

PREPARED BY



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# The Economic Benefits of **Alaska's Mining Industry**



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PREPARED FOR



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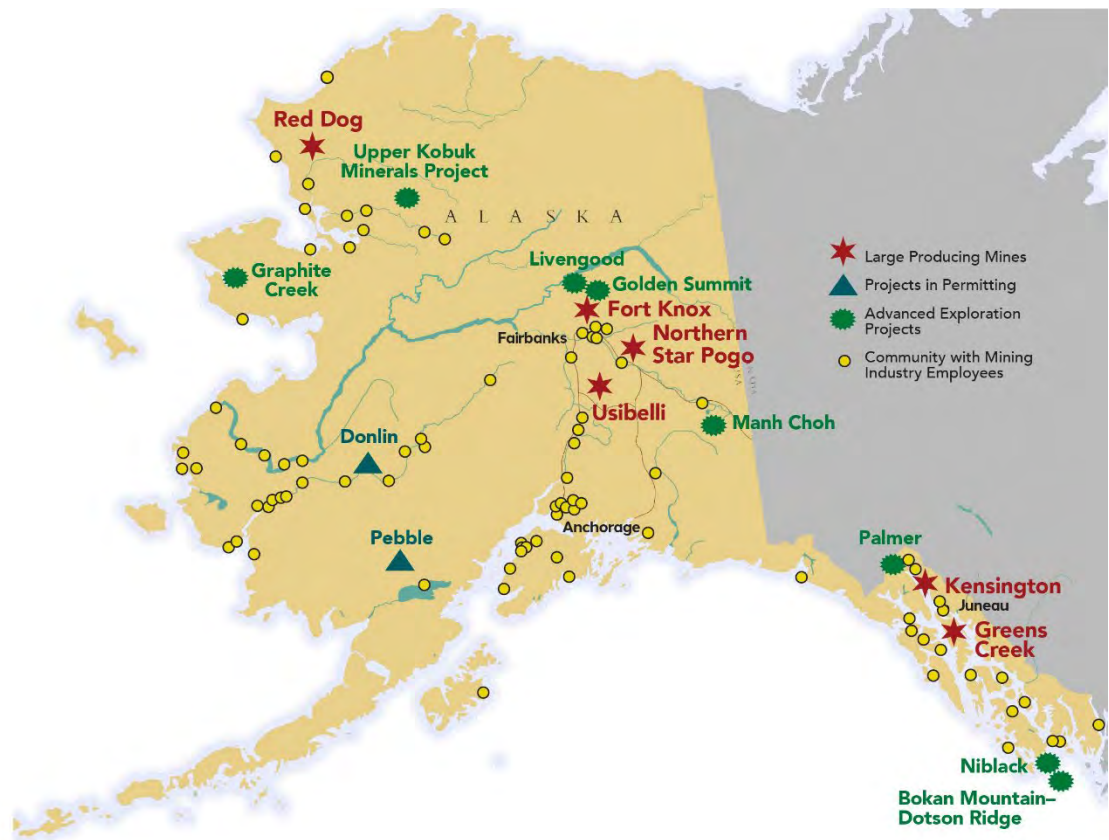
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# Executive Summary

This study measures the economic impact in 2021 of Alaska's mining industry, which includes exploration, mine development, and mineral production. The industry produces zinc, lead, copper, gold, silver, and coal, as well as rock, sand, and gravel. New minerals, such as graphite and rare-earth elements, may expand the Alaska mining industry's offerings. The mining industry creates a broad range of economic impacts in addition to jobs and income. The industry generates revenue for state and local governments and for public and private landowners and business interests. It offers training and skill development for Alaskans seeking careers within the industry and in other sectors of the economy that may have lifetime benefits. Finally, mining helps build infrastructure that can help support communities and other industries. The key impacts of the mining industry's activity in 2021 are summarized below.

**Figure 1. Map of Alaska's Mining Activity, 2021**



## Key Findings



### Exploration Activity

- Mineral exploration expenditures in Alaska totaled about \$170 million in 2021. Five operating mines accounted for 18% of exploration spending. Since 1981, \$4.2 billion has been spent on Alaska's mineral exploration programs.
- There were 50 significant exploration projects in Alaska, of which seven are advanced exploration projects, including Bokan Mountain (rare earth elements), Golden Summit (gold), Graphite Creek (graphite), Livengood (gold), Niblack (copper, gold, zinc, and silver), Palmer (copper, zinc, gold, and silver), and Upper Kobuk Minerals Project (Arctic and Bornite) (copper, zinc, gold, and silver) projects.



### Development Activity

- Since 1982, mining companies have invested \$7.7 billion in development of Alaska mining projects.
- There are three projects currently in the pre-development (permitting) or development stage: Donlin Gold, Manh Choh, and Pebble.
- About \$393 million in sustaining capital was invested in nine mining projects in Alaska; most (\$376 million) occurred at existing operations, including Red Dog Operations (Red Dog), Fort Knox, Pogo, Greens Creek, Kensington, and Usibelli Coal Mine (UCM).



### Production Activity

- Six major mines are operating in Alaska. Greens Creek, Red Dog, Fort Knox, Pogo, and Kensington are Alaska's five major metal mines. UCM is Alaska's only operating coal mine.
- In 2020, about 150 placer gold mines in Alaska produced 32,501 ounces of gold.
- The 2020 value of Alaska's rock, sand, and gravel minerals on State and federal lands was at least \$5.7 million or about 2.1 million short tons of production. Additional tonnage was mined from local and private quarries.
- Zinc accounts for 51% of mineral production value in Alaska. Gold ranks second (37%), followed by silver (7%), lead (3%), coal (2%), and rock, sand, and gravel (0.2%).
- Mineral and ore exports totaled \$2.1 billion, or 35% of Alaska's total exports.



### Mining Jobs and Wages

- Total direct mining industry employment in Alaska averaged about 5,400 jobs and \$625 million in annual wages. This includes workers engaged in production (metals, coal, and

industrial materials), exploration activities, or mine development. This employment also includes self-employed miners (often found in placer mines).

- A 2014 study found that Alaska's placer mining industry accounted for about 1,200 seasonal jobs, with about \$40 million in earnings in 2013. According to Alaska Department of Natural Resources, in 2020, there were an estimated 150 placer gold operations, employing an about 141 full-time-equivalent employees, down from 224 full-time equivalent jobs in 2014.<sup>1</sup>
- Multiplier effects stemming from expenditures on goods and services account for additional employment and wages in Alaska. Including direct, indirect, and induced employment, Alaska's mining industry accounted for about 10,800 jobs and \$985 million in wages in 2021.

### **ALASKA RESIDENT AND RURAL ALASKAN HIRE**

- Based on compilation of W2 data from all six producing mines (UCM, Greens Creek, Red Dog, Fort Knox, Pogo, and Kensington), about 74% of employees are Alaska residents.
- Workers in Alaska's mining industry live in all regions of the state. Rotation schedules allow Alaskans to live wherever they want while working at remote mines. Mines offer job opportunities to residents of rural Alaska, where few other job opportunities exist.
- Mining employees live in about 95 communities throughout Alaska (not including placer gold, and rock, sand, and gravel production workers).

### **EMPLOYMENT OUTLOOK**

- Several advanced exploration and new mine development projects could dramatically increase Alaska's mining employment over the next several years if they enter full production, for example:
  - Graphite Creek project, north of Nome, is expected to create 370 production jobs.
  - Livengood, just north of Fairbanks, will also create about 330 mining jobs.
  - Donlin Gold in Southwest Alaska is expected to require about 1,000 workers during its operations.
  - Pebble in Southwest Alaska would require an operations labor force of about 850.
  - Arctic, in Northwest Alaska, is expected to employ about 450 people during its operations.
- Exploration programs at all producing mines may extend mine life and sustain (if not increase) jobs.

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<sup>1</sup> <https://dggs.alaska.gov/webpubs/dggs/sr/text/sr076.pdf> (Accessed March 20, 2022).



## Spending on Goods and Services

- Alaska's six largest mines (UCM, Greens Creek, Red Dog, Fort Knox, Pogo, and Kensington), pre-development and development projects (Donlin Gold, Manh Choh, and Pebble), and advanced exploration projects together spent an estimated \$1.1 billion on a wide variety of goods and services in support of their operations.
- A total of \$640 million (or 59% of total goods and services spending) of this spending on goods and services was made with about 400 Alaska vendors. It is this spending, combined with high wages paid to Alaskan workers, and tax payments to state and local governments, that creates the mining industry's high multiplier effects in Alaska.



## Local and State Government Payments

### LOCAL GOVERNMENT

- Mining companies pay the largest share of local taxes in the Northwest Arctic Borough, Fairbanks North Star Borough, Denali Borough, and City & Borough of Juneau. Tax payments to local governments totaled an estimated \$44 million annually.
  - Fort Knox paid \$13 million in property taxes to the Fairbanks North Star Borough, making the mine the largest "single property" taxpayer in the Borough.
  - Greens Creek Mine paid \$2.6 million and Kensington paid \$1.4 million in property taxes to the City & Borough of Juneau. These two mines are the two largest taxpayers in the City & Borough of Juneau.
  - Red Dog paid \$25 million in payment in lieu of taxes (PILT) to the Northwest Arctic Borough, plus \$6 million in payments to the new Village Improvement Fund. Red Dog is the Borough's single largest source of revenue. The Borough has no sales tax or property tax revenues.
  - UCM pays taxes to the Fairbanks North Star Borough, Matanuska-Susitna Borough, and Denali Borough.
- In certain jurisdictions, mining companies pay sales tax on their local purchases of goods and services. For example, in Juneau, Greens Creek Mine paid an estimated \$727,230 in sales taxes.
- Many local governments also receive revenue from locally-owned or leased rock quarries, and sand and gravel pits.

### STATE GOVERNMENT

- The mining industry pays a wide variety of taxes, rent, royalties, and fees to the State of Alaska, including \$9 million in mining license fees in 2021.

- A portion of Alaska's mining industry rent and royalty payments are earned on behalf of the Alaska Permanent Fund. The Permanent Fund earned about \$8 million from the mining industry.
- Mining-related activity is an important source of revenue for the Alaska Railroad Corporation. The railroad earned about \$15 million from movement of coal and rock, sand, and gravel (representing about 20% of the railroad's total revenue from freight movement).
- Red Dog paid \$28 million to the Alaska Industrial Development and Export Authority for use of the DeLong Mountain Transportation System.
- The mining industry paid \$1 million to the Alaska Mental Health Trust for rents and royalty payments, as well as purchases of industrial materials from Trust lands.



## Partnerships with Alaska Native Corporations

- All Alaska Native corporations (ANCs) benefit from mining activity through jobs for shareholders, 7(i) and 7(j) royalty sharing payments, or business partnerships.
- As owners of 44 million acres of privately held land, much of which was selected for its mineral potential, ANCs and their shareholders are well positioned to play a key role in future development of the mining industry in Alaska. In partnership with the mining industry, most ANCs continue to evaluate mineral development opportunities on their lands, with potential resources ranging from gravel to gold, silver, copper, nickel, lead, zinc, platinum, tungsten, manganese, strategic minerals, jade, limestone, and coal.

## ALASKA NATIVE AND SHAREHOLDER HIRE

- At Red Dog, 52% of the year-round jobs are filled by NANA Regional Corporation (NANA) shareholders, including jobs with Teck Alaska, NANA Lynden Logistics, and NANA Management Services (NMS), NANA Construction, Kuna Engineering, and Paa River Construction.
- At Upper Kobuk Minerals Project, 47% of the employees and contractors were NANA shareholders in 2021.
- About 54% of the development jobs at Donlin Gold were filled by Alaska Native workers.
- Two-thirds (66%) of the workers at Pebble Project were Alaska Native shareholders or descendants.

## ROYALTY PAYMENTS

- Regional ANCs are mandated to annually redistribute 70% of net revenue earned on subsurface developments of their lands (also known as Section 7(i) payments) among all regional corporations. These Regional ANCs then distribute payments to their respective village corporations (also known as Section 7(j) payments).



- As part of a lease agreement, Red Dog pays a royalty to NANA that totaled \$161 million in 2021. Of this royalty payment, NANA redistributed \$98 million to all regional ANCs.
- Since 1989, NANA has distributed \$1.6 billion (not including NANA's distributive share) to the other ANCSA corporations in Section 7(i) payments. Half of these Section 7(i) payments were then redistributed to each village corporation and to at-large shareholders in the form of a Section 7(j) payment.
- While some royalties have already been paid to Calista Corporation (and lease payments to The Kuskokwim Corporation), the long-term benefit for Calista Corporation will come from royalties once Donlin Gold is in operation.

## BUSINESS DEVELOPMENT OPPORTUNITIES

- Mining provides opportunities for ANCs. For example, NMS provides meals and lodging services for mining camps, DeLong Mountain Logistics (NANA) provides transportation and logistics support for Red Dog, Tuuq Drilling (NANA) provides core drilling services, NANA Construction provides a broad range of construction services, Kuna Engineering (NANA) provides engineering services, Paa River Construction (NANA) provides construction and mining support, and Alaska Industrial Hardware (Bering Straits Native Corporation) provides equipment and supplies to the mining sector.



### Other Measures of Economic Impact

- Mining offers additional benefits to the Alaska economy, including:
  - Development of workforce skills that are often transferable to sectors of the economy other than mining.
  - Direct support for student performance (scholarships and internships) and endowments for faculty and research at the University of Alaska.
  - Public and private infrastructure investment that has broad benefit beyond the primary use of a mining venture, including roads, docks, and electric transmission.
  - Charitable contributions to at least 250 nonprofit organizations throughout Alaska totaling about \$3.3 million. In addition, more than \$800,000 went to many civic, business, and industry organizations in Alaska through sponsorships and membership fees. Several mines have employee-match giving programs, provide in-kind support for events and contributed thousands of employee hours volunteering in their communities and causes.



### Alaska's Mineral Endowment and Mining's Future in Alaska

- Although most of Alaska is unexplored, there are 7,200 known mineral occurrences, not including coal or industrial/construction materials deposits. With this resource potential

- along with rising global base and precious metals prices, conditions are right for further growth in Alaska's mining industry.
- Alaska's mines can produce several minerals that are listed as "critical" by the U.S. Geologic Survey for domestic manufacturing, including clean energy technology, such as graphite, cobalt, barite, and rare earth elements.

## Overall Summary

The table below highlights the economic impact of Alaska's mining industry in 2021.

**Table 1. Summary of Statewide Economic Impact of Alaska's Mining Industry, 2021**

Category	Amount
<b>Direct Jobs and Wages</b>	
Estimated mining industry jobs in Alaska	5,400
Estimated mining industry wages in Alaska	\$625 million
<b>Total Jobs and Wages (Including Multiplier Impacts)</b>	
Total jobs attributable to the Alaska mining	10,800
Total wages attributable to the Alaska mining industry	\$985 million
<b>Investment</b>	
Exploration expenditures	\$170 million
Total exploration investment in Alaska, 1981-2021	\$4.3 billion
Development expenditures	\$393 million
Total development investment in Alaska, 1982-2021	\$7.7 billion
<b>Production</b>	
Number of placer mines (2020)	150
Estimated placer gold production (2020)	32,501 ounces
Value of Alaska's mineral exports	\$2.1 billion
Mineral exports percentage of Alaska's total exports	35%
<b>Government Revenue</b>	
Payments to State of Alaska	\$83 million
Rents, royalties, and taxes (including mining license tax)	\$39 million
AIDEA facilities user fees	\$28 million
Mining commodity movement by Alaska Railroad	\$15 million
Payments to Alaska Mental Health Trust	\$1 million
Payments to local governments	\$44 million
<b>Native (ANCSA) Corporations</b>	
7(i) payments to ANCSA Regional Corporations	\$98 million

# Purpose and Methods

## Purpose

This study's purpose is to measure the direct, indirect, and induced economic impact of Alaska's mining industry in 2021, which includes exploration, mine development, and production. The industry produces zinc, lead, copper, gold, silver, coal, as well as construction materials, including rock, sand, and gravel.

## Methods

McKinley Research Group requested employment, resident hire, shareholder hire, vendor purchases and other operational spending, payments to local and state governments, and other data from Alaska's major mining companies (including companies engaged in exploration but not production). Secondary data were compiled from various public sources, including the Alaska departments of Labor and Workforce Development (DOLWD), Natural Resources (DNR), Commerce, Community and Economic Development (DCCED), and the federal Bureau of Economic Analysis (BEA).

There is no comprehensive public source of data regarding mining employment and payroll. Sources providing various partial measures of employment and payroll include the BEA, DOLWD, and DNR. Each source has advantages and disadvantages. Therefore, McKinley Research Group supplements these publicly available employment and payroll data with data obtained directly from the individual companies and other original research.

IMPLAN™, a model for estimating the size and linkages of different types of economic activity, was used to help assess the multiplier effects industry spending in generating jobs and payroll in Alaska's economy. Other measures of economic impacts are included, such as the industry's payments to local, borough, and state governments and Alaska Native corporations. The economic impact analysis is based on 2021, or the most currently available data. All photos were provided by Alaska's mining companies.

*This report is prepared for informational purposes only and is current only as of its report date. The data in this report have not been independently audited and are not intended to be used, relied on, or considered in making any legal, financial, or business decision. Data and analysis presented are subject to change at any time with or without notice. Similarly, the data in this report are not an official financial statement or disclosure by any of the mining companies and should be not deemed as such.*

# The Mining Cycle



According to the Mineral Information Institute, nearly 6.4 billion tons of minerals and energy fuels were produced in 2021 to meet the needs of the U.S., an average of more than 38,272 pounds of minerals for each American.<sup>2</sup> The U.S. Geological Survey estimates the average American will require 2.96 million pounds of minerals, metals, and fuels during his or her lifetime, or measured annually:

- 10,188 pounds of stone to make roads, buildings, bridges, and other construction uses
- 6,912 pounds of sand and gravel to make concrete, asphalt, roads, blocks, and bricks
- 11 pounds of copper in buildings, electrical and electronic parts, plumbing, and transportation
- 10 pounds of lead for transportation, batteries, electrical, communications, and TV screens
- 6 pounds of zinc to make paint, rubber, skin creams, rust resistant metals, and for use in nutrition and health care; and,
- 2,897 pounds of coal to produce energy<sup>3</sup>

It takes many years to develop a mine to supply these needs and requires various phases of activity in what is typically called the “mining life cycle.”

**Figure 2. The Mining Life Cycle**



<sup>2</sup> <https://mineralseducationcoalition.org/mining-mineral-statistics/>

<sup>3</sup> <https://mineralseducationcoalition.org/mining-mineral-statistics/> (Accessed March 25, 2022).



