# APPENDIX 3.II

## Co-Disposal Facility Management Plan

# Table of Contents

**TABLES**



**FIGURES**

## 3.II.1 INTRODUCTION

The Tailings and Mine Rock Co-disposal Facility (CDF) Management Plan of the Developer's Assessment Report (DAR) for the Fortune Minerals Limited (Fortune) NICO Cobalt-Gold-Bismuth-Copper Project (NICO Project) describes how the CDF will be constructed, operated, and closed.

This conceptual CDF Management Plan is organized into several sections discussing the following:

- NICO Project background;
- the physical, geotechnical and geochemical characteristic of the tailings and Mine Rock;
- the tailings and Mine Rock production schedule;
- the rationale for tailings and Mine Rock co-disposal;
- the conceptual design of the CDF;
- CDF drainage and water management;
- tailings and Mine Rock co-disposal strategy;
- tailings distribution system;
- CDF developmental plan;
- CDF operation and surveillance plan; and
- CDF Closure and rehabilitation plan.

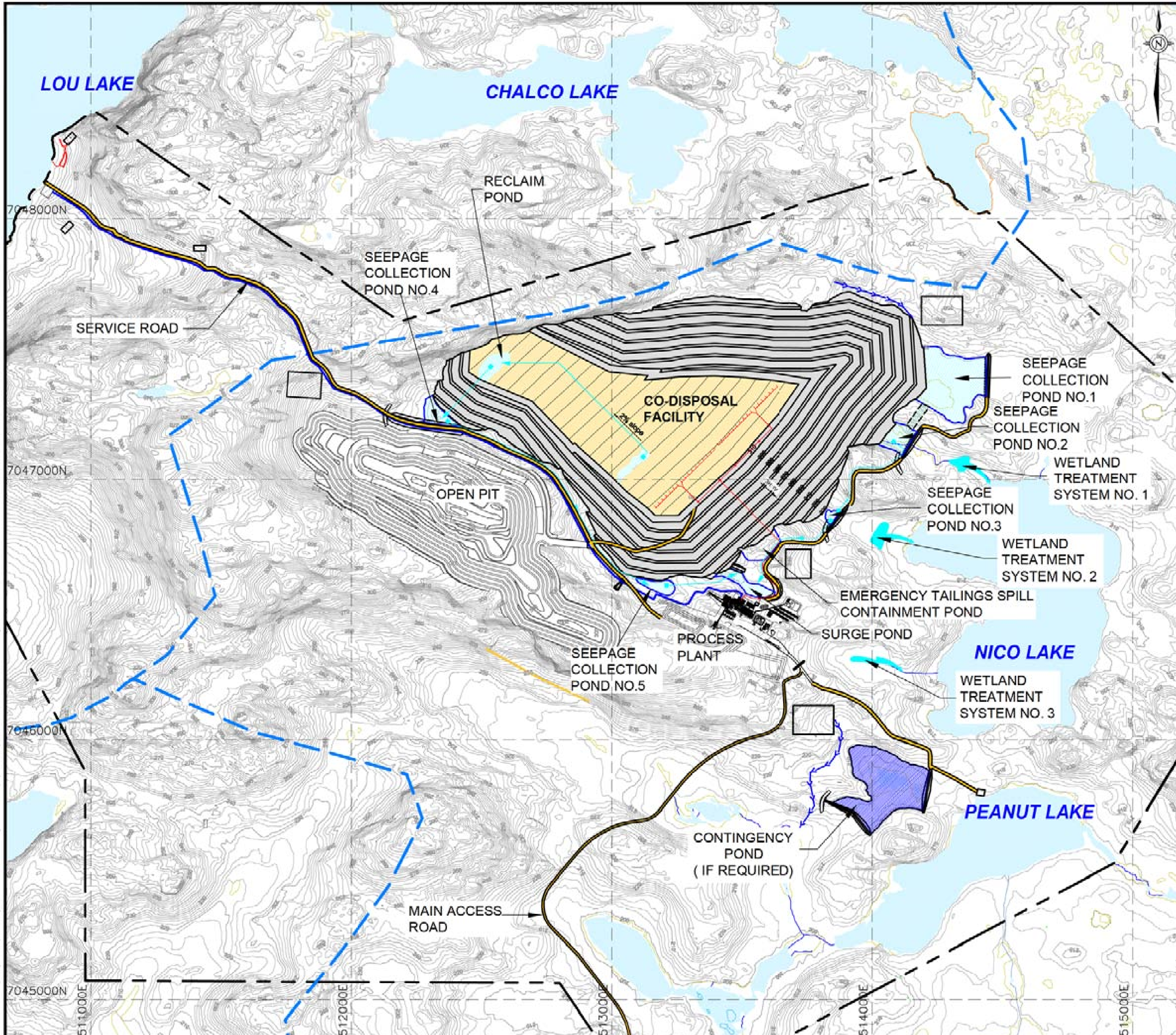
The conceptual CDF Management Plan is based on the preliminary engineering studies carried out for the NICO Project. Fortune will continue to refine the management plan during the subsequent detailed engineering design, construction and operations phases of the NICO Project.

