

## The Risks of Pebble Mine

### HIGHLIGHTS

- Pebble would be the largest open pit mine in North America.
- Pit Size: 2 miles wide, as much as 2,000 feet deep.
- Sequestering mine waste would require two giant tailings ponds enclosed by four earthen dams, the largest measuring 4.3 miles long and 740 feet high (far bigger than [Grand Coulee Dam](#)). Other dams would be 700, 400 and 175 feet tall.
- The Pebble site is an active seismic zone prone to frequent earthquakes.
- Acid Rock Drainage: Sulfide minerals in mine ores would generate acid when exposed to water and air.
- Mine site is upstream of the largest commercial sockeye salmon fishery in the world. Area rivers, streams and lakes are spawning grounds for salmon and other species of fish.
- Salmon are highly sensitive to pollution. Exposure to even miniscule amounts of copper and zinc, for example, interferes with their sense of smell, impairing their ability to locate spawning grounds and identify predators.<sup>1</sup>
- Pebble mine would use nearly 35 billion gallons of water a year, more than the annual water consumption in Anchorage, Alaska.<sup>2</sup>
- Pebble mine would disrupt the Mulchatna caribou herd, the third largest caribou herd in Alaska.

### PROJECT OVERVIEW

Roughly 200 miles southwest of Anchorage, Alaska, and just north of Lake Iliamna, the Pebble Limited Partnership (commonly called the Pebble Partnership of Anglo American PLC and Northern Dynasty Minerals), intends to build the Pebble mine, consisting of what would be the largest open pit mine in North America, and an additional large underground block-cave mine. Owners hope to excavate billions of tons of raw ore, primarily seeking significant quantities of copper, gold and molybdenum, along with smaller yields of silver, palladium and rhenium.<sup>3</sup>

Formed in July 2007, the Partnership consists of the wholly owned U.S. subsidiary of Anglo American PLC and a wholly owned affiliate of Northern Dynasty Minerals Ltd., a Canadian corporation. The Partnership, managed by its general partner, Pebble Mines Corp., is in the feasibility-exploratory phase

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<sup>1</sup> Copper: Adverse Effects on Salmonids: Scientific Abstracts and References; Dr. Carol Ann Woody:

[http://www.fish4thefuture.com/pdfs/Copper\\_Abstracts.pdf](http://www.fish4thefuture.com/pdfs/Copper_Abstracts.pdf)

<sup>2</sup> Alaska Division of Mining, Land & Water: Pebble Project: <http://dnr.alaska.gov/mlw/mining/largemine/pebble/waterapp.htm>

<sup>3</sup> Pebble Partnership, Project Information Overview: <http://www.pebblepartnership.com/pages/project-information/project-overview.php>

of the project and has not yet filed for specific federal or state mining permits.<sup>4</sup> However, the Partnership holds a lease on about 153 square miles, and mining operations, once begun, could cover 30 square miles including tailings ponds.<sup>5</sup> If built, mining operations at the site could continue for a century or more.

The Partnership has split the Pebble mining area into two parts. Pebble West, discovered in 1988 by Cominco (now Teck Cominco), which would likely be mined using the open pit method, and Pebble East, where deeper deposits found in 2005 might be mined using a block cave mine. No final decisions regarding how ores would be excavated have been made.<sup>6</sup>

According to the Partnership, the “measured and indicated” mineral resource totals 5.1 billion tons, with another 4 billion tons “inferred.” The deposits are thought to contain an estimated 72 billion pounds of copper, 94 million ounces of gold and 4.8 billion pounds of molybdenum.<sup>7</sup>

### THE REGION’S SUSTAINABLE RESOURCES

The site is located on state-leased land, an expanse of remote Alaska consisting of rolling hills, broad stretches of tundra and numerous creeks, streams and rivers. This pristine wilderness, which includes primes salmon-spawning habitat for the world’s most productive wild sockeye fishery, would be devastated by mining operations, and much would be lost if the mine is permitted and built.

The regional habitat supports a wide array of wildlife (moose, bear and caribou) and fish (salmon, Dolly Varden and rainbow trout) important to subsistence and recreational hunters and anglers. Meanwhile, the largest commercial wild sockeye salmon fishery in the world exists not far to the west at Bristol Bay, a fishery intimately linked to the region.<sup>8</sup>

Feeding that fishery are spawning grounds in rivers and streams within or adjacent to the mine site. All would be at immediate risk of pollution from mining operations, including Upper and Lower Talarik creeks, and the Kaktuli, Stoyahok, Chulitna and Newhalen rivers, as well as Iliamna Lake and the Kvichak River that drains the lake into Bristol Bay. Those spawning grounds have fed countless generations of

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<sup>4</sup> Pebble Partnership; Project Information Overview: <http://www.pebblepartnership.com/pages/project-information/project-overview.php>

<sup>5</sup> Economics of Wild Salmon Watersheds: Bristol Bay, Alaska, February 2007, John Duffield and David Patterson, Department of Mathematical Sciences, The University of Montana

<sup>6</sup> Pebble Partnership, Draft Environmental Baseline Studies Proposed 2008 Study Plans; Introduction: <http://www.pebblepartnership.com/EnvironmentalStudies/Introduction.pdf>

<sup>7</sup> Pebble Partnership; Project Information Overview: <http://www.pebblepartnership.com/pages/project-information/project-overview.php>

<sup>8</sup> Alaska Department of Fish and Game: [http://www.cf.adfg.state.ak.us/geninfo/features/b\\_bay/bayvisit.php](http://www.cf.adfg.state.ak.us/geninfo/features/b_bay/bayvisit.php)

Alaska Natives and today also support a healthy, sustainable fishing industry that is critical to the statewide economy.<sup>9</sup>

### THE THREAT TO SALMON AND CLEAN WATER

Metal mining requires prodigious quantities of water, and such mining has historically degraded those resources. Anglo American and its subsidiaries have contributed to that degradation wherever they have opened the earth for minerals. Developing Pebble would require billions of gallons of water annually. In 2006, Northern Dynasty Mines, Inc., the American subsidiary of Northern Dynasty Minerals Ltd., applied for Alaska water rights, anticipating use-levels of some 35 billion gallons a year<sup>10</sup> drained from the South and North forks of the Koktuli, and from Upper Talarik Creek, effectively obliterating salmon spawning habitat.