## Reconnaissance Exploration

The first phase of the mining cycle is exploration. Reconnaissance exploration is aimed at defining promising areas for a specific mineral while also identifying previously unrecognized mineral deposits with economic potential. Following discovery comes more focused exploration, sometimes termed “advanced” exploration. During this process, the deposit is sampled to determine grade and tonnage and the probability of profitable mining.

This is a complex phase of mineral resource development. Dozens of constantly changing economic, financial, and technical forces influence mine feasibility. Low grades, small tonnages, challenges with metallurgical recovery, infrastructure limitations, or high costs may mean that a deposit never advances beyond the assessment phase. Alternatively, it may sit idle for many years until rising metal prices, infrastructure development and access improvements, or technological advances help turn the project into a profitable venture.

Mineral exploration has become increasingly sophisticated, with reconnaissance exploration programs often beginning with analysis of satellite or high-altitude aerial photographs covering broad areas. Depending on the target minerals, airborne geophysical surveys may be employed over large tracts of land. Geochemistry also plays an important role in mineral exploration today. Chemical analysis of stream sediment and soil samples allows mining companies to make a preliminary assessment of mineral potential without sampling the underlying bedrock.

### RECONNAISSANCE EXPLORATION TECHNIQUES

**Geological surface mapping and sampling** to delineate areas of likely mineralization and deposits.

**Geophysical measures** to understand physical properties of the mineralization.

**Geochemical analysis (assay)** to determine the proportion of metallic or non-metallic presence.

**Water, oil, and soil tests** to determine hydrologic conditions and natural occurrences of elements in rocks, soils, and waters.

**Airborne or ground geophysical surveys** to map exposed bedrock, geological structures, mineral deposits and other features.

**Drilling** to obtain detailed information about rock types, mineral content, rock fabric, and the relationship between the rock layers close to the surface and at depth.

**Sampling** to estimate mineral quality and grade.

**Socioeconomic analysis** to understand how a new mine may affect an area and surrounding communities.





## Advanced Exploration

With advanced exploration comes the sometimes lengthy and costly process of determining if a prospect can be profitably and safely mined. Drilling, sampling, engineering, metallurgical analysis, financial analysis, and baseline environmental analysis are all part of the effort to determine if profitable and environmentally responsible mining is possible. Ore grade, tonnage, and mineral/metal prices are critical factors for mine feasibility, but so are costs, including the cost of preparing the ore body for mining, building a mill (concentrator), mining the ore, crushing, grinding, and refining a product from that ore, and eventual shut-down and site reclamation.

### ADVANCED EXPLORATION PROCESSES

**Mine-site design** by creating multiple scenarios, i.e., mine life, ore mined, to determine a viable project.

**Planning criteria and permit considerations** to ensure safety and operational risks are considered into the design and wellbeing of workers, contractors, and communities.

**Environmental impact** to develop strategies to minimize environmental impact.

**Economic vitality** includes various stages of analyses:

- Preliminary Economic Assessment (PEA)
- Pre-Feasibility Study (PFS)
- Feasibility Study (FS)
- Definitive Feasibility Study (DFS)

**Corporate social responsibility (CSR)** to find ways to give back to the local communities through jobs, vendor opportunities, shared infrastructure, environmental stewardship, nonprofit support, and other methods.



## Development (Construction)

During development, the ore body is prepared for mining, an ore processing mill is constructed, and the support infrastructure is developed—for example roads, electrical generation, marine facilities, etc. In large-scale mine projects, hundreds of millions of dollars, sometimes billions of dollars, are invested and hundreds of workers employed over a period of several years to prepare the mine for production. Large mining companies typically pursue multiple projects at different stages of development simultaneously.

### TYPES OF CONSTRUCTION

**Transportation infrastructure** including roads, rail, airstrips, pipelines, ports, and docks.

**Processing facilities** including crushing, grinding, and recovery of metals, and tailings treatment and management.

**Environmental management systems** to comply with regulations and meet corporate environmental policies.

**Employee housing and catering facilities**

**Other facilities** including maintenance facilities/workshop, management offices, storage, fueling areas, and power generation.

Mine construction involves building a mill or concentrating plant – a facility to separate the valuable metals from the surrounding rock. These facilities typically include mechanical (crushing, grinding, gravity separation) and/or chemical purification processes. In some cases, a “concentrate” is produced that is shipped to a smelter where final processing produces a metal product.

The mine construction effort also includes support facilities, which may involve transportation infrastructure (roads, docks, or airstrips, depending on the location of the mine), tailing disposal facilities, power generating plants if no outside power source is available, and office and lab structures for the mine’s managers, engineers, and geologists. For remote mines, facilities are required to house and feed the mine’s workforce.

Mine development includes the process of preparing the ore body for mining: for underground mines, driving tunnels from the surface (adits), sinking shafts, driving access and ventilation raises, and accessing ore blocks with crosscuts and other tunnels. For surface mines, development may include stripping overburden and removing waste rock above the deposit. Mine development expenditures are also made to purchase equipment such as drills, loaders, trucks, etc.



## Production

With mine development and construction complete, production can begin. To access ore, common methods of mining include surface mining, such as placer mining (open-cast), strip mining, open-pit mining, dredging, highwall mining, and underground mining. The recovered minerals are then processed using large crushers, mills, reactors, roasters, and other equipment to consolidate materials and extract the compounds and metals from the ore. In the case of placer mining, water is used to separate the valuable ore from the surrounding sediment. Ore is separated by heap leaching, flotation, and smelting. Additional chemical or mechanical methods used to extract the valuable metal from the mineral. Some metals are then formed into bars or ingots.

The production phase of the mineral cycle can last from a few years to several decades, depending on production rates, the size of the ore body, and market conditions. The life of a mine can be longer or shorter than anticipated. Increasing metal prices, improved technology, lower cost of production factors such as fuel or electric power can all add years to the life of a mine. Conversely, technical difficulties, falling metal prices, or increasing production costs can force temporary closure or prematurely end the life of a mine.



## Reclamation and Mine Closure

Mining companies must prepare a mine closure plan prior to starting development; governments need assurances the operators have a plan and the required funds to close the mine. The State of Alaska requires a reclamation bond for disturbances over 5 acres in size. A portion of the reclamation bond may be refunded upon approved reclamation.<sup>4</sup>

Mine closure includes sealing shafts, openings, buildings, and other mine components to keep them safe for the public. Mining companies must also remove waste and hazardous material from the site both during operation and at the time of mine closure.

Mine reclamation is the process of returning an area to a physically and chemically stable condition and converting mined or otherwise industrially developed land to some other useful function. In remote areas, the goal is most often to create productive ecosystems. In more urbanized areas, the goal might be to convert land to other industrial, commercial, or recreational uses. The process of mine reclamation can include grading and stabilizing the landscape, placing topsoil, and generating re-vegetation. Mine reclamation can also involve long-term commitments by mining companies to monitor environmental conditions in the reclaimed areas.

Reclamation occurs at all phases of a mine's life, including the exploration, development, operational (often referred to as contemporaneous reclamation), and closure phases.

### MINE CLOSURE PROCESS

1. Shut down
2. Decommissioning
3. Remediation/Reclamation
4. Post-closure

### RECLAMATION OCCUPATIONS EXAMPLES

Engineers  
Security  
Arborists  
Horticulturalists  
Biologists  
Landscape architects  
Heavy equipment operators and other  
various construction trades

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<sup>4</sup> <http://dnr.alaska.gov/mlw/mining/placer.cfm>

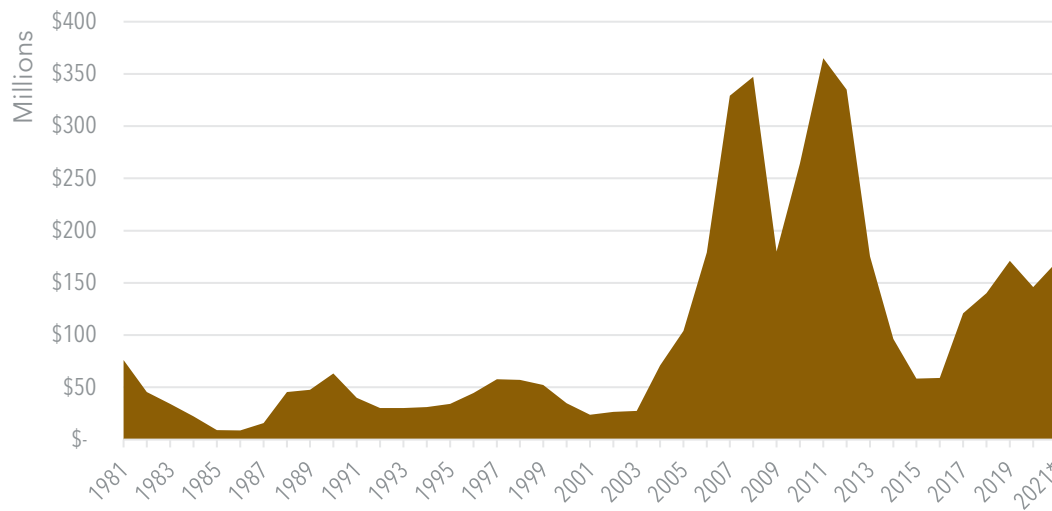
# Mining Activity in Alaska



## Exploration

An estimated \$170 million was spent on exploration in Alaska in 2021. Since 1981, mining and exploration companies have spent \$4.2 billion in Alaska on mineral exploration programs.<sup>5</sup>

**Figure 3. Exploration Expenditures in Alaska, 1981-2021\*, \$million**



Sources: *Special Report 76, Alaska's Mineral Industry 2020*, State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys. \*McKinley Research Group estimates.

<sup>5</sup> *Special Report 76, Alaska's Mineral Industry 2020*, State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys.

In 2021, about 50 individual exploration projects reported activity in Alaska (some companies managed multiple projects).<sup>6</sup> Alaska's five operating metal mines spent \$31 million for exploration (or 18% of exploration spending). At least 21 active reconnaissance exploration projects spent more than \$1 million each. These and other active projects are listed in the table below by region, project, exploration company, and minerals prospected.

**Table 2. Active Reconnaissance Exploration Projects, 2021**

Project	Exploration Company	Prospect
<b>Aleutians</b>		
Unga-Popov	Heliostar (Redstar Gold)	Gold
<b>Eastern Interior Region</b>		
Caribou Dome	PolarX Ltd.	Copper
Golden Zone	Avidian Gold Inc.	Gold, silver, copper
Shorty Creek	Freegold Ventures Ltd.	Copper, molybdenum
Red Mountain	White Rock Minerals	Polymetallic
Stellar	PolarX Ltd.	Gold, copper
Tanacross	Kenorland Minerals	Gold, copper, zinc, silver, lead
<b>Fairbanks District</b>		
Amanita	Avidian Gold Inc.	Gold
<b>Goodpaster District</b>		
64North Gold	Millrock Resources, Resolution Minerals	Gold
Healy	Kenorland Minerals	Gold, silver
<b>Northern Region</b>		
Anarraaq-Aktigiruaq	Teck American	Lead, zinc
Lik	Solitario Zinc, Teck American	Zinc, lead, silver
<b>Richardson District</b>		
SAM	Great American Minerals Exploration Inc.	Gold, silver
Shamrock	Contango Ore	Gold
<b>Southcentral Region</b>		
Genesis	New Age Metals	Palladium, platinum, nickel, copper
Icy Cape	Alaska Mental Health Trust Land Office	Heavy mineral concentrates
Johnson Tract	HighGold Mining Inc.	Gold, copper, zinc, lead
<b>Southeastern Region</b>		
Cantoo	Blackwolf Copper and Gold Ltd.	Gold, copper
Herbert Gold	Grand Portage Resources Ltd.	Gold

<sup>6</sup> McKinley Research Group estimates.



### Active Reconnaissance Exploration Projects, 2021 (continued)

Project	Exploration Company	Prospect
<b>Southwestern Region</b>		
Estelle	Nova Minerals	Gold
<b>Tolovana District</b>		
Shorty Creek	Freegold Ventures	Gold
<b>Western Region</b>		
Honker	Western Alaska Minerals	Gold
Illinois Creek	Western Alaska Minerals	Gold, silver, copper, polybdenum
Round Top	Western Alaska Minerals	Copper, molybdenum, lead, zinc, silver

Sources: Various company websites and direct contact by McKinley Research Group

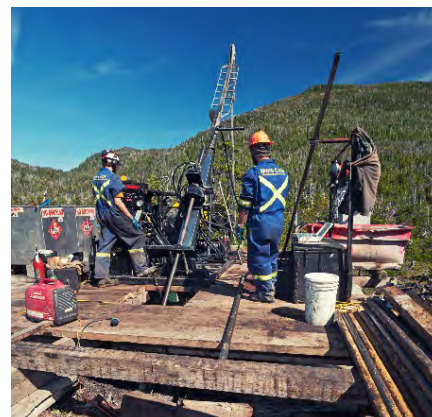
## Advanced Exploration Projects

Seven projects have completed a Preliminary Economic Assessment (PEA) and are considered in the advanced exploration phase, including Bokan Mountain-Dotson Ridge, Golden Summit, Graphite Creek, Livengood, Niblack, Palmer, and Upper Kobuk Minerals Project.

### BOKAN MOUNTAIN-DOTSON RIDGE

The Bokan Mountain project, about 37 miles southwest of Ketchikan, is owned by Ucore Rare Metals and contains rare earth elements (REE). As currently envisioned, a 1,500-metric ton/day underground operation would include processing components - a material sorting and leaching process plant and an advanced separation process - to produce rare earth oxide (REO) concentrates.

According to its 2013 PEA, the initial capital cost for the project is \$221.3 million. The project would require two years of construction. Once in production, the mine would support 118 jobs.<sup>7</sup> Ucore continues to conduct mineralogy and metallurgical studies to upgrade the Bokan mill flowsheet for REEs and co-products and is completing a due diligence process with AIDEA for approval of a \$3.5 million financing package to develop the Alaska Strategic Metals Complex (SMC) in Ketchikan, a commercial-scale operation of the REE separation facility.<sup>8</sup>



<sup>7</sup> <https://ucore.com/docs/PEA.pdf> (Accessed March 16, 2022).

<sup>8</sup> <https://ucore.com/bokan-mountain/> (Accessed March 16, 2022).

## GOLDEN SUMMIT

Freegold Ventures Limited's Golden Summit gold prospect is located about 18 miles northeast of Fairbanks and five miles from Kinross's Fort Knox mine. The large relatively low-grade gold deposit has potential for development of a surface mine with heap leach and biooxidation gold extraction. At a cut-off grade of 0.3 grams per ton, the deposit includes 133 million tons of indicated and inferred resources.

Its PEA outlines a two-phase, 24-year open pit mine producing 10,000 tons per day, with peak annual gold production of 158,000 ounces and annual average production of 96,000 ounces, based on \$1,300 per ounce of gold. Oxide ore would be mined during the first phase of production, with sulfide ore mining starting in Year 9. An initial investment of \$88.4 million would be required to initiate mining and heap leach operations. Another \$348.3 million capital investment would be required over the life of the project to mine and process the sulfide ore.<sup>9</sup> Next steps for Freegold at Golden Summit are to expand through additional drilling of the heap-leachable oxide resource.

## GRAPHITE CREEK

The Graphite One Project, about 35 miles north of Nome, is envisioned to be an owner-operated year-round open-pit operation, which would mine 4 million metric tons of material each year over a 40-year mine life. Of these, about 1 million metric tons with an average graphite mineralization grade of 7% Cg ("contained graphite") would be delivered to the processing plant adjacent to the mine. On an annual basis, the processing plant would reduce 1,018,000 metric tons of graphite mineralization to 60,000 metric tons of graphite concentrate at 95% Cg. The dried concentrate would be packaged and transported to the Port of Nome and shipped on a seasonal schedule to a manufacturing plant, where the concentrate would be pelletized and turned into spheroid-shaped particles and coated and graphitized.<sup>10</sup>



Its 2017 PEA projected capital cost totaling \$363 million, including \$43 million at the mine, \$158 million for the processing plant, \$32 million for supporting infrastructure, and \$130 million for the manufacturing plant. Projected annual operating costs at full capacity are \$98.2 million. Estimated project employment includes 174 mine workers, 95 processing plant workers, 102

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<sup>9</sup> [https://www.freegoldventures.com/site/assets/files/1862/pea\\_goldensummit.pdf](https://www.freegoldventures.com/site/assets/files/1862/pea_goldensummit.pdf) (Accessed March 16, 2022).

<sup>10</sup> <https://www.graphiteoneinc.com>. (Accessed March 16, 2022).

manufacturing plant workers for a total of 371.<sup>11</sup> In 2017, the U.S. Geological Survey listed graphite as one of 23 materials for which the U.S. is 100% import dependent and is a Critical Mineral Resource.<sup>12</sup> Graphite One is currently working simultaneously to prepare a Pre-Feasibility Study (PFS) (expected to be released in 2022) and generate additional data for its Feasibility Study (FS).

## LIVENGOOD GOLD

Located 70 miles northeast of Fairbanks, International Tower Hills Mines Ltd.'s Livengood Gold Project is aimed at developing a surface gold mine producing 317,000 ounces of gold annually over a 20-year mine life (a total 6.4 million ounces of gold).<sup>13</sup>

The updated 2021 Livengood Gold Project PFS estimates the Livengood Gold Project mineral resource is 646 million measured metric tons at an average grade of 0.60 g/metric ton and 58.5 million indicated metric tons at an average grade of 0.619 g/metric ton for a total of 704.5 million metric tons at an average grade of 0.60 g/metric ton.



The estimated initial capital cost of the mine, processing plant, and general site infrastructure is \$1.93 billion, including a contingency of \$220 million. The life of mine sustaining capital costs would be an additional \$658 million, excluding \$317 million for reclamation. During the three-year construction period, employment would peak at 800 jobs. During production, direct employment is estimated at 331 jobs.

## NIBLACK

The Niblack copper-gold-zinc-silver project, owned by Blackwolf Copper & Gold Ltd., is located 27 miles southwest of Ketchikan on Prince of Wales Island. While resource estimates will be updated in 2022, the 2011 PEA estimates grades of 1.7% copper, 3.2g/t gold, 3.6% zinc and 72.6 g/t silver within the 5.6 million tons of indicated resource containing 317,000 ounces of gold and 118 million pounds of copper, along with 3.4 million tons inferred.<sup>14</sup> The 2011 PEA indicated Niblack would have a minimum 10-year mine life.

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<sup>11</sup> <http://www.graphiteoneresources.com/projects/graphite-one-project-pea/overview/>

<sup>12</sup> [http://www.graphiteoneresources.com/news/news-display/index.php?content\\_id=267](http://www.graphiteoneresources.com/news/news-display/index.php?content_id=267)

<sup>13</sup> <https://www.ithmines.com/resources/technical-reports/3661012-000000-40-ERA-0001-R00.pdf> (Accessed March 16, 2022).

