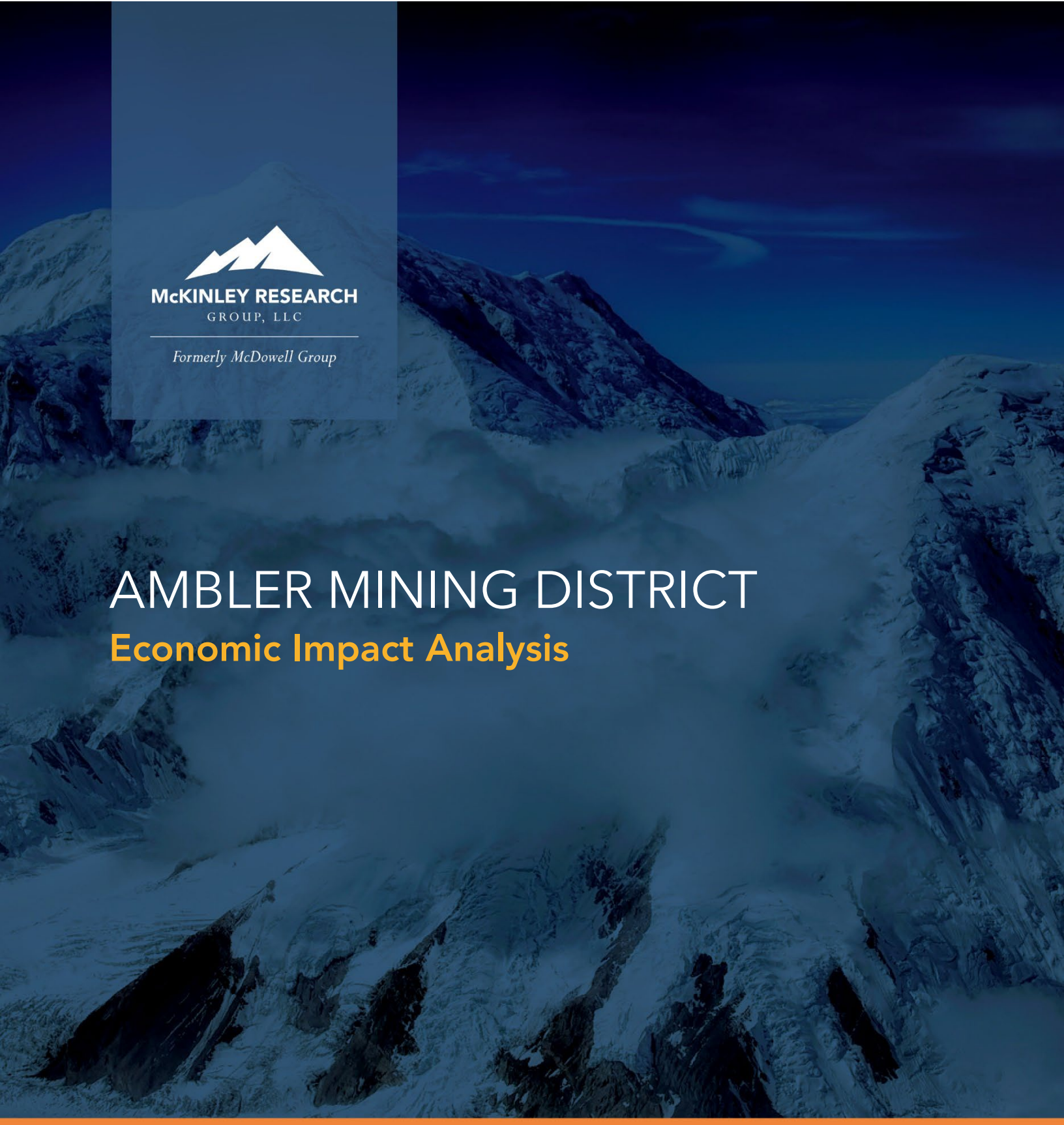

McKINLEY RESEARCH
GROUP, LLC

Formerly McDowell Group

AMBLER MINING DISTRICT

Economic Impact Analysis

November 2024

PREPARED FOR:

Ambler Metals LLC

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Executive Summary

Ambler Metals LLC (Ambler Metals) contracted with McKinley Research Group (MRG) to prepare an economic impact analysis related to development of the Arctic Project, the most advanced exploration project within the Ambler Mining District, including the impacts of establishing surface transportation access to the region. Economic impacts are presented at the statewide and regional levels. Potential cost-of-living savings to residents from the construction of a private access road are also estimated based on several possible spur road scenarios.

The Ambler Mining District, in Northwest Alaska, has been a site of mineral exploration for decades, with several current projects at various stages of exploration. Projects in the district face logistical and cost barriers, as the region is unconnected to the state's highway system, with only barge or air access to bring in fuel, freight, and passengers. This lack of surface transportation to the region creates high shipping and personal transportation costs, which significantly increase the region's cost of living.

Source: Trilogy Metals Inc.

To address these barriers to development and project feasibility, the State of Alaska evaluated a range of potential transportation corridors to establish access to the Ambler Mining District. Options include routes from tidewater on Norton Sound or Kotzebue Sound and routes from the Elliott and Dalton Highways. The evaluation led to the proposed Ambler Access Project, a 211-mile private controlled-access road to connect the region to the Dalton Highway. The road is intended to enhance access to the district and is required infrastructure for development of mining projects in the region. The Alaska Industrial Development and Export Authority (AIDEA), a public corporation of the State of Alaska, assumed a coordinating role on the Ambler Access Project (AAP) in 2013.

Following are the key economic benefits of Arctic Project development and establishing surface transportation access to the Ambler Mining District.

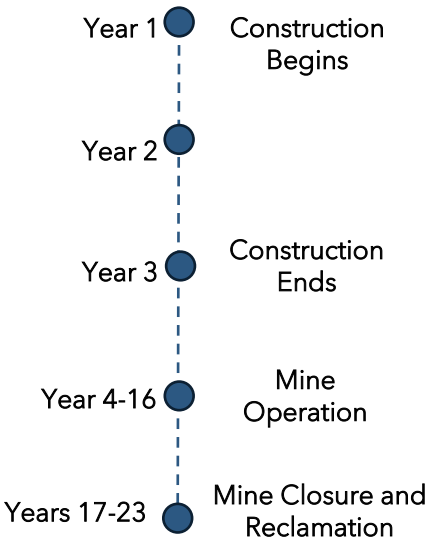
Arctic Mine Impacts

The following are expected economic impacts related to development and operation of the Arctic Project in the Ambler Mining District.[1] Establishing surface transportation access from Alaska's highway system to the Ambler Mining District would be required prior to permitting and construction of the mine.

Mine Construction Impacts

The total capital costs of Arctic Mine construction, an estimated $1.2 billion, are expected to be spread across a three-year construction period.

- The mine construction project is expected to directly support an annual average of 500 workers over the three-year period, with a peak workforce of 650 workers. Workers are expected to earn a cumulative $160 million in wages over the mine construction phase.
- Including all direct, indirect, and induced impacts, Arctic Mine construction is expected to support an average of 750 workers each year over the three-year period, supporting a cumulative $220 million in wages.



Mine Operation Impacts

- The mine will directly create 430 jobs and pay a total of $60.2 million in annual wages over its 13-year life. This includes employees hired by Ambler Metals and on-site contractors.
- Arctic Mine plans to offer preferential hiring for NANA Regional Corporation, Inc. (NANA) shareholders. Based on shareholder employment at Red Dog Mine (about 53% in 2023), the Arctic Mine is expected to employ about 230 NANA shareholders annually.
- The mine expects to spend about $330 million annually on goods and services in support of operations, including expenditures for concentrate transportation, fuel and other consumables, camp services, and equipment parts and maintenance.
- The State of Alaska levies various taxes and fees on mining activity, including Mining License, Corporate Net Income, and fuel taxes. Arctic Mine production is expected to result in $31.3 million in state taxes and fees in each year of production.

[1] Based on data as presented in *Arctic Project NI 43-101 Technical Report and Feasibility Study*, Trilogy Metals, Inc., January 20, 2023.

- Ambler Metals expects to negotiate a payment in lieu of tax (PILT) agreement with the Northwest Arctic Borough (NWAB), with annual payments beginning with mine operations. After several iterations of the PILT agreement and 30 years of operations, the current Borough Red Dog Mine PILT provides about $26.8 million in revenue, representing about 80% of total Borough revenue.
- Ambler Metals and NANA have an existing agreement which provides for NANA to receive a 1% net smelter royalty (NSR) in exchange for surface use of NANA-owned land. NSR payments are expected to total $85.7 million over the 13-year mine life.
- NANA will have the opportunity to acquire a 16%-25% interest in the Arctic Mine or may elect to receive an annual 15% net proceeds royalty. Total revenue generated by Arctic Mine accruing to NANA would depend upon the corporation's decision to acquire interest in the project. For example, a 15% net proceeds royalty is expected to vary between $40 million and $57 million each year between mine operating years 3 and 13, based on long-term metal price assumptions used in the Arctic Feasibility Study and current commodity prices. Over the 13-year mine operating life, 15% net proceed royalty payments are expected to total between $400 million and $570 million.
- Including all direct, indirect, and induced employment, mine operations are expected to create 870 jobs and $89.8 million in wages in Alaska over the mine life.

Arctic Mine Statewide Economic Impacts

Statewide Economic Impacts	Direct	Indirect & Induced	Total
Construction Phase Impacts			
Employment (average annual)	500	250	750
Wages ($millions average annual)	$54.0	$20.0	$74.0
Cumulative Wages ($millions)	$160.0	$60.0	$220.0
Operations Phase Impacts			
Employment (average annual)	430	440	870
Wages ($millions average annual)	$60.2	$29.6	$89.8

Source: Ambler Metals and McKinley Research Group estimates

Resident Employment and Wages

For both the construction and operations phases, the size of the local labor force will be a limiting factor in the rate of resident hire at the Arctic Mine.

- An estimated 25% of construction and operations phase jobs will be held by regional residents, based on current rates of resident employment in the regional construction industry and at Red Dog Mine.
- Regional residents are expected to represent 120 of the 500 direct construction-phase employees, and 110 of 430 direct operations-phase jobs.
- Due to limited goods and services procurement within the NWAB, the multiplier impacts of mine construction and operations will be lower within the region compared to statewide

impacts. Nevertheless, residents employed at the Arctic Mine will support additional employment in their communities as they spend their wages locally.

- Including all direct, indirect, and induced impacts, Arctic Mine construction is expected to support an annual average of 160 regional jobs and a cumulative $50.0 million in total wages. Mine operations are expected to support 160 jobs and $20.0 million in annual wages within the NWAB over the 13-year life of the mine.

Arctic Mine Northwest Alaska Region Economic Impacts

Regional Economic Impacts	Direct	Indirect & Induced	Total
Construction Phase Impacts			
Employment	120	40	160
Cumulative Wages ($millions)	$40.0	$10.0	$50.0
Operations Phase Impacts			
Employment	110	50	160
Wages ($millions average annual)	$15.1	$4.9	$20.0

Source: Ambler Metals and McKinley Research Group estimates

While this study focuses on the potential economic impact of a single mining operation, as a world-class mining belt, the Ambler Mining District has the potential for multiple mine development projects with additional economic impacts. Construction of an access road to the region would significantly reduce freight transportation costs in the region and reduce logistics requirements to move materials to the Northwest Arctic. Once complete, such surface transportation infrastructure has potential to stimulate additional minerals exploration in the region due to the reduction of transportation costs.

Transportation Costs and Resident Cost-of-living Impacts

The proposed Ambler Access Project route would provide the first road connection from the Dalton Highway to the Northwest Arctic region and would be nearest to nine communities: Alatna, Allakaket, Ambler, Bettles, Evansville, Hughes, Huslia, Kobuk, and Shungnak.

Current freight transportation to these communities is expensive due to the lack of road access and long supply chain required for goods to reach these villages. Bettles and Evansville have seasonal winter trail access to the Dalton Highway, reducing transportation costs. Hughes and Huslia are considerably further from the proposed access route and are not included in this report's analysis of potential cost-of-living impacts.

	Distance from Ambler Access Route	Population
Upper Kobuk Communities		
Ambler	22 miles	256
Kobuk	9 miles	169
Shungnak	15 miles	251
Koyukuk Communities		
Alatna	35 miles	10
Allakaket	34 miles	170
Bettles	8 miles	22
Evansville	8 miles	12
Hughes	68 miles	78
Huslia	92 miles	313

If surface transportation access were established, Arctic Mine development would require construction of a permanent road from the Ambler Access Project road to the Dahl Creek Airstrip. This access route would establish a permanent road connection between the Ambler Access Project and the community of Kobuk. Ambler Access Project construction and spur roads leading directly to Kobuk and nearby communities can potentially reduce transportation costs, and therefore cost of living, for residents, school districts, businesses, and construction companies in the region.

This study estimates the potential transportation cost savings that could result if the Ambler Access Project road were constructed under several spur road scenarios, as described below. Decisions on spur road connections would require agreement between each village and the right-of-way land owners. The scenarios below are hypothetical and intended to demonstrate the magnitude of cost savings to village residents and businesses.

Scenario 1 – No Spur Construction: Arctic Mine development will require construction of a permanent road from the Ambler Access Project road to the Dahl Creek airstrip, providing year-round access to Kobuk. Under this scenario, no additional spur roads would directly connect the Ambler Access Project road to regional villages. Freight such as groceries, consumer goods, and building materials destined for village consumers outside of Kobuk would not be transported via the access road. In this scenario, annual transportation cost savings of $432,396 would result from fuel, food, and other materials transported to Kobuk via surface transportation access.