## 3.II.2 PROJECT BACKGROUND

### 3.II.2.1 Mining

The proposed NICO Project is an Open Pit and underground mine with about 31.0 million tonnes (Mt) of ore reserves. Ore processing at the NICO Project will include crushing, grinding, and 2 stages of flotation to produce bulk concentrate. The resulting bulk concentrate will be thickened and filtered, packaged, and shipped to the Saskatchewan Metals Process Plant, in Langham, Saskatchewan for further processing. The primary and secondary flotation processes will generate a rougher and a cleaner tailings streams, respectively.

About 96.4% of the processed ore in the NICO Project will report to the tailings stream. In addition to the tailings, the NICO Project is expected to generate approximately 96.9 Mt of Mine Rock during the predicted 18 years mine life. Both the tailings and the Mine Rock will be disposed in an integrated CDF as shown in Figure 3.II.2-1.




**LEGEND**

- TAILINGS DELIVERY AND DISTRIBUTION
- WATER RECLAIM LINE
- DIVERSION DITCH
- DITCH EXCAVATED
- REGIONAL WATERSHED BOUNDARY
- PROJECT LEASE BOUNDARY
- AIRSTRIP / ACCESS ROAD
- EMERGENCY SPILLWAY
- SEEPAGE COLLECTION / SURGE POND
- CO-DISPOSED TAILINGS AND MINE ROCK
- PERIMETER DYKE
- CONTINGENCY POND
- WATER BODY

**NOTES:**

1. ALL ELEVATIONS (GEODETIC DATUM) AND GRID COORDINATES (UTM NAD83, ZONE 11) SHOWN IN THIS DRAWING ARE IN METRES.

**REFERENCE**

Base mapping provided in digital format by Fortune Minerals Limited received 20 February 2004.

Process plant and mine infrastructure provided by Aker Solutions filename 0000g001d (plant site oct252010).dwg provided 26 October 2010. Revised pits provided by P & E Mining Consultants, ultimate pit and topo.dxf on 26 January 2010.

Project lease boundary provided by Fortune (8 October 2008) with comments provided 19 December 2009.

300 0 300

SCALE 1:15000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**GENERAL ARRANGEMENT PLAN OF CO-DISPOSAL FACILITY**

Golder Associates
Edmonton, Alberta

FILE No: E-AP3-001-CAD

| PROJECT No: 09-1373-1004 | | | SCALE AS SHOWN | REV. 0 |
|---|---|---|---|---|
| DESIGN | KH | 10 May 2011 | FIGURE 3.II.2-1 | |
| CAD | TDR | 10 May 2011 | | |
| CHECK | KH | 10 May 2011 | | |
| REVIEW | KAB | 10 May 2011 | | |

PLOT DATE: May 13, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML NWT)\-JC-\10111180046JC3II2-1.dwg

### 3.II.2.2 Site Description

The NICO Project site has rugged topography as shown in Figure 3.II.2-2. The site terrain has been shaped by the action of glaciers which scoured the bedrock outcrops into round ridges and hills. Lakes, ponds, and swamps of varying size are present in the low-lying areas. The ground elevation within the NICO Project site area ranges from 198 to 365 metres (m) above sea level. The south end of the NICO Project site is located on a ridge of exposed bedrock, which slopes down towards the north end in the Grid Pond depression. While valley floor are densely wooded, the slopes and bedrock hills and ridges are sparsely covered with trees.