<sup>14</sup> [http://www.niblackproject.com/s/About\\_Niblack.asp?ReportID=579360&\\_Type=About-Niblack&\\_Title=Niblack-Project-Status](http://www.niblackproject.com/s/About_Niblack.asp?ReportID=579360&_Type=About-Niblack&_Title=Niblack-Project-Status)

## PALMER

The Palmer project is a joint venture partnership between Constantine (45%) and Dowa Metals & Mining Co., Ltd. (55%), with Constantine as operator. It is a high-grade copper-zinc-gold-silver deposit with the potential for underground mining, about 37 miles northwest of Haines. The current inferred resource estimate is 9.6 million metric tons with metal grades of 0.59% copper, 4.95% zinc, 0.39 g/ton gold, and 69.3 g/ton silver.<sup>15</sup>



According to its amended 2019 PEA, the mine will produce 3,500 metric tons of ore daily. Pre-production development costs are estimated at \$278 million over two years, with sustaining capital and closure costs of \$140 million (total capital costs of \$418 million). Over an 11 years mine life, estimated recovered metal production is 1,068 million pounds of zinc, 196 million pounds of copper, 18 million ounces of silver, 91,000 ounces of gold and 2.89 million metric tons of barium sulfate.<sup>16</sup>

## UPPER KOBUK MINERALS PROJECT

### *Arctic*

The Arctic Project is Ambler Metal's most advanced exploration/pre-development effort in its Upper Kobuk Minerals Project and the most advanced project among all properties in the Ambler Mining District. The Arctic property includes 112,000 acres of State of Alaska mining claims and patented federal mining claims. The Arctic Project is located about 22 miles northeast of Kobuk, and 162 miles west of the Dalton Highway.



The Arctic deposit hosts 39.5 million metric tons of indicated resources containing copper, zinc, lead, gold, and silver. The deposit is very high grade, with an average copper grade of 3.1% and a copper-equivalent grade of 5.8%. The Arctic Feasibility Study (FS) indicates an open-pit mine

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<sup>15</sup> Data provided by Constantine Metal Resources, May 6, 2022.

<sup>16</sup> <https://constantinemetals.com/projects/palmer/> (Accessed March 16, 2022).

processing about 10,000 tons of ore daily over a 12-year mine life. A construction workforce of about 600 people is estimated. Once in production, it is estimated about 400 people will be employed at the mine site.

The FS assumes concentrate will be moved by truck via an access road constructed from the Dalton Highway and financed much like Alaska Industrial Development and Export Authority's (AIDEA) Delong Mountain Transportation System. In 2017, the Bureau of Land Management (BLM) launched an Environmental Impact Statement (EIS) process for the Ambler Access Project (AAP). In 2020, the BLM and Army Corp of Engineers issued their Joint Record of Decision; however, in February 2022, the Biden Administration asked the U.S. District Court for Alaska to send the permit approval back to the U.S. Department of Interior so it can conduct a supplementary environmental analysis.

While the Arctic Project is the most advanced project in the Ambler district (and the most advanced concentrate-producing mine project in the broader Railbelt region) its likelihood and timing of development is uncertain. Several key factors are at play, including building of the AAP road.

### ***Bornite***

The Bornite deposit, located about 16 miles southwest of the Arctic Project, is on property owned by NANA Regional Corporation. Though lower grade than Arctic, Bornite is a larger copper deposit, with potential for both surface and underground mining. The Bornite resource has been estimated to include 185.8 million metric tons of indicated and inferred resources, including 41.7 million tons of indicated resource containing 99 million pounds of copper, and 144.1 million tons of inferred resource containing 5.3 billion pounds of copper. With grades ranging from 1% to 2.5%, the Bornite deposit contains just under 6.3 billion pounds of copper. The Bornite deposit has been an exploration target for many years.

In 2021, Ambler Metal's largely seasonal employment in Alaska was 139 workers, of which 47% were NANA shareholders.<sup>17</sup> Ambler Metals announced a \$28 million budget to conduct a full 2022 summer field season, including about 2,000 meters of drilling at Arctic, 5,500 meters of drilling surrounding Arctic, and 2,500 meters of drilling at Bornite.<sup>18</sup>

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<sup>17</sup> Data provided by Ambler Metals.

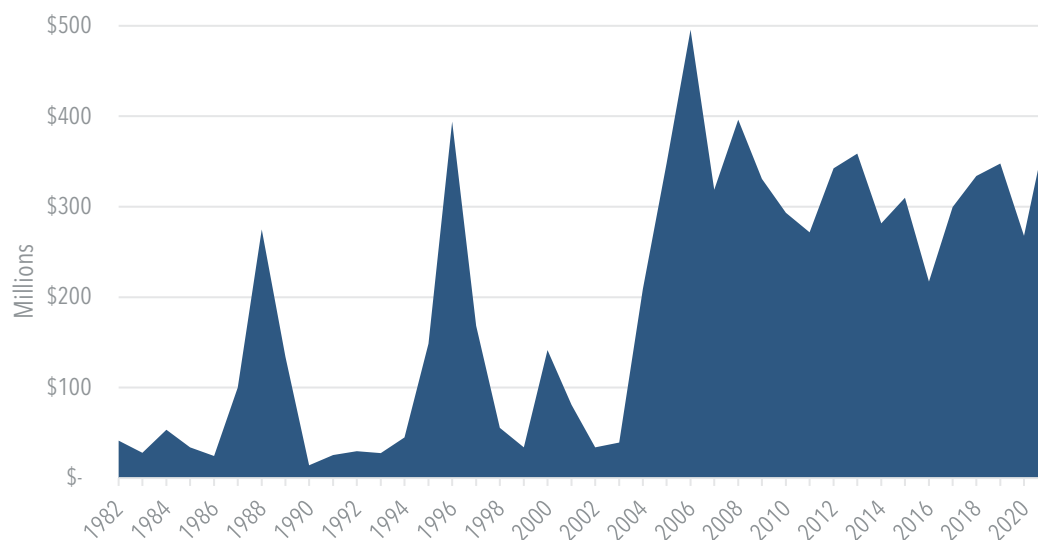
<sup>18</sup> <https://www.amblermetals.com/newsletters> (Accessed March 16, 2022).



## Development

Investment in mine development can be variable year to year, depending on the extent to which new mines are being constructed. Development investment is more consistent for enhancements, improvements, or expansions of existing mines. Between 1982 and 2021, about \$7.7 billion was spent on mine development in Alaska. In 2021, nine mining projects invested about \$393 million in development in Alaska. About 96% percent of total sustaining capital spending (about \$376 million) was done by existing mines, including Red Dog, Fort Knox, Pogo, Kensington, Greens Creek, and UCM.<sup>19</sup>

**Figure 4. Development Expenditures in Alaska, 1982-2021\*, \$million**



Source: *Special Report 76, Alaska's Mineral Industry 2020*, State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys. \*McKinley Research Group estimates.

## Projects in or Near Development

### DONLIN GOLD

The Donlin Gold project is in the historic Kuskokwim Gold Belt of Southwest Alaska, 10 miles north of the village of Crooked Creek, and is managed by Donlin Gold LLC, which is owned equally by subsidiaries of NOVAGOLD and Barrick Gold Corporation. Donlin Gold leases the sub-surface rights from Calista Corporation and the surface rights from The Kuskokwim Corporation.

<sup>19</sup> McKinley Research Group estimates.

The Donlin Gold project is one of the highest-grade known open-pit gold deposits, with a grade of 2.24 grams per metric ton containing 39 million ounces of gold in the measured and indicated resource categories.<sup>20</sup> The planned operating mine life is 25 years, with annual average production of 1.1 million ounces.<sup>21</sup> Initial capital costs are \$7.4 billion with additional sustaining capital costs of \$1.7 billion over the life of mine. Contributions for reclamation, closure, and financial assurance will total \$292 million.<sup>22</sup>



Infrastructure plans call for an access road from the mine site to the Kuskokwim River Port site, an airstrip, barge cargo and fuel terminal at Jungjuk, marine cargo terminal at Bethel, two open-pit mines, process plant, fuel storage, power-generation plant, water-treatment plant, construction camp for 2,560 people and permanent accommodation camp (maximum 638 people), a 14-inch natural-gas-pipeline, and a waste rock storage facility. Key federal permits for the project have been received and state permitting is well-advanced. Up to 1,000 operating jobs are anticipated, depending on the production timeline.

In 2021, Donlin Gold had an annual average employment of 53 workers, of whom 54% were Alaska Native people. About 100 full-time and year-round contractors worked on site.

## MANH CHOH

Peak Gold, LLC (Peak Gold) owns Manh Choh, a joint venture between Kinross Gold Corporation (70%) and Contango ORE, Inc (30%). KG Mining (Alaska) is the manager of Peak Gold.<sup>23</sup> Manh Choh is located about 10 miles south of Tok and 12 miles west of the traditional Alaska Native village of Tetlin. The project is accessed from a 7-mile road off the Tetlin Village Road, which connects to the Alaska (Alcan) Highway.

The project is entirely on land owned and controlled by the Native Village of Tetlin tribal organization, which owns the fee-simple surface and sub-surface mineral rights. As owners of the surface and sub-surface rights, the Native Village of Tetlin will earn royalties once the mine is in operation. The value of the royalties will depend on ore grades, recovery rates, gold prices, operating costs, and the specific terms of the royalty agreement.

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<sup>20</sup> <https://www.novagold.com/resources/Novagold-2022-January.pdf> (Accessed March 16, 2022).

<sup>21</sup> <https://www.novagold.com/resources/reports/S-K-1300.pdf> (Accessed March 16, 2022).

<sup>22</sup> <https://www.novagold.com/resources/projects/Technical-Report-Donlin-Gold-2021.pdf> (Accessed March 16, 2022).

<sup>23</sup> As the project is still in the study phase, all data presented are preliminary.



The Manh Choh project plan includes open pit mining near Tetlin from which ore will be trucked about 250 miles one-way for processing at the existing Fort Knox mine located about 25 road miles northeast of Fairbanks. Ore processing will occur within existing permitted facilities at Fort Knox; no mill or tailings facilities are needed at Manh Choh.

The proposed mine's access road construction, Twin Road and Site Road, and site preparation are scheduled to start in 2022 with completion by the end of 2023. With pre-stripping starting in the 3<sup>rd</sup> quarter of 2023, the mine is scheduled to start production in the 1<sup>st</sup> quarter of 2024 and continue for 4.5 years.

Development of the \$150 million capex mine project is expected to directly generate \$50 million in labor income and about 280 new jobs over the construction period. Including multiplier effects from in-state spending in support of mine construction (indirect impacts) and spending by construction workers (induced impacts) in the Alaska economy, employment will total about 485 direct, indirect, and induced jobs with a total labor income of about \$75 million statewide.

The mine operations labor force is expected to average about 500 workers annually over the estimated 4.5-year life of mine, with an estimated annual direct payroll of \$75 million and an estimated total of \$376 million over the estimated life of mine. The average annual wage is estimated to be about \$128,000 (not including benefits). Total annual direct, indirect, and induced employment while the project is fully operational is expected to be about 950 jobs statewide with annual average payroll of \$120 million.

While in production, Manh Choh will be the second largest private employer and source of income in the Southeast Fairbanks Census Areas after the Northern Star Pogo mine located near Delta Junction.<sup>24</sup> In 2021, Manh Choh temporarily employed 40 on-site contractors.

## PEBBLE

The Pebble Project, a copper-gold-molybdenum-silver-rhenium deposit, is about 200 miles southwest of Anchorage in the Bristol Bay region within the Lake & Peninsula Borough. Northern Dynasty Minerals owns 100% of Pebble Project. The current resource estimate includes 6.5 billion metric tons in the measured and indicated categories containing 57 billion pounds copper, 71 million ounces gold, 3.4 billion pounds molybdenum, 345 million ounces silver and 2.6 million kilograms rhenium; and 4.5 billion metric tons in the inferred category, containing 25

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<sup>24</sup> McKinley Research Group, *Summary Manh Choh Project: A Regional Socioeconomic Profile and Assessment of Potential Impacts*, Prepared for Peak Gold, LLC, December 2021.

billion pounds copper, 36 million ounces gold, 2.2 billion pounds molybdenum, 170 million ounces silver and 1.6 million kilograms rhenium. Palladium also occurs in the deposit.<sup>25</sup>

In January 2018, the U.S. Army Corps of Engineers accepted Pebble Partnership's permit application to formally begin the permitting process under the National Environmental Policy Act (NEPA) review process and other permitting efforts associated with the project. The U.S. Army Corps of Engineers published a final Environment Impact Statement (EIS) in July 2020, finding that the proposed mine 'would not have measurable effects on fish populations or fisheries' in southwest Alaska. However, the Corps published a Record of Decision (ROD) in November 2020 denying Pebble a key permit under the Clean Water Act on the grounds that its 'compensatory mitigation plan' is non-compliant and the project is not in the 'public interest'. An administrative appeal is underway.<sup>26</sup>

In its 2021 PEA, the primary off-site project infrastructure includes a 6-MW power plant located at the marine terminal, an 82-mile transportation corridor from the mine site to the marine terminal, a marine terminal, and a pipeline system to transport concentrate to the marine terminal. The on-site facilities include temporary and permanent worker accommodations, power reticulation, site roads, administration buildings, truck shop, warehouse, maintenance facilities, as well as tailings storage facilities, water management ponds, water treatment plants and a 270-megawatt power plant.

The initial capital costs for development are an estimated \$6.05 billion. Sustaining capital investment in the proposed project over the 20-year mine life is an additional \$1.52 billion.<sup>27</sup>

The Pebble Project will directly employ about 2,000 workers during its four-year construction phase, and about 850 workers during its 20-year operations phase.<sup>28</sup>



In 2021, Pebble employed an annual average of 11 people, of whom 66% were Alaska Native.

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<sup>25</sup> <https://www.northerndynastyminerals.com/pebble-project/project-overview/> (Accessed March 16, 2022).

<sup>26</sup> <https://www.northerndynastyminerals.com/pebble-project/project-status/> (Accessed March 16, 2022).

<sup>27</sup> [https://www.northerndynastyminerals.com/site/assets/files/4335/pebble\\_project\\_pea\\_executive\\_summary\\_fnl-2021-11-17.pdf](https://www.northerndynastyminerals.com/site/assets/files/4335/pebble_project_pea_executive_summary_fnl-2021-11-17.pdf) (Accessed March 16, 2022).

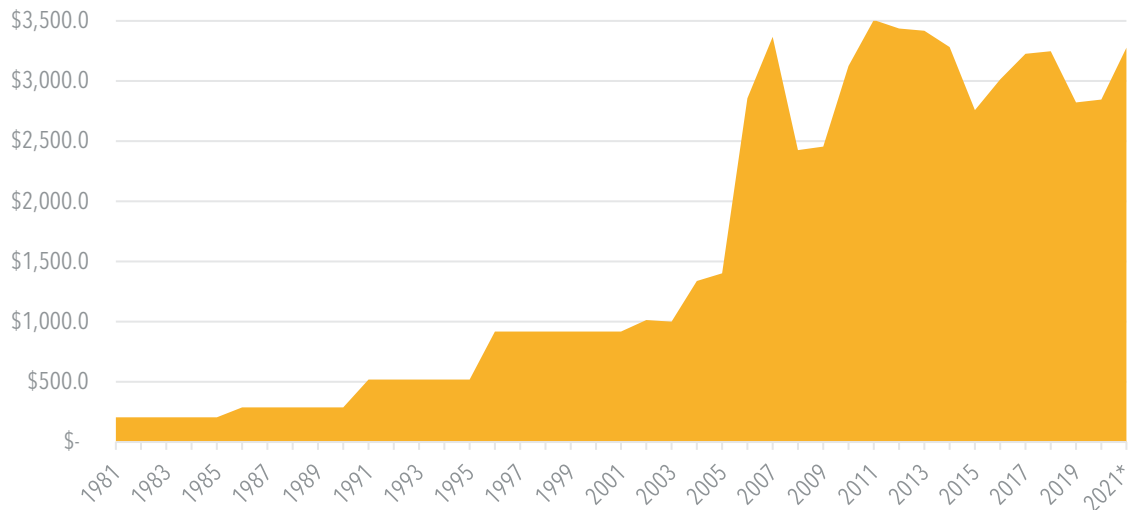
<sup>28</sup> Pebble Project EIS, <https://pebbleprojecteis.com/> (Accessed March 20, 2022).

## Production

In 2021, the estimated production value of mining in Alaska was \$3.3 billion. Between 1981 and 2021, the total value of Alaska's mineral production was about \$64.4 billion.<sup>29</sup> This estimate is based on global prices for refined metal products. This estimate significantly overstates the revenue earned by mines as the value of Alaska's production as it leaves the state is lower, because much of the metal is contained in concentrates rather than a refined form.

A more accurate estimate of revenue to the industry would be based on actual sales (stockpiling for sales, hedging by locking in the future selling prices, and the price at the time of sale accounting for deductions because of other valuable metals or impurities in the concentrate), including smelting and refining charges for the removal of impurities and transportation of the final product).

**Figure 5. Mine Production Values in Alaska, 1981-2021\*, \$million**



Notes: These annual production values overstate the value of the commodity to Alaska producers as it is based on refined costs, rather than sales of concentrates that require additional processing once leaving the state. \*McKinley Research Group estimates.

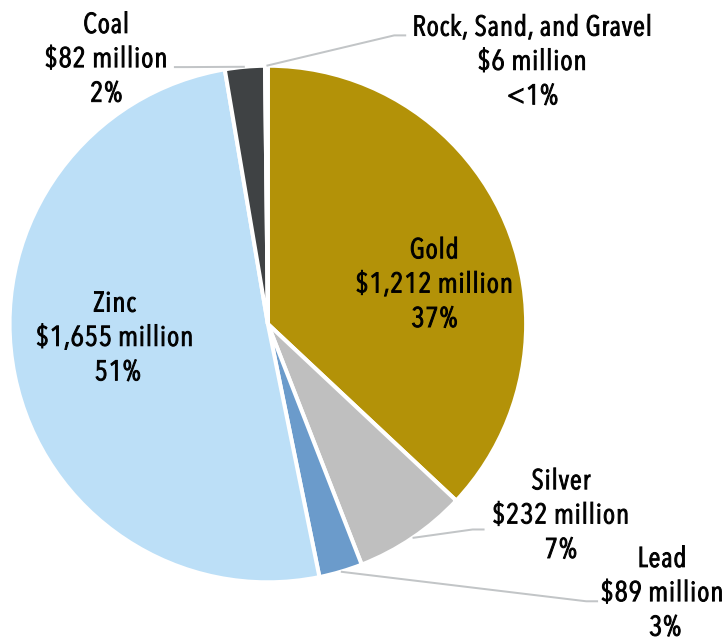
Sources: 2021 Annual Reports for Teck, Coeur, Hecla, Northern Star Resources, 2020 production estimates for coal, placer gold, and rock, sand, and gravel found in *Special Report 76, Alaska's Mineral Industry 2020*, State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys.

