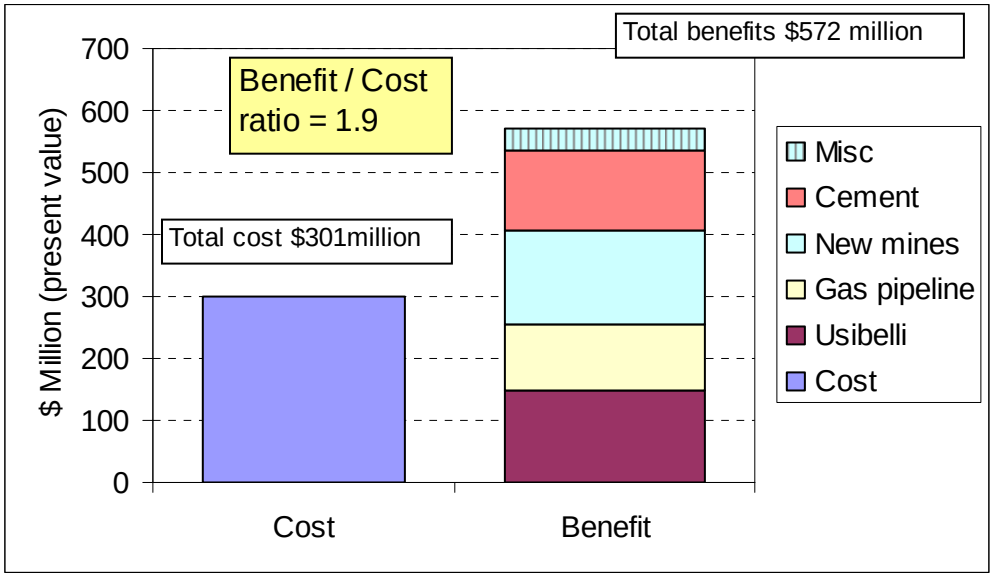
The total discounted value of benefits from reduced transportation costs, based on the analysis presented in the previous sections, is $572.3 million. As shown in Table 13, the benefit to cost ratio for the rail extension is 1.9 considering only reduced transportation costs.

Table 13. Summary of benefits from reduced transportation costs

	Tons per year	Years of operation		Benefits from reduced rail and port cost NPV at 5%	Notes
Usibelli Coal	1,000,000	2012 - 2061	$	148,711,175	
Gas pipeline materials	N/A	2013 - 2015	$	105,838,887	1
Ore from new mines	1,879,750	2017 - 2056	$	151,038,111	2
Cement plant	1,095,000	2020 - 2061	$	130,031,810	3
Misc commodities	250,000	2012 - 2061	$	36,694,410	4
Total benefits			**$**	**572,314,393**	
Construction cost			$	275,000,000	
O&M cost (NPV of $1.5 million/yr)			$	26,079,894	
Total cost			**$**	**301,079,894**	
Benefit / Cost ratio from transportation savings				**1.9**	

Figure 6. Benefits of Port MacKenzie rail extension from reduced transportation costs

(Present value @ 5.0%; does not include motorist time savings)



3. Fiscal Benefits to State of Alaska

In this section we estimate the direct fiscal benefits to the State of Alaska that are likely to occur. We have estimated four categories of significant benefits. These are: 1) additional corporate income taxes from the additional corporate income generated by lower transportation costs; 2) additional petroleum revenues due to a lower construction cost for the gas pipeline that

would be reflected in a lower pipeline tariff; 3) avoided infrastructure costs; and 4) additional mining license taxes, royalty revenue, and corporate income taxes from new mineral development. Items 1), 2) and 3) are a portion of the total benefits of $633.1 million from reduced transportation costs, as already computed above. Item 4) represents additional benefits not counted in the transportation cost savings.[21]

3.1 Corporate income taxes from reduced transportation costs

Since items such as coal, cement, and other bulk commodities are sold into competitive national or world markets, it is reasonable to assume that reduced rail transportation and/or reduced port costs would flow through into increased "netback value" and increased Alaska income for the resource developers. We assume that the State of Alaska collects 7% of this additional income as corporate income tax receipts. The 7% rate is lower than the statutory rate of 9.4% to allow for credits, deductions, and/or incomplete pass-through of lower transportation costs into taxable profits. Table 14 shows that the state would collect between about $1 million and $3 million of additional income taxes per year, with a discounted present value of $36.9 million. These collections are a part of -- and not in addition to -- the transportation cost savings of $573.2 million reported above.

Table 14. Additional State of Alaska corporate income tax revenue due to reduced rail transportation costs

	2012	2020	2030	2040	2060
Additional income from:					
New mines	-	3,768,009	17,332,842	19,405,247	-
Usibelli coal production	8,553,208	8,553,208	8,553,208	8,553,208	8,553,208
Cement production	-	11,577,777	11,577,777	11,577,777	11,577,777
Miscellaneous commodities	2,110,500	2,110,500	2,110,500	2,110,500	2,110,500
Total additional income	10,663,708	26,009,495	39,574,327	41,646,732	22,241,486
State of Alaska tax @7% (avg rate)	**746,460**	**1,820,665**	**2,770,203**	**2,915,271**	**1,556,904**
Net present value (2012-2061) @ 5%:	**32,653,285**				

3.2 Additional petroleum revenues from a lower gas pipeline tariff

As discussed above, the rail extension would avoid the need for $93 million of infrastructure improvements otherwise necessary to support pipeline construction. We assume

