

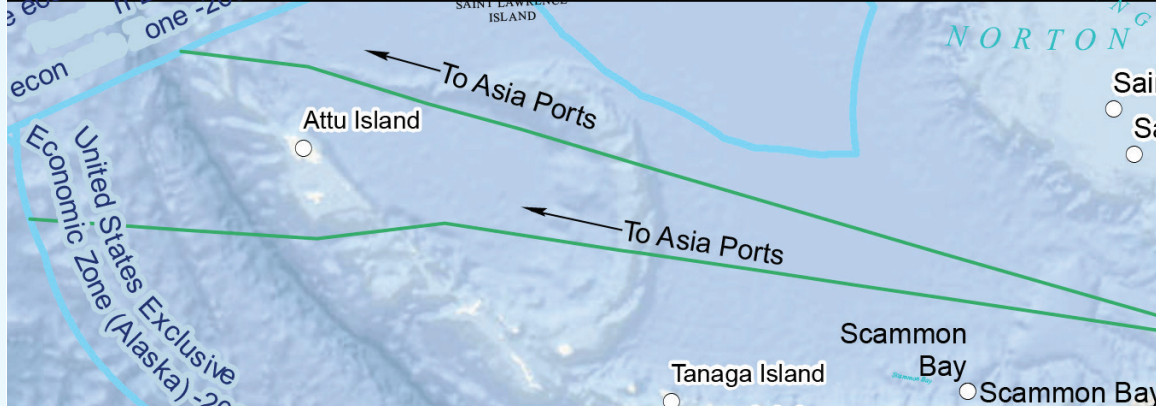
PEBBLE WATCH

FACT SHEET

September 2020

Quick Read

- Advocates for development of the Pebble mine argue the deposit of copper, gold, and molybdenum would contribute to U.S. resource independence.
- They say that developing the mine would create a domestic supply of minerals for the U.S., thus reducing dependence on countries such as China.
- However, developers also plan to ship mineral concentrates directly from a port on Cook Inlet to ports in Asia.
- Concentrate would be smelted and refined outside the U.S.
- Once out of the U.S., concentrates are no longer considered part of the domestic supply chain. The U.S. would have to buy back the refined product.
- To count toward domestic supply, and resource independence, Pebble developers would have to smelt and refine copper domestically.
- There are three operating copper smelters in the U.S., located in Arizona and Utah. There are a few copper refineries in Texas. These are owned by large mining corporations, which also export some of their copper concentrate.
- If these corporations had capacity, and if they agreed to process Pebble copper concentrate, getting it to Arizona or Utah may not be economically viable. It would require more expensive transportation by ship and then train/truck.



Mineral Independence and the Pebble Mine

One of the arguments made in favor of development of the proposed Pebble mine is that it would create a domestic supply of copper, gold, and molybdenum and would contribute to resource independence for the United States.¹

Northern Dynasty Minerals (NDM) added the critical mineral rhenium to that list in August 2020, saying, “As a significant deposit of Rhenium on US soil, development of the Pebble resource will materially advance America’s goal of achieving self-sufficiency in the critical minerals needed to support and sustain its economic growth, military security, manufacturing industries and transition to a lower carbon future.”²

The existence of these minerals on U.S. soil is just the first part of the equation, however. The argument ignores a critical aspect of the supply chain: how concentrate gets turned into a product ready for end users.