Zinc accounts for 51% of mineral production value in Alaska. Gold ranks second (37%), followed by silver (7%), lead (3%), coal (2%), and rock, sand, and gravel (0.2%).

<sup>29</sup> <http://dggs.alaska.gov/webpubs/dggs/sr/text/sr072.pdf> p. 3.



**Figure 6. Mining Production Value in Alaska, by Commodity, 2021\* (\$million)**

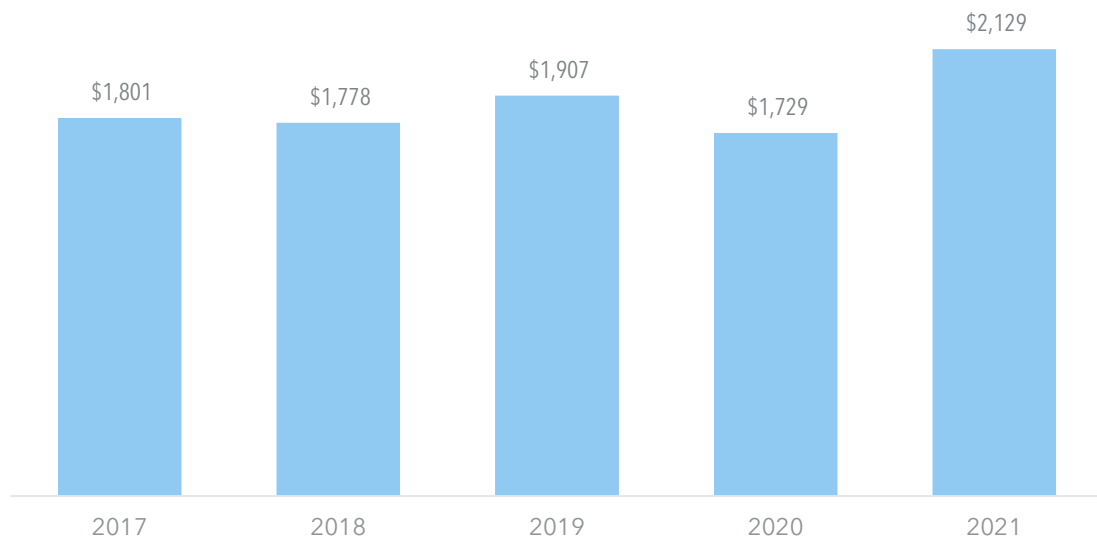


Source: \*McKinley Research Group estimates.

## Exports of Alaska's Minerals and Ores

In 2021, mineral and ore exports totaled \$2.1 billion, or 35% of Alaska's total exports (\$6.0 billion).

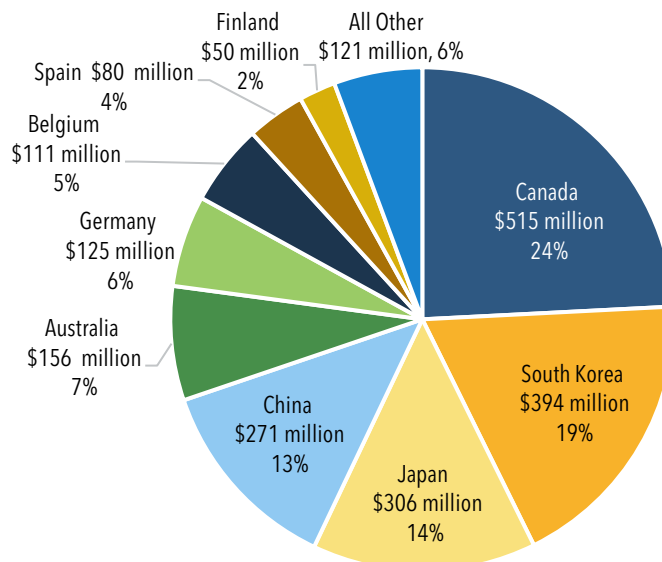
**Figure 7. Value of Alaska's Minerals and Ores Exports, 2017-2021 (\$millions)**



Source: International Trade Administration, U.S. Department of Commerce (USA Trade Online) (Accessed March 16, 2022).

Canada is the largest market for Alaska’s exported minerals and ores (\$515 million or 24% of minerals and ores exports). South Korea (\$394 million), Japan (\$306 million), China (\$271 million) and Australia (\$156 million) round out the top five export markets.

**Figure 8. Alaska’s Minerals and Ores Export Markets, 2021**



Source: International Trade Administration, U.S. Department of Commerce

In 2021, Alaska had six large mines in operation, including Greens Creek, Kinross Fort Knox, Kensington, Northern Star Pogo, Red Dog, and UCM, along with about 150 placer mining operations, and multiple rock quarries, and sand and gravel pits.

## Alaska Producing Mines

### LARGE METAL MINES

#### Greens Creek

Greens Creek Mine began production in 1989 under the operation of Kennecott Minerals Company. Hecla Mining Company “Hecla” has long held an interest in the mine, and in 2008 acquired full ownership. Located on Admiralty Island southwest of Juneau, Greens Creek was the largest silver mine in the United States in 2019 and one of the largest in the world.<sup>30</sup> Greens Creek was also the third largest zinc producer, sixth largest lead producer, and 23rd largest gold

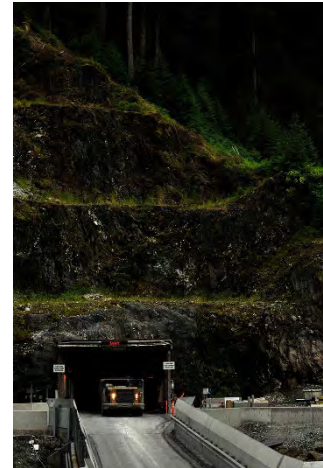
<sup>30</sup> <https://www.usgs.gov/centers/national-minerals-information-center/silver-statistics-and-information>. Minerals yearbook for silver. (Accessed March 17, 2022).

producer in the U.S. in 2018.<sup>31</sup> In 2021, Greens Creek produced 9.2 million ounces of silver, 46,088 ounces of gold, 19,873 tons of lead, and 53,648 tons of zinc.<sup>32</sup>

Greens Creek is an underground mine, which operates on 23 square miles of land, including land leased from the U.S. Forest Service. The mine runs 24 hours per day, 365 days per year. Mine facilities include the underground workings, a dry stacked tailings facility, a ship-loading facility, camp facilities, and a crewboat dock. The mine holds current proven and probable silver reserves of 125 million ounces, 946,000 ounces of proven gold, as well as 282,250 tons of lead and 725,920 tons of zinc. Based on these reserves, Greens Creek has a 14-year reserve.<sup>33</sup>

Greens Creek directly employed an annual average of 450 people in 2021 with total annual wages of \$56 million. More than half (58%) of these employees were Alaska residents; most (168) residing in Juneau.<sup>34</sup> The mine is Juneau's largest private sector employer in terms of annual average, full-time employment and total annual wages.<sup>35</sup> Goods and services spending totaled \$43 million with Alaska-based vendors.<sup>36</sup>

Greens Creek is ranked first among principal property taxpayers to the City and Borough of Juneau.<sup>37</sup> Property tax combined with sales tax payments generated \$2.6 million in payments to the City and Borough of Juneau.<sup>38</sup> Additionally, Greens Creek paid \$5.4 million to the State of Alaska, predominantly for the Mining License Tax (\$4.8 million) and \$412,578 to the U.S. Forest Service. Interruptible power sales from AEL&P to Greens Creek help keep electricity rates low for all Juneau customers. The local utility's revenue from interruptible power sales directly offset costs paid by firm rate payers.



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<sup>31</sup> <https://www.usgs.gov/centers/national-minerals-information-center/silver-statistics-and-information>. Minerals yearbooks for zinc, lead, and gold. (Accessed March 17, 2022).

<sup>32</sup> <https://www.hecla-mining.com/greens-creek/>. (Accessed March 17, 2022).

<sup>33</sup> <https://www.hecla-mining.com/greens-creek/> (Accessed March 17, 2022).

<sup>34</sup> Data provided by Hecla Mining Company.

<sup>35</sup> City and Borough of Juneau, *Comprehensive Annual Financial Report- Fiscal Year Ended June 30, 2021*. 2021. <https://juneau.org/index.php?gf-download=2022%2F01%2FFY-21-ACFR-Final.pdf&form-id=22&field-id=11&hash=69d4d245e2c0ac10cd832644a840751bb9957bf04c7f10af8e80a3dec8676a98>. (Accessed March 17, 2022).

<sup>36</sup> Data provided by Hecla Mining Company.

<sup>37</sup> City and Borough of Juneau, *Comprehensive Annual Financial Report- Fiscal Year Ended June 30, 2021*. 2021. <https://juneau.org/index.php?gf-download=2022%2F01%2FFY-21-ACFR-Final.pdf&form-id=22&field-id=11&hash=69d4d245e2c0ac10cd832644a840751bb9957bf04c7f10af8e80a3dec8676a98>. (Accessed March 17, 2022).

<sup>38</sup> Data provided by Hecla Mining Company.

## ***Kinross Fort Knox***

In production since 1996, Fort Knox mine is a wholly-owned subsidiary of Canadian-based Kinross Gold Corporation. The mine is a conventional open pit mine located about 26 miles northeast of Fairbanks via road (21 miles paved and five miles unpaved). The mine occupies land owned by the State of Alaska and the Alaska Mental Health Trust. It is in the Fairbanks mining district, a belt of lode and placer gold deposits considered one of the largest gold-producing areas in Alaska and was the ninth largest gold producer in the U.S. in 2018.<sup>39</sup>

The mine operates 24 hours per day, seven days a week, year-round. Higher-grade ore is processed at a mill facility with a nominal capacity of 36,267 tons per day.<sup>40</sup> In 2007, permits were acquired from the State of Alaska for a mine heap-leaching project in the Walter Creek drainage area, and in 2008 the facility was constructed to process lower-grade ore, thus extending the mine's life to 2030. In 2019, Fort Knox Mine poured its 8 millionth ounce of gold. In 2021, 264,283 ounces of gold were produced.<sup>41</sup>



The mine's monthly electrical power requirement ranges between 32 and 35 megawatts and is supplied by a powerline extending from the Golden Valley Electric Association (GVEA) substation at Gold Hill to Fort Knox site (about 29 miles).<sup>42</sup> Buildings on site include the mill complex, administration and security building, maintenance facility and warehouse, and primary crusher and control office.<sup>43</sup>

Kinross gained mineral rights to 709 acres of adjacent land (known as Gilmore Dome) from the National Oceanic and Atmospheric Administration in December 2017. This expansion added 2.1 million ounces to Fort Knox's estimated measured and indicated resources, and 300,000 ounces in estimated inferred resources.

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<sup>39</sup> <https://www.usgs.gov/centers/national-minerals-information-center/silver-statistics-and-information>. Minerals yearbook for gold. (Accessed March 17, 2022).

<sup>40</sup> [https://s2.q4cdn.com/496390694/files/doc\\_downloads/2018/Fort-Knox-June-2018-Technical-Report.pdf](https://s2.q4cdn.com/496390694/files/doc_downloads/2018/Fort-Knox-June-2018-Technical-Report.pdf). (Accessed March 17, 2022).

<sup>41</sup> <http://kinross.com/> (Accessed March 17, 2022).

<sup>42</sup> [https://s2.q4cdn.com/496390694/files/doc\\_downloads/2018/Fort-Knox-June-2018-Technical-Report.pdf](https://s2.q4cdn.com/496390694/files/doc_downloads/2018/Fort-Knox-June-2018-Technical-Report.pdf). (Accessed March 17, 2022).

<sup>43</sup> [https://s2.q4cdn.com/496390694/files/doc\\_downloads/2018/Fort-Knox-June-2018-Technical-Report.pdf](https://s2.q4cdn.com/496390694/files/doc_downloads/2018/Fort-Knox-June-2018-Technical-Report.pdf). (Accessed March 17, 2022).

Fort Knox had annual average employment of 701 employees in 2021, of whom 99% live in Alaska. Total payroll (excluding benefits) was \$80 million. An additional 84 full-time or temporary contractors worked on-site in 2021. Fort Knox spent about \$234 million (or 67% of total goods and services spending) with 246 Alaska vendors.<sup>44</sup>

As measured in a 2020 economic impact study, Fort Knox-related direct, indirect, and induced employment statewide totaled 1,215 jobs with total wages of \$121 million (2019).<sup>45</sup> Fort Knox is GVEA's single largest commercial customer, accounting for 15% of its total revenues and 20% of its total kilowatt-hours sold in 2019.<sup>46</sup>

### **Kensington**

Coeur Alaska, a subsidiary of Coeur Mining Inc., operates the Kensington Mine, located about 45 miles north-northwest of Juneau in Southeast Alaska. The mine consists of the Kensington, Raven, Jualin, and other nearby deposits along with exploration targets. Juneau is the principal service and supply center for the mine. The company acquired the property in 1987, started developing the mine in 2005, and after permitting-related delays started



production in July 2010. In 2021, 121,140 ounces of gold were produced at Kensington. As of December 31, 2021, the mine has 261,000 ounces of proven and probable reserves, 983,000 ounces of measured and indicated gold resources, and 455,000 ounces of inferred gold resources.<sup>47</sup>

In 2021, Coeur Alaska Inc. employed an annual average of 379 workers, of whom 54% were Alaska residents. In addition, an annual average of 106 contractors worked on-site.<sup>48</sup> These contractors provided transportation and warehouse services, construction, engineering, maintenance, electrical, safety, geology, food and camp services, supply chain, and technical

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<sup>44</sup> Data provided by Kinross Fort Knox.

<sup>45</sup> McDowell Group, "The Socioeconomic Benefits of Fort Knox Mine," prepared for Kinross Fort Knox, 2020.

<sup>46</sup> Communication with Monica Grassi, Vice President of Member Services, Golden Valley Electric Association. April 8, 2020.

<sup>47</sup> [https://www.coeur.com/\\_resources/pdfs/Technical%20Reports/Kensington%20TR.pdf?v=1.001](https://www.coeur.com/_resources/pdfs/Technical%20Reports/Kensington%20TR.pdf?v=1.001) (Accessed March 17, 2022).

<sup>48</sup> Data provided by Coeur Alaska.



services. Coeur Alaska spent about \$103 million on goods and services in 2021, including \$40 million with 164 Alaska vendors.

Total sustaining and development capital expenditures were about \$28 million in 2021.<sup>49</sup> Kensington is the second largest property taxpayer to the City and Borough of Juneau.<sup>50</sup>

### **Pogo**

Pogo operations are about 85 miles southeast of Fairbanks and 38 miles northeast of Delta Junction in the Goodpaster River Valley. The underground high-grade gold mine is accessed by a 49-mile all-season road from the Richardson Highway. Evaluation of mineral potential began in 1981, with claims first staked in 1991. The mine was originally permitted in 2003. In 2005, underground mine development began and by January 2006, the deposit had been fully developed with a large



permanent camp, ore processing facilities, water treatment plant, power transmission lines, provisions for tailings disposal, and underground workings. The first gold pour was in February 2006. Until 2009, the Pogo project was a joint venture of Teck Resources Ltd., Sumitomo Metal Mining Co. Ltd., and Sumitomo Corporation, with Teck as the operator. In 2009, Teck sold its interest in the mine to a joint venture of Sumitomo Metal Mining Co., Ltd. and Sumitomo Corporation. In 2018, Northern Star Resources Ltd., an Australian-based gold producer, purchased the mine and became the sole owner and operator of Pogo.

Because of its remoteness, Pogo is a camp-supported operation, including housing, food services, water treatment, emergency medical care, and a full-service fire department at the mine site. Power is supplied from the regional grid via a 50-mile power line paralleling the access road. The mine and mill are open year-round and operate 24-hours per day, seven days per week.

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<sup>49</sup> Data provided by Coeur Alaska.

<sup>50</sup> City and Borough of Juneau, *Comprehensive Annual Financial Report- Fiscal Year Ended June 30, 2021*. 2021. <https://juneau.org/index.php?gf-download=2022%2F01%2FFY-21-ACFR-Final.pdf&form-id=22&field-id=11&hash=69d4d245e2c0ac10cd832644a840751bb9957bf04c7f10af8e80a3dec8676a98>. (Accessed March 17, 2022).

Total resources are 22.9 million metric tons of ore with an average gold grade of 0.3 ounces per ton and with total gold content of 6.9 million ounces.<sup>51,52</sup> Total reserves are 66.8 million tons and 4.5 million ounces of gold. In 2018, Pogo was the 11th largest gold producer in the U.S.<sup>53</sup> In fiscal year 2021, Pogo produced 209,647 ounces of gold.<sup>54</sup>

In 2021, Pogo directly employed an average of 483 workers, of whom 63% live in Alaska. Pogo generated \$66 million in payroll (excluding benefits) in 2021. On average, Pogo's wages (\$137,533) are more than twice the average of private sector workers in Alaska and Fairbanks North Star Borough. In 2021, \$92 million was spent on goods and services purchased from about 154 Alaska businesses, or 40% of total vendor spending, and paid about \$7.4 million in taxes and royalties to the State of Alaska in 2021.<sup>55</sup>

### **Red Dog**

Red Dog is an open-pit zinc, lead, and silver mine located 90 miles north of Kotzebue and 55 miles inland from the Chukchi Sea. Red Dog is owned and operated by Teck Alaska, and on property owned by NANA Regional Corporation. It was both the largest lead producer and zinc producer in the U.S. in 2018, and the second largest silver producer in the U.S. in 2019.<sup>56</sup> Production in 2021 included 503,400 metric tons of zinc concentrate and 97,400 metric tons of lead concentrate.<sup>57</sup>

Construction of Red Dog began in 1986 with production commencing in December 1989. The mine required construction of a 52-mile access road from a port site on the Chukchi Sea. While ore is mined year-round, the concentrate produced is stored for shipment at the port and shipped during the summer months when waters are ice-free and navigable. In 2021, shipping occurred from July to October.

Red Dog is the most capital-intensive mining project in Alaska with original construction costs and subsequent investments totaling more than \$550 million, plus an additional \$265 million invested by Alaska Industrial Development and Export Authority (AIDEA) in DeLong Mountain Transportation System (DMTS)'s road and port. Red Dog has repaid AIDEA's investment in the form of user fees.

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<sup>51</sup> <https://www.nsr ltd.com/investor-and-media/asx-announcements/2021/august/2021-annual-report> (Accessed March 17, 2022).