### 3.II.2.3 Geotechnical Investigations

There have been 3 rounds of geotechnical investigation campaigns within the footprint areas of the CDF and associated water management facilities. The locations of the boreholes drilled are shown on Figure 3.II.2-3.

In the hilly parts of the NICO Project area, rock outcrops are common. In the valley bottoms, the bedrock is typically overlain by overburden soils. The maximum thickness of overburden soils recorded is 9.3 m. The stratigraphic sequence of overburden soils from top to bottom consists of:

- peat or topsoil;
- glacio-lacustrine deposits; and
- glacial till or cobble and boulder materials.

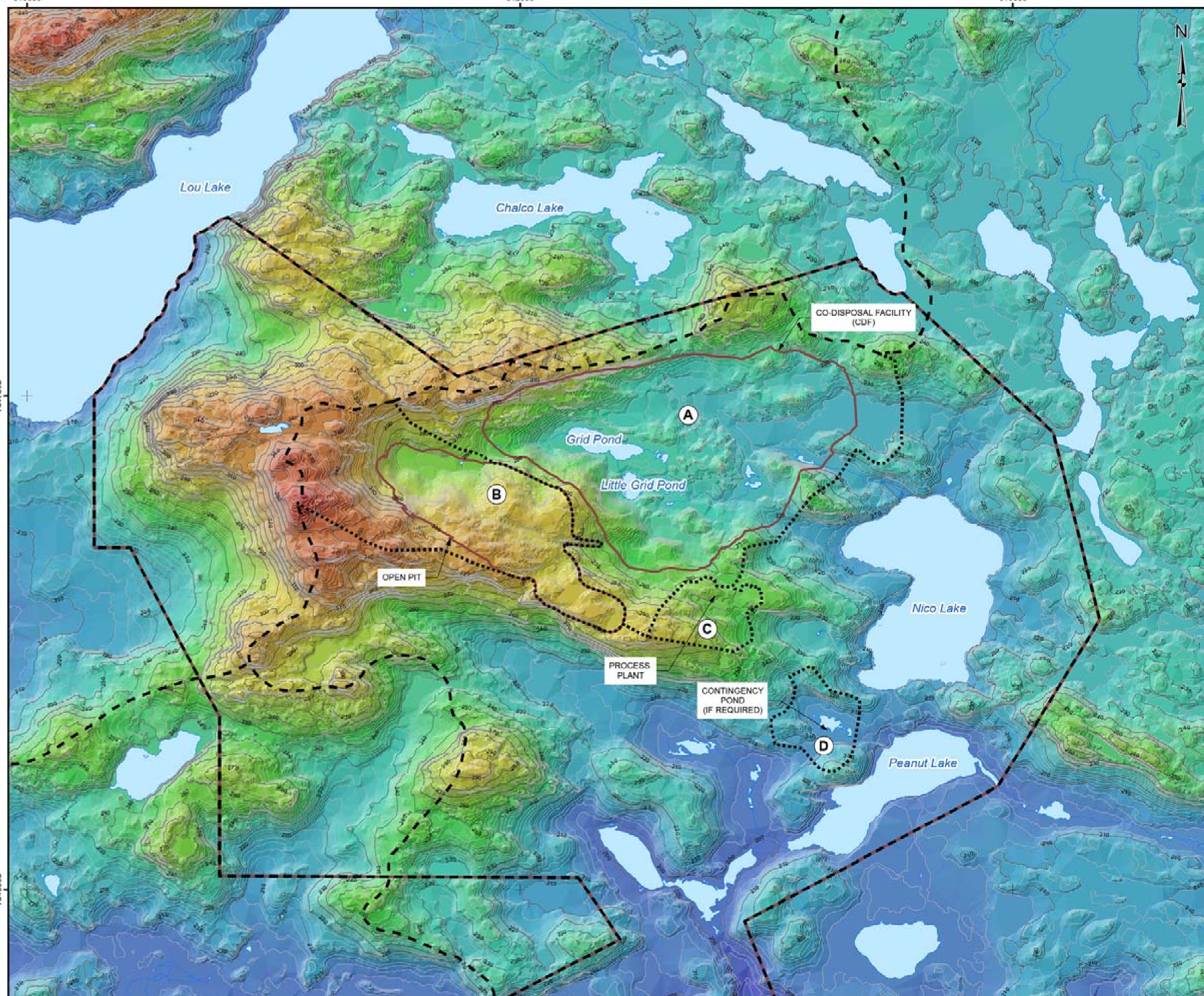
The peat only occurs in poorly drained areas. The glacio-lacustrine deposits occur at lower elevations, typically below about elevation 215 m. Glacial till is often exposed on the surface on the flanks of the hillsides and a layer of angular boulders is often present on the surface of till deposits.

