



Pre-Permitting Environmental/Socio-Economic Data Report Series

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# Report Series F: Surface Water & Groundwater Quality

Since 2004, the Pebble Partnership has worked with a number of Alaska-based consultants to manage an ongoing program of surface water and groundwater quality data collection at key locations within the Pebble Project deposit area, in Lake Iliamna, and along the proposed transportation corridor.

Surface water is found above the surface of land including lakes, streams, rivers, ponds and seeps/springs. Groundwater is found beneath surface in overburden pore spaces and in the fractures of bedrock. Seep water samples are collected from locations where groundwater naturally flows out onto the surface.

Companies contributing to Pebble Project water quality studies between 2004 and 2007 include:

- HDR Alaska
- SLR Alaska
- Water Management Consultants
- Columbia Analytical Services, Inc.
- Bristol Environmental & Engineering Services Corporation
- CH2M Hill
- SGS Environmental Services
- Shaw Alaska

## Program Overview:

The objectives of the Pebble Partnership's water quality baseline studies are:

- to collect data for the characterization of surface water and groundwater resources, with a particular focus on site specific water chemistry;
- to inform assessments of aquatic and fish resources and wetlands habitat;
- to provide data to support the engineering design of facilities;
- to synthesize the information obtained into a baseline data set for use in project permitting;
- to provide a foundation for establishing a long term monitoring plan.

Surface and groundwater samples have a limited number of field analysis including pH, temperature, dissolved oxygen, specific conductivity, oxidation-reduction potential and turbidity performed with portable water quality meters at the sample site. Samples for laboratory analysis are collected and poured into pre-prepared sample bottles with appropriate preservatives for each of the applicable analytical methods. Procedures for sample handling and data management are the same for both surface and groundwater sampling programs with one exception:

- Groundwater samples to be analyzed for dissolved metals are filtered directly at the wellhead during field sample collection because of the potential for oxygen-depleted groundwater to become oxygenated during subsequent handling.
- Surface water samples to be analyzed for dissolved metals are filtered upon return to the Iliamna base camp at the conclusion of the field workday.

After field collection, the samples are returned to the Iliamna base camp the same day where the sample's integrity is verified, then they are packed into coolers for air transport with completed chain of custody documents. The sample coolers are then

transported to laboratories where they are analyzed for a wide range of analytical parameters which typically have included:

- 24 total and dissolved trace metals;
- 9 major cations and anions;
- nutrients;
- total dissolved solids, total suspended solids;
- acidity, alkalinity, hardness;
- dissolved organic carbon (added June 2007) (surface water only);
- cyanides (total, weak acid dissociable, thiocyanate);
- organics (semi-volatile organic compounds, volatile organic compounds, pesticides, and petroleum hydrocarbon) (select surface water samples only)

## **Program Study Area/Locations:**

### **Surface Water:**

The surface water quality study program covers the general vicinity of the proposed project. Sampling sites were selected based on their proximity to the mineral deposit and the need to understand the water chemistry for potential milling, tailings disposal and other facilities. Sites were selected both upstream and downstream of the deposit and all potential mine facilities. A subset of these sampling locations will be maintained for operations and closure monitoring, once final monitoring programs are defined in the permitting process.

The deposit area stream surface water sampling program documents water chemistry for a range of different flows throughout the year. Sampling from among 41 selected stream and river surface water locations on the North Fork Koktuli River, South Fork Koktuli River, Upper Talarik Creek, Kaskanak Creek and their tributaries was conducted on 36 occasions from the spring of 2004 when the first of the sites were sampled through the end of 2007. Note that several stream and river sample locations were either added or discontinued from the sampling program, therefore not all locations were necessarily sampled on all 36 occasions. Sampling was conducted at monthly intervals from the time of spring break up each year and throughout the summer with reduced sampling frequency occurring in the winters of 2004, 2005 and 2006. Sampling was performed monthly throughout all of 2007.

In addition to the stream and river sampling, surface water from 19 deposit area pond/ waterbody locations, 125 deposit area surface seep locations and nine Lake Iliamna locations were intermittently sampled as part of separate sampling programs.

To define chemical characteristics of freshwater streams near the proposed road and in the proximity of the proposed port facility, 24 sampling stations were established at stream crossings. Sample locations were determined in conjunction with those chosen for fish studies.

### **Groundwater:**

Groundwater samples have been collected quarterly in the deposit area from dedicated groundwater sampling wells in order to document seasonal hydrologic variations of groundwater quality. The deposit area groundwater quality study encompasses the area surrounding the headwaters of the Koktuli River and Upper Talarik Creek, and includes local and regional groundwater. Monitoring wells are sampled both up-gradient and down gradient of the deposit area. Between 2004 and 2007, a total of 37 groundwater monitoring wells were installed and sampled. Groundwater sampling wells are typically installed at a single surface location in clusters of up to three different depths indicated in the location ID with the suffix of S, M or D for shallow, medium or deep depths to characterize groundwater in the overburden, at the bedrock interface, and in bedrock.

Groundwater was also sampled for the transportation corridor studies from four existing drinking-water wells in the communities of Iliamna, Newhalen, Nondalton and Pedro Bay.

Both surface water and groundwater are compared to the State of Alaska Aquatic Life Protection Criteria and State of Alaska Drinking Water Standards. All drainages in the study area exhibit some surface and groundwater constituents with naturally elevated concentrations, indicating concentrations of constituents that are above water quality regulatory criteria.

**Complete copies of the Groundwater & Surface Water Quality data reports, released as part of the Pebble Partnership's Pre-Permitting Environmental & Socio-Economic Data Report Series, are available online at [www.pebblepartnership.com](http://www.pebblepartnership.com).**

***\*Preliminary data only. Do not cite or quote.***