[21] We have netted out the corporate income taxes attributable to rail transportation savings from item 4) since they are already included in item 1).

that half of this $93 million cost of infrastructure improvements would need to be funded by private industry and would thus be an avoided cost that otherwise would get rolled into the capital cost of the pipeline. The rail extension would also generate about $28.5 million in reduced rail transportation costs to the gas pipeline builders. These reduced rail transportation costs would also result in a lower pipeline construction cost. Since the gas pipeline tariff will be determined by regulation and based on allowable capital costs, we assume that these construction cost savings will be reflected in a lower tariff. Using a conservatively low assumption of a 10% allowed rate of return, we estimate that total pipeline charges would be reduced by about $6.9 million due to construction cost savings.[22] These savings translate directly into increased wellhead value of North Slope gas. Assuming a total revenue "take" of 42% (17% royalty + 25% average tax rate), the State of Alaska would receive about $2.9 million per year in additional gas revenues with a present value of $33 million over the 30-year life of the pipeline as a result of lower pipeline construction costs. Table 15 summarizes these calculations. These revenues are a part of -- and not in addition to -- the total transportation cost savings of $572.3 million reported above.

Table 15. Additional State of Alaska petroleum revenue due to reduced gas pipeline construction cost

		2017	2020	2030	2040
Reduction in construction cost:	75,033,933				
Levelized annual reduction in pipeline charges, = increased wellhead value		6,859,745	6,859,745	6,859,745	6,859,745
Average State of Alaska "take" (royalty rate plus taxes)		42%	42%	42%	42%
Additional State of Alaska revenue		**2,881,093**	**2,881,093**	**2,881,093**	**2,881,093**
Net present value (2017-2046) @ 5%:	**33,049,476**				

3.3 Direct savings from avoided infrastructure costs

We assume that while private industry would otherwise pay for half of the required $93 million of infrastructure upgrades needed to support gas pipeline construction, the State of Alaska would pay the other half. Therefore, with the rail extension the state would directly avoid

[22] If a higher rate of return is assumed, both the annual savings from lower pipeline charges and the resulting additional gas revenues to the state would be higher.

$46.5 million of infrastructure costs. The discounted present value of this amount (discounted back to year 2010) is $41.2 million. These savings are a part of -- and not in addition to -- the total transportation cost savings of $572.3 million reported above.

3.4 Additional mining royalty and tax revenue from new mines

The State of Alaska collects mining license fees, royalties, and corporate income taxes from mines. Metz (2007b, 2008) produced detailed pro-forma financial projections for the three mines discussed above. These included projected revenues to the state. The average State of Alaska share of the gross metal value from these new mines is about 7 to 9 percent. With projected gross metal value increasing from $580 million to $5.7 billion, Metz projects annual revenues to the State of Alaska ranging from $42 million in 2017 to $602 million in 2037. The discounted present value of these projected revenues is $4.3 billion. However, it is important to remember that the discounted present value is low because these revenues would largely accrue after 2030. The undiscounted total is about $18 billion. These mining royalty and tax revenues are in addition to the transportation cost savings of $572.3 million reported above.

3.5 Fiscal benefits summary

Overall, we estimate that the State of Alaska would receive more than $111 million of taxes, royalties, and avoided costs even without attributing the existence of the new large mines to the rail extension. Revenue to the state from these mines is projected by Metz (2007b, 2008) to reach more than $1 billion per year (real dollars) by 2037. Including all of these revenues, the total benefits to the state have a present discounted value of $4.4 billion.

Table 16. Summary of direct fiscal benefits to State of Alaska (millions of year 2007 dollars, discounted to year 2010 at 5%)

Benefit type	$ million, NPV @ 5%	
1 Corporate income tax from reduced transport costs	32.7	
2 Oil and gas revenue from lower pipeline construction cost	33.0	
3 Avoided infrastructure cost	41.2	
subtotal excluding new mines:		***106.9***
4 Additional fees, royalties, and taxes from new mines	4,268.6	
total, including new mineral revenue:		***4,375.5***

4. Community and Regional Economic Impacts

In this section we briefly discuss the effects of the potential new economic activity that may be generated by the rail extension. Clearly, any additional economic activity will bring significant benefits in the form of jobs, income, and new business opportunities to Alaskans and others. For example, Metz (2007a) estimated that the three new large mines discussed above could generate up to $3 billion per year in additional economic activity in Railbelt communities. A world-scale cement plant would also generate many high-paying jobs with economic multiplier effects throughout the state.

Detailed quantification of these impacts is well beyond the scope of this analysis. However, the following points should be kept in mind. First, any broader benefits from increased resource development activity are *in addition* to the benefits already calculated above. Second, some of the impacts will be in the form of additional costs – for schools, public services, and possible changes to the quality of life. This caveat applies to all development and to all infrastructure projects; there is nothing special about the rail extension in this regard. Third, there is the problem of attribution: some projects might proceed without the rail extension while others may depend crucially upon its completion.

Finally, and perhaps most important, in the long-run Alaskans will benefit from an improved transportation system in ways that cannot be projected now. To take just one example of these possibilities, a technological change may dramatically reduce the cost of turning coal into liquid fuel. Alaska's vast coal reserves might then soar in export value, but only if the coal

or coal-to-liquids resources can be efficiently moved to market. Just as it is not possible even to look backward and tally up the total economic value of the *existing* Alaska railroad system, it will never be possible to say with certainty *exactly* how much development and prosperity can be traced to any single project. However, history does show that investment in efficient basic infrastructure is crucial for long-term economic progress.

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