Scenario 2 – Winter Trail Road Spur Construction: If winter trail roads were constructed between the Ambler Access Project road and regional villages, freight and fuel could be transported to the communities via truck in three to four months of each year, replacing expensive air delivery. If a winter trail were constructed from the Ambler Access Project road to each community, truck transportation during access months could save the five communities included in this study an annual combined $2.49 million. This cost savings relies heavily on the assumption that many communities in the region have sufficient fuel storage capacity to appropriately time fuel purchases to take advantage of the winter trail connection.

Scenario 3 – Year-Round Gravel Spur Construction: Year-round gravel spur road construction to the regional villages would allow nearly all freight and fuel to be transported via truck, replacing the highest portion of expensive air and barge freight. This scenario has the highest potential to reduce regional residents' cost of living. Construction of a gravel spur road from the Ambler Access Project road to each of the five communities included in this study would result in the highest combined transportation cost savings, an estimated $3.44 million per year.

Transporting fuel, food, and other goods from Fairbanks to the study-area communities via the Ambler Access Project road would result in different cost savings based on various spur road connections to the villages. The table below describes the estimated cost savings to residents and businesses of Alatna, Allakaket, Ambler, Kobuk, and Shungnak based on spur road scenario.

Estimated Annual Transportation Cost Savings Via Ambler Access Project Road Connection

	Scenario 1 – No Spur	Scenario 2 – Winter Trail Road Spur	Scenario 3 – Gravel Spur
Fuel-Related Cost Savings	$103,163	$1,644,396	$1,999,608
Upper Kobuk Communities	$103,163	$1,508,620	$1,588,166
Koyukuk Communities	$0	$135,776	$411,442
Food-Related Cost Savings	$63,450	$140,170	$293,610
Upper Kobuk Communities	$63,450	$127,558	$255,775
Koyukuk Communities	$0	$12,612	$37,835
Other Goods-Related Cost Savings	$265,783	$704,587	$1,143,391
Upper Kobuk Communities	$265,783	$529,866	$793,948
Koyukuk Communities	$0	$174,722	$349,443
Total Cost Savings	$432,396	$2,489,153	$3,436,610
Upper Kobuk Communities	$432,396	$2,166,044	$2,637,890
Koyukuk Communities	$0	$323,109	$798,720

Source: McKinley Research Group estimates
Note: Upper Kobuk communities include Ambler, Kobuk, and Shungnak; Koyukuk communities include Alatna and Allakaket.

Household Savings

High transportation costs have a significant impact on families in this region.

- **Heating oil** is an essential commodity for regional households who rely on fuel to heat their homes. Transportation costs currently add an estimated $3.89 per gallon on top of highly variable fuel prices. Spur road construction could cut this transportation cost to an estimated $1.15 per gallon, a 70% savings.
- Although Alaska Bypass offers a low, subsidized air freight rate, costs are still above trucking estimates and many communities do not order **produce** due to shipping times. Costs could be reduced by about half if truck transportation were available, and communities could benefit from a wider range of temperature-sensitive options.
- Consumer goods that are not eligible for the Alaska Bypass program can be prohibitively expensive for households in the region. As an example, vehicles such as **ATVs and snowmachines** often provide basic in-region transportation and can be vital to subsistence practices. Shipping an ATV or snowmachine from Kotzebue to Kobuk currently costs about $1,250. If a spur road were constructed, truck transportation of an ATV from Fairbanks to Kobuk could cost about $175-$200 if the truck was at maximum capacity, a savings of about $1,000. While ATVs or snowmachines sourced from Fairbanks may be somewhat higher-priced compared to Anchorage, this represents more than 80% in cost savings on transportation.
- Transportation of **building materials and equipment** to unroaded communities in this region adds considerable expense to the cost of building a new home or other community infrastructure. Establishing surface transportation access to this region is likely to significantly impact affordability of housing in the region. For example, transporting building materials to Shungnak currently adds about $420,000 to the cost of building a single-family home. If a spur road were constructed, truck transportation of these materials from Fairbanks to Shungnak would reduce total material transportation costs by an estimated $287,000, a nearly 40% reduction in home construction costs.

Introduction and Methodology

Ambler Metals LLC contracted with McKinley Research Group to prepare an economic impact analysis related to development of the Arctic Project, the most advanced exploration project within the Ambler Mining District, including potential cost-of-living impacts of establishing surface transportation access to the District.

The Ambler Mining District in Northwest Alaska has been a site of mineral exploration activity for decades. The Trilogy Metals explorations team has been conducting exploration in this region since 2004. In early 2020, Trilogy Metals partnered with South32 Limited to form Ambler Metals, a joint venture owned equally by Trilogy Metals and South32, to continue advancing the Upper Kobuk Minerals Projects towards mine production. Exploration work has identified high-grade copper resources, and Trilogy Metals recently published an updated feasibility study for the Arctic Project, the most advanced of the Upper Kobuk Minerals Projects.

This region is unconnected to Alaska's highway system, and barge or air access are used to bring in fuel, freight, and passengers. The State of Alaska evaluated a range of potential transportation corridors to establish access to the Ambler Mining District, including routes from tidewater on Norton Sound or Kotzebue Sound and routes from the Elliott and Dalton Highways. The preferred route was a 211-mile road connecting to the Dalton Highway. AIDEA assumed a coordinating role on the Ambler Access Project in 2013.

Surface transportation access to the region could be developed under various operation models. One such model is the Delong Mountain Transportation System (DMTS), which supports transportation of fuel and materials to, and ore from, the Red Dog Mine. This system is described further in Chapter 4 of this report.

The regional economic and cost-of-living impacts estimated in this study are based on a set of communities without current road access in closest proximity to the Ambler Access Project road route and Arctic Project. Communities considered in this study include:

- Upper Kobuk River communities of Ambler, Kobuk, and Shungnak.
- Koyukuk River communities of Alatna and Allakaket.

Other communities in this region are not included in this impact analysis due to current seasonal road access (Bettles/Evansville) or relative distance from the proposed route (Hughes/Huslia). Cost-of-living estimates may be estimated for these communities in future phases of study.

This study is intended to inform stakeholders about the regional and statewide economic benefits associated with development of the Arctic Mine and related surface transportation access to the Ambler Mining District. This study considers how the development of specific

mining activity and road access might benefit the region by providing employment opportunities to local residents, and by reducing the cost of fuel and freight transportation.

Methods and Sources

Estimates of the direct mine construction and operations-phase spending and labor requirements in this report are based on the *Arctic Project Technical Report and Feasibility Study* prepared for Trilogy Metals by Ausenco Engineering Canada, published in February 2023. Ambler Metals also provided information about the workforce employed in its exploration program in the Ambler region for use in this study.

The Red Dog Mine provides an important model for understanding the potential economic impacts of mine development in this study region. All data in this report has been accessed via publicly available reports and materials published by NANA, NWAB, or Teck Resources Limited.

Other data sources related to road or mine economic impacts include the Alaska departments of Commerce, Community, and Economic Development, and Labor and Workforce Development. U.S. Bureau of Economic Analysis data was also accessed to inform regional and community socioeconomic characteristics. Electricity rates and fuel consumption data used in this report are based on Alaska Energy Authority Power Cost Utilization annual reports.

Multiplier Effects

This study estimates the indirect and induced employment and wage impacts of Arctic Mine construction and operations spending. Collectively, these impacts are often referred to as "multiplier effects." McKinley Research Group uses IMPLAN, an industry-standard economic impact modeling tool, to estimate multiplier effects. Estimates are based on IMPLAN data set year 2022 and are specific to the NWAB and Alaska.

Regional Economic Impacts

In addition to economic impacts to Alaska, this study estimates regional economic impacts of Arctic Mine construction and operation. These regional economic impacts are specific to jobs and wages held by residents of the eleven communities within the NWAB.

Cost-of-Living Impacts

This report estimates potential cost-of-living impacts that could occur due to development of a main surface connection to Alaska's highway system and spur road development. Current pricing and transportation used to transport fuel and other goods to study-area communities was informed by interviews conducted with local retailers and other organizations. These include the following:

- Alaska Native Industries Cooperative Association
- City of Allakaket
- City of Ambler
- City of Kobuk
- Denaak'e Kookaayayh/Allakaket Village
- H&A Store (Kobuk)
- NANA Management Services
- Northwest Arctic Borough School District
- Poppas Store (Kobuk)
- Shungnak Native Store/Native Village of Shungnak (Shungnak)
- Yukon-Koyukuk School District

Estimates of current transportation costs and potential future costs under several road scenarios were also informed by interviews with the following organizations:

- Alaska Power & Telephone
- Bering Air
- Carlile Transportation
- Crowley Fuels
- Everts Air
- Lynden Transport
- Riverside Hotel (Eagle)
- Wright Air Service

This report estimates transportation cost savings under several spur road scenarios. This analysis assumes that the 211-mile road corridor would operate as a private, controlled-access road open only to authorized, industrial traffic.

This analysis does not assume any financing structure or permitting process related to construction of spur roads. Decisions on spur road connections would require agreement between each village and the right-of-way land owners. The scenarios analyzed in this study are hypothetical and intended to demonstrate the magnitude of cost savings to village residents and businesses. Transportation cost saving estimates are all based on an assumption that a surface transportation provider would offer fuel and/or freight service to the study-area communities if a road were constructed.

Report Organization

The remainder of this report is organized as follows:

- **Chapter 1** includes an overview of the Ambler Mining District, the destination of the Ambler Access Project road and location of the Arctic Project.
- **Chapter 2** provides an overview of regional and community socioeconomic characteristics in the study area, including information about residents, business activity, and government structures.
- **Chapter 3** estimates the potential economic impacts of Arctic Mine construction and operation.
- **Chapter 4** describes the Ambler Access Project, which enables mine development and cost-of-living benefits to residents.
- **Chapter 5** estimates the potential cost-of-living impacts to residents connected to Alaska's highway system if surface transportation were established under various spur road scenarios.

Chapter 1. Ambler Mining District

Ambler Mining District Resources

The Ambler Mineral Belt is a 75 mile-long copper-zinc zone of mineralization within the Ambler Mining District in Northwest Alaska. The zone also has deposits of cobalt, lead, gold, and silver. The district has been the site of mineral exploration activity since the 1950s. Several projects within the Ambler Mining District are in various stages of development. These include Ambler Metals' Upper Kobuk Mineral Projects, which include the Arctic and Bornite projects described in more detail below.

Source: Trilogy Metals Inc.

Upper Kobuk Mineral Projects

The Upper Kobuk Mineral Projects encompass about 448,217 acres of land within the Ambler Mining District, including state, federal patented, and NANA lands. The Upper Kobuk Mineral Projects are owned by Ambler Metals LLC, a 50/50 joint venture between Trilogy Metals Inc. (Trilogy Metals) and South32 Limited (South32).

In 2011, Trilogy Metals entered into an Exploration Agreement and Option to Lease with NANA related to lands in the Ambler Mining District. This agreement states that NANA will grant Trilogy Metals exclusive right to explore the Bornite Lands and to construct temporary access roads, camps, airstrips, and other incidental works to support exploration.[2] The agreement also grants NANA opportunity to acquire 16% to 25% of mining projects on lands subject to the agreement. Alternatively, the agreement grants NANA opportunity to not exercise the back-in-right provision and instead receive a 15% net proceeds royalty. Further, the agreement outlines potential mining lease provisions that would grant NANA net smelter royalties of 1% to 2.5% based on land ownership.[3]

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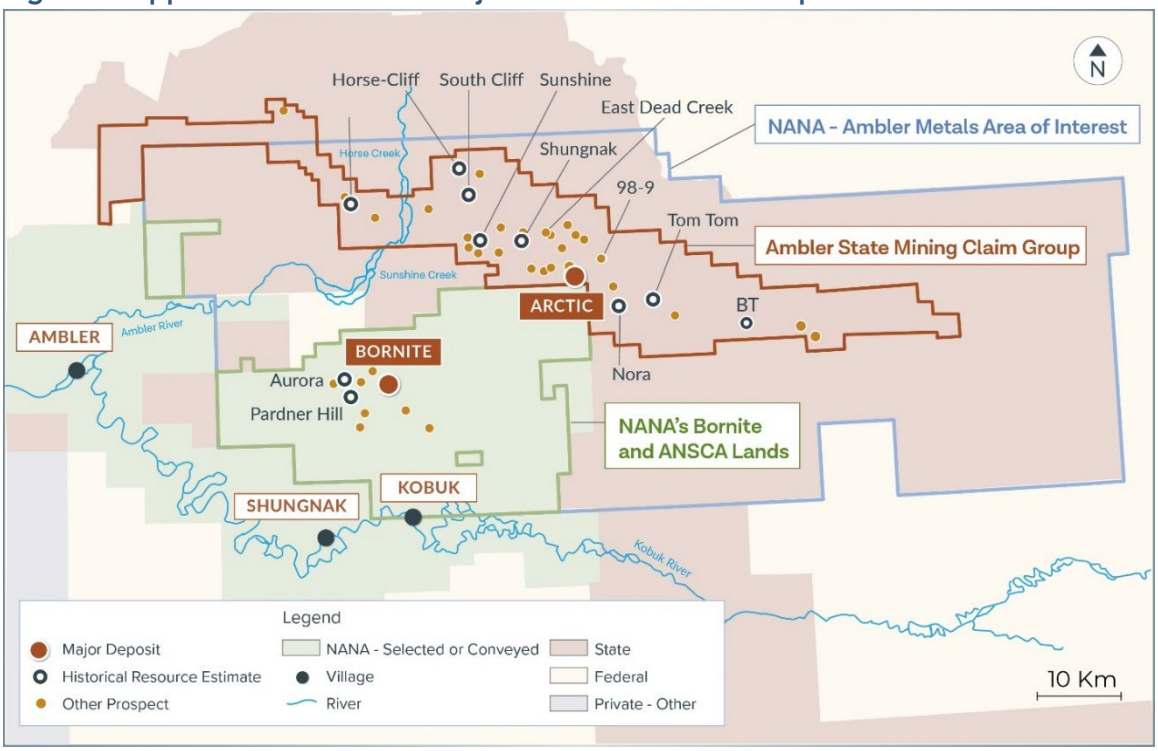
[2] Trilogy Metals. *NI 43-101 Technical Report Mineral Resource Update of the Bornite Project, Northwest Alaska, USA*. January 26, 2023.
[3] Trilogy Metals. *NI 43-101 Technical Report Mineral Resource Update of the Bornite Project, Northwest Alaska, USA*. January 26, 2023.