<sup>52</sup> <https://www.nsr ltd.com/our-assets/resources-and-reserves> (Accessed March 17, 2022).

<sup>53</sup> <https://www.usgs.gov/centers/national-minerals-information-center/silver-statistics-and-information>. Minerals yearbook for gold. (Accessed March 17, 2022).

<sup>54</sup> <https://www.nsr ltd.com/investor-and-media/asx-announcements/2021/august/2021-annual-report> (Accessed march 17, 2022).

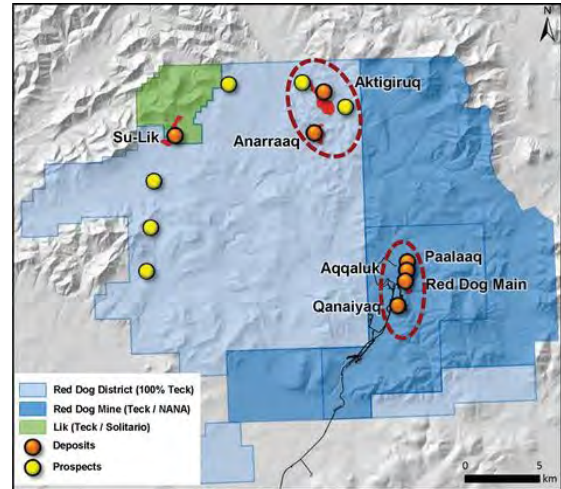
<sup>55</sup> Data provided by Northern Star Resources Ltd.

<sup>56</sup> <https://www.usgs.gov/centers/national-minerals-information-center/silver-statistics-and-information>. Minerals yearbooks for lead, zinc, and silver. (Accessed March 17, 2022).

<sup>57</sup> <https://www.teck.com/media/2021-Annual-Report.pdf> (Accessed April 5, 2022).

Red Dog directly employs an average of 603 year-round workers (not including contractors), with about \$81 million in total annual wages. An annual average of 702 contractors also worked on site (largely for NANA Management Services and DeLong Mountain Logistics). About 52% of the workers at Red Dog are NANA shareholders.

Teck's regional exploration has focused on a significant high-grade zinc deposit, known as Aktigiruaq, for several years. Aktigiruaq is located adjacent to the Anarraaq deposit about 7 miles northwest of Red Dog Mine. Anarraaq hosts 19.4 million metric tons of inferred resource averaging 14.4% zinc and 4.2% lead.<sup>58</sup> Drill data suggests the Aktigiruaq deposit may contain between 80 million and 150 million metric ton of mineralization at a grade of between 16% and 18% combined zinc and lead. If realized, this would make the Aktigiruaq zinc deposit one of the top undeveloped zinc deposits in the world. In addition to Anarraaq and Aktigiruaq, Teck is exploring the Lik zinc project on state land about 14 miles northwest of Red Dog under a 50-50 partnership with Solitario Zinc Corp.



## Large Non-Metal Mines

### *Usibelli Coal Mine*

UCM, located in Healy, Alaska, has been producing coal for nearly 80 years and is Alaska's only operating coal mine, producing about 1 million tons of coal annually. It supplies 100% of the coal used to generate electricity and heat in Interior Alaska, with about 20% consumed at a power plant near the mine and the remainder shipped to Fairbanks-area power plants via the Alaska Railroad Corporation (ARRC). UCM staff are in Healy, Fairbanks, and Palmer. The mine is Healy's largest year-round employer, located within the Denali Borough (about one in 10 Healy residents are employed at the mine).

<sup>58</sup> <https://www.miningnewsnorth.com/story/2021/01/19/mining-explorers-2020/teck-scales-back-exploration-due-to-covid/6637.html> (Accessed March 17, 2022).

UCM directly employs an average of 102 year-round workers (not including contractors), with about \$13 million in total payroll (not including benefits). All UCM's employees live in Alaska.



In a 2021 study conducted by McKinley Research Group, in 2020 UCM accounted for about 232 jobs and \$20.6 million in annual wages in Interior Alaska including all direct, indirect, and induced employment. Statewide, the mine's impact included a total 322 jobs and \$26.4 million in wages.<sup>59</sup>

## PLACER MINING

"Placer mining" is a type of mining that removes valuable minerals such as gold, platinum, and precious stones from unconsolidated detrital material. Placer deposits are formed when the host rock is eroded over millions of years, and minerals are transported and concentrated by rivers and streams.

Archeological records have shown that Alaska Natives were the earliest miners in Alaska, extracting copper, marble and other materials. But placer mining is the oldest form of mining by Western inhabitants in Alaska. The first placer coal was mined on the Kenai Peninsula during the later 1840s and 1850s by the Russians. The earliest gold prospectors were also the Russians who discovered gold at Hope and on the Russian River in 1849.

The first significant discovery of placer gold was near Juneau with later discoveries along the Yukon River near Rampart, Fortymile River, and Circle. At the turn of the 20th century, placer deposits were discovered at Nome and Fairbanks. With the introduction of large-scale cold-water thawing, hydraulic stripping, and mechanized excavation, Alaska became a leading gold producing state with a yield of nearly 750,000 ounces of gold in 1940, most of which came from placer mines.



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<sup>59</sup> McKinley Research Group, "Energy and Economic Impacts of Coal in Interior Alaska," prepared for UCM, December 2021.



However, gold mining was shut down during World War II by Presidential Order. After the war, the industry failed to recover due to rising operating costs and fixed gold prices. Most placer mining was discontinued by the 1960s. With the lifting of gold ownership restrictions and abandoning of a fixed price in the 1970s, gold production rose dramatically. By 1982, there were more than 500 placer mines statewide (including recreational mines) producing 174,900 ounces of gold worth \$70 million.



There is a strong link between the number of operating placer mines, placer production, and gold prices. For instance, gold prices saw a marked improvement in the late 1970s peaking at over \$800 per ounce in 1980, followed by a gradual but fluctuating decline to \$256 per ounce in 2001. With the fall in prices, the number of operating family-run placer mines dropped to 42. From a 2005 price of \$450 per ounce, prices rose steadily to an all-time high of nearly \$1,900 in August 2011. Following the same trend, the number of producing placer mines climbed from 71 in 2005 to a recent peak of 321, with production at a nine-year high of 100,041 ounces in 2012. For the past several years, the price of gold has steadily improved (\$1,937 per ounce, as of April 5, 2022). In 2020, there were an estimated 150 placer gold operations in Alaska producing a total of 32,501 ounces of gold. These operations employed an estimated 141 full-time-equivalent employees.<sup>60</sup> Just over half of the state's active placer mines are in the Eastern Interior region.

In a 2014 McDowell Group study, each placer mine had four workers. For miners receiving compensation, 56% were paid a wage, while the remaining 44% were compensated with a share of gold.<sup>61</sup>

## ROCK, SAND, AND GRAVEL

Rock, sand, and gravel deposits (industrial materials) are being mined in most Alaska communities, supporting road, airstrip, and other commercial, industrial, and residential

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<sup>60</sup> <https://dggs.alaska.gov/webpubs/dggs/sr/text/sr076.pdf> (Accessed March 20, 2022).

<sup>61</sup> McDowell Group, "The Economic Impacts of Placer Mining in Alaska," prepared for Alaska Miners Association, October 2014.

construction projects throughout Alaska. Some of the operations are quite small, ranging from small gravel pits serving village communities to large quarries and gravel pits found closer to the larger population centers along the Alaska Railbelt. For instance, some of the larger gravel pit operations are found in Anchorage, Palmer, Wasilla, and Fairbanks. Rock quarries produce shot rock, crushed stone, D-1, riprap, and modest quantities of ornamental stone.

Annual rock, sand and gravel production is often a reflection of trends within the construction market. For example, production dipped in the mid-1980s and mid-1990s, and peaked in the late 1990s, reflecting booms and declines in Alaska's housing, industrial and commercial construction markets.

The 2020 value of Alaska's rock, sand, and gravel minerals on State and federal lands was at least \$5.7 million or about 2.1 million short tons of production.<sup>62</sup>

## RECREATIONAL MINING

Recreational mining opportunities are expanding rapidly and are documented throughout most of Alaska. Generally, after paying the state mining license tax, the visiting miners can keep the gold they find or participate in a venture where recovered gold is split equally amongst the participants.

Recreational mining operations range from gold-panning activities attracting several thousand tourists spending \$25 and a few hours to find some gold flakes (such as Crow Creek Mine in Girdwood) to operations where a few hundred people spend as much as \$3,400 per week (including equipment, room and board) for as long as two months looking for more significant rewards for their efforts (such as Gold Fever Prospecting in Chicken).

Based on previous research with recreational mine operators, at least 800 people traveled to Alaska to primarily participate in recreational mining, amounting to at least 1,000 miner-weeks of annual recreational mining at the remote pay-to-mine camps.<sup>63</sup> Several thousand miner-weeks are also estimated to occur at highway accessible sites near Anchorage and Fairbanks.

### RECREATIONAL MINING

Is an amateur, casual, short-term mining for placer gold using non-mechanized equipment, such as a gold pan or a small, backpackable sluice box, metal detector, rocker-box, or small suction dredges.

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<sup>62</sup> <https://dggs.alaska.gov/webpubs/dggs/sr/text/sr076.pdf> (Accessed March 20, 2022).

<sup>63</sup> McDowell Group, "The Economic Impacts of Alaska's Mining Industry," prepared for Alaska Miners Association, 2013.



No attempt has been made to estimate the number of recreational miners visiting federal and State designated gold panning areas, but it is likely to exceed the number visiting commercial sites.<sup>64</sup>

Though no specific data are available, the total economic impact of recreational mining in Alaska likely exceeds several million dollars, including payments to private owners and spending on transportation, accommodations, food, services, and supplies.



## Reclamation

Reclamation bonding is required in Alaska for mining projects.<sup>65</sup> State reclamation standards apply to state, federal, municipal, and private lands and waters subject to mining the reclamation bond is based on a Reclamation Plan that must be approved by the Alaska Department of Natural Resources prior to mining.<sup>66, 67</sup> The five metal mines in operation have secured a combination of more than \$883 million in bonds as their obligation to meet the terms of their reclamation and closure plans, waste management, dam certificates, and road and power line rights-of-way permits.<sup>68</sup> Combined with other mines in closure or exploration, bond payments total \$892 million. Donlin Gold currently has a reclamation bond payment obligation of \$322 million; mining operations may not begin until this financial assurance is met.<sup>69</sup>

### RECLAMATION STANDARD

A mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation to leave the site in a stable condition. (§AS 29.19.020)

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<sup>64</sup> There are several free sites located on State and Federal lands withdrawn from claim staking and available for recreational use, while there are others which are commercial and located on private property or permitted mining claims that charge for the right to mine.

<sup>65</sup> §Alaska Statute 27.19 and § 27.21.

<sup>66</sup> §Alaska Statute 27.19.030.

<sup>67</sup> The Alaska Department of Environmental Conservation has separate bonding requirements that can be included with the Alaska Department of Natural Resources in a single bond.

<sup>68</sup> Email correspondence with Kyle Mozelle, Office of Project Management & Permitting (April 15, 2022).

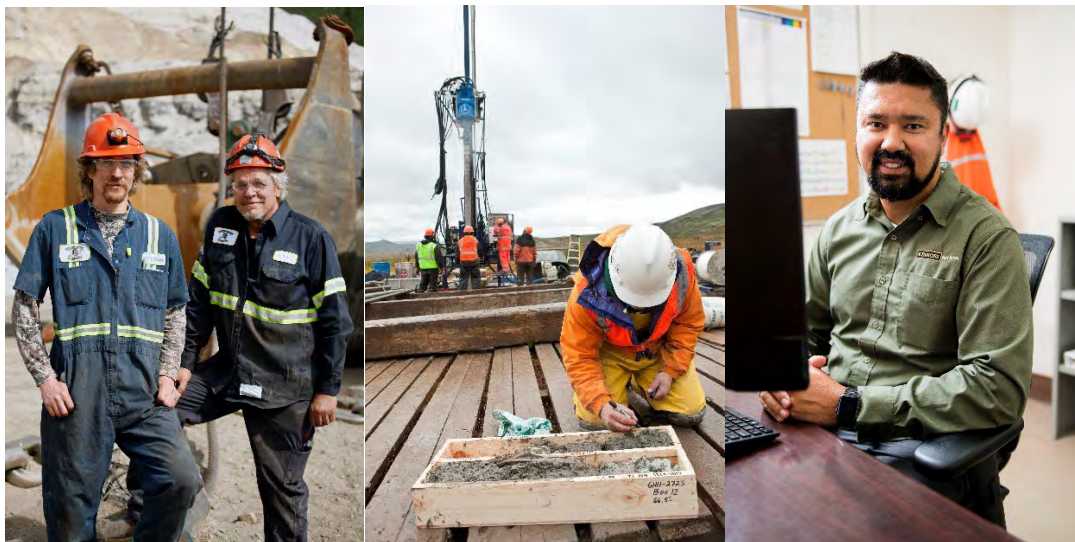
<sup>69</sup> [https://dnr.alaska.gov/mlw/mining/large-mines/donlin/pdf/donlin\\_rpa.pdf](https://dnr.alaska.gov/mlw/mining/large-mines/donlin/pdf/donlin_rpa.pdf) (Accessed April 14, 2022).

**Table 3. Reclamation Financial Assurances, Hard Rock Mine Project, As of April 2022**

Project	Status	Amount	Type (Holder)
Fort Knox Mine (including Gil Deposit)	Operating	\$102,235,000	Letter of Credit (State)
Greens Creek	Operating	\$92,176,539	Surety Bonds (2 USFS; State 1)
Illinois Creek	Post-Closure	\$1,451,000	Trust Fund managed by Alaska Department of Revenue
Kensington Mine	Operating (permit renewal 5/2022)	\$30,704,008	Surety Bonds (5 USFS)
Niblack Exploration Project	Approved temporary suspension	\$1,264,412	Surety Bond (State)
Nixon Fork	Limited Operations	\$6,033,000	Surety Bond (BLM)
Palmer Exploration Project	Exploration	\$155,403	Surety Bond (State)
Pogo Mine	Operating	\$71,908,000	Letter of Credit (State)
Red Dog Mine	Operating	\$585,662,000	Letters of Credit (State);
Rock Creek ("Nanuuq") Mine	Post-closure	\$30,000	Letter of Credit (State)
True North	Post-closure	\$20,000	Letter of Credit (State)
<b>Total</b>		<b>\$891,639,362</b>	
Donlin Creek	Permitting	\$322,031,000	Pending (required prior to start of construction)

Source: Office of Project Management and Permitting, Alaska Department of Natural Resources.

# Direct Jobs and Payroll Impacts



The mining industry creates thousands of jobs and millions of dollars in payroll throughout the Alaska economy. These jobs and payroll are related to exploration, development, and production, along with other mining related activities such as recreational mining. Direct job and payroll impacts include employees of mining and exploration companies who work in Alaska.

## Direct Jobs and Payroll Estimates

Based on job and wage data collected directly from the mining industry and other research and analysis to develop a more comprehensive measure of annual average jobs and total annual wages, McKinley Research Group's estimates for 2021 are 5,400 jobs and \$625 million.

On average, wages paid to workers at Alaska's operating mines (not including exploration or development projects) is \$130,000.

### ALASKA NONRESIDENT HIRE

Nonresidents are often employed in seasonal industries, at remote site locations (where workers work on a rotation schedule, allowing for workers to not live close to their job), or when specific job skills are not readily available in Alaska.

Using W2 data provided by the producing mines – Alaska's largest mining employers have lower percentages of Alaska nonresidents in their work forces than DOLWD estimates (see below),

particularly the long-established mines. For example, in 2021, UCM did not employ any Alaska nonresidents and only 1% of Fort Knox's workers were Alaska nonresidents. Based on compilation of W2 data from all six producing mines (UCM, Greens Creek, Red Dog, Fort Knox, Pogo, and Kensington), about 26% of employees are not Alaska residents.

## JOBS FOR ALASKANS STATEWIDE

Alaska's mining industry supports mostly year-round jobs for residents from about 95 communities throughout Alaska, over half of which are found in rural Alaska (off the road system) where few other jobs are available. Including employment at sand and gravel operations and rock quarries, mining supports workers living in all areas of the state. Because of rotation schedules and camp setups, many mine workers reside in areas different from where they work. Below are some summaries of residents working at Alaska's producing mines in 2021:

- Fort Knox:** While most employees live in Fairbanks and North Pole, other employees live in Anchorage, Delta Junction, Eagle River, Ester, Healy, Nenana, Ninilchik, Palmer, Tok, Two Rivers, Wasilla, and Willow.<sup>70</sup>
- Greens Creek:** While most of Greens Creek Mine Alaska employees reside in Juneau or Douglas, other Alaska employees live in smaller communities, including Angoon, Big Lake, Chugiak, Coffman Cove, Eagle River, Fairbanks, Gustavus, Haines, Hoonah, Kasilof, Kenai, Klawock, Ninilchik, North Pole, Palmer, Petersburg, Seward, Sitka, Soldotna, Sterling, Sutton, Valdez, Ward Cove, Wasilla, Willow, and Wrangell.<sup>71</sup>
- Kensington:** Most of Kensington's Alaska resident employees live in Juneau. Others live in Anchorage, Angoon, Chugiak, Craig, Delta Junction, Eagle River, Fairbanks, Gustavus,

**Figure 9. Alaska Communities Where Mining Employees Live**



Note: Does not include communities with employees involved in placer mining, and rock, sand, and gravel production.

<sup>70</sup> Data provided by Kinross Fort Knox.

<sup>71</sup> Data provided by Greens Creek.

Haines, Hoonah, Houston, Kake, Kasilof, Kenai, Ketchikan, Kodiak, Nikiski, Palmer, Sitka, Soldotna, Sterling, Talkeetna, Tenakee, Wasilla, Willow, Wrangell, and Yakutat.<sup>72</sup>

- **Pogo Mine:** Employees live in dozens of different Alaska communities, from as near to the mine as Delta Junction to as far as Southeast Alaska.<sup>73</sup>
- **Red Dog:** Red Dog employees live in 33 communities throughout Alaska including the Northwest Arctic Borough communities of Ambler, Buckland, Deering, Kiana, Kivalina, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, and Shungnak.<sup>74</sup>
- **UCM:** All UCM workers live in Alaska. Most live in Healy, as well as Anchorage, Cantwell, Fairbanks, Nenana, North Pole, and Palmer.<sup>75</sup>

Exploration and development projects also include employees from rural communities, such as residents of 23 communities in the Calista region (half of all 56 Calista region villages) working at Donlin Gold, residents of Haines, Klawock, and Valdez working at Palmer, residents of Nome working at Graphite, and residents of Iliamna and Newhalen working at Pebble.<sup>76</sup>

#### ALASKA NATIVE AND SHAREHOLDER HIRE

As explained in the *Mining Activity in Alaska* section, many mines and projects are situated on Alaska Native lands and demonstrate a key benefit of mining that often happens in remote areas where employment opportunities are limited. For example, in 2021:



- 52% of the year-round jobs at Red Dog were filled by NANA shareholders, including Teck Alaska, DeLong Mountain Logistics, and NMS jobs.
- 47% of the seasonal and full-time employees and contractor hires at Upper Kobuk Minerals Project were NANA shareholders.
- 54% of jobs at Donlin Gold were filled by Alaska Native shareholders or descendants, largely from the Calista Corporation region.
- 66% of the workers at Pebble Project were Alaska Native shareholders or descendants.