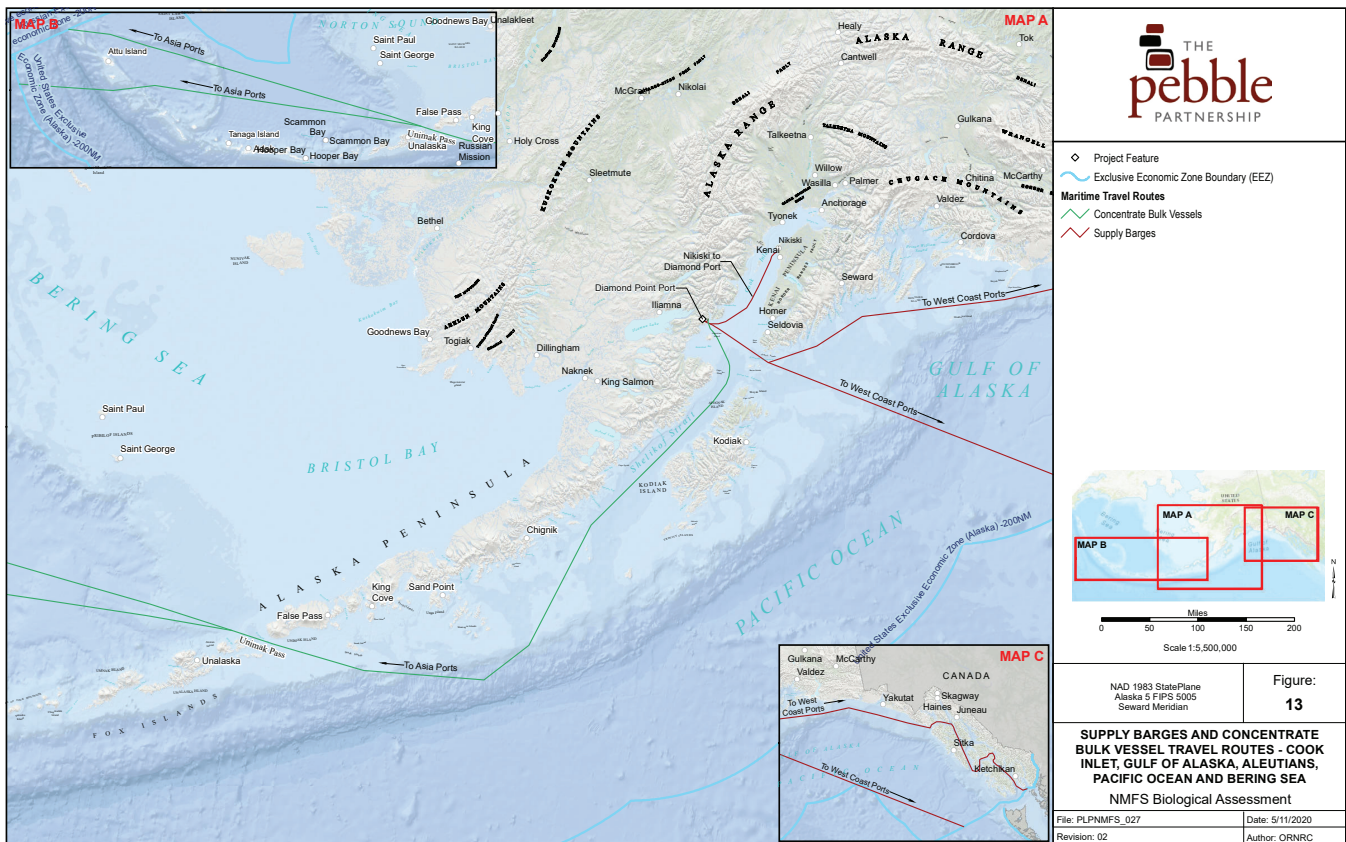
That’s where the U.S. loses out on any resource independence advantage from the Pebble deposit.

Pebble developers have been clear that concentrate shipped from the deposit would head to Asian markets for smelting and refining.³ In a November 2017 presentation to investors, NDM CEO Ron Thiessen said, “You can’t find a better spot to build and develop a mine. It’s effectively in the middle of nowhere, but it’s very close to tidewater, which gives us good access to the ocean and shipment to Asian smelters.”

That plan has not changed. In the Final Environmental Impact Statement developed by the U.S. Army Corps of Engineers, a map in Appendix H clearly illustrates the vessel routes “to Asia ports.”⁴

Shipping concentrate to other countries isn’t unusual for mines in Alaska, which produce 36% of the state’s exports.^{5,6} The Alaska Resource Development Council says, “Worldwide interest in Alaska’s mineral potential continues to grow... Driving interest is the demand for metals, primarily from Asian countries like China, Japan, and India. The export value from Alaska

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May 2020 Concentrate Bulk Vessel Travel Route map, from the Pebble Project Final EIS, Appendix H, indicates concentrate shipments “to Asia ports.”

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production was \$1.7 billion in 2018.”⁷

Pebble developers envision a port on Cook Inlet that would provide easy access to those markets. If the U.S. wanted that Alaska-sourced copper, gold, molybdenum or rhenium in the future, it would have to buy the refined product back from another country, likely China or Japan, which have the smelting and refining capacity that the U.S. currently lacks.

Alaska Senator Lisa Murkowski and other legislators have been pointing out the flaws in this supply chain for years.^{8,9} In 2011 testimony on Critical Minerals and Materials Legislation, Senator Mark Udall (D-Colorado) said, “We used to dominate the United States did, the world’s supply chain, not just because we had the mines, but because we developed the

know how as to how to process the minerals and put them into advanced technology...we currently then have to ship the products of those mines to China to be processed into useful materials.”

Not controlling the production aspect of the mineral supply chain leaves the nation at the mercy of countries who may or may not choose to sell refined metals, critical minerals and rare earths to the U.S. in the future.