The two most advanced projects within the Upper Kobuk Mineral Projects are the Arctic and Bornite projects, described in more detail below.

Figure 1. Upper Kobuk Minerals Projects and Land Ownership



Source: Trilogy Metals Inc.

ARCTIC DEPOSIT

The Arctic Project has a Probable Mineral Reserve classification of 46.7 million tonnes at a grade of 2.11% copper, 2.90% zinc, 0.56% lead, 31.83 grams/tonne silver, and 0.42 grams/tonne gold. Trilogy Metal's Arctic Mine Feasibility Study, completed in February 2023, is based on an open-pit mine and mill processing 10,000 tonnes of ore per day over a 13-year mine life. Assuming long-term metal prices of $3.65/pound of copper, $1.15/pound of zinc, $1.00/pound of lead, $21.00/ounce of silver, and $1,650/ounce of gold, the study finds the project could be economically feasible.

Development of the Arctic Project is expected to require $1.2 billion in initial capital investment. This initial investment does not include the cost of developing surface transportation from Alaska's highway system to the region such as the Ambler Access Project, described below.

Additional infrastructure developed for the Arctic Project would include an open pit mine, workshops and warehouses, processing plant and facilities, camp facilities, and others. Mine development plans require construction of private transportation infrastructure including minor

access roads connecting the Arctic Mine to the airstrip and Ambler Access Project and upgrade of the Dahl Creek airstrip.

Electric power would be generated on-site by five diesel generators. Diesel fuel storage capacity would be provided by 12 30,000-gallon tanks. Diesel fuel and other materials required for mining are expected to be trucked to the mine site via the Ambler Access Project. The economic impact estimates in this study are based on diesel-fueled electricity generation occurring at the mine site. However, opportunity exists for alternative energy sources to supplement mine energy requirements. Mine telecommunications are expected to use a satellite connection with stations located at several points across the project footprint. Radio communications will be used for communications within the site.

A feasibility study has been completed for the Arctic Project. Details about employment associated with mine construction and operations are provided in Chapter 3 of this report.

BORNITE DEPOSIT

Ambler Metals is also exploring and assessing the copper-cobalt Bornite deposit about 15 miles southwest of the Arctic Project. The deposit contains about 6.5 billion pounds of copper at grades ranging from 1.15% to 3.48%.[4]

The Bornite Project is on lands owned by NANA, and, if developed, NANA would receive a 2%-2.5% annual net smelter royalty and either a 15% net proceed royalty or an equity stake of 16%-25% based on the corporation's election to exercise the back-in-right provision regarding development of the Upper Kobuk Mineral Projects, as described above. The Bornite Project is accessible by air via three gravel airstrips in the project area; a 16-mile gravel road connects the project's field camp to the village of Kobuk. The site has an existing 85-person camp.

[4] Trilogy Metals. *NI 43-101 Technical Report Mineral Resource Update of the Bornite Project, Northwest Alaska, USA*. Effective date January 20, 2023; Release date February 2023.

History of Mining in Northwest Alaska

Operated by Teck Alaska, the Red Dog Mine is the only producing mine in the NWAB. Red Dog is an open-pit zinc and lead mine 90 miles north of Kotzebue and 55 miles from the Chukchi Sea. The mine is on land owned by NANA, an Alaska Native corporation that earns royalty revenue based on mine production.

Construction of the mine began in 1986 following decades of exploration and predevelopment work. Production began in December 1989. Mine development required construction of a port and 46-mile access road from the mine to the port site on the Chukchi Sea. Construction of this transportation infrastructure was financed by AIDEA. Red Dog pays road and port user fees to repay the initial cost of capital and interest.

Mining and processing occur on site year-round. Concentrate produced at the mine and processing facilities are shipped from the port to facilities in British Columbia, Canada, and customers in Asia and Europe between July and October. Concentrate is stored on site between November and June when Arctic conditions preclude access to the port.

Borough Government Funding

The NWAB was incorporated in 1986, coinciding with construction of the Red Dog Mine. The Borough does not levy property tax. Rather, Teck Alaska has an agreement to make payments in lieu of taxes (PILT). The initial PILT agreement was made in 1987. PILT agreements negotiated between 1987 and 2010 often included payments made directly to the Northwest Arctic Borough School District.

The current 10-year PILT agreement became effective in January 2016. The current PILT level is calculated based on the net book value of mine lands, buildings, and equipment. The agreement includes a second payment based on mine profitability, which is paid into the Village Improvement Fund (VIF), a fund supporting capital projects and service improvements across villages within the borough.

Between 1990 and initial PILT renegotiation in 1996, PILT payments made to the NWAB averaged about $1.9 million.[5] In FY2023, $26.8 million in PILT revenue was received by the NWAB, representing about 80% of total Borough revenue. An additional $8.0 million was paid into the VIF in FY2023.

[5] *Analysis of Red Dog Mine Payments to Local Government and Contributions to the NWAB Economy*. McDowell Group, prepared for Teck Alaska, Inc. September 2015.

Resident Employment

Mining is the largest private-sector industry in the Northwest Arctic Borough in terms of employment. In 2022, an annual average of 930 workers were employed by mining companies in the region.[6] The Red Dog Mine accounts for the majority of this employment, and in 2022 Alaska resident workers represented about 75% of all workers directly employed at the mine. Resident hire at the Red Dog Mine includes about 25% of employees who live in one of the eleven communities in the Northwest Arctic Borough.[7]

ANCSA Revenue Sharing

The Red Dog Mine is operated on land owned by NANA, one of Alaska's 12 Alaska Native Claims Settlement Act (ANCSA) regional corporations. ANCSA was enacted federally in 1971 to resolve Alaska Native land claims across Alaska. ANCSA corporations are for-profit companies owned by Alaska Native shareholders.

ANCSA includes revenue sharing provisions – known as Sections 7(i) and 7(j). These provisions mandate that revenue generated by each regional corporation from natural resources held in subsurface estate must be distributed among 12 regional corporations annually, with the regional corporations in turn distributing revenue to ANCSA village corporations in their region. In FY2022, NANA distributed $263.6 million in 7(i) payments to ANCSA regional corporations based on royalties earned from ownership in Red Dog Mine.[8] NANA's revenue-sharing payments based on Red Dog Mine royalty revenue represent the largest proportion of total ANCSA corporation revenue sharing and are distributed statewide.

NANA Shareholder Hire

The Red Dog Mine operating agreement between Teck and NANA, originally signed in 1982, included explicit goals related to the percentage of Red Dog workers who are NANA corporate shareholders. In 2023, Red Dog Mine directly employed 980 shareholders, spouses, or descendants at some point in the year, including 618 working directly for Teck and another 362 employed by NANA companies working at the mine.[9] These shareholders earned $62.8 million in wages in 2023. NANA shareholders, spouses, and descendants include those living in the Northwest Arctic Borough, elsewhere in Alaska, or outside the state.

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[6] Alaska Department of Labor and Workforce Development
[7] Personal communications with NANA Regional Corporation.
[8] NANA Annual Report 2022.
[9] NANA Regional Corporation, *2023 Annual Report*. Shareholder hire numbers include any shareholder who worked at Red Dog or a NANA-owned contractor working at the mine at any point throughout the year not adjusted for turnover.

Shareholder employment at Red Dog varies seasonally along with employment at the mine. In winter 2023, NANA shareholders represented 53% of average monthly mine employment, increasing to 60% during the summer shipping season.[10]

[10] Personal communications with NANA Regional Corporation.

Chapter 2. Regional and Community Socioeconomic Conditions

This chapter summarizes socioeconomic conditions in the region and communities in closest proximity to the proposed Ambler Access Project road and the Ambler Mining District projects. Communities in the study area include:

- Upper Kobuk River communities of Ambler, Kobuk, and Shungnak.
- Koyukuk River communities of Alatna and Allakaket.

Ambler, Kobuk, and Shungnak are closest to the Arctic and Bornite Projects. All three communities are within the NWAB and within the NANA region. The communities of Alatna and Allakaket are within the Yukon-Koyukuk Census Area (YKCA). These villages are represented by the ANCSA village corporation K'oyitl'ots'ina.

Other communities farther from the mine projects and proposed access road may be impacted by mine and road development through revenue paid to the borough government, employment opportunities, or added transportation access to the region. These include the communities of Bettles and Evansville (currently connected to the Dalton Highway through a seasonal winter trail road), Hughes, and Huslia. While not included in this study, the expected impacts of road and mine construction on Hughes and Huslia will be studied in the next phase of this research.

The study-area communities are remote, rural communities with no roads connecting them to the rest of the state. Small planes, boats, snowmachines and four-wheelers are the primary means of transportation in and around the area. When conditions allow, temporary winter trails connect Kobuk and Shungnak.

Low population and school enrollment numbers persist in the region. The majority of area residents are Alaska Native, and more than half are working age. Residents of the region rely largely on diesel-generated electricity and fuel oil to heat their homes. Almost all households engage in subsistence hunting, fishing, and foraging activities. The region has a mixed subsistence and cash economy.

Population and Demographics

In 2022, the study region had a population of 856 residents. Ambler and Shungnak were the most populated villages in the region, both with about 250 residents, and Alatna the least with just 10 residents. Since 2013, the study area's total population has decreased from 951 to 856 residents (-10%).

Table 1. Population by Community, 2013-2022

Community	2013	2022	2013-2022 Change	2013-2022 % Change
Upper Kobuk Communities				
Ambler	272	256	-16	-6%
Kobuk	171	169	-2	-1%
Shungnak	300	251	-49	-16%
Koyukuk Communities				
Alatna	24	10	-14	-58%
Allakaket	184	170	-14	-8%
Study Region Total	**951**	**856**	**-95**	**-10%**
Alaska	*737,708*	*736,556*	*-1,152*	*-0.2%*

Source: Alaska Department of Labor and Workforce Development

Population Change

Since 2013, the population in the larger borough and census areas has declined and at a higher rate than at the state level. Negative net migration (more people moving out of than into the borough) has driven the 8% population decline in NWAB. The outflow of residents has been tempered by a relatively high number of births (about 1,400). In the past decade, the YKCA population has declined by 10%, driven by a relatively high number of deaths compared to births. The state's population has declined by less than 1% since 2013.

Table 2. Population Change by Borough/Census Area, 2013-2022

	Northwest Arctic Borough	Yukon-Koyukuk Census Area	Alaska
2013 Population	**7,944**	**5,731**	**737,708**
Births	1,452	692	93,580
Deaths	533	531	42,711
Net Migration	-1,517	-742	-52,021
2022 Population	**7,346**	**5,150**	**736,556**
2013-2022 Change	*-598 (-8%)*	*-581 (-10%)*	*-1,152 (-0.2%)*

Source: Alaska Department of Labor and Workforce Development

By 2050, the Alaska Department of Labor and Workforce Development projects a slight increase in the NWAB population (+1%) and a continued decline in the YKCA population (-21%). The state is projected to see a 3% increase by 2050.

Table 3. Projected Population Change by Borough/Census Area, 2022-2050

Year	Northwest Arctic Borough	Yukon-Koyukuk Census Area	Alaska
2022	7,346	5,150	736,556
2025	7,632	4,976	740,369
2030	7,569	4,766	749,942
2035	7,509	4,563	755,972
2040	7,461	4,379	759,191
2045	7,436	4,215	759,917
2050	7,428	4,093	759,111
Projected Change 2022-2050	**+82**	**-1,057**	**+22,555**
Projected % Change 2022-2050	***+1%***	***-21%***	***+3%***

Source: Alaska Department of Labor and Workforce Development

Demographics

The working age population (age 18-64) made up more than half of the study region's population in 2022, and the Elder population (65+) made up just 10%. Comparatively, 63% of the state's population was working age and 13% was 65+. Children (under 18) made up more than one-third of the study region's population compared to one-quarter statewide.

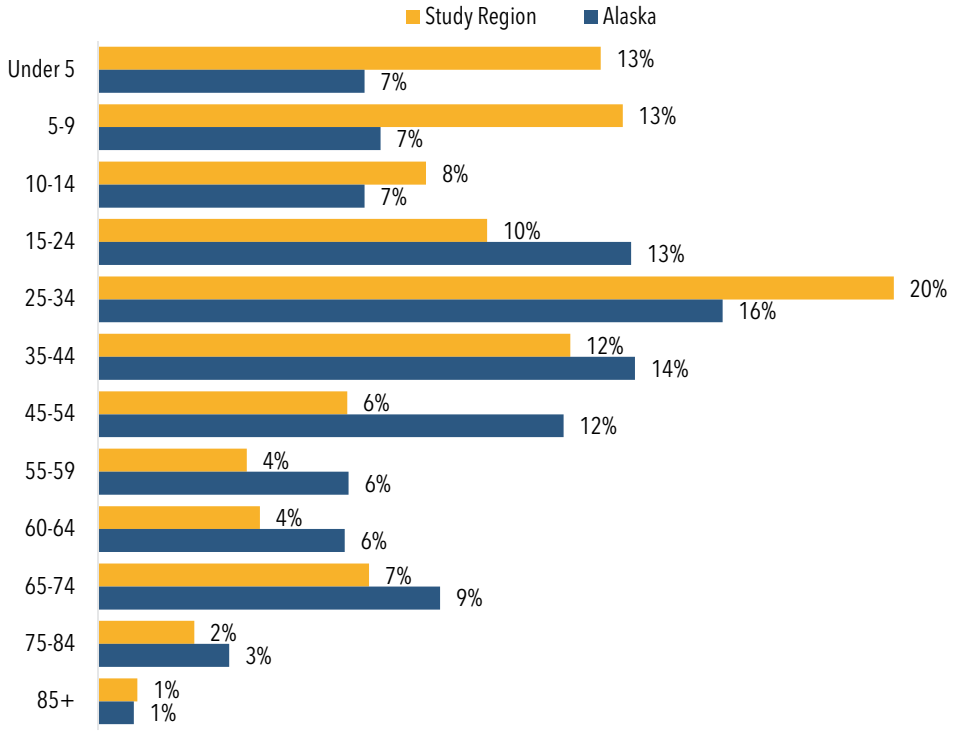
Table 4. Age Distribution by Community, 2018-2022 Five-Year Estimates

Community	Children Population (Below Age 18)	Working-Age Population (Ages 18-64)	Elder Population (Aged 65 and Above)
Upper Kobuk Communities			
Ambler	29%	52%	19%
Kobuk	50%	45%	5%
Shungnak	38%	54%	9%
Koyukuk Communities			
Alatna	-	81%	19%
Allakaket	43%	55%	3%
Study Region Total	**36%**	**53%**	**10%**
Alaska	***24%***	***63%***	***13%***

Source: U.S. Census Bureau, 2018-2022 American Community Survey Five-Year Estimates
Note: Rows may not sum to 100% due to rounding.

