Pebble Project

NORTHERN DYNASTY MINES INC.

ENVIRONMENTAL BASELINE STUDIES

PRELIMINARY SUMMARY
STUDIES PERFORMED BY SLR ALASKA

1. TRACE ELEMENTS STUDIES—MINE STUDY AREA

The trace elements study for the Pebble Project was initiated in 2004. Northern Dynasty Mines Inc. (NDM) contracted with SLR Alaska in late 2004 to expand and continue the trace elements study in the area of the potential mine. NDM also contracted with Bristol Environmental & Engineering Services Corporation in 2004 to initiate a similar study of the potential transportation corridor. The trace elements study for the transportation corridor is described in the summary prepared by Bristol Environmental. To help ensure consistency across the two study areas, SLR developed the methods and support tools used by both firms.

Work in the mine study area is focused on those portions of the South Fork Koktuli, North Fork Koktuli, Upper Talarik, and Newhalen watersheds that surround the east and west Pebble Deposits and their most logical access corridors from the city of Iliamna.

The primary objectives of the trace elements study are as follows:

- Collect baseline data to provide defensible documentation of the natural levels of trace elements and anions in surface soil and vegetation before mining operations begin.
- Identify naturally occurring biogenic fingerprints in surface soil associated with petroleum hydrocarbon analysis to support long-term site-monitoring objectives.
- Determine organic content in surface soils to support long-term site-monitoring objectives.

1.1 TRACE ELEMENT FIELD DATA COLLECTION

Each summer since the program began, teams have collected site-specific data across seven different habitat types and all of the various landforms across the mine study area. Sample locations were randomly selected in 2004 and were adjusted in 2005 to ensure adequate coverage across the different habitat types in the study area. Approximately 80 individual locations were identified for surface-soil sampling, and

subsurface samples were collected at 10 percent of those locations to evaluate the variability of elemental concentration by depth. Soil sampling was conducted at the same locations in two consecutive summers to evaluate annual variability of elemental concentrations.

Vegetative sampling was conducted at a subset of the soil-sampling locations. A variety of plant species—with emphasis on those used as browse by animals or for subsistence use by humans—were collected from approximately 20 locations in each summer. For each plant-sampling location, at least one species each of lichen, moss, forb, and shrub was collected, where possible, to cover the range of plant types present in the study area. In 2004, a single vegetative sampling event was conducted, and both vegetative and reproductive portions of plants were separately sampled and analyzed. In 2005 and 2006, two sampling events were conducted each year, one in the early part of the growing season (i.e., July) and one later in the season when berries were ripe (i.e., August) to evaluate differences in elemental uptake within a growing season. The same locations were sampled each year to obtain data on annual variability of elemental concentrations in plants.

Plant and soil samples were collocated to obtain data on plant uptake factors as a function of species, habitat, and landform. At each sampling location, the following types of data were collected:

- Vegetation composition—detailed lists of plants found.
- Soil descriptions—soil survey type detail for the top 18 inches of soil.
- Elemental concentrations in surface soil, including metals and major anions and cations.
- Biogenic fingerprints of petroleum-range hydrocarbons (i.e., diesel-range organics and residual-range organics) at 10 percent of all soil-sampling locations.
- Organic carbon content of soil at 10 percent of all soil-sampling locations.
- Elemental concentrations in leaves of sampled plants (all sampling events).
- Elemental concentrations in berries of sampled plants (late-season events only).

In 2005 and 2006, samples of aquatic plant species and collocated samples of sediment and surface water were collected from a variety of ponds in the mine study area. The data collected for the pond samples were the same as those listed above for upland areas. Five ponds were sampled in 2005, and 17 ponds were sampled in 2006. The additional ponds sampled in 2006 were identified in coordination Three Parameters Plus, Inc., which is conducting a small pools study for Pebble Project, and included four ponds in each of the three major drainages in the study area (South Fork Koktuli, North Fork Koktuli, and Upper Talarik). Within each drainage, three types of ponds were sampled: groundwater fed, surface-drainage fed, and beaver dammed.

1.2 TRACE ELEMENT DATA INTEGRATION

Part of the trace elements program is to integrate the data collected by other firms on trace elements in freshwater and marine sediment, surface water, and fish tissues with the data on upland areas and ponds. This includes data collection efforts in both the Bristol Bay and Cook Inlet drainages. This information will be integrated in the upcoming environmental baseline document.

2. GROUNDWATER STUDIES—MINE STUDY AREA

The groundwater studies for Pebble Project were initiated in 2004. Working with Water Management Consultants, SLR has expanded and continues to conduct groundwater studies. The two primary tasks in the groundwater sampling program are to characterize groundwater quality and to interpret groundwater flow rates.

2.1 WELL AND PIEZOMETER INSTALLATION

SLR geologists and engineers work with Foundex Drilling to install groundwater monitoring wells and piezometers throughout the proposed mine study area. Wells are installed up-gradient of, down-gradient of, and in the proposed mine-site area and also in locations where other mine infrastructure may be sited. Wells are installed when groundwater quality samples are needed. Piezometers are often installed when physical groundwater characteristics, rather than chemical parameters, are needed.

2.2 GROUNDWATER-QUALITY SAMPLING

The primary objectives of the groundwater-quality program are to characterize the groundwater quality and to provide hydrological data to support the interpretation of groundwater flow rates. Since 2004, 34 monitoring wells and 181 piezometers have been installed. Wells and piezometers are installed in overburden, at the bedrock interface, and in bedrock to look at groundwater quality at different depths. Wells are sampled quarterly, with 21 wells sampled in 2004 and 34 wells sampled in 2005 and 2006.

Wells are equipped with dedicated submersible pumps, and SLR scientists employ low-flow micro purging techniques prior to sampling. Field parameters are measured on site using a flow-through cell. Field parameters measured at each well include specific conductance, dissolved oxygen, total dissolved solids, pH, and temperature. Groundwater samples are collected and analyzed for major anions, total and dissolved metals, nutrients, and petroleum hydrocarbons. A rigorous quality assurance/quality control program for sampling is followed by all of the science teams at the Pebble Project.

2.3 GROUNDWATER-LEVEL MEASUREMENTS

Groundwater-level measurements are collected monthly at 215 wells and piezometers throughout the mine study area. All wells are accessed by helicopter only and are sampled within a seven-day period each month. Water levels are measured to the closest 1/100 of a foot. Water levels are recorded in a database and distributed to other scientists and engineers working on related water studies. The water-level data are used to determine seasonal fluctuation of the various aquifers identified in the mine study area. The monthly water-level data for each well in the network is also used by Water Management Consultants to develop a groundwater flow model for the site and to help with interpretation of groundwater flow rates.

3. DRINKING-WATER WELL INSTALLATION AT NONDALTON

SLR is working with NDM, the Alaska Native Tribal Health Consortium (ANTHC), Foundex Drilling, and the city of Nondalton to install a new drinking-water well for the community. An SLR hydrogeologist and engineer oversaw drilling operations and well installation activities in October 2006. NDM is providing support for the drilling-rig costs, and ANTHC is providing the well supplies. This cooperative effort will provide the city with a new potential drinking-water source by the winter of 2007.