There are a couple other different methods used in published information about direct mining jobs and payroll in Alaska, primarily those used by the Alaska Department of Labor and

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<sup>72</sup> Data provided by Coeur Kensington Mine.

<sup>73</sup> Data provided by Northern Star Resources Pogo.

<sup>74</sup> Data provided by Red Dog Operations.

<sup>75</sup> Data provided by Usibelli Coal Mine.

<sup>76</sup> Data provided by Donlin Gold, Constantine Metals, Graphite One, and Pebble Partnership.

Workforce Development (DOLWD) and the state Division of Geological and Geophysical Surveys (DGGGS).

## Alaska Department of Labor and Workforce Development Estimates

DOLWD compiles wage and salary employment data from Quarterly Contribution Reports, which all Alaska employers are required to submit for purposes of calculating employment security taxes. These reports provide a count of all workers employed each month, as well as their total quarterly wages. In the DOLWD data, there are no distinction between full-time and part-time employment. DOLWD jobs are categorized according to the North American Industry Classification System (NAICS) (see *inset*).

Mining-related activity falls into several other NAICS categories as well, though it is combined with non-mining employment. For example, several mineral exploration firms are classified as professional services. Additionally, other types of businesses and professionals engaged in exploration projects include geological exploration services, drilling services, camp support services, helicopter support services, construction services, and scientific and other professional research services. Of these services, DOLWD provides mining specific data only for drilling services, but this is only a partial measure as some drilling jobs are included in the construction sector. DOLWD data do not include self-employed “proprietors,” such as small-scale placer mining operations, or individuals working under contract, such as exploration geologists.

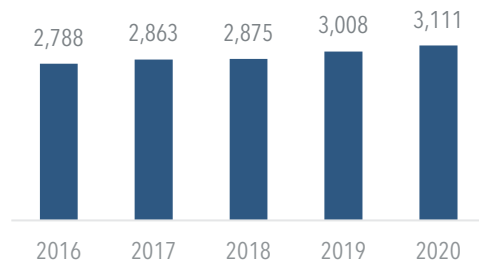
According to DOLWD data, metal mining employed an average of 2,722 wage and salary workers in 2020. Alaska’s metal mining industry generates some of the highest paying jobs in Alaska, with an average annual wage of \$122,004 in 2020, about double the state average of \$61,116 for all sectors of the economy. Only the oil industry generates higher annual wages than the mining industry in Alaska. Including coal mining and non-metallic mineral mining or quarrying activity, mining employment in 2020 averaged 3,111 employees with an average annual wage of \$117,888.

### NAICS MINING CATEGORIES

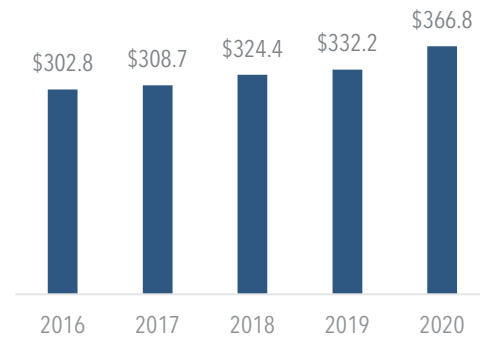
- Coal
- Metal ore
- Metal ores mining
  - Gold ore and silver ore mining
  - Lead ore and zinc ore mining
  - All other metal ore mining
- Non-metallic Mineral, Quarrying
  - Crushed and broken limestone mining and quarrying
  - Other crushed and broken stone mining and quarrying
  - Construction sand and gravel mining
  - All other non-metallic mineral mining
- Mining Support Activities
  - Metal mine drilling
  - Non-metallic mine drilling



**Figure 10. Alaska Mining Industry Employment, 2016-2020**



**Figure 11. Alaska Mining Industry Wages, 2016-2020**

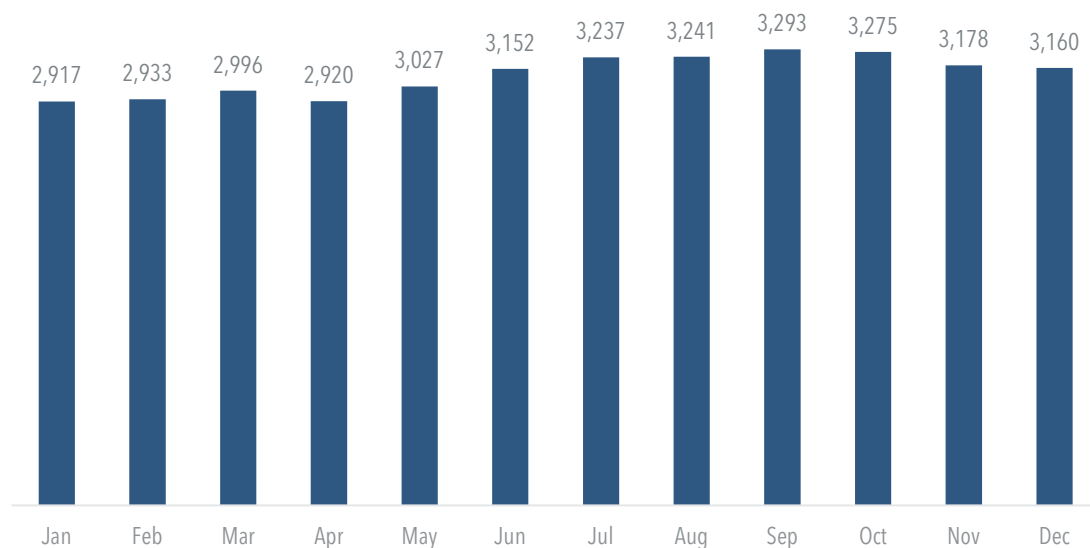


Note: Includes metal ore, coal, and nonmetallic mining.  
Source: Alaska Department of Labor and Workforce Development.

Mining jobs are relatively stable year-round, with some growth largely associated with summer exploration projects.

Data for the first nine months of 2021 indicate further growth. Employment was up 7.1% in the first three-quarters of 2021 compared to the same period in 2020, while total wages were up 4.3%. If those increases persisted for the full year, mining employment in 2021 will have averaged 3,300 jobs with total annual wages of \$382 million.

**Figure 12. Monthly Employment in Alaska's Mining Industry, 2020**



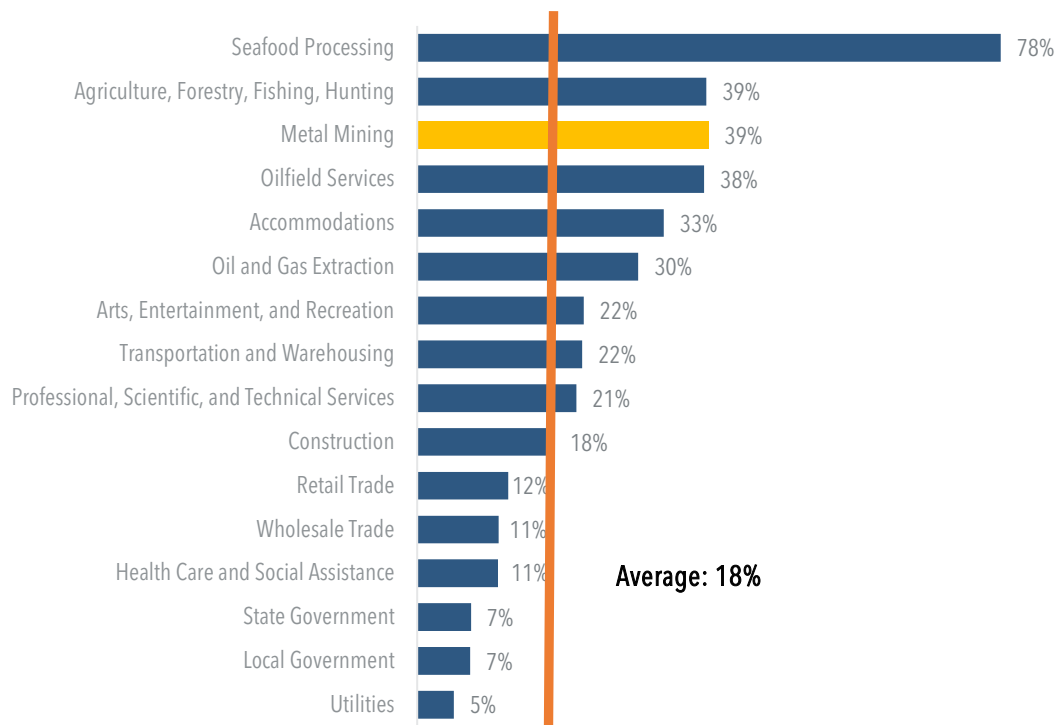
Note: Includes metal ore, coal, and nonmetallic mining.  
Source: Alaska Department of Labor and Workforce Development.

## ALASKA NONRESIDENT HIRE

DOLWD publishes nonresident hire data using worker residency based Permanent Fund Dividend (PFD) applications. While these calculations are instructive, they often result in conservative estimates of “resident” employment because an applicant must reside in Alaska for a full calendar year before being eligible for a PFD. To illustrate, a new resident who arrived in Alaska in February of 2019 would not be eligible to apply for a PFD until the 2021 application period. As a result, this applicant could reside in Alaska for nearly two years before being recorded as an Alaska resident.

For comparison purposes, in 2020, on average 18% of Alaska’s jobs were held by nonresidents. Some sectors, including the oil and gas sector, are above that average. Other sectors relying on nonresidents include seafood processing (78%); agriculture, forestry, fishing, and hunting (39%), oilfield services (38%), accommodations (33%); transportations and warehousing (22%); and professional, scientific, and technical services (21%). The DOLWD metal mining nonresident rate was 39% in 2020.<sup>77</sup>

**Figure 13. Percent of Positions Held by Nonresidents, by Selected Sector, 2020**



Note: Data exclude self-employed, fishermen, and private household workers.  
Source: Alaska Department of Labor and Workforce Development.

<sup>77</sup> <https://live.laborstats.alaska.gov/reshire/nonres.pdf> (Accessed March 4, 2022).

The nonresident rate also differs significantly depending on the occupation of the worker employed at a metal mine. The table below provides information on the 10 largest occupations in Alaska's metal mining industry where nonresidency rates range from 5.4% to 94.4%.

**Table 4. Top 10 Occupations in Alaska's Metal Mining Industry, 2020**

Occupation	Total Workers	Percent Nonresident
1. Underground mining machine operators, all other	758	32
2. Extraction workers, all other	264	55
3. Mobile heavy equipment mechanics, except engines	260	46
4. Earth drillers, except oil and gas	162	94
5. Mining and geological engineers, including mining safety engineers	147	39
6. Millwrights	105	42
7. Plant and system operators, all other	92	5
8. Electricians	90	71
9. Geoscientists, except hydrologists and geographers	85	59
10. Miners, except drillers and machine operators	82	33

Notes: Occupations totals include only workers in the industry. Additional workers in these occupations may be found in other industries.

Source: Alaska Department of Labor and Workforce Development.

## Division of Geological and Geophysical Surveys Estimates

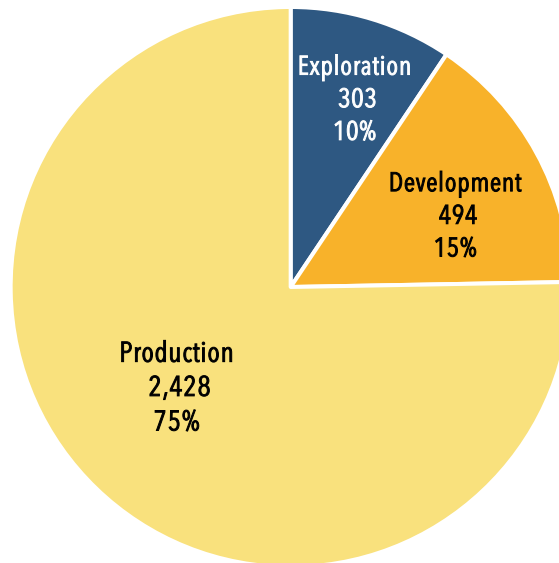
DGGS provides a broader measure of mining industry jobs in Alaska. Its report, *Alaska's Mineral Industry 2020*, estimated mining industry jobs at 3,225 full-time equivalent jobs. This includes both direct and some employment that conventionally would be defined as indirect. The data are from a survey of businesses, agencies, and individuals in Alaska that are engaged in some aspect of mining in the state.

The DGGS estimate includes production jobs such as that reported by DOLWD as well as a broad range of contract employment in drilling, camp support, and other professional and trade services. The DGGS estimate also includes construction materials handling jobs that are likely captured by DOLWD in the construction sector rather than in the mining sector and might be considered indirect. Finally, it includes the smaller operations, many of which are placer operations, that do not report jobs to DOLWD because they often are sole proprietors.

The best comprehensive estimate available for exploration program jobs in Alaska is provided by DGGS. In 2020, DGGS estimated 303 annual average, full-time equivalent jobs in exploration. Though data are not available, the number of jobs during the peak summer season is much higher.

The figure below shows DGGs's breakout of jobs by exploration, development, and production categories.

**Figure 14. Mining Employment, by Activity, Full-time Equivalent Jobs, 2020**



Source: DGGs, Alaska Department of Natural Resources.

# Spending on Goods and Services



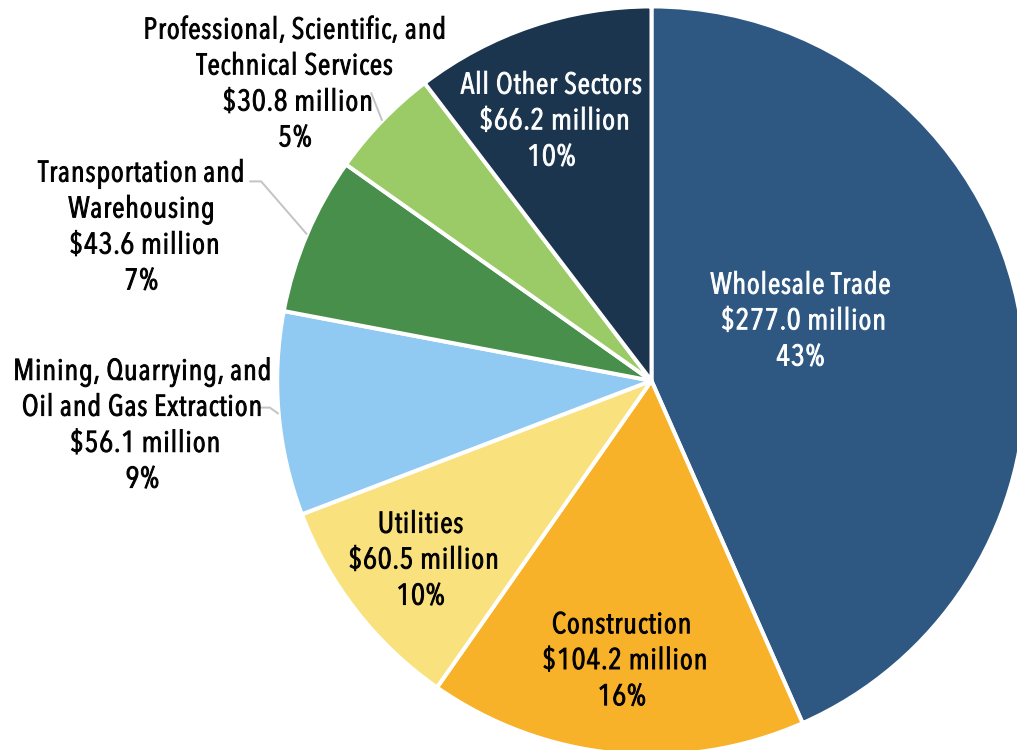
This section describes how Alaska businesses, other than mining companies, benefit from development of the state's mineral resources. In-state spending with Alaska firms by mining companies in support of their mining and mine development projects benefits hundreds of Alaska businesses. Partnerships and other relationships with Alaska corporations that own mineral property rights are other important avenues that convey the economic benefits of mining to Alaska businesses and therefore to individual Alaskans.

Spending patterns differ whether a project is in the exploration, advanced exploration, development, or production stage. For example, exploration spending is primarily with businesses providing professional services (such as engineering, environmental services, consulting, etc.), services (such as camp support services), transportation (helicopter support, marine and air transportation), and drilling and mining support services. Producing mines spend mostly with wholesale and retail trade businesses, companies providing professional, scientific, and technical services, utilities (mostly electricity), and construction services.

Alaska's six largest mines (UCM, Greens Creek, Red Dog, Fort Knox, Pogo, and Kensington) and advanced exploration projects spent an estimated \$1.1 billion in 2021 with businesses inside and outside Alaska. About \$6 out of every \$10 spent (about \$640 million) of these goods and services purchases were made with about 400 Alaska vendors.

The figure below shows how mining company spending was distributed among different types of Alaska vendors in 2021, with wholesale trade making up the largest portion of spending (43%) followed by construction services (16%), utilities (10%), mining services (9%), and transportation services (7%).

**Figure 15. Alaska Mining Industries Goods and Services Spending, by Type of Vendor, 2021**



Source: McKinley Research Group estimates.



# Local and State Government Revenue



The extent to which mining generates revenues for particular state and local governments depends largely on the location of the mine and the tax structure in local jurisdictions. The table on the next page outlines the land ownership and local jurisdiction for Alaska's largest producing and potential mining projects.

Most mining projects pay either property tax or a payment in lieu of taxes (PILT) to a local government, however most are on private or federal land and therefore not subject to state royalty payments. In addition to state royalties and property tax payments, several other fees and taxes are imposed on the mining industry. This includes mining license fees, annual mining claim rentals, severance taxes on coal produced from state land, severance taxes on gravel production, and other miscellaneous fees. Like other businesses, mining firms also pay corporate income taxes to the State of Alaska.

