



NORTHERN DYNASTY MINES INC.

**DRAFT ENVIRONMENTAL BASELINE STUDIES
PROPOSED 2007 STUDY PLANS**

**CHAPTER 8.
GEOCHEMICAL CHARACTERIZATION AND
METAL LEACHING/ACID ROCK DRAINAGE**

DRAFT

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TABLE OF CONTENTS

TABLE OF CONTENTS	8-i
LIST OF TABLES	8-i
ACRONYMS	8-ii
8. GEOCHEMICAL CHARACTERIZATION AND METALS LEACHING/ ACID ROCK DRAINAGE	8-1
8.1 Objectives of Study	8-1
8.2 Proposed Work Plan	8-1
8.2.1 Pebble West Studies	8-1
8.2.1.1 Overburden	8-1
8.2.1.2 Tertiary Rock	8-1
8.2.1.3 Pre-Tertiary Rock	8-2
8.2.1.4 Tailings	8-2
8.2.2 Pebble East Studies	8-2
8.3 References	8-3

LIST OF TABLES (attached)

Table 8-1, Study Summary for Geochemical Characterization and Metals Leaching/Acid Rock Drainage, 2004-2007

LIST OF FIGURES (attached)

Figure 8-1, Collars of Existing Diamond Drill-holes Proposed for ML/ARD Project Samples, 2007

ACRONYMS

ABA	acid-base accounting
ML/ARD	metal leaching/acid rock drainage
SRK	SRK Consulting (Canada) Inc.

8. GEOCHEMICAL CHARACTERIZATION AND METALS LEACHING/ACID ROCK DRAINAGE

This study plan for geochemical characterization and metal leaching/acid rock drainage (ML/ARD) addresses the geochemical characterization of tailings and the mine-rock facilities for the Pebble Project mine site. The term “mine rock” includes waste rock, waste rock to be used for construction, the walls and floor of the open pit, walls and floors of underground workings, broken rock produced by block-caving, and stockpiles. SRK Consulting (Canada) Inc. (SRK) will lead the geochemical and ML/ARD work for the mine site.

Table 8-1 summarizes tasks for the geochemical characterization and ML/ARD studies for 2004 through 2007.

8.1 Objectives of Study

The objectives and background of the study will be as described in Section 8.1 of the *Draft Environmental Baseline Studies, 2005 Study Plans* (NDM, 2005).

8.2 Proposed Work Plan

Studies conducted in 2007 will be performed as described in Chapter 8 of the 2005 study plan (NDM, 2005), with the exceptions described below. The proposed work for 2007 will continue and expand some components of existing studies on the Pebble West deposit and expand characterization of waste rock and tailings to the Pebble East deposit. Figure 8-1 shows the locations of the drill-holes expected to be included in the 2007 study.

8.2.1 Pebble West Studies

For Pebble West, 2007 studies will focus primarily on improving understanding of the weathering and leaching of Tertiary waste rock which is needed for construction but will also include characterization of overburden and tailings.

8.2.1.1 Overburden

Samples of overburden were collected in 2006. These samples will be analyzed in 2007 for total and leachable components.

8.2.1.2 Tertiary Rock

Evaluation of Tertiary rock will include the following components:

- Characterization of carbonate minerals in Tertiary rock to obtain an accurate understanding of the form of neutralization potential. These data are needed so that potentially acid-generating (PAG)

waste rock can be segregated for separate disposal rather than used for construction. Samples will be tested using x-ray diffraction, and individual mineral grains will be analyzed using microprobes.

- Mineralogical characterization of the form of arsenic and selenium in individual mineral grains. These data are needed to understand leaching of these rock components and to develop a source term for Tertiary rock.
- Construction of small-scale on-site leaching tests to evaluate weathering of Tertiary rock under field conditions. These are currently planned to be barrel tests containing about 250 kilograms of rock. The tests will be initiated after breakup and will be monitored through the open-water season in 2007. Waters will be sampled once a month and analyzed for the same suite of parameters as for the kinetic tests. Parallel laboratory tests will be constructed on the same material to calibrate the field tests.
- Construction of laboratory tests to evaluate the leaching behavior of Tertiary rock under sub-aqueous conditions. The test protocol will be comparable to that previously used for pre-Tertiary rock.
- Continuation of testing with seven existing humidity cells on Tertiary rock.