A layer of fibrous peat or topsoil was encountered in the various boreholes drilled. The thickness of the stratum varies from 0.6 to 4.5 m. The peat typically has high natural moisture contents ranging from 200 to 1300 percent (%) and organic contents of 3 to 96%.

The thickness of the glacio-lacustrine deposit ranges from 2.9 to 6.2 m. In general, the deposit comprises clayey silt to sandy silt and occasionally silty-clay. The particle size distribution tests showed that the stratum has 0 to 2% gravel, 1 to 43% sand, 38 to 74% silt, and 8 to 62% clay. The plastic limit of the deposit varies from 13 to 39% and the liquid limit from 18 to 48%. The specific gravity of the soil varies from 2.73 to 2.76.

The glacial till varies in thickness from 0.4 to 4.4 m. The till is classified as silty-clay, clayey silt, sandy-silt to gravelly sand. The stratum has a particle size distribution of 0 to 66% gravel, 1 to 46% sand, 8 to 60% silt, and 3 to 49% clay. The plastic limit of the soil varies from 13 to 21%, and the liquid limit varies from 18 to 36%. The specific gravity of the soil varies from 2.62 to 2.75. The glacial till contains frequent angular cobbles and boulders and the upper surface of the till is often marked by a layer of boulders deposited by ablation of the glacier.

Slightly weathered to fresh bedrock was encountered beneath the glacial till at depths ranging from 0.4 to 9.3 m from the ground surface. The major rock types encountered include: porphyry, breccia, schist, tuff, and wacke. The measured hydraulic conductivity of the bedrock averaged about $1.3 \times 10^{-8}$ metres per second.




**LEGEND**

- PROJECT LEASE BOUNDARY
- PROPOSED NICO MINE SITE
- WATERCOURSE
- CONTOUR - *(2 m INTERVAL)*
- CONTOUR - *(10 m INTERVAL)*
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- WATERBODY

**ELEVATION (m)**

HIGH: 380.0

LOW: 190.0

**WATERSHED AREAS**

| WATERSHED | NATURAL GROUND AREA (ha) | FACILITY AREA (ha) | TOTAL AREA (ha) |
|---|---|---|---|
| A | 76 | 136 | 212 |
| B | 39 | 50 | 89 |
| C | 4 | 6.5 | 10.5 |
| D | 8 | 7 | 15 |

**REFERENCE**

Topographic mapping obtained from Eagle Mapping, Fortune Minerals Limited, 2006 (File: Basemapping FML, 20060718).dwg)

Open Pit Configuration - Provided by P & E Mining Consultants Inc. (File: End_of_year2031.dxf Received August 26, 2010)

Advanced Exploration Infrastructure - Provided by Aker Solutions (File: 0000g001D.dwg Received October 25, 2010)