In the 2019 USGS Critical Minerals Review¹⁰, authors note, “It is not always the case that the strategic vulnerability for a given mineral commodity is a mining and concentrate production issue... Simply establishing domestic mining and concentrate production does

nothing to mitigate risks if downstream processing is highly concentrated geographically, imported and unreliable.”

In a 2019 interview with SmithWeekly, Thiessen discussed this lack of U.S. processing capacity as well, noting that the last time a copper smelter was permitted in the United States was in 1974. He noted it was never built.¹¹

Yet the company’s September 2020 presentation to investors still highlights Pebble as a “key domestic source of strategic minerals.”¹²

Pebble: Strategic Metals
US Economic & Military Security, and Climate Change Adaptation

- Pebble will be a key domestic source of US strategic metals
- US currently dependent on foreign imports

METAL	NET IMPORTS	US IMPORT RELIANCE	KEY USES
Copper	100%	100%	Transportation; electronics; clean and renewable energy
Gold	100%	100%	Jet engines
Platinum	100%	100%	Electrical applications

IN SIGHT: AMERICA'S NEXT GREAT COPPER-GOLD MINE
THE PEBBLE PROJECT
 SEPTEMBER 2020

Argument resonates with supporters

The idea of Pebble as a domestic source of strategic minerals continues to resonate with some supporters of the project. Public comments on the U.S. Army Corps of Engineers Pebble Project EIS site show concern over resource independence as a reason for developing the Pebble deposit ¹³:

"This project will also help the United States become more dependent on our own natural resources for rare Earth's minerals such as Rhenium and Molybdenum instead of relying on places like China."

"I am afraid of the Chinese and their dominance of critical minerals needed to defend our country."

"I am concerned about our reliance on China for scarce resources...We need this mine to ensure our safety."

The irony of this argument is that, once developed, Pebble might be sending minerals from the U.S. directly to China. Or Japan, South Korea, or Chile. Any place with capacity to process the concentrate. At that point, it is out of U.S. hands.

In September 2020, Axios wrote about the global need for copper, and quoted Pebble Limited Partnership spokesperson Mike Heatwole: "While we can't say for certain where Pebble copper will end up, U.S. and global demand for clean and renewable power, electrical vehicles and the grid infrastructure that supports these ... will clearly be important drivers for the development of new copper producers." ¹⁴

Pebble is located in the U.S., so it's a domestic supply, right?

The United States Geological Survey keeps track of mineral supplies¹⁵ and copper concentrates don't count toward domestic supply numbers unless they are smelted and refined domestically.

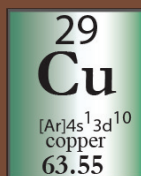
When determining the amount of domestic supply of refined copper in the U.S., any concentrates shipped and refined overseas don't factor in. In calculating the supply of domestically mined copper, concentrates extracted here would be considered, but any amount shipped overseas will be subtracted out in the calculation, and only those concentrates that remain in the country will be accounted for as being supplied domestically.

For copper producers like Pebble that aren't in the smelting/refining business, there can be tolling agreements where Company A produces concentrates, Company B smelts/refines the concentrates and returns them to Company A. Then Company A is in charge of the sale and distribution of the refined copper cathodes. In a scenario where there's a toll agreement to process concentrates into cathode, the resulting refined production would count as domestic supply. That scenario has never been described as part of Pebble's plan.

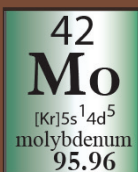
Unless Pebble developers change plans to seek out toll agreements or direct concentrate to facilities in the U.S., Alaska-sourced copper will not count toward the nation's domestic supply.

U.S. EXPORTS

Source: USGS Mineral Commodities Summaries 2020



From 2015 to 2019, the U.S. exported an estimated 1,543,000 metric tons of copper ore and concentrate.



In 2019, roasted and unroasted molybdenum concentrate exports increased by 26% and 13%, respectively, compared with those during the same period in 2018.

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Couldn't Pebble send concentrate to U.S. smelters to keep these minerals for domestic supply?

A: It would be very unlikely, and expensive.

There is no economic benefit for Pebble to do so, even if it could find capacity.

Multiple U.S. copper producers state in their financial reports that 100% of their copper concentrates are sold to foreign companies. For example, in 2019 Capstone Mining Corporation's Pinto Valley mine exported 100% of copper concentrate production to Asia, specifically Japan, Korea, and the Philippines. The copper concentrate was hauled using a modular truck system and shipped out of the port of Guaymas, Mexico.¹⁶

The few U.S.-based smelters and refineries in existence are already associated with, or owned by, large mining companies such as Freeport, Asarco, and Rio Tinto. (Even they send some of their own concentrate to Asia through Guaymas.)^{17 18}

Those companies would have to agree to take on Pebble concentrates for processing, when they already have limited capacity for their own concentrate.