In 2022, about one-quarter of the study area's population was under 10 years old, compared to 14% statewide. About 20% of the study area's population was between 25 and 34 years old in 2022 compared to 16% statewide. Similar to the state, the 85+ age group made up the smallest share of the study area's population in 2022.

Figure 2. Study Area and Alaska Population by Age, 2022



Source: U.S. Census Bureau, 2018-2022 American Community Survey Five-Year Estimates

In the 2022-2023 school year, enrollment in the study area's four schools totaled about 200 students. Shungnak had close to half of the region's total enrollment (84 students). Historically, children in Alatna attend school in Allakaket, crossing the frozen river in the winter months and alternatively, staying in Allakaket when the river is impassable.[11] Schools with average enrollment under 10 students do not receive state funding.[12]

(See table on next page)

[11] Tanana Chiefs Conference Alatna-CP-2020.pdf (tananachiefs.org)
[12] Alaska Department of Education and Early Development ADA_Funding_Program_Overview_2024_eff1-2023.pdf (alaska.gov)

Table 5. School Enrollment and Facilities by Community, Academic Year 2022-2023

Community	School Name	Total Enrollment
Upper Kobuk Communities		
Ambler	Ambler School	57
Kobuk	Kobuk School	35
Shungnak	Shungnak School	84
Koyukuk Communities		
Alatna	-	-
Allakaket	Allakaket School	27
Study Region Total	**-**	**203**

Source: Alaska Department of Education and Early Development

Community and Culture

Almost 90% of residents in the study region are Alaska Native, compared to 20% of Alaskans statewide. By community, the percentage of Alaska Native residents ranged from 76% in Allakaket to 100% in Alatna and Shungnak.

Table 6. Percentage of Residents who are Alaska Native by Community, 2022

Community	% Alaska Native
Upper Kobuk Communities	
Ambler	84%
Kobuk	97%
Shungnak	100%
Koyukuk Communities	
Alatna	100%
Allakaket	76%
Study Region Total	**89%**
Alaska	***20%***

Source: U.S. Census Bureau, 2018-2022 American Community Survey Five-Year Estimates
Note: Percentages provided on race are Alaska Native alone or in combination with one or more other races.

Most Alaska Native residents of the NWAB are Inupiat people, an Indigenous group that spans the northern and northwest arctic region of Alaska. Alatna and Allakaket residents are predominantly Koyukon Athabascan and Kobuk Eskimo.[13] Federally recognized tribes are present in all study-area communities and subsistence activities are a fundamental part of the collective culture.

[13] Tanana Chiefs Conference Allakaket – Tanana Chiefs Conference

Table 7. Alaska Native Heritage Groups by Community

Community	Heritage Group	Federally Recognized Tribe
Ambler	Inupiat	Native Village of Ambler
Kobuk	Inupiat	Native Village of Kobuk
Shungnak	Inupiat	Native Village of Shungnak
Alatna	Athabascan	Alatna Village
Allakaket	Athabascan	Allakaket Village

Source: Alaska Department of Commerce, Community, and Economic Development; Tanana Chiefs Conference

Subsistence practices are an important part of the culture in the study region communities and provide nutrition to most households in the region. Residents engage in subsistence activities based on seasonal availability, and caribou, fish, moose, and berries are the most common wild foods harvested. According to Alaska Department of Fish and Game's latest comprehensive subsistence survey, almost all households in the study area participated in subsistence activities and brought in more than 1,000 pounds per household. Extreme weather conditions during the time of the survey may have led to a smaller harvest than was anticipated by users.[14]

Table 8. Subsistence Harvest Profile by Community, 2011/2012

Community	% of Households Participating	Harvest in Pounds per Household	Pounds per Capita
Upper Kobuk Communities			
Ambler	96%	2,243	603
Kobuk	100%	1,410	309
Shungnak	100%	1,462	367
Koyukuk Communities			
Alatna	100%	1,047	299
Allakaket	95%	1,351	525

Source: Alaska Department of Fish and Game
Note: Data on harvest for Alatna and Allakaket based on a 2011 survey; data for Ambler, Kobuk, and Shungnak based on a 2012 survey.

[14] Alaska Department of Fish and Game ADF&G, Subsistence, Community Subsistence Information System (alaska.gov)

Economic Characteristics

The region's economy is a mix of subsistence activities and cash income. While subsistence hunting and fishing provides sustenance, some clothing, and goods for barter, families need cash to purchase other food and grocery items, electricity, and fuel for their vehicles and home heating. Cash is also necessary to support a subsistence lifestyle; fishing nets and other tools are needed for subsistence expeditions.

Mining, education, health care, and social assistance are the key activities that drive the region's cash economy. In 2022, the average household median income in the study region was close to $45,000, compared to about $86,000 statewide. The study region's median income in 2022 ranged from $25,000 in Allakaket to $69,000 in Shungnak.

High rates of unemployment persist in the study region because of limited and seasonal employment opportunities. In 2022, the highest rates of unemployment were in Ambler and Shungnak, both 22%, compared to an average of 14% in the study region, and 6% statewide. About one quarter (26%) of study region families live below the poverty level compared to 7% statewide. The U.S. Census Bureau determines poverty threshold by income and family size.

Table 9. Select Economic Characteristics by Community, 2022

Community	Median Household Income	% Unemployment	% of Families Below Poverty Line
Upper Kobuk Communities			
Ambler	$37,857	22%	21%
Kobuk	$36,250	6%	22%
Shungnak	$68,750	22%	25%
Koyukuk Communities			
Alatna	$53,125	0%	0%
Allakaket	$25,000	18%	61%
Study Region Total	**$44,919**	**14%**	**26%**
Alaska	***$86,370***	***6%***	***7%***

Source: U.S. Census Bureau, 2018-2022 American Community Survey Five-Year Estimates
Note: Median household income for the Study Region is calculated as the weighted average of the community medians. Small sample sizes in the study region communities may lead to high margins of error associated with this data.

Sources of Income

Personal income totaled $410 million in NWAB, $337 million in YKCA, and $50 billion statewide in 2022. Personal income generally describes the level of money that a region's residents earn or receive each year and is measured from three sources. Earnings from work activities include income earned through formal employment and self-employment. Investment earnings include interest on investments and earnings from rent, and government transfers include all monetary

government social benefits, including Social Security income and the Alaska Permanent Fund Dividend (PFD). In 2022, Alaska was the only state to receive an increase in government transfers from the previous year due to a large PFD.[15]

In 2022, total per capita personal income in NWAB was about $55,000 and about $65,000 in YKCA compared to close to $69,000 statewide. Per capital personal income from work activities was about $29,000 in both NWAB and YKCA.

Table 10. Sources of Personal Income by Borough/Census Area (Millions), 2022

Source of Personal Income	Northwest Arctic Borough	Yukon-Koyukuk Census Area	Alaska
Population	**7,346**	**5,150**	**736,556**
Earnings from Work Activities	$213	$152	$30,600
Government Transfers	$166	$143	$10,719
Investment Earnings	$31	$42	$9,031
Total Personal Income	**$410**	**$337**	**$50,350**
Personal Income per Capita	*$55,286*	*$65,096*	*$68,635*

Source: Alaska Department of Labor and Workforce Development; U.S. Bureau of Economic Analysis

Industry Employment

In 2022, most wage and salary employment (excluding self-employment) in the NWAB was in the mining industry and local government, including public education. The Red Dog Mine, located north of Kotzebue, employs the largest share of workers in the region's mining sector. In YKCA, about 90% of jobs were in local government, including public education.

Table 11. Wage and Salary Employment by Borough/Census Area, 2022

Industry	Northwest Arctic Borough	Yukon-Koyukuk Census Area
Government Employment	**995**	**1,581**
Local government	890	1,433
State government	57	84
Federal government	48	64
Private Employment	**1,735**	**637**
Mining	930	*
Trade, transportation, and utilities	261	186
Leisure and hospitality	113	*
Education and health services	*	172
Membership organizations	*	123

[15] U.S. Bureau of Economic Analysis

Industry	Northwest Arctic Borough	Yukon-Koyukuk Census Area
Construction	67	*
Professional and Business services	*	42
Financial Activities	37	*
Information (Broadcasting and Telecommunication)	37	12
All other	290	102
Total Employment	**2,730**	**2,218**

Source: Alaska Department of Labor and Workforce Development and McKinley Research Group estimates
* Employment data not disclosable due to confidentiality requirements.

Cost of Living

The cost of living in Alaska is about 24% higher than the national average.[16] Due to the low level of manufacturing in state, the added costs of shipping goods to Alaska are a significant driver of this high cost differential.

Rural communities, especially those with limited or no road access, have higher costs compared to Alaska's urban centers. The following table provides the most recent available data on the cost-of-living differential between various regions of Alaska and Anchorage. As of 2008, the cost of living in Kotzebue was 61% higher compared to cost of living in Anchorage. The cost of living in NWAB villages in this study area are likely higher than the Kotzebue differential due to added transportation costs.

No cost-of-living differential has been calculated to include the communities of Alatna or Allakaket. The "roadless interior" region included communities of Galena, Fort Yukon, and McGrath, and provided the closest analogy to the YKCA communities in this study region. Costs of living in this region were 31% above Anchorage costs as of 2008.

Table 12. Geographic Cost Differentials, 2008

Area/Region	2008 Differential
Kotzebue	1.61
Roadless Interior	1.31
Fairbanks	1.03
Anchorage	**1.00**

Source: Alaska Geographic Differential Study, McDowell Group, 2008

[16] The Council for Community and Economic Research, *Cost of Living Index*, 2023.

Transportation Access

As previously stated, high transportation costs and distance of the communities from population centers contributes significantly to the high cost of living in the study region. The study region communities have limited seasonal winter trail connections to nearby communities but lack road access to regional hubs. With the exception of Alatna, each community has an airstrip. Barge service to the communities is limited to summer or early fall due to ice conditions, and low water levels often impact barging during these seasons.

Table 13. Transportation Linkages and Infrastructure

Community	Winter Trail Connection	Airstrip/Airport	Barge Service
Upper Kobuk Communities			
Ambler	-	✓	✓
Kobuk	to Shungnak	✓	✓
Shungnak	to Kobuk	✓	✓
Koyukuk Communities			
Alatna	to Hughes, Bettles, Tanana	-	-
Allakaket	to Hughes, Bettles, Tanana	✓	✓

Source: Alaska Department of Commerce, Community, and Economic Development

FUEL AND FREIGHT TRANSPORTATION

Ambler, Kobuk, and Shungnak freight is shipped only by air, first from Anchorage to Kotzebue, and then by a smaller air carrier to the individual communities. Air freight is typically combined with that of other communities to reduce the high cost of shipping. Inclement weather frequently interrupts air shipments. Allakaket freight is transported by truck from Anchorage to Fairbanks, and then by air from Fairbanks to Allakaket.

Allakaket, Ambler, Kobuk, and Shungnak receive fuel shipments by air carriers as well as by barge. Barge lines offer lower rates than air carriers, at $6.21 per gallon for shipping fuel by barge vs. $10.77 per gallon by air. Barges also transport considerably larger volumes, but river ice and water levels limit the timing and number of barge runs. For example, a barge can transport a year's supply of fuel to the Allakaket School, but the run must be timed carefully due to the Koyukuk River's changing water levels. Often barge runs to a particular community are possible only once a year.

Table 14. Fuel Cost Inclusive of Transportation Cost, by Mode

Transport Mode	Ave. Price per Gallon (PCE)
Truck	$4.59
Barge	$6.21
Air Carrier	$10.77

Source: Alaska Energy Authority; Regulatory Commission of Alaska.

ALASKA BYPASS SYSTEM

To offset the high cost of shipping to remote communities, the Alaska Bypass mail program was established in 1972 for shipments of 1,000 pounds or more at a rate of $0.485 per pound. This rate is significantly below current non-Bypass rates of $0.89 to $2.00 per pound.[17] The shipments, most of which are groceries, bypass post offices and are delivered by air carriers contracted by the U.S. Postal Service (USPS) to deliver mail. Alaska Bypass shipments shift shipping costs from consumers to the USPS, which subsidizes the program. Bypass shipments may be delayed considerably by higher-priority cargo. If local retailers choose to stock temperature-sensitive goods, such as produce, these are often shipped by standard shipping methods so they arrive in remote locations in better condition than they would by Bypass. Across Alaska, many retailers do not stock produce because of these shipping complications and costs.