Projection: UTM Zone11 Datum: NAD 83

500 0 500

SCALE 1:20,000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

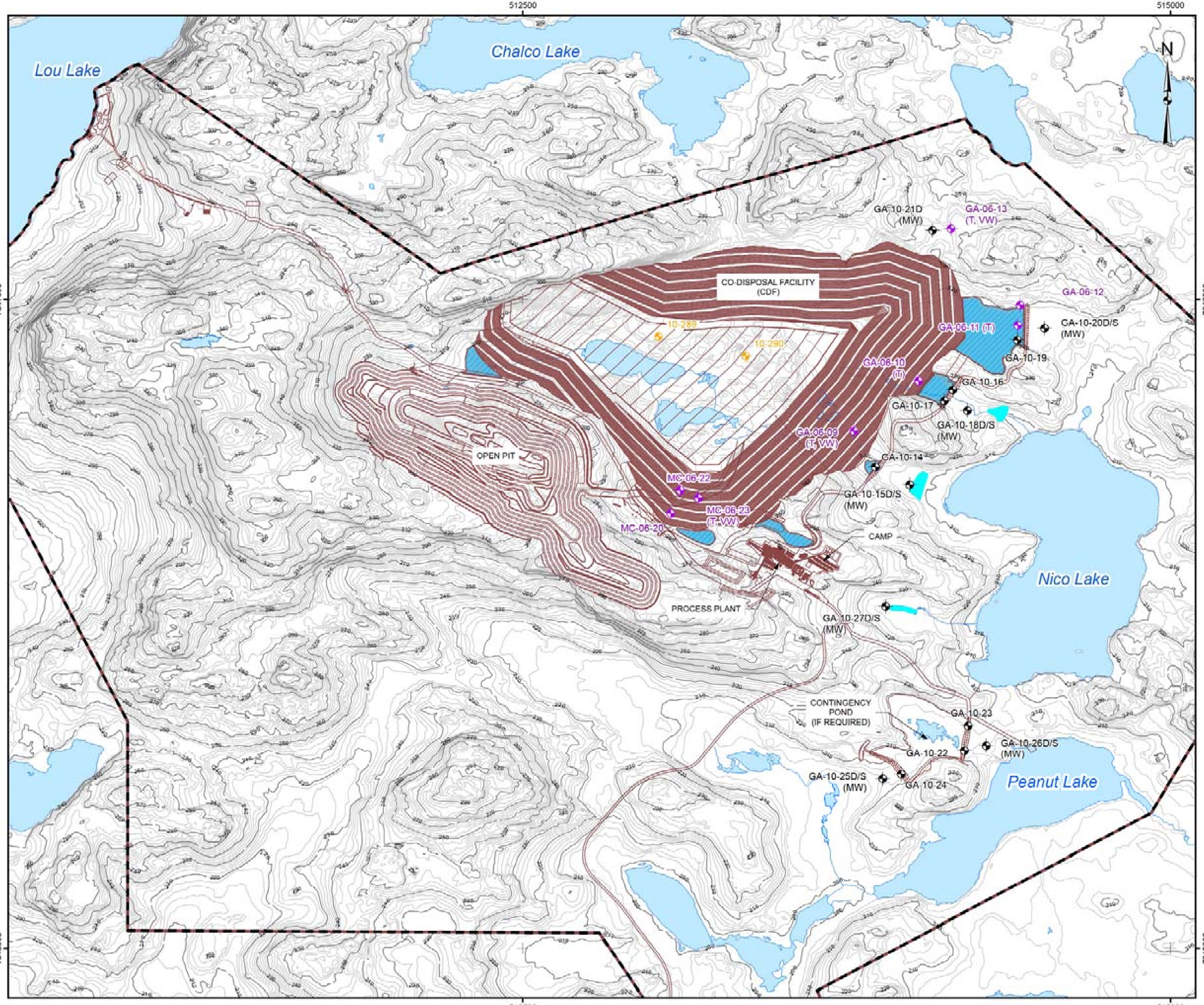
## TOPOGRAPHIC AND WATERSHED MAP

Golder Associates
Edmonton, Alberta

FILE No. E-WM-003-GIS.mxd

| PROJECT NO. 09-1373-1004 | | | SCALE AS SHOWN | REV. 0 |
|---|---|---|---|---|
| DESIGN | SC | 16 Feb. 2011 | FIGURE: 3.II.2-2 | |
| GIS | SC | 9 May. 2011 | | |
| CHECK | KH | 9 May. 2011 | | |
| REVIEW | KAB | 9 May. 2011 | | |

G:\Projects\2010\10-1118-0046_NicoFortuneMinerals\GIS\MXDs\Final\DAR Figures\CDF Management\E-AP3-002-GIS.mxd




**LEGEND**

**PREVIOUS INVESTIGATIONS**

- GA-06-10 (GOLDER 2006)
- MC-06-23 (GOLDER 2006)
- GA-10-25 (NICO 2010)
- 10-289 (NICO 2010)
- PROJECT LEASE BOUNDARY
- PROPOSED NICO MINE SITE
- WATERCOURSE
- CONTOUR - *(2 m INTERVAL)*
- CONTOUR - *(10 m INTERVAL)*
- WATERBODY
- TREATMENT WETLANDS
- PONDS