Additional costs would be incurred to ship Pebble concentrate from Cook Inlet to a port in the U.S. and

then by truck or train to smelters in Utah or Arizona and refineries in Texas.¹⁹

Shipping from Alaska to another U.S. port is considerably more expensive than shipping to Asia markets due to the Jones Act, which requires goods shipped between U.S. ports to be transported on ships that are built, owned, and operated by United States citizens or permanent residents.²⁰

There are even fewer options in the U.S. for rhenium production. Rhenium is produced as a by-

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Union Pacific Copper Concentrate Shippers



This Union Pacific map illustrates copper concentrate transport routes, along with ports, smelters and refineries.

Statistics for Pebble’s contribution to resource independence are misleading

Even if Pebble concentrate were by some chance to remain in the domestic supply chain, Pebble exaggerates its contribution to resource independence by citing estimates from the full Pebble deposit:

“The 80 billion pounds of copper estimated in the Pebble deposit has the potential to meet approximately 33% of U.S. annual needs for many years.” – Pebble website ¹

“New Pebble mineral resource estimate increases US strategic Rhenium sources by 84%” – NDM press release on rhenium, August 20, 2020 ²

But the project under consideration would produce a fraction of that amount. An expansion of the mine plan beyond that would require additional permitting.

Under the 20-year plan, NDM proposes to mine 318 million pounds of copper annually. Over 20 years, this is 6.3 billion pounds recovered out of an estimated 83 billion pounds (approximately 7.7%).¹²

NDM has not provided a breakdown of how much rhenium would be recovered under its existing 20-year plan. The NDM technical report on rhenium is expected to be made public in early October 2020 and may include this information.

However, since rhenium is produced as a by-product of molybdenum smelting, we can get a general idea of how much rhenium could be produced based on the percentage of molybdenum recovered under the 20-year plan. Under that plan, NDM estimates an average molybdenum concentration production of 14 million pounds. Over 20 years, this is 280 million pounds recovered out of an estimated 5.6 billion pounds (approximately 5%).

	Overall estimate in all categories	Estimated amount to produce under existing 20 year mine plan proposal	Percentage of overall resource to be produced in 20 years
COPPER	83 billion lb	6.3 billion lb	7.7%
MOLYBDENUM	5.6 billion lb	280 million lb	5%
RHENIUM	4.2 million kg	NDM has not published this data. The percentage of overall resource is likely similar to that for molybdenum (5%), as rhenium is produced as a by-product of molybdenum.	

Source: NDM corporate presentation, September 2020, NDM rhenium press release, August 20, 2020

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product of molybdenum. The USGS Critical Minerals report on rhenium states that, in 2012, there were three molybdenum mines in the U.S. with associated roasters. Only one of the roasters – Sierrita in Arizona – was equipped to recover rhenium.²¹ A 2018 USGS dataset reports that, “the United States has insufficient processing capacity to meet domestic need for rhenium. The United States ships molybdenum concentrates to Chile for recovery and then imports the refined rhenium.” ²²

Finally, NDM is an exploration company, not a mining company. Its main goal is to bring on partners to develop the mine, or to sell outright, for the ultimate benefit of its investors. Would future partners put a high value on U.S. resource independence as part of their calculus when determining the economics of Pebble? Would they seek out toll agreements or costly and convoluted shipping modes just to keep concentrate within the U.S.?

The promise of the Pebble deposit is exciting for many. There would be jobs and economic benefits.

There would be more copper, gold, molybdenum, silver and rhenium extracted from Alaska bedrock.

But if Pebble developers continue to claim these minerals as a domestic source of strategic minerals, more details are needed that describe exactly how those minerals will be mined, smelted, refined and retained within the U.S. for its benefit.

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- ⁸ **2011 testimony on Critical Minerals and Materials Legislation**, "We used to dominate, the United States did, the world's supply chain, not just because we had the mines, but because we developed the know how as to how to process the minerals and put them into advanced technology. We sold that technology, however. The intellectual property rights went to countries like China and Japan and now we no longer have the manufacturing capabilities nor a skilled work force at the level that we need to have it or want in this country. So even if we were to open and I know we will, more rare Earth mines in the United States, we currently then have to ship the products of those mines to China to be processed into useful materials." -former U.S. Sen Mark Udall, (D-Colorado), www.govinfo.gov/content/pkg/CHRG-112shrg70660/html/CHRG-112shrg70660.htm
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About Pebble Watch • www.pebblewatch.com

Pebble Watch is an impartial, educational and fact-based resource for sharing information about the proposed Pebble project. It is a program of the Bristol Bay Native Corporation Land Department. Questions? Write info@pebblewatch.com.