Freight ineligible for the Alaska Bypass program is generally transported to the communities by air. Organizations such as the school district may take advantage of reduced shipping costs through specific state contracts, or by using the Amazon Prime system, which does not charge any additional shipping to these communities.[18]

Energy Infrastructure and Cost

Regional residents primarily rely on heating oil for home heat, and diesel-generation provides the majority of electricity. Given this reliance on petroleum-based energy sources, fuel costs significantly impact the cost of living and doing business in the region.

Community fuel prices as described in the table below were gathered through interviews with local retailers and the Summer 2023 Alaska Fuel Price Report. Heating oil retail prices ranged from $8.00/gallon in Allakaket (also serving Alatna) to $18.00/gallon in Ambler, compared to $4.09/gallon in Fairbanks. Unleaded fuel sold for $9.50/gallon at the pump in Shungnak to $18.00/gallon in Ambler, compared to $4.49/gallon in Fairbanks.[19]

Table 15. Gasoline and Heating Fuel Retail Cost per Gallon by Community, 2023

	Gasoline	Heating Oil		Gasoline	Heating Oil
Upper Kobuk Communities			Koyukuk Communities		
Ambler	$18.00	$18.00	Alatna	-	-
Kobuk	$14.64	$13.90	Allakaket	$11.50	$8.00
Shungnak	$9.50	$9.50	*Fairbanks*	*$4.49*	*$4.09*

Source: Alaska Department of Commerce, Community, and Economic Development; McKinley Research Group estimates

[17] McKinley Research Group estimates.
[18] School district can purchase custodial and office supplies through a State of Alaska contract established with W.W. Grainger at no additional shipping costs.
[19] Alaska Department of Commerce, Community, and Economic Development.

The Alaska Energy Authority administers the Power Cost Equalization (PCE) program which subsidizes high rural electricity costs. All study-area communities have been determined eligible for the PCE program based on usage and cost per kilowatt-hour. Study-area utilities extend credits to customers, lowering the cost of electricity paid by the customer, and then receive a reimbursement from an endowment fund.[20]

In FY 2023, pre-subsidy electricity rates were as high as $1.10 per kilowatt hour (kWh) in the study region communities. PCE subsidy rates between $0.60 and $0.76/kWh brought the effective residential rate paid as low as $0.26/kWh compared to $0.21/kWh in Anchorage.

Table 16. Electricity Cost per kWh by Community, FY 2023

Community	Cost per kWh	PCE Rate per kWh	Subsidized Rate per kWh
Upper Kobuk Communities			
Ambler	$0.86	$0.60	$0.26
Kobuk	$1.10	$0.76	$0.33
Shungnak	$1.10	$0.76	$0.33
Koyukuk Communities			
Alatna	$1.10	$0.76	$0.34
Allakaket	$1.10	$0.76	$0.34
Anchorage	*$0.21*	-	*$0.21*
Fairbanks	*$0.31*	-	*$0.31*

Source: Alaska Energy Authority
Note: Kobuk and Shungnak rates are from Alaska Village Electric Cooperative; Anchorage rates are from Chugach Electric Association; Fairbanks rates are from Golden Valley Electric Association

Government Structures and Revenue

NWAB is a home-rule borough and was incorporated in 1986. The Borough does not levy a property or sales tax. PILT revenue related to Red Dog Mine operations is the Borough's primary source of revenue, although NWAB also receives some income from marijuana and tobacco excise taxes.

All study-area communities in NWAB are second-class cities. Ambler and Kobuk both levy a 3% sales tax. Ambler, Kobuk, and Shungnak receive additional revenues from state taxes levied on some utility cooperatives (telephone and electric).

[20] Alaska Energy Authority Alaska Energy Authority > What We Do > Power Cost Equalization (akenergyauthority.org)

The YKCA communities within this report's study area are not located in an organized borough. Allakaket is a second class city, and the city levies no taxes.

Table 17. Government Structure and Tax Revenue, FY2022

Borough/Census Area and Community	Municipal Structure	Property Tax Revenue	Sales Tax Revenue	Other Tax Revenue
Northwest Arctic Borough	Home Rule	-	-	$783,308
Ambler	Second Class City	-	$31,010	$5,153
Kobuk	Second Class City	-	$13,478	$3,167
Shungnak	Second Class City	-	-	$3,693
Yukon-Koyukuk Census Area	Census Area	-	-	-
Alatna	Census Designated Place	-	-	-
Allakaket	Second Class City	-	-	-

Source: Alaska Department of Commerce, Community, and Economic Development; Alaska Department of Revenue

Chapter 3. Mine Construction and Operation Economic Impacts

This chapter describes the direct and multiplier impacts of construction and operation of the proposed Arctic Mine that would result from establishing surface transportation access to the region. As described in Chapter 1 of this document, the Arctic Project is the most advanced exploration project in the Ambler Mining District. The following analysis is based on financial analysis as presented in the *Arctic Project NI 43-101 Technical Report and Feasibility Study*, published by Trilogy Metals Inc. on January 20, 2023.

Construction Phase Impacts

The total capital costs of Arctic Mine construction, $1.2 billion, are expected to be spread across a three-year construction period. Mine development and construction of related facilities and infrastructure will require substantial investment in construction services; equipment; mining support services, such as blasting work; fuel; and other materials and supplies. Transportation services will be critical to move equipment to Alaska and from Fairbanks to the project site.

Mine capital costs are expected to include about $160 million in total wages. The number of workers on site will vary by season and stage of project development. Annual average employment of 500 is expected over the three-year period, with a peak workforce of 650 workers. Direct employment includes workers hired by Ambler Metals and on-site contractors.

Total Construction Phase Impacts

Construction projects support additional economic activity as spending to support construction circulates in the Alaska economy. Including all direct, indirect, and induced impacts, Arctic Mine construction is expected to support an average of 750 workers each year over the three-year period. Over the three-year period, Arctic Mine construction is expected to support a cumulative $220 million in wages, about $74 million each year.

Table 18. Arctic Mine Construction Average Annual Employment Impacts, Alaska

Impact Level	Average Annual Employment	Cumulative Wages ($millions)
Direct Impacts	500	$160.0
Indirect and Induced Impacts	250	$60.0
Total Impacts	**750**	**$220.0**

Source: Ambler Metals and McKinley Research Group estimates

Operations Phase Impacts

The following sections describe annual average economic impacts expected over the 13-year life of mine.

Employment and Wage Impacts

Based on the Arctic Feasibility Study, the mine operating labor force employed directly by Ambler Metals will average 340 workers over the mine life. Mining operator and maintenance staff will vary over the mine life, averaging about 145 workers in the first six operating years before gradually declining. Annual wages related to direct mine employment are expected to average $45.1 million, including the cost of employer-paid benefits.

Direct employment also includes contractor employees working onsite throughout the mine's life. On-site trucking, camp services, and blasting contractor employment will average about 90 jobs and $15.1 million in annual wages over the mine's life. Including employees hired by Ambler Metals and on-site contractors, the mine will directly employ 430 people and pay a total $60.2 million in annual wages over the 13-year mine life.

Table 19. Arctic Mine Project Operating Phase Average Annual Onsite Employment

Employment Category	Employment	Wages ($millions)
Direct Operating Employment	**340**	**$45.1**
Mining Operations and Maintenance	136	$16.0
Processing Operations and Maintenance	143	$21.0
General & Administrative	61	$8.1
On-Site Contractor Employment	**90**	**$15.1**
Trucking	56	$9.3
Camp Services	24	$3.1
Blasting	8	$2.7
Total Direct Operating Employment	**430**	**$60.2**

Source: Ambler Metals and McKinley Research Group estimates
Note: Direct operating labor includes contracted blasting employment.

Employees working directory for the mine or on-site contractors are expected to earn an annual average wage of $115,000. These expected wages exceed the average annual wages of all employees working in the NWAB in 2022 ($80,500) by about 42% and the Yukon-Koyukuk Census Area ($46,000) by 150%.[21]

[21] Average annual wages by work location based on Alaska Department of Labor and Workforce Development, Quarterly Census of Employment and Wages 2022.

Purchase of Goods and Services

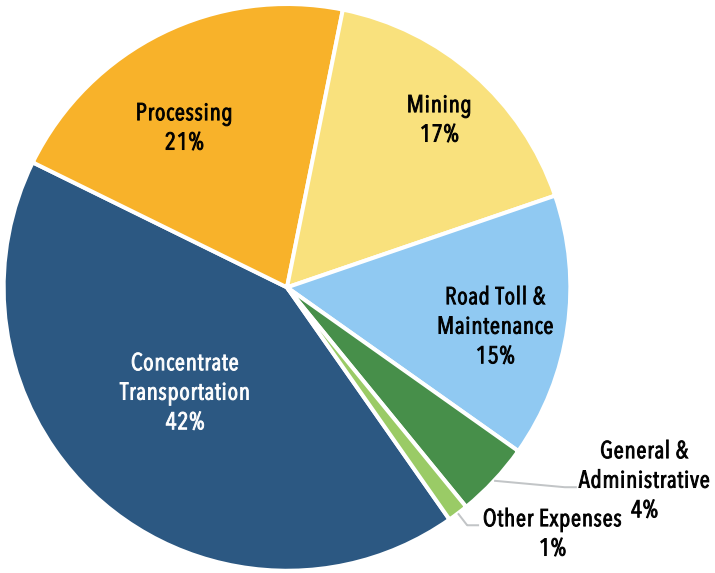
Ambler Metals expects to spend about $330 million annually on goods and services in support of Arctic Mine operations, excluding direct personnel expenses previously described.

The highest share of annual operating costs will be related to transportation mineral concentrate from the mine site to international ports. Ambler Metals expects to spend about $140 million annually related to concentrate transportation, about 42% of total goods and services spending. Transporting concentrates from the mine to market will include several transportation modes:

- Trucks will move concentrate from the mine site to Fairbanks over the Ambler Access Project road and Dalton Highway.
- Railroad transportation will be used to move concentrate between Fairbanks and the Port of Alaska in Anchorage.
- Marine vessel transportation will bring concentrate from the Port of Alaska to international markets.

Ore processing and mining represent the next highest shares of goods and services spending in support of Arctic Mine operations. Fuel consumption represents a high proportion of these costs due to the diesel required to power processing facilities, mining equipment, and other site infrastructure. Equipment parts and maintenance and explosives also represent a significant share of these costs.

Figure 3. Arctic Mine Operations Phase Goods and Services Spending by Category



Source: Ambler Metals and McKinley Research Group estimates

State and Local Government Revenue Impacts

The Arctic Mine would be subject to several state and federal taxes and is expected to negotiate a PILT agreement with the NWAB.

STATE OF ALASKA TAXES AND FEES

The State of Alaska levies various taxes and fees on mining activity, including the following:

- **Alaska Mining License Tax** is a tax on the net income of all mining property in the state irrespective of land ownership status. This graduated tax is capped annually at $4,000 plus 7% of net income and royalties, less exploration and other credits.
- **Alaska Corporate Net Income Tax** is levied on all businesses in Alaska and is based on profitability. This tax is calculated from the federal taxable income with certain Alaska adjustments. Tax rates are graduated from 1% to 9.4% in increments of $10,000 of taxable income.

Ambler Metals expects to pay an annual average of $31.3 million in state taxes, including $10.5 million in Alaska Mining License Tax and $20.8 million in Alaska Corporate Income Tax.[22]

Alaska also earns production royalties for mining activity operating on state-owned land. The Arctic Mine will operate only on private, patented lands and will not be subject to state royalty payments.

FUEL TAX

Alaska levies a motor fuel tax and surcharge on all fuels sold, transferred, or used within the state, with some exemptions. Alaska's motor fuel tax rate for highway fuel is $0.08 per gallon. All motor fuel revenues are designated as funding for infrastructure maintenance. The state's $0.0095 per gallon motor fuel surcharge is levied on all nonaviation fuel. Revenues from the surcharge are set aside for appropriations by the Alaska Department of Environmental Conservation Spill Prevention and Response Division. Assuming 13.0 million gallons of fuel will be used by the Arctic Mine each year, total estimated fuel tax payments and surcharge will average about $1.2 million annually, or $15.1 million over the 13-year mine life.[23]

TOLL REVENUE

Ambler Metals would develop a lease agreement to establish toll payments for the mine's use of the Ambler Access Project road. This agreement may be similar in structure to the agreement

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[22] Ausenco Engineering Canada Inc. *Arctic Project NI 43-101 Technical Report and Feasibility Study*. Prepared for Trilogy Metals Inc. January 20, 2023.
[23] Ausenco Engineering Canada Inc. *Arctic Project NI 43-101 Technical Report and Feasibility Study*. Prepared for Trilogy Metals Inc. January 20, 2023.

between AIDEA and the Red Dog Mine for use of the Delong Mountain Transportation System, as described in Chapter 4 of this report.

LOCAL GOVERNMENT PAYMENTS

As previously described, the Red Dog Mine currently makes payment in lieu of tax to the NWAB. Arctic Mine is likely to negotiate a similar PILT agreement to fund local government operations.

NANA Revenue Impacts

As described in Chapter 1 of this report, an existing agreement between Ambler Metals and NANA provides for NANA to receive a 1% net smelter royalty (NSR) in exchange for surface use. Net smelter royalty payments are expected to total $85.7 million over the 13-year mine life, an annual payment of $6.6 million based on long-term metal price assumptions in the feasibility study. The expected annual 1% royalty payment increases to about $8.8 million, or $114.6 million over the 13-year life of mine using current metal price assumptions.[24]

The NANA agreement includes an opportunity for an election to acquire a direct interest between 16% and 25% in the Arctic Mine. If NANA does not elect to acquire this direct interest, Ambler Metals will pay an annual 15% net proceeds royalty to NANA.

The amount of revenue generated by Arctic Mine accruing to NANA would depend upon the corporation's decision to acquire interest in the project or accept the net proceeds royalty.