**Table 5. Current and Expected State and Local Tax Obligations**

	Land Status	State Mining License Tax	State Royalty Payments	Local Government Tax Payments	Local Taxing Authority
<b>Producing Mines</b>					
Fort Knox	State/Mental HealthTrust	✓	✓	✓	Fairbanks North Star Borough
Greens Creek	Private/Federal	✓		✓	City & Borough of Juneau
Kensington	Private/Federal/State	✓	✓	✓	City & Borough of Juneau
Pogo	State	✓	✓		
Red Dog	Private	✓		✓	Northwest Arctic Borough*
Usibelli Coal	State	✓	✓	✓	Denali Borough
<b>Development Projects</b>					
Donlin Gold	Private	✓			
Manh Choh	Private	✓			
Pebble	State	✓	✓	✓	Lake & Peninsula Borough**
<b>Advanced Exploration Projects</b>					
Bokan Mountain-Dotson Ridge	Federal	✓			
Golden Summit	State	✓	✓	✓	Fairbanks North Star Borough
Graphite	State/Federal	✓	✓		
Livengood	State/Mental Health Trust/Federal	✓	✓		
Niblack	State/Federal	✓	✓		
Palmer	Federal/State/Mental Health Trust	✓	✓	✓	Haines Borough
Upper Kobuk Minerals Project	State/Federal/Private	✓	✓		

Notes: \*Payment in Lieu of Taxes. \*\*Payment in Lieu of Development.  
Source: Compiled by McKinley Research Group.

## State of Alaska Payments

In 2021, the State of Alaska received \$83 million in revenues from the mining industry through mechanisms such as license fees, rents, royalties, material sales, and other fees. revenues are described below.

**Table 6. Mining Industry Payments to the State of Alaska, 2021**

	Description	Amount
Mining License Tax	This is a tax on the net income of, and royalties received in connection with, all mining property in the state irrespective of land ownership status. It applies only to mining. For mining income under \$40,000, no tax is charged; for income over \$100,000, the tax is capped at \$4,000 plus 7% of net income and royalties, less exploration and other credits (minerals exploration incentive and qualifying education tax credits). Except for quarry rock, sand, and gravel, and marketable earth mining operations, new mining operations are exempt from the mining license tax for a period of 3.5 years after production begins.	\$9,000,000
Annual Claim Rental	The Annual Rental law (AS 38.05.211) requires locators and holders of State mining locations to pay an annual rental. The requirement applies to mining claims, leasehold mining leases, offshore mining leases and prospecting sites on state land. For all traditional mining claims (40 acres), the annual rental amount is \$35 per year for the first five years, \$70 per year for the second five years, and \$170 per year thereafter. For quarter section mining claim (160 acres), the annual rental amount is \$140 per year for the first five years, \$280 per year for the second five years, and \$680 per year thereafter. For all leases, the annual rent is \$.88 per acre per year for the first five years, \$1.75 per acre for the second five years, and \$4.25 per acre per year thereafter. It is noted that an acre is about 208 by 208 feet. For prospecting sites, there is a one-time upfront fee of \$255, which covers the two-year term of the site.	\$11,107,426
Production Royalty	The Production Royalty Law (AS 38.05.212) requires holders of state mining locations to pay a production royalty on all revenues received from minerals obtained from state land. The production royalty is 3 percent of net income as determined under the Mining License Tax Law (AS 43.65), and regulations (15 AAC 65). A production royalty return must be filed and all required royalty payments must be made by anyone: who <ul style="list-style-type: none"> <li>• Owns, leases, and operates a mining property</li> <li>• Owns a mining property and receives lease fees, royalty payments based on production, or a combination of lease fees and royalty payments from the property</li> <li>• Leases a mining property from another person and operates the property</li> <li>• Possesses a mineral interest, whether an economic or production interest, in a producing property, including royalty, lease fees, working or operating interests, net profits, overriding royalties, carried interests, and production payments.</li> </ul>	\$1,631,483
Annual Labor	The payment in lieu of annual labor is based on the premise that when prospecting or discovering a locatable mineral, and staking a mineral location, annual labor must be performed each year in the further development of the locatable minerals so they can be mined. Every year, a minimum of \$100 or \$400 worth of labor or improvements must be performed on or for the benefit or development of each mining claim on leasehold location on state land. Every year \$100 worth of labor or improvements must be performed on each partial or whole 40 acres of each mining lease. The holder of a mining claim, leasehold location, or mining lease may make a cash payment to the state equal to the value of labor required (\$100 or \$400 per claim).	\$376,412
Coal Rents and Royalties	The standard rate for coal royalties on state lands for new leases is 5% of gross value. For coal leases in existence on June 18, 1982, the royalty rate at the next time of adjustment will be five% of the adjusted gross value. Certain costs may be deducted.	\$2,854,582

	Description	Amount
	There are three types of materials sales from which the state receives payments:	
Material Sales	<ol style="list-style-type: none"> <li>1. Limited Material Permit, where there is no filing or application fee</li> <li>2. "Limited" and small "negotiated" sales where the price is set by the Alaska Department of Natural Resources based generally on the fair market value of material in the area</li> <li>3. "Negotiated" and "competitive" sales where the amount charged for larger material sales (&gt;25,000 cubic feet) is based on a site-specific appraisal or an abbreviated appraisal. A "competitive" sale price is initially set by an appraisal but may be increased during an auction if more than one person or company competes for the material.</li> </ol>	\$2,442,468
State Fuel Tax	Alaska levies a tax on motor fuel sold, transferred, or used within the state.	\$1,367,505*
Corporate Net Income Tax (Collections)	All corporations doing business in Alaska must file a tax return. The corporate net income tax payment is based on profitability and is calculated from the federal taxable income with certain Alaska adjustments. Multi-state corporations apportion income on a "water's edge" basis using the standard apportionment formula of property, payroll, and sales. Tax rates are graduated from 1 to 9.4% in increments of \$10,000 of taxable income. The maximum rate (9.4%) applies to taxable income of \$90,000 and higher.	\$8,895,061
Large Mine Permit Coordination Program	The Large Mine Permit Team (LMPT) establishes a Memorandum of Understanding (MOU) with each applicant and Reimbursable Service Agreements with each participating state agency to reimburse the State's costs for the LMPT process. These agreements are renewed annually and "not-to-exceed" limitations are applied.	\$1,125,259
Bond Pool Payment	Bonding is required for all operations having a mined area over five acres on State Land. The required bond is \$750 per acre, unless the miner can demonstrate that a third-party contractor can do the needed reclamation for less than that amount. A statewide bonding pool has been established and all mining operators can participate. No reclamation plan approval goes into effect until the bonding pool deposit and an annual nonrefundable fee are paid. A portion of the reclamation bond may be refunded upon approval of the reclamation	\$29,399
Other State Mining Fees	These fees include filing, penalty, surface mining application, and Annual Placer Mining Application fees.	\$160,146
<b>TOTAL</b>		<b>\$38,989,741</b>

Note: \* Based on five-year average (2016-2020).

Sources: Alaska Department of Revenue and Alaska Department of Natural Resources. McKinley Research Group estimates

## Permanent Fund

The Alaska Constitution was amended in 1977 to establish a permanent investment fund into which, "at least 25% of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments and bonuses received by the state" are to be deposited annually.<sup>78</sup> This 25% applied to state mining leases issued on or before December 1, 1979. For mines operating with state leases issued after December 1, 1979, 50% is deposited into the Permanent Fund.

<sup>78</sup> AS 37.13.010.

In 2021, about \$8.0 million of the state rents and royalty payments by Alaska's mining industry was deposited into the Permanent Fund.

## Alaska Unemployment Insurance Tax

Like all industries, mining employers and employees contribute to Alaska unemployment insurance tax system, a federal-state program jointly financed through federal and state employer payroll taxes. The mining industry taxable rate is 2.52% on the first \$43,600 in wages; the employer pays 2.02% and the employee pays 0.5%. These tax funds are held in the Unemployment Insurance Trust Fund which is held by the U.S. Treasury. Only when these funds (along with other funds in the \$379 million trust fund (as of September 30, 2021)) are paid out as unemployment insurance benefits to unemployed workers is there an economic impact in Alaska.<sup>79</sup> The industry paid about \$2.6 million into the Trust Fund in 2021.<sup>80</sup>

## Other State Agency Fees

The mining industry is also an important source of revenue to quasi-government organizations such as the Alaska Railroad Corporation (ARRC) and the Alaska Industrial Development and Export Authority (AIDEA).

### ALASKA RAILROAD

ARRC is owned by the State of Alaska. Coal from UCM in Healy moves to Fairbanks (for power generation). A short spur line provides access to gravel resources near Palmer. During the building season (April through October) aggregate products move from the Matanuska-Susitna Valley to Anchorage.

In 2021, the mining industry paid about \$15 million to ARRC for moving coal, sand, and gravel, representing 20% of the Corporation's revenue from freight movement.<sup>81,82</sup>



### ALASKA INDUSTRIAL DEVELOPMENT AND EXPORT AUTHORITY

Teck Alaska (TAK), as the operator of Red Dog Mine, pays a toll for use of the state-owned DeLong Mountain Transportation System (DMTS), the 52-mile road and port that serve Red Dog.

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<sup>79</sup> <https://live.laborstats.alaska.gov/sites/default/files/2021-12/Tax%20rates%20for%20employer%20and%20employee.pdf> (Accessed April 12, 2022).

<sup>80</sup> McKinley Research Group estimates.

<sup>81</sup> Email correspondence from Barbara Amy, Alaska Railroad Corporation, April 11, 2022.

<sup>82</sup> [https://www.alaskarailroad.com/sites/default/files/Communications/ARRC\\_2021\\_Annual\\_Report\\_WEB.pdf](https://www.alaskarailroad.com/sites/default/files/Communications/ARRC_2021_Annual_Report_WEB.pdf) (Accessed April 11, 2022).

AIDEA owns the DMTS and TAK payments go to AIDEA to repay the cost of construction of the transportation system and provide a return on AIDEA's investment in the port and road. The lease requires TAK to pay a minimum annual user fee of \$6 million until 2040.<sup>83</sup>

Initial construction of the DMTS cost \$180 million with a subsequent upgrade of \$85 million for a total cost of \$265 million. In 2021, Red Dog paid AIDEA \$28 million for use of the system. By the end of 2021, the state had received about \$530 million from Red Dog for use of DMTS.<sup>84</sup>

In 1990, AIDEA purchased the Skagway Ore Terminal. The facility includes a warehouse and vessel loading equipment for base metal concentrates exported from the Yukon Territory to international markets. While the terminal was not used for mineral shipments in 2021, Canadian mining projects such as the Casino Mine, Wellgreen, Selwyn, Whitehorse Copper Tailings, and Tulsequah Chief have indicated interest in future use of the terminal.<sup>85</sup>



Combining payments to AIDEA and ARRC with the tax, royalty, and fee obligations, the mining industry paid about \$43 million to the State of Alaska in 2021.

**Table 7. Other Payments to State of Alaska Agencies, 2021**

	Amount
User fees to AIDEA (DTMS)	\$28 million
Payments to Alaska Railroad Corporation for Movement of Coal and RSG	\$15 million

Source: Red Dog and Alaska Railroad Corporation.

## Payments to Alaska Mental Health Trust Authority

In 1956, the US Congress passed the Alaska Mental Health Enabling Act, transferring the responsibility of providing mental health services from the federal government to the Territory of Alaska. To establish the Alaska Mental Health Trust, the state selected a million acres of land to provide funds for the development of the mental health services. In 1994, a legal settlement reconstructed the Trust with 500,000 acres of original Trust lands and 500,000 acres of replacement land. The Trust contracts with the Alaska Department of Natural Resources to manage the Trust's land. These lands are managed separately from other State of Alaska lands.

<sup>83</sup> <https://www.teck.com/media/2021-Annual-Report.pdf> (Accessed April 5, 2022).

<sup>84</sup> McKinley Research Group estimates.

<sup>85</sup> [https://www.aidea.org/Portals/0/Meeting%20Docs/2021BoardMeetings/102721/6.D\\_Skagway\\_Ore\\_Terminal\\_Evaluation\\_Report.pdf](https://www.aidea.org/Portals/0/Meeting%20Docs/2021BoardMeetings/102721/6.D_Skagway_Ore_Terminal_Evaluation_Report.pdf) (Accessed April 5, 2022).



Most Trust mineral lands are in Interior and Southeast Alaska, with active exploration and mining taking place in Interior Alaska. For example, Fort Knox is on Trust land north of Fairbanks. The Trust continues to solicit interest in the Salcha land block, containing 180,000 acres of Trust land in the Salcha area, about 30 miles northwest of Pogo Mine.<sup>86</sup> Other Interior Alaska lands available for competitive bid include the Liberty Bell land block about 20 miles northeast of Healy (copper-gold porphyry), the Ophir Block about 36 miles west northwest of McGrath (gold). In Southwest Alaska, the Trust has about 4,700 acres available near Thorne Bay (iron, copper, and gold), as well as other lands including coal deposits in the Healy, Tyonek, and Sutton areas.

In 2021, the mining industry paid \$997,213 to the Alaska Mental Health Trust for rents and royalty payments, and construction material sales.<sup>87</sup>

## Payments to Local Governments

The mining industry paid an estimated \$44 million to local governments in 2021. There are several ways the mining industry provides direct payment to local governments, including property taxes, sales tax, severance taxes, payments in lieu of taxes (PILT), payments in lieu of development fees (PILD), and rents or production revenue from rock, sand, and gravel production on local government lands. While there is no taxing authority where Pogo Mine is located, Northern Star Resources Pogo contributed \$200,000 to the City of Delta Junction in 2021.

### Property Tax

Mining companies represent some of the largest property taxpayers in the City & Borough of Juneau and Fairbanks North Star Borough. In 2021,

- Fort Knox Gold Mine paid the Fairbanks North Star Borough \$13 million in real property and business property taxes, making the mine the largest single property taxpayer in the Borough.
- Greens Creek paid \$2.6 million in real and business property taxes and sales tax to the City & Borough of Juneau.
- Kensington Mine paid \$1.4 million in property taxes to the City & Borough of Juneau.

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<sup>86</sup> <https://mhtrustland.org/index.php/minerals-materials/>

<sup>87</sup> Email correspondence with Dr. Karsten Eden, Trust Land Office, April 14, 2022.

- Many mining companies also paid property taxes for office space owned in Anchorage, Fairbanks, Palmer, and elsewhere.

## Payment in Lieu of Taxes (PILT) and Development (PILD)

Local government payments can also include a PILT for those jurisdictions that do not have property tax taxing authority.

In 2021, Teck Alaska's PILT payment to the Northwest Arctic Borough totaled \$25,448,390.<sup>88</sup> In 2017, the new PILT agreement was signed between Teck Alaska (operator of the Red Dog Mine) and the Northwest Arctic Borough, retroactive to 2016 and lasting 10 years with an option to renew. In 2021, the new PILT is based upon 4.0% of Red Dog's annual fixed asset value.

Since 1989 when mining began at Red Dog, the mine has contributed about \$290 million in PILT to the Northwest Arctic Borough, direct payments to the Northwest Arctic Borough School District, and the Village Improvement Fund.<sup>89</sup> Red Dog is the Borough's single most important source of revenue. The Borough receives no sales tax or property tax revenues.

Pebble Partnership has an agreement with the Lake and Peninsula Borough to pay a PILD that helps offset the Borough's costs associated with Pebble exploration and potential development activities, such as legal fees and consultant fees. In 2021, Pebble Partnership paid the Lake and Peninsula Borough \$100,000 in PILD.<sup>90</sup>

## Severance Tax

The Denali Borough and the City and Borough of Yakutat levy severance taxes against the activity of harvesting or extracting natural resources within their jurisdictions. The Lake & Peninsula Borough has in its code a section that authorizes a severance tax on resources (though no tax revenues are currently being generated). In the Denali Borough, UCM pays a severance tax of \$0.05 per ton of coal. The Borough also receives other severance tax payments for limestone and gravel operations. In 2021, mining companies paid \$54,109 in severance taxes to the Denali Borough and \$33,511 was paid to the City and Borough of Yakutat.<sup>91</sup>

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<sup>88</sup> Data provided by Red Dog Operations.

<sup>89</sup> McKinley Research Group estimates.

<sup>90</sup> Data provided by Pebble Partnership and Lake and Peninsula Borough.

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<https://www.commerce.alaska.gov/web/Portals/4/pub/OSA/taxable%20reports/2021%20Alaska%20Taxable%20Report%20FINAL%20January%2025%20Errata.pdf?ver=2022-01-25-125017-950> (Accessed April 5, 2022).

## Sales Tax

In certain jurisdictions, mining companies pay sales taxes on their local purchases of goods and services. For example, based on goods and services purchased in 2021, Greens Creek paid an estimated \$727,232 in sales taxes.<sup>92</sup>

## Rock, Sand, and Gravel Production

Most local governments also receive payments for the production from locally owned or leased rock quarries, and sand and gravel pits. While much of these local government payments are relatively small, for some small communities they may be important sources of revenue and for supporting local construction projects.

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<sup>92</sup> Data provided by Greens Creek.

## Beyond the Mine



Mining offers some additional benefits to the Alaska economy beyond what occurs at the mine site, including benefits to Alaska Native corporations, charitable and membership organization support, the development of workforce skills to support mining (and other support sectors), and public and private infrastructure that has broader benefit beyond the primary use of a mining venture.

### Benefits to Alaska Native Corporations

The Alaska Native Claims Settlement Act (ANCSA) was signed into federal law in 1971. It established legal title to land by 12 regional and more than 200 village Alaska Native corporations (ANC). ANCs are major private holders of land and sub-surface mineral interests in Alaska. Much of these lands have significant mineral potential, including several historic mining districts, such



as the Ambler district, numerous placer gold areas, and rock, sand, and gravel deposits.

ANCs benefit from mining industry activity - through business partnerships, in 7(i) and 7(j) royalty sharing payments, or jobs for shareholders.

## Business Development Opportunities

ANCs have taken the opportunity to develop businesses that serve the mining sector. Below are a few examples.

- NMS (NANA) provides meals and lodging services for mining camps.
- DeLong Mountain Logistics (NANA) provides transportation and logistics support for Red Dog, including transporting materials and supplies to and from the mine and trucking zinc concentrate from the mine to the port.
- Tuuq Drilling (NANA) provides core drilling services.
- NANA Construction provides construction services.
- Alaska Industrial Hardware (Bering Straits Native Corporation) for equipment and supplies.
- Kuna Engineering (a subsidiary of Sivu, LLC, a whole-owned subsidiary of NANA Corporation) provides engineering, surveying, and environmental services.
- Paa River Construction (NANA) engages in civil construction, aggregate production, and mining support services.