8.2.1.3 Pre-Tertiary Rock

The proposed work for 2007 is primarily the continuation of kinetic testing started in 2005. The following kinetic testing is currently underway:

- Waste Rock Humidity Cells — 2 tests.
- Waste Rock Sub-aqueous Columns — 4 tests.

8.2.1.4 Tailings

The proposed work for 2007 is primarily the continuation of kinetic testing started in 2005. The following kinetic testing is currently underway on non-pyritic tailings:

- Tailings Humidity Cells — 2 tests.
- Tailings Sub-aerial Columns — 2 tests

Metallurgical test work is underway, and testing of pyritic tailings derived from processing of Pebble West ores is expected to begin in 2007.

8.2.2 Pebble East Studies

Although the gross geochemical characteristics of the east deposit are expected to be similar to the west deposit, there are several aspects of the Pebble East deposit that indicate a need for significant additional characterization:

- Pebble East is richer in copper. The reactivity of the ore and associated waste rock may be different from the west deposit.

- The proposed block-caving underground-mining method will presumably result in remaining broken ore-grade rock in the mine.
- After mining, the workings will flood, resulting in long-term sub-aqueous conditions for broken and fractured, weathered pre-Tertiary and Tertiary rocks.

Pre-Tertiary and Tertiary rock in the vicinity of Pebble East has not been characterized to date. The following studies are planned for 2007:

- A suite of rock samples will be selected from existing diamond drill core using a similar approach to that used for the Pebble West in 2005 (NDM, 2005). Samples will be selected to characterize Tertiary and pre-Tertiary rock. Roughly 400 samples will be selected.
- The samples will be analyzed for acid-base account (ABA) using the same methods as for Pebble West. Element concentrations will be determined on the samples if this was not previously done as part of the exploration program.
- The ABA and element concentration data will be used to select samples for kinetic testing. Approximately 28 humidity cell tests will be started.
- Sub-aqueous column tests will be started on Tertiary and pre-Tertiary rock.

Metallurgical test work on Pebble East ores will also provide tailings for testing. Test work initiated on these samples will include the following:

- Static testing.
- Mineralogical characterization to determine forms and composition of minerals.
- Kinetic testing, including humidity cells, sub-aerial columns, and sub-aqueous columns depending on the types of samples provided by the metallurgists.

8.3 References

Northern Dynasty Mines Inc. (NDM). 2005. Draft Environmental Baseline Studies, 2005 Study Plans.

TABLE

TABLE 8-1
Pebble Project Environmental Studies
Study Summary for Geochemical Characterization and Metals Leaching/Acid Rock Drainage, 2004-2007
Consultant: SRK Consulting

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
ML/ARD Mine Study Area	Selection of samples for static testing	Initiation of humidity cells on rock samples	Continued kinetic testing on rock samples	Continue kinetic testing on Pebble West rock samples
	Static testing	Initiation of humidity cells on tailings samples	Continued kinetic testing on tailings samples	Continue kinetic testing on Pebble West tailings samples
	Selection of samples for kinetic testing	Initiation of column tests on rock samples	Additional static testing on rock	Mineralogical characterization of element occurrence in Tertiary rock
	Visit to site to review logging practices	Initiation of column tests on tailings samples		Mineralogical characterization of carbonate in Tertiary rock
	Selection of drill-holes for mine walls	Additional static testing on mine-wall drill-holes		Field tests on Tertiary rock
		Specific characterization of Tertiary rock samples		Select samples for ABA and kinetics for Pebble East
		2004 progress report		Characterization of Pebble East tailings
				Characterization of pyritic tailings

FIGURE