For example, 15% of net cashflows before taxes are expected to average $40 million to $57 million each year between mine operating years 3 and 13, based on long-term metal price assumptions in the feasibility study. This would result in a total of $400 million to $570 million over the mine's 13-year operating life.

Royalty payments to NANA are not expected to be subject to revenue sharing requirements as outlined in ANCSA sections 7(i) and 7(j).[25]

Community Benefits and Investment

Mining companies operating in Alaska routinely contribute to local and statewide nonprofit organizations, education programs, scholarships, and special events. Community contributions and investments can range from cash payments to in-kind support and volunteerism.

Ambler Metals currently funds the Kuuvangmiut Scholarship Fund in partnership with NANA. This fund provides post-secondary scholarships to NANA shareholders pursuing mining-related

[24] Based on current metals price assumptions of $4.45/lb copper, $1.40/lb zinc, $0.95/lb lead, $2,645/oz gold, $31.50/oz silver.
[25] Based on communications with Trilogy Metals.

college or vocational education. Currently funded at $40,000 per year, Ambler Metals has pledged to increase scholarship funding to $100,000 per year during Arctic Mine operations. Through 2024, the fund has awarded a cumulative $460,000 in scholarships.

Total Operations Phase Impacts

Arctic Mine operations will support additional employment in the Alaska economy as the mine purchases goods and services from vendors in the state and as those directly employed at the mine spend their wages locally. Including all direct, indirect, and induced effects, operation of Arctic Mine is expected to support an average of 870 jobs and $89.8 million in wages in Alaska over the life of mine.

Table 20. Arctic Mine Operations Phase Average Annual Employment Impacts, Alaska

Impact Level	Average Annual Employment	Average Annual Wages ($millions)
Direct Operating Employment	340	$45.1
On-site Contractor Employment	90	$15.1
Indirect and Induced Impacts	440	$29.6
Total Impacts	**870**	**$89.8**

Source: Ambler Metals and McKinley Research Group estimates

Workforce Residency

For both the construction and operations phases, the size of the local labor force will be a limiting factor in the rate of resident hire at the project. The three communities closest to the planned mine site – Ambler, Kobuk, and Shungnak – have a combined working-age population of about 345 residents.[26]

The level of nonresident participation in Alaska's labor force varies regionally. In the NWAB, borough residents represent 47% of workers employed in the private sector, followed by 30% who live elsewhere in Alaska but work in the borough, and 23% living outside Alaska. Of the Alaska residents working in the NWAB and YKCA who do not live where they work, Anchorage, Fairbanks, and the Matanuska-Susitna Borough are all common places of residence.

[26] Based on Alaska Department of Labor and Workforce Development population estimates and U.S. Census Bureau, American Community Survey population by age.

Table 21. Private Industries Workforce by Worker Residency, 2022

Percent of Workforce	Northwest Arctic Brough	Yukon-Koyukuk Census Area
Local residents	47%	43%
Other Alaska residents	30%	37%
Non-Alaska residents	23%	20%
Total	**100%**	**100%**

Source: Alaska Department of Labor and Workforce Development

Construction Phase Workforce Residency

Between 2012 and 2022, an average of 20% of Alaska's construction workforce were not Alaska residents.[27] Nonresident participation in construction projects is often higher in Alaska's most remote regions due to a limited labor force. Alaska residents accounted for about 73% of the construction workforce in Northern Alaska in 2022, including 25% local area residents and 48% who lived elsewhere in the state.

Table 22. Construction Workforce by Worker Residency, 2022

Percent of Workforce	Northern Region
Local residents	25%
Other Alaska residents	48%
Non-Alaska residents	27%
Total	**100%**

Source: Alaska Department of Labor and Workforce Development

A portion of the jobs created during the construction phase will be filled with mining employees required for pre-stripping activity. Based on this pattern of employment, an estimated 360 construction-phase jobs will be held by Alaska residents, including 120 jobs held by residents of the NWAB. Local residents are expected to earn about $40.0 million in wages from work on the mine construction project.

Table 23. Arctic Mine Construction Average Annual Employment by Employee Residence

Residence	Employees	Wages ($millions)
Alaska Residents	360	$116.8
Northwest Arctic Borough residents	*120*	*$40.0*
Other Alaska residents	*240*	*$76.8*
Non-Alaska residents	140	$43.2
Total Direct Employment	**500**	**$160.0**

Source: Metals and McKinley Research Group estimates

[27] Alaska Department of Labor and Workforce Development, *Nonresidents Working in Alaska 2022*, February 2024.

Operations Phase Workforce Residency

Between 2012 and 2022, an average of 38% of Alaska's metal mining workforce were not Alaska residents.[28] As with many private industries in the state, the percentage of residents working across Alaska's six operating mines varies by mine location, proximity to population centers, and transportation access.

In 2022, Alaska residents accounted for 82% of the Ambler Mine project workforce. Of Alaska residents, NWAB residents accounted for about 30% of the total exploration workforce.

Table 24. Ambler Metals Workforce by Place of Residence, 2022

Residence Community	2022 Employees
Ambler	2
Kobuk	6
Shungnak	9
Kotzebue	4
Other NWAB	4
Anchorage	20
Fairbanks/North Pole	12
Other Alaska	10
Alaska Resident Workers	**69**

Source: Ambler Metals

Employment at Red Dog Mine illustrates regional resident participation in the mining industry and may be used as a proxy to estimate resident employment at the Arctic Mine project. In 2022, Red Dog employed an average 715 workers, including about 520 Alaska residents.

Based on Red Dog Mine operations, this analysis assumes about 75% of operations-phase jobs will be filled by Alaska residents, including about 25% filled by residents of the NWAB. An estimated 315 operations-phase jobs will be held by Alaska residents, including 110 jobs held by residents of the NWAB. Local residents are expected to earn about $15.1 million in annual wages from work at the mine.

(See table on next page)

[28] Alaska Department of Labor and Workforce Development, *Nonresidents Working in Alaska 2022*, February 2024.

Table 25. Arctic Mine Project Operating Phase Average Annual Employment by Employee Residence

Residence	Employees	Wages ($millions)
Alaska Residents	315	$44.1
Northwest Arctic Borough residents	*110*	*$15.1*
Other Alaska residents	*205*	*$29.0*
Non-Alaska residents	115	$16.1
Total Direct Employment	**430**	**$60.2**

Source: Ambler Metals and McKinley Research Group estimates

Total Mine-Related Economic Impacts

About 120 NWAB residents are expected to be directly employed during construction of the Arctic Mine over the three-year construction period. Few construction-related services, supplies, and materials are expected to be procured from businesses within the NWAB. Therefore, the regional multiplier impacts associated with mine construction will be limited. Including all direct, indirect, and induced impacts, Arctic Mine construction is expected to support 160 temporary jobs and a cumulative $50 million in wages in the NWAB over the duration of the project.

Table 26. Mine Construction-Related Economic Impacts by Residence

Region	Employment	Wages ($millions)
Regional Economic Impacts		
Direct Employment	120	$40.0
Indirect and Induced Employment	40	$10.0
Total Impacts	**160**	**$50.0**
Statewide Economic Impacts		
Direct Employment	500	$160.0
Indirect and Induced Employment	250	$60.0
Total Impacts	**750**	**$220.0**

Source: Ambler Metals and McKinley Research Group estimates

Many of the specialized consumables, services, and other supplies required for Arctic Mine operations are not available for procurement from businesses within the NWAB. As previously described, many of the goods and materials used in the mining process will be transported from Fairbanks to the mine site. Due to the limited goods and services procurement within the NWAB, the multiplier impacts of mine operations will be lower within the region compared to the statewide impacts.

Nevertheless, residents employed at the Arctic Mine will support additional employment in their communities as they spend their wages locally. Including all direct, indirect, and induced

impacts, Arctic Mine operations are expected to support 160 jobs and $20.0 million in annual wages within the NWAB over the 13-year life of the mine.

Table 27. Mine Operations-Related Economic Impacts by Residence

Region	Employment	Wages ($millions)
Regional Economic Impacts		
Direct Employment	110	$15.1
Indirect and Induced Employment	50	$4.9
Total Impacts	**160**	**$20.0**
Statewide Economic Impacts		
Direct Employment	430	$60.2
Indirect and Induced Employment	440	$29.6
Total Impacts	**870**	**$89.8**

Source: Ambler Metals and McKinley Research Group estimates

Shareholder Hire

Ambler Metals plans to offer preferential hiring for NANA shareholders during the mine construction and operation phases. Although not all NANA shareholders are NWAB residents, providing employment opportunities to shareholders can provide important economic benefits to the region. Ambler Metals is likely to hire shareholders, descendants, and spouses at a similar rate to the Red Dog Mine, about 53% of Red Dog Mine employment in 2023. Based on this level of shareholder hire in the region, Arctic Mine operations could employ an annual average of 230 NANA or Doyon shareholders, including shareholders living in-region and elsewhere in Alaska.

Mine Reclamation and Closure

Mine reclamation and closure will begin at the end of mine life and continue for many years following Arctic Mine's operating phase. Reclamation and closure objectives include removal and demolition of all camp and industrial facilities, long-term slope stability of mine property, water quality and tailings provisions, and re-establishment of vegetation of areas returned to normal land use. Ambler Metals expects to spend $120.1 million on goods, services, labor, and other indirect costs during the closure phase. Post-closure activities will extend beyond the reclamation and closure period to confirm closure objectives have been met. Ambler Metals expects to spend $250.7 million during the post-closure phase.[29]

[29] Post-closure costs based on a net present value of total post-closure costs over a 100-year period.

Chapter 4. Ambler Mining District Access Planning

As previously stated, no surface transportation access currently exists from Alaska's road system to the Ambler Mining District. This chapter describes the Ambler Access Project, a proposed 211-mile road, which would connect the Dalton Highway to the Ambler Mining District.

Routes

Prepared by the U.S. Bureau of Land Management (BLM), the Ambler Road Final Environmental Impact Statement, published in 2020, includes a description of three alternative routes. The preferred alternative, listed as Alternative A, would run west from the Dalton Highway crossing land owned or managed by federal, state, municipal, and private entities. The following table describes the distance between the proposed route and the five communities included in this study and other communities within 100 miles of the proposed route.

Table 28. Distance of Proposed Ambler Access Project Road to Study-Area Communities

Community	Distance (Miles)
Study Region Communities	
Ambler	22
Kobuk	9
Shungnak	15
Alatna	35
Allakaket	34
Other Communities within 100 Miles of the Route	
Bettles	8
Evansville	8
Hughes	68
Huslia	92

Source: Ambler Access Project Final Environmental Impact Statement
Note: Based on road Alternative A

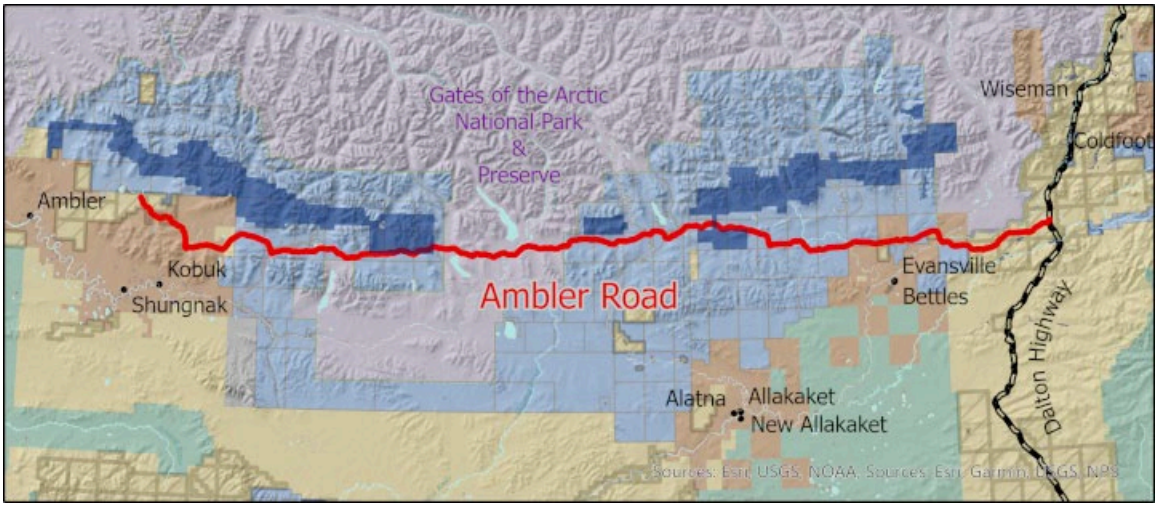
Construction is expected to occur in three phases. This economic impact study includes expected construction impacts associated with the initial four-year Phase 1 and Phase 2 development.

- **Phase 1:** Construction of a single-lane, gravel-surfaced pioneer road on a shallow roadbed. Phase 1 is expected to require two years, with a winter access trail established during the first year and the single-lane road completed in Year 2.
- **Phase 2:** Upgrade of the pioneer road to be a one-lane, gravel-surfaced roadway over a full-depth roadbed. Phase 2 construction is expected to take two years and would immediately follow Phase 1.
- **Phase 3:** Road upgrade to expand width to two full lanes. This phase is expected to start about 10 years after construction of Phase 2 depending on mine development and trucking requirements.

Access

Access to the Ambler Access Project road would be privately controlled and limited to industrial traffic. AIDEA documents indicate the private road could also be used for limited commercial access for delivery of goods and services to local communities but would not be open to the general public.

Figure 4. Proposed Ambler Access Project Road Route



Source: Alaska Department of Natural Resources, Division of Mining, Land and Water

Project Funding

Various funding models exist to establish new surface transportation access. Road construction could be paid for using state or federal funding, or through another entity using other sources of capital. Described below, the Delong Mountain Transportation System capitalization, ownership, and operations structure provides an example of one model that could be used to finance construction of the Ambler Access Project. Under this model, investment in road

infrastructure would be repaid through tolls and fees assessed on road users through a lease agreement.