**NOTES**

1. Process Plant geotechincal holes not included on this figure.
2. (S) - Stand Pipe
3. (T) - Thermistor
4. (VW) - Vibrating Wire Piezometer
5. (D/S MW) - Deep or Shallow Monitoring Well

**REFERENCE**

Topographic mapping obtained from Eagle Mapping, Fortune Minerals Limited, 2006 (File: Basemapping FML, 20060718).dwg)

Open Pit Configuration - Provided by P & E Mining Consultants Inc. (File: End_of_year2031.dxf Received August 26, 2010)

Advanced Exploration Infrastructure - Provided by Aker Solutions (File: 0000g001D.dwg Received October 25, 2010)

Projection: UTM Zone11 Datum: NAD 83

500 0 500

SCALE 1:15,000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

## GEOTECHNICAL INVESTIGATION PLAN

Golder Associates
Edmonton, Alberta

| | | | | |
|---|---|---|---|---|
| FILE No. E-AP3-003-GIS.mxd | | | | |
| PROJECT NO. 09-1373-1004 | | | SCALE AS SHOWN | REV. 0 |
| DESIGN | SC | 16 Feb. 2011 | FIGURE: 3.II.2-3 | |
| GIS | SC | 10 May. 2011 | | |
| CHECK | KH | 10 May. 2011 | | |
| REVIEW | MR | 10 May. 2011 | | |

G:\Projects\2010\10-1118-0046_NicoFortuneMinerals\GIS\MXDs\Final\DAR Figures\CDFManagement\E-AP3-003-GIS.mxd

Thermistors were installed in 9 boreholes within the NICO Project site to measure the ground temperature. The measurements confirmed the existence of discontinuous permafrost in the NICO Project site. Permafrost conditions were recorded at few boreholes drilled in valley floors where the surface peat layer is thick and the vegetation cover is dense. The active zone in these boreholes ranged in thickness from 2 to 4 m. Unfrozen conditions were recorded in the boreholes drilled in the valley slopes, bedrock hills and ridges where the vegetation cover is generally sparse.

## 3.II.3 TAILINGS CHARACTERISTICS

### 3.II.3.1 Physical and Geotechnical Characteristics

The 2 stages of flotation within the Mineral Process Plant (Plant) will generate 2 tailings streams; rougher tailings and cleaner tailings. The rougher tailings (from the first flotation step) will make up approximately 90.8% of the combined tailings stream, while the cleaner tailings (from the second stage of flotation) will make up the remainder. These 2 tailings streams will be combined in the Plant, thickened and then pumped to the CDF as a single combined tailings stream for disposal.

The particle size distributions of the combined stream are shown in Figure 3.II.3-1. The combined tailings are predominantly silt sized with little sand or clay sized particles. About 85% of the tailings particles by weight passed the No. 200 sieve (75 $\mu$m).