Those waters would be subject to pollution from a variety of chemical and organic compounds.<sup>11</sup> Some would come from mountains of mine waste, perhaps 8 billion to 9 billion tons' worth, containing elements that would threaten salmon spawning and wildlife health, such as aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, zinc, sulfides and naturally radioactive uranium, thorium and potassium-40. Also contributing pollutants would be explosives, fuels, oils, grease, antifreeze, water treatment chemicals and road de-icing compounds.

Ore mined from the ground would be pulverized and mixed with water to separate the copper, gold and other metals. The waste rubble and fluids left behind – known as tailings – would represent about 99 percent of the raw tonnage. Process chemicals in the tailings could include lime, sodium isopropyl xanthate, dithiophosphate and thionocarbamate, methyl isobutylcarbinol and polypropylene glycol methyl ether.

The Partnership proposes submerging two valleys beneath tailings storage lakes sealed off from surrounding land by four massive earthen dams. The largest of these structures would rise 740 feet and stretch a length of 4.3 miles. Other dams would measure 700, 400 and 175 feet tall. The tailings lakes would bury two valleys.

### THE MINE LOCATION IS AN ACTIVE SEISMIC ZONE

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<sup>9</sup> Alaska Department of Fish and Game: [http://www.cf.adfg.st.ak.us/geninfo/features/b\\_bay/bayvisit.php](http://www.cf.adfg.st.ak.us/geninfo/features/b_bay/bayvisit.php)

<sup>10</sup> Alaska Division of Mining, Land & Water: Pebble Project: <http://dnr.alaska.gov/mlw/mining/largemine/pebble/waterapp.htm>

<sup>11</sup> Pebble Hydrogeology and Geochemistry Issues, Robert Moran, Sept. 2007: <http://eyeonpebblemine.org/wp-content/uploads/pebble-hydrogy-geochemisy-moran-sep07.pdf>

While mine operations might last several decades, mine waste would last for centuries, even millennia, requiring safety and containment measures to last equally long. That may be impossible, given that the Pebble mine site sits only a few miles from a known earthquake fault in one of the most seismically active zones in the world.<sup>12</sup> More than half of all earthquakes in the United States occur in Alaska. The state sustains a quake between magnitude 6 and 7 at least five times a year, gets hit with a magnitude 7 at least once a year, and a magnitude 8 roughly every 13 years.<sup>13</sup>

Major earthquakes can cause ground rifts hundreds of miles from their epicenters. A 7.9 magnitude quake in early November 2002<sup>14</sup> located at the Susitna Glacier fault, which was not even known to exist prior to the event, ruptured the surface for over 200 miles, triggered landslides, damaged airports and created shockwaves felt 2,000 miles away. The same plate tectonics govern the Castle Mountain-Lake Clark fault system near Pebble.<sup>15</sup> If tailings dams were damaged by earthquakes, mine waste could be released into the environment and the rivers and streams that support fisheries with devastating results.

### EMPTY PROMISES

Partnership spokespeople have attempted to assure Alaskans that safety and mitigation measures would suffice to reduce and eliminate risk. But nowhere in the world has such a mine ever left the environment undamaged. In fact, Anglo American, the Partnership's corporate arm that actually has mining experience, has a checkered track record that includes polluting air and water resources, uprooting whole communities and violating safety regulations.<sup>16</sup>

While there may be metal wealth in the ground, its value is fleeting when compared to the enormous economic and social riches to be derived forever from the sustainable fisheries and wildlife habitat a Pebble mine would ruin.

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<sup>12</sup> Alaska Earthquake Information Center: [http://www.aeic.alaska.edu/maps/southcentral\\_seismicity\\_map.html](http://www.aeic.alaska.edu/maps/southcentral_seismicity_map.html)

<sup>13</sup> Alaska Earthquake Information Center: [http://www.aeic.alaska.edu/html\\_docs/faq.html#How\\_many\\_earthquakes\\_do\\_we\\_have\\_in](http://www.aeic.alaska.edu/html_docs/faq.html#How_many_earthquakes_do_we_have_in)

<sup>14</sup> The Susitna Glacier Thrust Fault: Characteristics of Surface Ruptures on the Fault that Initiated the 2002 Denali Fault Earthquake: Anthony J. Crone, et al; *Bulletin of the Seismological Society of America*; December 2004; v. 94 <http://bssa.geoscienceworld.org/cgi/content/abstract/94/6B/S5?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&searchid=1&FIRSTINDEX=10&resourcetype=HWFIG>

<sup>15</sup> Geological Society of America Bulletin' October 2002: <http://rock.geosociety.org/news/pr/02-43.htm>

<sup>16</sup> Anglo American's Track Record: Rhetoric or Realty? By Philip Mattera; [http://eyeonpebblemine.org/wp-content/uploads/anglo\\_trackrecord\\_final1.pdf](http://eyeonpebblemine.org/wp-content/uploads/anglo_trackrecord_final1.pdf)