Delong Mountain Transportation System

DMTS is an infrastructure system developed for transportation of concentrate from the Red Dog Mine to export barges. The system traverses NANA- and State of Alaska-owned land as well as an easement held by NANA within a federal national monument. Construction of the system was financed by AIDEA with an initial investment of about $180 million.[30]

AIDEA and Teck maintain a lease agreement for use of the DMTS designed to repay AIDEA's investment through four tolls, including a minimum and supplemental annual assessment tolls, tonnage fees, and a zinc price escalator.

Teck's lease, representing the initial and expansion capital investments in DMTS including 6.5% interest, are expected to be fully repaid by 2024. Following repayment, tolls and fees paid by Teck to AIDEA will be considered net income and will be considered as part of the dividend paid by AIDEA to the State of Alaska general fund.[31] AIDEA receives total tolls and fees averaging about $17 million each year between 2006 and 2016.[32]

Project Status and Cost

The BLM issued a Final Environmental Impact Statement for the Ambler Access Project in March 2020. Following this process, a 50-year right-of-way permit was signed by BLM, the National Parks Service, and AIDEA. BLM began a supplemental environmental impact statement process in 2022 following the voluntary remand of its previously issued Record of Decision. A new Record of Decision was signed in June 2024 selecting the "No Action Alternative", effectively denying the right-of-way application for the road. Final investment decisions and any resulting economic benefits are dependent on securing a new Record of Decision and right-of-way.

As of 2020, construction of the Ambler Access Project was estimated to cost about $519.3 million spread over a four-year construction period. Constructing the 211-mile-long, one-lane gravel road corridor is expected to cost $447 million, including mobilization costs, labor, temporary construction camp facilities, and other materials and services. An initial capital investment of

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[30] Arcadis. *Delong Mountain Transportation System Asset Management Review*. Prepared for the Alaska Industrial Development Export Authority. December 2017.
[31] Arcadis. *Delong Mountain Transportation System Asset Management Review*. Prepared for the Alaska Industrial Development Export Authority. December 2017.
[32] Arcadis. *Delong Mountain Transportation System Asset Management Review*. Prepared for the Alaska Industrial Development Export Authority. December 2017.

$43.4 million is expected for installation of communications infrastructure, such as fiber optic cables and radio communications sites.

Construction of road maintenance stations is expected to cost $26.4 million. These stations will include a bunkhouse for maintenance personnel, communication infrastructure, and material and bulk fuel storage. Each maintenance station is expected to have an adjacent airstrip, which would be used during construction phases for construction crew transportation.

Table 29. Ambler Access Project Construction Costs by Component ($2020)

Infrastructure	Cost ($millions)
Road	$447.0
Communications infrastructure	$43.4
Maintenance stations	$26.4
Landing strips	$2.5
Total construction cost	**$519.3**

Source: Ambler Access Project Final Environmental Impact Statement
Note: Based on road Alternative A

Potential Community Impacts

Construction of the Ambler Access Project road is expected to enable development of mining projects in the region and reduce transportation costs for residents, businesses, and other organizations. Communities in the study region may also benefit from improved intra-region access for purposes of emergency response, school- and sports-related travel, or for culture activities if the Ambler Access Project and subsequent spur roads were constructed.

Chapter 5: Cost-of-living Impacts

Transportation of freight to the study region is expensive given the lack of surface transportation and long supply chain required for goods to reach these villages. Fuel, food, and other goods brought to these communities often originate in the Lower 48 and are brought to Anchorage or Fairbanks via barge, truck, or air. From Anchorage or Fairbanks, freight bound for NWAB communities is often shipped to Kotzebue, where it is then transferred for final delivery. Similarly, freight bound for YKCA communities is forwarded on from Fairbanks to final destinations, often via air.

Construction of the Ambler Access Project road and spur roads leading directly to each community has the potential to reduce transportation costs for residents, school districts, businesses, and construction companies in the region.

This chapter estimates the current transportation costs and expected cost savings associated with bringing fuel, food, and other goods into the study-region communities under various spur road scenarios.

Current Freight Transportation

The following sections describe the current level of freight transported to these communities annually.

Fuel

Communities in this region use diesel fuel for electricity generation, heating oil to heat homes and other buildings, and gasoline to power vehicles. Three types of organizations are generally responsible for arranging fuel transport:

- Electric utilities transport diesel fuel to the communities for use in electricity generation, often storing fuel in on-site bulk storage facilities.
- Retailers bring in heating oil and other fuel to be sold to residents for home heat and vehicle use. Retail operations are often run by the city government or local tribal organization.
- School districts transport fuel for school facility use. Schools may also have on-site bulk fuel storage.

An estimated 729,000 gallons of fuel is transported to the study-area communities annually.

Table 30. Estimated Annual Fuel Consumption (Gallons)

Community	Total	Population	Gallons per Capita
Alatna/Allakaket	150,000	180	833
Ambler	271,000	256	1,059
Kobuk	53,000	169	314
Shungnak	255,000	251	1,016
Study Region Total	**729,000**	**856**	**852**

Source: McKinley Research Group estimates

When water levels allow, fuel is transported to the study-area communities by barge one or two times per year. Barged fuel accounts for an estimated 284,000 gallons (39%) of fuel consumption. Air transportation is used to bring fuel to the communities when barge service is unavailable. An estimated 445,000 gallons (61%) of annual fuel transported to these communities is brought in by airplane.

FUEL TRANSPORTATION COSTS

Fuel prices are highly variable due to underlying changes in oil prices and transportation modes used to ship the commodity across Alaska. Per gallon rates quoted by transportation companies generally include the underlying commodity price and transportation costs; transportation rates alone are rarely, if ever, available. The most recent fuel delivery prices were used to estimate the differential in prices between barge, air, and ground transportation for purposes of this analysis.

In 2023, fuel commodity prices in Fairbanks averaged $3.975 per gallon. Fuel delivered by barge to the study region cost $4.85 to $8.75 per gallon. On average, the added barge transportation cost was an estimated $2.23 per gallon in 2023. Fuel transported to the study region communities by air was significantly more expensive and varied by community. Prices ranged from a low of $7.18 up to $15.12 per gallon. Based on 2023 commodity and per gallon sales price, air transportation cost was an estimated $4.95 per gallon in the study region.

Based on these estimates rates, transport of fuel to the study-area communities costs a combined $2.8 million each year. These costs are paid for by local utilities, the school district, residents, and the Power Cost Equalization (PCE) program, which subsidizes the price of electricity in rural Alaska.

Table 31. Estimated Current Fuel Transportation Costs

Transportation Mode	Annual Fuel Transportation (Gallons)	Cumulative Transportation Costs
Air	445,000	$2,204,429
Barge	384,000	$633,528
Total	**729,000**	**$2,837,958**

Source: McKinley Research Group estimates

Food

Transportation of food to the study-area communities ultimately requires a network of transportation modes that include trucking, air, and occasionally barge service. Air transportation is the most common final transportation mode for food from a regional origin to its destination in the study area:

- Ambler, Kobuk, and Shungnak groceries travel exclusively by air from Anchorage to Kotzebue and then on to the communities.
- Allakaket groceries are shipped by truck from Anchorage to Fairbanks, and then flown to Allakaket.
- At least one school in the study region ships some canned goods and dry goods by barge once a year when rivers are navigable, although this is a small portion of school food purchases.

An estimated 1.25 million pounds of groceries are transported to these communities annually. Most food (99%) is transported by air, with 13% also shipped by truck for part of the journey and less than 1% by barge.

Retailers ship food primarily via the Alaska Bypass system. Schools rarely use Bypass to transport food, except for canned goods, due to the length of time and unreliability of Bypass shipping, which often causes perishables to arrive in poor condition.

FOOD TRANSPORATION COSTS

Most food transported to this study area is shipped via the Alaska Bypass program at shipping rates of $0.485 per pound. Transportation costs for food not shipped through the Alaska Bypass program range from $0.89 to $2.00 per pound, including freight tax. Given the high use of the Bypass program, this study uses $0.485 per pound to estimate current transportation costs. Transportation of food to the study-area communities costs a combined $606,000 each year.

Other Goods

Data available from the U.S. Bureau of Transportation Statistics provides one measure of total cargo transported to communities in the study region via air, including food and grocery items. Excluding food shipments, this data indicates about 922,000 pounds of other goods, including construction materials and consumers goods, are transported to the study region communities each year.

Table 32. Estimated Annual Other Goods Transportation (Pounds)

Community	Total	Population	Pounds per Capita
Alatna/Allakaket	281,809	180	1,566
Ambler	189,563	256	740
Kobuk	214,341	169	1,268
Shungnak	236,377	251	942
Study Region Total	**922,090**	**856**	**1,077**

Source: McKinley Research Group estimates

Barging is also a transportation option for some other goods, but only within the timeframe allowed by ice and water levels. This study assumes the vast majority of nonfood items are transported to the study region by air.

TRANSPORATION COSTS OF OTHER GOODS

The other goods described in this section are not eligible for Alaska Bypass shipping rates, and many do not fit well within palletized loads. The cost of shipping general air freight is $1.21 per pound. Costs can be significantly higher for large items, such as furniture, building materials, snowmachines, boats, and other vehicles, as well as for hazardous materials and items sourced from the Lower 48. Shipping rates for oversized items are 120% to 200% of the general air freight, or $1.45 to $2.42 per pound.

This analysis assumes an average transportation rate of $1.50 per pound for a total transportation cost of $1.37 million. There is a large margin of error associated with this estimate given the varied transportation pricing based on product weight and dimensions, special handling requirements, and airplane capacity.

Summary of Current Transportation Costs

The total current costs associated with air or barge transportation of fuel and other freight is an estimated $4.8 million annually.

Table 33. Estimated Current Transportation Costs

Freight Type	Gallons/ Pounds	Cost per Unit	Total Transportation Costs
Fuel (gallons)	729,000	$3.89	$2,837,958
Food (pounds)	1,249,404	$0.49	$605,961
Other goods (pounds)	922,090	$1.50	$1,373,914
Study Region Total	-	-	**$4,817,833**

Source: McKinley Research Group estimates

Freight Transportation with Ambler Access Project Road

The Ambler Access Project road would represent the region's first surface transportation connection to Alaska's highway system. Arctic Mine development will require construction of a spur road from the Ambler Access Project road to the Dahl Creek airstrip to connect the project site to the existing exploration camp and other construction startup requirements. This road will serve as a connection between the Ambler Access Project road and the community of Kobuk.

The current Ambler Access Project does not include funding for spur road connection between the access road and other nearby communities. The Ambler Access Project road would still be 15 miles from the next closest community (Shungnak) and 35 miles from the farthest (Allakaket/Alatna). Several connection scenarios to the remaining communities could occur and would come with various cost-of-living benefits to residents based on reduced freight transportation costs. Each scenario described below assumes a connection from the Ambler Access Project road to Kobuk will be established.

Scenario 1 – No Spur Construction: Under this scenario, no spur roads would be constructed between the Ambler Access Project road and nearby communities beyond the road connection to Kobuk. With no further spur road connection, the ability to leverage the access road and mine operations would be limited. Freight such as groceries, consumer goods, building materials, and others could not be transported from the road to all communities in this study area. Residents would continue to use winter trails to travel between communities. This scenario would provide the least potential cost-of-living benefits to regional residents.

Scenario 2 – Winter Trail Road Spur Construction: Under this scenario, seasonal winter trail roads would be constructed between the Ambler Access Project road and nearby communities. Freight such as groceries, consumer goods, building materials, and fuel could be transported from the road to the community about three to four months of each year. This scenario assumes winter trail spur roads would be groomed to accommodate trucks, with no use of equipment such as a Pistenbully to bring freight from the access road to the villages. This scenario would provide a complementary transportation mode in seasons when barge access is not possible.

Scenario 3 – Year-Round Gravel Spur Construction: Under this scenario, year-round gravel spur roads would be constructed between the Ambler Access Project road and nearby communities. Freight such as groceries, consumer goods, building materials, and fuel could be transported from the road to the community year-round. This scenario would provide the greatest potential cost-of-living benefits to regional residents.

The following sections describe how freight transportation in the region may change under each scenario.

Fuel

As previously described, each connection scenario poses some opportunity for surface transportation of fuel to one or all communities in this study region. The following table describes the percentage of fuel (diesel, unleaded gasoline, and heating oil) that could be transported via surface road access under each scenario.

SCENARIO 1: NO SPUR

This analysis assumes that, under Scenario 1, the mine would be willing to sell fuel to nearby communities at cost. Due to the volume of fuel purchased by large-scale mining operations, this scenario is expected to have the lowest transportation costs but would be able to divert only a small percentage of fuel from current barge or air transportation delivery modes. Due to its proximity to the mine and expected road connection as part of the Arctic Mine infrastructure, Kobuk is the most likely community to benefit from these direct purchases.

SCENARIO 2: WINTER TRAIL SPUR

Construction of winter trail roads is expected to divert a portion of fuel currently delivered by air to surface transportation. The amount of fuel that can be diverted depends on each communities' storage capacity given the seasonal nature of winter roads. For example, if the various fuel purchasers in Shungnak have sufficient capacity to store a year's supply of fuel, that community could potentially purchase all fuel within the three-month period of road operation, diverting all barged and air fuel to surface transportation.

Allakaket fuel sellers and consumers contacted for this study indicate that the community does not have sufficient storage capacity to divert all air or barged fuel to road access. Therefore, this study assumes that about one-third of fuel currently transported via air would be diverted to surface transportation. Ambler, Kobuk, and Shungnak all have sufficient capacity to divert about 80% to 100% of fuel from current transportation modes to surface delivery. This analysis assumes that fuel transported by air would be the primary delivery mode replaced by truck transported due to the high cost and seasonality of winter trails. Where a community has sufficient storage to meet all annual consumption, this analysis assumes that barged fuel would also be replaced by fuel brought in via road connection.