## Royalty Payments

ANCs can lease their land to mining companies which provide arrangements for direct payments (royalties) to ANC's. Because the potential for resource development differed, depending on the location of each ANC's land title, ANCSA Sections 7(i) and 7(j) were included in the law to help equalize ANC revenues from activities such as oil and gas development, mineral development, and timber sales. Section 7(i) states,

*...70 percent of all revenues received by each Regional Corporation from the timber resources and subsurface estates...shall be divided annually by the Regional Corporation among all twelve Regional Corporations...according to the number of Natives enrolled in each region.*

Section 7(j) states,

*Not less than...50 [percent] thereafter, shall be distributed among the Village Corporations in the region and the class of stockholders who are not residents of those villages [at-large shareholders] ...*

Red Dog is operated by Teck Alaska under an agreement with the property owner, NANA Regional Corporation. In FY2021, NANA earned \$161 million in royalties based on 35% of net

proceeds of production (NPP) from the mine.<sup>93</sup> The NPP increases by 5% every fifth year to a maximum of 50%. The next adjustment, to 40%, is anticipated to occur in October 2022.

NANA distributed about \$98 million, net of allowable costs, directly to ANCs and indirectly to village corporations as part of its Sections 7(i) and 7(j) payment requirements.<sup>94</sup> Since 1990, NANA has distributed \$1.6 billion (not including NANA's own distributive share) through Section 7(i) payments to ANCs.

In 2021, about \$3 million in royalties were paid by mining companies to Calista Corporation for all its mineral interests, including Donlin Gold and Nyac Mine, and to Bristol Bay Native Corporation by Greens Creek.<sup>95,96</sup>

## Other Mining Projects and Prospects

NANA has entered into a formal exploration agreement with Ambler Metals in the Ambler Mining District. Within the district, the Arctic Project is the most advanced (*see "Exploration" section of this report*).

ASRC has been engaged in evaluating its coal resources in the Western Arctic since the late 1980s. Four trillion tons of high quality bituminous and subbituminous coal – one-ninth of the world's known coal resources, and one-third of the U.S. resource – are estimated to lie within ASRC's region.<sup>97</sup>

In 1995, Calista Corporation entered into a lease for mineral exploration and development for the Donlin Gold project. Calista Corporation holds the sub-surface rights and The Kuskokwim Corporation holds the surface rights (*see "Development" section of this report*). Calista continues to promote other properties such as its Goodnews Bay platinum operation, the Stuyahok property, the Nyac gold prospect, and other placer leases on Crooked Creek and the Tuluksak River.

The Aleut Corporation has sub-surface lease option agreements for the Unga Gold Project (Shumagin Property and the Unga-Popof Property) with Heliostar Metals Ltd. Unga has high-grade gold vein mineralization, as well as near surface-gold-silver mineralization.

Tectonic Metals, Inc. continued exploration at its Seventymile gold project, located 40 miles west of Eagle. The project includes the Flanders, Alder Creek, and Bonanza Creek lode prospects, among others, and is leased from underlying landowner Doyon, Ltd. Doyon has issued other

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<sup>93</sup> Email correspondence with NANA, April 12, 2022.

<sup>94</sup> Email correspondence with NANA, April 12, 2022

<sup>95</sup> McKinley Research Group estimates.

<sup>96</sup> Data provided by Greens Creek.

<sup>97</sup> <https://www.asrc.com/about/our-lands/coal/> (Accessed April 5, 2022).



mineral exploration and development lease option agreements for exploration projects throughout the Doyon region.

## Charitable Giving and Membership Organization Support

In 2021, about \$3.3 million was given in charitable support by Alaska's mining community, assisting at least 250 nonprofit organizations throughout the state in health, arts, civic, education, recreation, youth, and social services. At least \$60,000 worth of employee giving was matched by mining companies, including Kensington and UCM. Mines also provided in-kind support for events and contributed thousands of employee hours volunteering in their communities and causes.

Mining companies also provided over \$800,000 in support to many civic, business, and industry organizations in Alaska through sponsorships and membership fees. These organizations include local Chambers of Commerce, Alaska Chamber of Commerce, Alaska Miners Association, Alaska Support Industry Alliance, Council of Alaska Producers, local economic development organizations (such as Fairbanks Economic Development Corporation and Southeast Conference), and Resource Development Council of Alaska, among others.

## Workforce Development

The mining industry can offer long-term, year-round employment. Many of the jobs are rural based, offering transferable skills in a rapidly growing industry. Direct job training is available in management, engineering and science (geologists, metallurgists, environmental scientists, etc.); technical specialties (surveyors, drafters, computer technicians, instrumentation technologists, lab technicians, environmental, etc.); mine and mill work (millwrights, electricians, diesel mechanics, plumbers, maintenance planners, metallurgical samplers, machinists, welders, industrial mechanics, operators, drillers, laborers, etc.); and administrative and support staff (accountants, purchasing agents, in-house trainers, employee relations personnel, payroll clerks, secretaries, health workers, cooks, security guards, warehouse workers, etc.).

The training and experience Alaskans (particularly rural Alaskans) gain from working in the mining industry makes them more employable in other projects around the state, for example, in the oil and construction industries, in environmental monitoring activities, and in a broad range of other sectors of the economy. Skills gained on-the-job or through mine training make residents better able to fill positions that may come available in their communities (jobs that might otherwise be filled by non-residents,) or in other remote jobs that might allow them to maintain rural residence while working rotational shift schedules (i.e., week-on, week-off). Also, the skills learned in many cases are in demand throughout the world; having these skills can greatly increase personal opportunities.

There are several institutions and organizations in Alaska currently providing training support for and with the mining industry. Notable is the University of Alaska's Mining and Petroleum Training Service (MAPTS) program and the University of Alaska Southeast (UAS) Center for Mine Training.

### University of Alaska's Mining and Petroleum Training Service (MAPTS)

The University of Alaska established the Mining and Petroleum Training Service (MAPTS) in 1979 to deliver training, development, and consulting services to mining students. MAPTS clients include Alaska mining and petroleum companies, federal, state, and municipal agencies, Alaska Native corporations, environmental firms, and industrial health and safety organizations. MAPTS provides training and workforce development ranging from employer-driven soft-skills (such as job-readiness, work ethic, and career planning) to hands-on industrial training. The program averages 60 annual graduates; 85% have jobs within one year.<sup>98</sup>

While MAPTS' administrative office is in Soldotna, the program also offers classes through University of Southeast Alaska (UAS) and University of Alaska Anchorage (UAA).

In 2015, MAPTS acquired the Delta Mine Training Center. The Center features simulators and heavy-duty mine equipment, a surface and underground classroom, several shops and a warehouse, a 36-bed camp and kitchen/dining hall, and about 6,000 feet of mine drift complete with two underground classrooms and a three-story underground office complex. MAPTS provides standardized training that meets the requirements for the State of Alaska and the Mine Safety and Health Administration (MSHA).<sup>99</sup>

### UAS Center for Mine Training

The UAS Center for Mine Training is a partnership between UAS and MAPTS. Administered by UAS Career Education, the program encourages students to pursue workforce training leading to an Applied Associate of Science degree or Occupational Endorsement certificate program, concentrating on Mine Mechanics/Heavy Duty/Diesel or Fixed Plant Mechanics.<sup>100</sup> In 2012, the Center became the first school in the U.S. to house an underground mine simulator named Cybermine. Mining companies, such as Greens Creek, have provided financial support for the Center.

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<sup>98</sup> [https://www.uaf.edu/mapts/about/MAPTS\\_Impact.pdf](https://www.uaf.edu/mapts/about/MAPTS_Impact.pdf) (Accessed April 5, 2022).

<sup>99</sup> <http://www.alaska.net/~mapts/pdf/MAPTS%20Mine%20Training%20Program%20Brochure.pdf> (Accessed April 5, 2022).

<sup>100</sup> [https://uas.alaska.edu/career\\_ed/mining/index.html](https://uas.alaska.edu/career_ed/mining/index.html) (Accessed April 5, 2022).

## Educational Support

The mining industry is also active in promoting student performance and interest in areas of study where the mining sector has employment needs, such as engineering, geology, environmental sciences, and the building and construction trades. Over \$1.1 million has been contributed by the mining industry to support education in Alaska, including scholarships, academic chairs, instructional support, and foundations. Examples of educational support in 2021 include:

- Ambler Metals provided \$31,900 in educational support to NANA shareholders through the Ambler Metals/NANA scholarship.
- Ambler Metals and Teck Alaska contributed to the GeoFORCE Alaska Program, that creates STEM opportunities for students from rural Alaska.<sup>101</sup>
- Several mining companies, including Ambler Metals, Coeur Alaska Kensington, Kinross Alaska, Constantine Metals, and UCM provide support to the organization, Alaska Resource Education, which provides statewide educational opportunities to students and teachers, and distributes primary education curriculum that meets Alaska State Science Standards.
- Teck Alaska (Red Dog) provides annual employee scholarships, and university and vocational scholarships, as well as support for Aqqaluk Trust scholarships for NANA shareholders and descendants.
- Coeur Alaska Kensington donated \$300,000 to the University of Alaska Southeast Coeur Alaska Kensington Gold Mine Environmental Science Endowment Fund.
- All Council of Alaska Producers (CAP) members contribute to CAP's support for the Institute for Social and Economic Research (ISER) Visiting Professor of Public Policy position.<sup>102</sup>
- Donlin Gold contributed \$22,000 to the University of Alaska. Greens Creek donated \$367,209 to the UA Foundation, UCM also donated (\$300,000), as did Kinross Fort Knox.

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<sup>101</sup> [https://issuu.com/uafgeoforce/docs/2021\\_ar\\_1](https://issuu.com/uafgeoforce/docs/2021_ar_1) (Accessed May 23, 2022).

<sup>102</sup> CAP members included Coeur Alaska Kensington, Hecla Greens Creek, Kinross Alaska, Northern Star Resources Pogo, Teck Alaska, Ambler Metals, Donlin Gold, NANA, NovaGold, Tower Hill Mines, Constantine Metals, and Pebble Partnership.

## Infrastructure Development

Alaska's mining industry has also played a historical role in the development of important infrastructure, including the development of the Alaska Railroad, Richardson Highway, Steese Highway, Hatcher Pass, the road into Denali National Park, and even the settlement of Anchorage. Though initially developed for mining-related purposes, this infrastructure now has obvious value to non-mining interests. Ambler Metals pays for continued maintenance on the Bornite Road between Dahl Creek and the Bornite project for local and business use.

## Utility Impacts

### Alaska Electric Light and Power

Greens Creek is Alaska Electric Light and Power's (AEL&P) largest interruptible power customer. In exchange for lower rates, interruptible customers agree to have service interrupted in an emergency or when the utility does not have capacity to serve all firm customers. Interruptible customers allow AEL&P to fully utilize available water for hydroelectric generation, and largely avoid running their costly diesel generators except during emergency situations. In the long run, sales to Greens Creek mine also help the utility cost-effectively build new hydro capacity to serve Juneau's growing load.

### Golden Valley Electric Association

Fort Knox Mine is Golden Valley Electric Association's (GVEA) single largest commercial customer. According to GVEA, the mine purchases about 19% of the total kilowatt-hours sold each year by GVEA, valued at \$37 million in 2021. Fort Knox Mine is by far the largest of GVEA's eight industrial customers (only using transmission voltage) and accounted for 15% of GVEA's total operating revenues of \$256 million in 2021.<sup>103</sup>

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<sup>103</sup> Communication with Meadow Bailey, Director of External Affairs and Public Relations, Golden Valley Electric Association. April 12, 2020.

# Total Economic Impact



The direct jobs figures presented previously in this report do not include all the support sector jobs in Alaska that are linked to mining. There are two other ways jobs and payroll impact Alaska's economy:

- **Indirect** jobs and payroll in Alaska businesses that provide goods and services to mining and exploration companies.
- **Induced** jobs and payroll created when mine workers spend their payroll dollars in the local economy.

The non-payroll spending by mining companies and spending by employees creates additional economic activity in Alaska, sometimes described as the "multiplier effect." The Alaska mining industry has a high multiplier effect relative to other industries (second only to the oil industry). However, it does not have as large a multiplier effect as mining in some other regions of the U.S. simply because fewer of the materials the industry needs are manufactured in Alaska, such as explosives, chemical reagents used in ore processing, drilling supplies, and equipment.

Mining-related spending flows through the Alaska economy in a variety of ways, creating additional spending, employment, and payroll. For example:

- **Mining companies collectively purchase several hundred million dollars' worth of goods and services** from hundreds of Alaska businesses located throughout the state. Regional centers such as Anchorage, Fairbanks, and Juneau provide many of the goods and services that can be provided in-state, but businesses in smaller communities also benefit from local purchases, especially in support of remote exploration programs.
- **Jobs in other sectors are dependent on Alaska's mining industry, including regulatory and research jobs.** These include federal government jobs with the US Bureau of Land Management, the US Geological Survey, and the USDA Forest Service, and state government jobs such as those in the departments of Natural Resources, Fish & Game, and Environmental Conservation, University of Alaska's Mineral Industry Research Laboratory and UAF College of Engineering and Mines through the Department of Mining and Geological Engineering tasked with conducting mining regulatory oversight and research.
- **Mining creates jobs for Alaska residents in other industries.** Because of the industry's above-average wages, spending by mining employees creates more induced activity than most other sectors in Alaska (only the oil and gas industry pays a higher average wage.)
- **Royalties paid to regional Alaska Native Corporations (ANCs)** show how mining can benefit every area of the state. For mines located on ANC land, royalties are paid under provisions of the ANCSA, half of distributions go to the regional corporation under Section 7(i) and half to the village corporations in each region under 7(j).
- **Tax revenue paid to the State of Alaska** supports state government activity throughout the state, including payroll for state workers and program support (such as education funding). The Mining License Tax is a mining-specific tax not paid by other industries.
- **Taxes paid to local governments** are an important source of revenues for several jurisdictions in Alaska. These payments support local government jobs, payroll, and public services in the communities closest to the mining operations.

All these factors together mean that the mining industry has significant multiplier effects throughout the Alaska economy.

The input-output model, IMPLAN™ (a widely-used input-output model for analyzing the economic impact of industrial and commercial development projects), can aid in assessing the effects of industry spending in the form of "multipliers". However, the model is adjusted by McKinley Research Group as it does not capture all the economic effects of mining in Alaska, such as the ANCSA 7(i) and 7(j) distributions.



## Total Employment and Payroll Effects

Based on detailed analysis of industry spending patterns, an employment multiplier of about 2.0 accurately captures the total direct and indirect employment impact of the mining industry employment in Alaska, including the full breadth of the industry, from coal and metal mining, exploration and development spending, and construction materials mining. With that multiplier, total direct, indirect, and induced employment in 2021 was about 10,800 jobs. Total direct, indirect, and induced payroll is an estimated \$985 million.

## Economic Output

Economic output – a measure of total spending – is another indicator of the total economic impact of mining in Alaska. The total value of mineral production in Alaska was \$3.3 billion in 2021. However, this estimate of value overstates economic impact in Alaska because it is based on prices for refined mineral products, not the value of the concentrates that are produced by and exported from Red Dog and Greens Creek, for example. In terms of economic impacts, a more relevant measure of the value of Alaska mineral production would be the value of concentrates that are produced by Alaska mines, plus the value of dore gold bars produced in Alaska and exported for further refining, and the value of construction materials (sand, gravel, and rock) produced and used in Alaska. Though this kind of measure is not available from any published sources, a proxy value is the estimated export value of concentrates and gold are exported from Alaska.

Based in part on export value, the total value of Alaska mineral production was about \$3.3 billion in 2021. Applying an Alaska output multiplier of 1.6 to this total indicates in-state economic activity of about \$5.2 billion.

# Future Mineral Potential



Over 190 million acres of federal, State, and Native-owned lands are open for mineral-related activities and mining. Since 1880, Alaska's mining industry has produced about 51 million ounces of gold, 444 million ounces of silver, 18 million tons of zinc, 3.7 million tons of lead, and significant quantities of copper, tin, and platinum. The industry has also produced 84 million short tons of coal, and over 1.3 billion tons of sand and gravel.<sup>104</sup> Fifty different mining districts have historically each produced more than 10,000 ounces of gold. Six districts have produced more than one million ounces of gold, ranging from the Nome district in western Alaska to the Juneau district in Southeast. With 44 million acres of privately held land, much of which was selected for its mineral potential, ANCs and their shareholders will play a key role in future development of the mining industry in Alaska.

While Alaska has a rich mining heritage spanning over 100 years, and the industry today plays an important role in local and regional economies, the future of mining in Alaska holds the promise of a very rich mineral endowment, including:<sup>105</sup>



<sup>104</sup> <https://dggs.alaska.gov/pubs/minerals> (Accessed March 25, 2022).

<sup>105</sup> <https://dggs.alaska.gov/pubs/minerals> (Accessed March 25, 2022).

Alaska's mines can produce several minerals that are listed as "critical" by the USGS for domestic manufacturing, including clean energy technology, including:

- Graphite – The Graphite Creek property hosts a very large deposit of this form of carbon that is widely used for lubricants and as the anode material in the lithium-ion batteries that power electric vehicles.
- Cobalt – Associated with carbonate-replacement copper, platinum group metals and volcanogenic massive sulfide deposits in many parts of Alaska, cobalt is used in superalloys and as a cathode material in lithium-ion rechargeable batteries. The Bornite project in the Ambler Mining District contains cobalt.
- Barite – Found in abundance at the Palmer volcanogenic massive sulfide deposit in Southeast Alaska, barite is primarily used as a weighting agent in drilling mud for oil and gas exploration and development drilling.
- Rare Earth Elements (REEs) – REEs have diverse defense, energy, industrial, and military technology applications. About 40% of the rare earths in the Dotson Ridge deposit at Bokan Mountain are in the heavy REE category.

A recent UAA ISER study considered the economic potential of Alaska's mining industry over the next 20 years. The future of mining involves significant uncertainty, depending on the state remaining an attractive investment environment, with stable regulatory and tax regimes and a supportive political environment. ISER constructed three different future scenarios: one with unfavorable industry- economic and policy conditions, one where status quo conditions prevail, and a third with favorable conditions.<sup>106</sup> Unfavorable conditions, from falling and persistently depressed mineral prices, degrading infrastructure, or enactment of sweeping restrictions, Alaska's mining industry could halve in size over the next 20 years. Alternatively, there is a reasonable expectation that Alaska's mineral industry could double in size over the 20 years. To realize this growth, state investments in infrastructure would be required to support the industry, along with streamlined permitting processes, and robust mineral prices. The benefit to Alaska would include increase exports, more tax revenue to state and local governments, and more jobs (as much as 17,000 direct, indirect, and induced jobs).<sup>107</sup>

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<sup>106</sup> Bob Loeffler and Brett Watson, *The Economic Potential of Alaska's Mining Industry*, UAA ISER, March 8, 2022.

<sup>107</sup> Ibid.



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