SCENARIO 3: GRAVEL SPUR

Construction of a year-round gravel road could divert up to 100% of fuel delivery to surface transportation access for all communities.

Table 34. Annual Percentage and Gallons of Fuel Transported Via Ambler Access Project Road Connection by Scenario

Scenario	Percentage of Current Volume Diverted to Surface Transportation	Gallons Diverted to Surface Transportation
1 – No Spur	7%	53,000
2 – Winter Trail Road Spur	82%	599,500
3 – Gravel Spur	100%	729,000

Source: McKinley Research Group estimates

FUEL SURFACE TRANSPORTATION COSTS

The purchase price of fuel transported to the communities via the Ambler Access Project road is expected to be significantly below air or barge costs. In the no-spur case under which a limited number of consumers purchase fuel directly from the mine, this analysis assumes the fuel would be purchased at cost. Remote mine operations in Alaska consume a high quantity of fuel and therefore receive favorable bulk pricing. This analysis assumes a fuel cost of $3.92 per gallon.[33] With 53,000 gallons of fuel transported via this scenario, the no-spur scenario has potential to save about $103,163 in fuel transportation costs annually.

A significantly higher volume of fuel could be transported to the communities with seasonal winter trail or permanent road construction. Transportation of fuel from Fairbanks to Prudhoe Bay on Alaska's North Slope provides a reasonable proxy for estimating these transportation costs due to that route's length and similar remote characteristics. Currently, a highway load of fuel, about 8,500 gallons, costs $9,600 to transport from Fairbanks to Prudhoe Bay, including base rates and a 20% fuel surcharge. This rates results in transportation costs of an estimated $1.15 per gallon of fuel. Based on the volume of fuel that could be diverted to surface transportation under the winter trail or gravel spur scenarios, shipping via this method could save an estimated $1.6 million to $2.0 million in fuel transportation costs annually.

Table 35. Estimated Annual Fuel Transportation Cost Savings Via Ambler Access Project Road Connection by Scenario

Scenario	Current Transportation Costs	Expected Cost with Surface Transportation	Expected Transportation Cost Savings
1 – No Spur	$2,837,958	$2,734,795	$103,163
2 – Winter Trail Road Spur	$2,837,958	$1,193,562	$1,644,396
3 – Gravel Spur	$2,837,958	$838,350	$1,999,608

Source: McKinley Research Group estimates

[33] Ausenco Engineering Canada Inc. *Arctic Project NI 43-101 Technical Report and Feasibility Study*. Prepared for Trilogy Metals Inc. January 20, 2023.

Food

At a transportation rate of $0.48 per pound, the Alaska Bypass System provides strong incentives for regional retailers and suppliers to continue using air transportation for eligible food items. However, current truck transportation rates are expected to be below this price per pound if truck capacity is filled appropriately. This analysis assumes the following pounds of food could be directed to truck transportation if deliveries can be made on a timely basis at rates below the Bypass system.

Many retailers have stopped offering produce or other temperature-sensitive products given frequent delays in shipping via the Alaska Bypass system. Given the drawbacks of shipping these products via Bypass, connecting these communities to Alaska's road system is likely to increase the availability of produce and other temperature-sensitive goods in the study area, subject to availability of appropriate temperature-controlled vans.

SCENARIO 1: NO SPUR

Only food items transported to Kobuk are expected to be diverted to surface transportation if no additional spur roads from the Ambler Access Project road to other nearby communities are constructed.

SCENARIO 2: WINTER TRAIL SPUR

The study-area communities do not have significant food storage capacity to transport a year-long supply of food to the community over the three-month winter trail time period. This analysis assumes that construction of winter trail roads has the potential to divert one-third of food deliveries from current air transportation to truck transportation for communities connected only by winter trail. This analysis assumes food items transported to Kobuk would be diverted to surface transportation access based on the connection created as part of Arctic Mine development.

SCENARIO 3: GRAVEL SPUR

Construction of a gravel road could divert up to 100% of food delivery to surface transportation access.

Table 36. Annual Percentage and Pounds of Food Transported Via Ambler Access Project Road Connection by Scenario

Scenario	Percentage of Current Volume Diverted to Surface Transportation	Pounds Diverted to Surface Transportation
1 – No Spur	22%	270,000
2 – Winter Trail Road Spur	48%	596,468
3 – Gravel Spur	100%	1,249,404

Source: McKinley Research Group estimates

FOOD TRANSPORTATION COSTS

Transportation of palletized freight from Fairbanks to Prudhoe Bay provides a reasonable proxy for estimating food transportation costs. Currently, transporting a container van with maximum capacity of about 45,000 pounds of palletized freight costs about $8,800, including base rates and a 20% fuel surcharge. This rate results in an estimated $0.21 per pound transportation costs if the van is filled to capacity. Based on the amount of food that could be diverted to surface transportation under the winter trail or gravel spur scenarios, shipping via this method could save about $140,000 to $300,000 in food transportation costs annually.

Table 37. Estimated Annual Food Transportation Cost Savings Via Ambler Access Project Road Connection by Scenario

Scenario	Current Transportation Costs	Expected Cost with Surface Transportation	Expected Transportation Cost Savings
1 – No Spur	$605,961	$542,511	$63,450
2 – Winter Trail Road Spur	$605,961	$465,791	$140,170
3 – Gravel Spur	$605,961	$312,351	$293,610

Source: McKinley Research Group estimates

Other Goods

The following table describes the percentage of nonfood material and goods that could be transported via surface road access under each scenario. Current air freight costs for transport of these goods is often expensive given the size of many consumer goods, such as furniture, appliances, ATVS, and more, that are brought into these communities. Given these high costs, establishing a road connection to the study region may increase consumption in the study area beyond current levels.

SCENARIO 1: NO SPUR

Only other goods transported to Kobuk are expected to be diverted to surface transportation if no additional spur roads from the Ambler Access Project road to other nearby communities are constructed.

SCENARIO 2: WINTER TRAIL SPUR

While winter trail spur roads would provide community access for about three months of each year, a higher percentage of goods are likely to be diverted to surface transportation in this scenario. Residents, local businesses and organizations, and construction companies would likely time material shipments to align with the winter trucking season to take advantage of lower shipping costs. This analysis assumes that construction of winter trail roads has the potential to divert half of other materials deliveries from current air transportation to truck transportation given the high cost of air freight. Realizing the expected benefits of this scenario would require

material purchase and transportation coordination, in some cases, well in advance of the construction season.

SCENARIO 3: GRAVEL SPUR

Construction of a gravel road could divert up to 100% of other goods delivery to surface transportation access.

Table 38. Annual Percentage and Pounds of Other Goods Transported Via Ambler Access Project Road Connection by Scenario

Scenario	Percentage of Current Volume Diverted to Surface Transportation	Pounds Diverted to Surface Transportation
1 – No Spur	23%	214,341
2 – Winter Trail Road Spur	62%	568,215
3 – Gravel Spur	100%	922,090

Source: McKinley Research Group estimates

OTHER GOODS SURFACE TRANSPORTATION COSTS

Freight transportation from Fairbanks to Prudhoe Bay also provides a reasonable proxy for estimating transportation costs for nonfood consumer and construction goods. This study uses current flatbed transportation rates to estimate surface transportation costs. This type of surface transportation would be appropriate for construction materials, such as rebar and concrete blocks, and consumer goods, such as ATVs and appliances, which do not fit well in a container van. Currently, transporting a flatbed truck at maximum capacity costs about $9,200, including base rates and a fuel surcharge. This rate results in an estimated $0.20 per pound transportation cost if the trailer is filled to capacity. Based on the level of goods that could be diverted to surface transportation under the winter trail or gravel spur scenarios, shipping via this method could save about $704,600 to $1.1 million in material transportation costs annually.

Table 39. Estimated Annual Other Goods Transportation Cost Savings Via Ambler Access Project Road Connection by Scenario

Scenario	Current Transportation Costs	Expected Cost with Surface Transportation	Expected Transportation Cost Savings
1 – No Spur	$1,373,914	$1,108,131	$265,783
2 – Winter Trail Road Spur	$1,373,914	$669,327	$704,587
3 – Gravel Spur	$1,373,914	$230,522	$1,143,392

Source: McKinley Research Group estimates

Total Potential Cost-of-living Benefit

Transporting fuel, food, and other goods from Fairbanks to the study-area communities via the Ambler Access Project road would result in different cost savings based on various spur road connections to the villages. In the no-spur scenario where Kobuk is the only community connected, transportation cost savings of $435,288 would result from fuel, food, and other materials transported to Kobuk via surface transportation access.

If a winter trail were constructed from the Ambler Access Project road to each community, truck transportation could be used three to four months of each year, saving the communities a combined $2.49 million. This cost savings relies heavily on the assumption that many communities in the region have sufficient fuel storage capacity to appropriately time fuel purchases to take advantage of the winter trail connection. Similarly, realizing cost savings in the winter trail scenario assumes that residents, businesses, local governments, and construction companies would also time material purchases to align with this shipping season.

Table 40. Estimated Annual Transportation Cost Savings Via Ambler Access Project Road Connection by Freight Type

Scenario	Fuel-Related Cost Savings	Food-Related Cost Savings	Other Goods-Related Cost Savings	Total Cost Savings
1 – No Spur	$103,163	$63,450	$265,783	$432,396
2 – Winter Trail Road Spur	$1,644,396	$140,170	$704,587	$2,489,153
3 – Gravel Spur	$1,999,608	$293,610	$1,143,392	$3,436,610

Source: McKinley Research Group estimates

Construction of a gravel spur road from the Ambler Access Project road to each community would result in the highest combined transportation cost savings, an estimated $3.44 million per year. In addition to posing varied cost savings, the three spur road scenarios have significantly different development cost and seasonal access. Gravel spur road construction is expected to have the highest cost savings and comes with the highest spur construction costs. Winter trail development costs are often significantly less expensive compared to gravel spur construction, yet access is limited to a few months and highly dependent on snow conditions.

Table 41. Estimated Annual Transportation Cost Savings Via Ambler Access Project Road Connection by Scenario

Scenario	Current Transportation Costs	Expected Cost with Surface Transportation	Expected Transportation Cost Savings
1 – No Spur	$4,817,833	$4,385,437	$432,396
2 – Winter Trail Road Spur	$4,817,833	$2,328,679	$2,489,153
3 – Gravel Spur	$4,817,833	$1,381,224	$3,436,610

Source: McKinley Research Group estimates

COST-OF-LIVING BENEFITS BY COMMUNITY

If no additional spur roads were constructed, Kobuk is the only community in which costs of transporting fuel, food, and other goods could decrease. Residents, businesses, and other organizations in Kobuk would save about $432,396 in total transportation costs each year under this scenario. Limited transportation cost savings could be seen in Shungnak due to its proximity to Kobuk, however the magnitude of these savings would be low and depend on snowmachine traffic between the communities.

If winter trails were constructed linking the Ambler Access Project road to communities along the route, communities with the highest fuel storage capacity, such as Ambler and Shungnak, would benefit most from transportation cost savings. Connecting the Ambler Access Project road to each community would bring the highest transportation cost savings to all villages along the route.

Table 42. Estimated Annual Transportation Cost Savings Via Ambler Access Project Road Connection by Community and Scenario

Scenario	1 – No Spur	2 – Winter Trail Road Spur	3 – Gravel Spur
Allakaket/Alatna	$0	$323,109	$798,720
Ambler	$0	$893,361	$1,075,877
Kobuk	$432,396	$474,609	$474,609
Shungnak	$0	$798,074	$1,087,403
Regional Total	**$432,396**	**$2,489,153**	**$3,436,609**

Source: McKinley Research Group estimates

Other Potential Benefits

This section quantifies the potential transportation cost savings related to fuel, food, and goods currently transported to the study region communities. However, establishing surface transportation access to the region may increase the volume, and type, of products brought to these communities.

Building materials provide one example of this potential. The cost of transporting building materials and equipment to the study region significantly increases construction costs, including those for home construction, community facilities, and other infrastructure. For example, the construction of a standard single-family home in the Upper Kobuk villages by the Northwest Inupiat Housing Authority (NWIHA) currently costs about $727,000.[34]

[34] Personal communications with Northwest Inupiat Housing Authority. Based on construction of a single-family, four bedroom, one bathroom home with Arctic entry, connection to water, sewer, and electrical utilizes, and gravel pad.

Transportation costs to bring building materials to the community accounts for over half of total construction costs (about $420,000), as materials are transported from Seattle to Anchorage, and then to Fairbanks via truck before being flown to the community. In total, NWIHA pays $3.00 per pound in transportation costs. Flight costs to transport materials from Fairbanks to communities such as Shungnak account for a high proportion of these costs, at $2.30 per pound.

Based on the scenarios described above, establishing surface transportation access to these communities from Fairbanks would reduce costs per pound of bringing materials from Fairbanks to rural communities in the Upper Kobuk region from $2.30 to $0.25. For an average NWIHA-built home, this would reduce the total construction cost by about $287,000, a nearly 40% savings in total construction costs.

Table 43. Estimated Transportation Cost Savings per House With Gravel Spur Access

	Current Access	Gravel Spur Scenario	Cost Savings per House
Total Material Transportation Costs	$420,000	$133,000	$287,000
All Other Home Construction Costs	$307,000	$307,000	-
Total Construction Cost per House	$727,000	$440,000	$287,000

Source: Northwest Inupiat Housing Authority and McKinley Research Group estimates

Establishing surface transportation access to these communities would likely reduce materials shipping costs significantly, allowing organizations such as NWIHA to increase the number of units added across the region. In addition to reducing material and equipment transportation costs, establishing surface transportation access may allow regional organizations to build modular units offsite and transport them to study-area communities, further reducing construction costs.

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