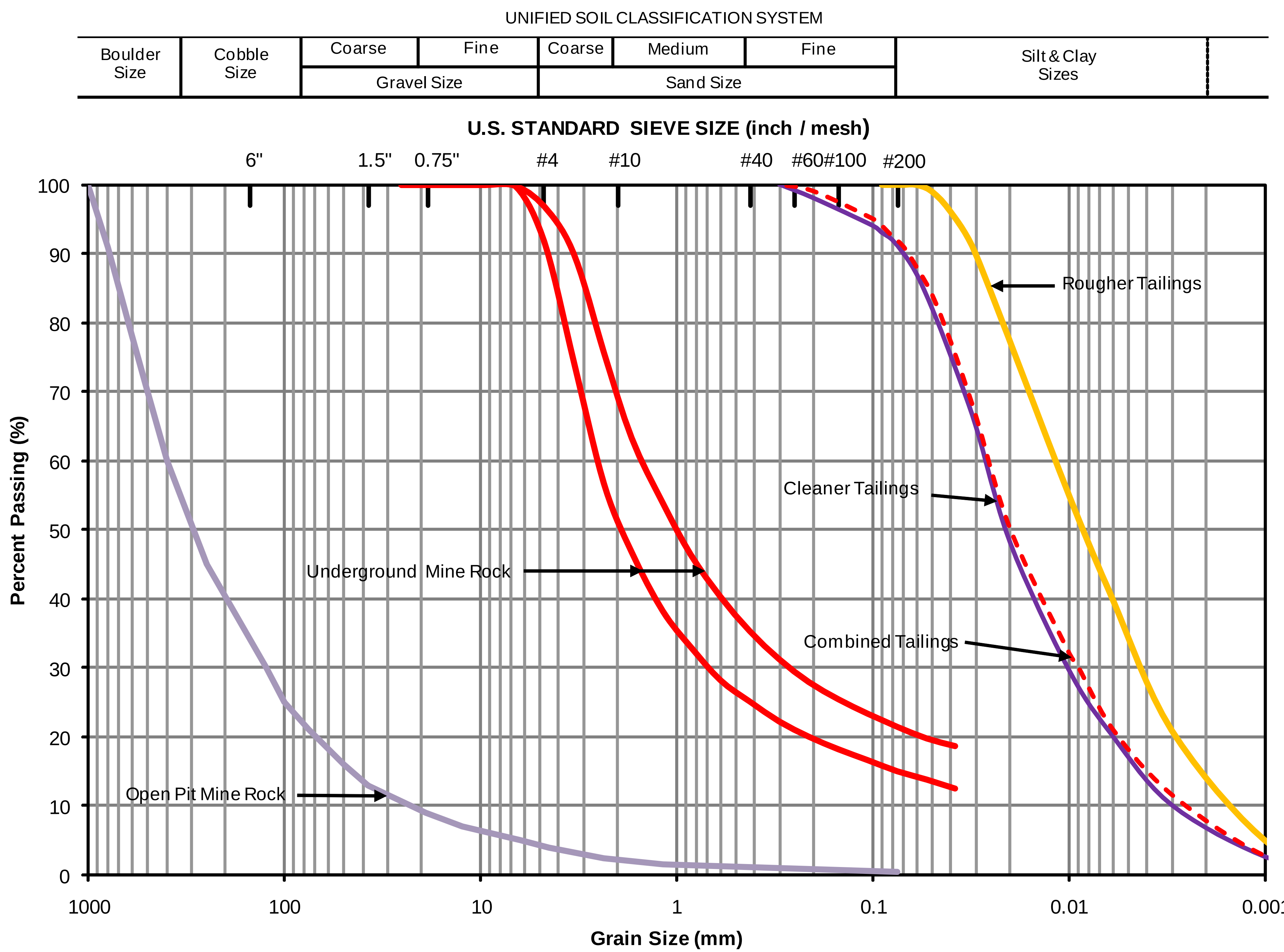
The average specific gravity for the rougher tailings and cleaner scavenger tailings are 3.33 and 3.18, respectively. The specific gravity for the blended tailings will be about 3.32.

### 3.II.3.2 Tailings Thickening

The dewatering characteristics of the rougher and cleaner tailings were tested by Golder PasteTec (PasteTec 2010). Prior to deposition in the CDF, the tailings will be thickened to 73 to 77% solids content. With a solids content in this range, the thickened tailings is not anticipated to segregate on deposition.

A 2 stage flocculation in a deep bed thickener will be required to achieve the solids content range. The deep bed thickener will be located within the Plant site and heated. The dimensions of the thickener will be 13 m diameter and 7.25 m high side walls, with a sloped bottom at 30 degrees.

The non-segregating tailings will be pumped using a positive displacement (PD) pump. Two pumps will be provided, one operating and one on standby.




FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**PARTICLE SIZE DISTRIBUTION OF TAILINGS AND MINE ROCK**

Golder Associates
Edmonton, Alberta

| | | | |
|---|---|---|---|
| FILE No: E-AP3-004-CAD | | | |
| PROJECT No: 09-1373-1004 | | SCALE AS SHOWN | REV. 0 |
| DESIGN | KH | 10 May 2011 | |
| CAD | TDR | 10 May 2011 | |
| CHECK | KH | 10 May 2011 | |
| REVIEW | KAB | 10 May 2011 | |

FIGURE 3.II.3-1

PLOT DATE: May 13, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\~JC~\1011180046JC3II3-1.dwg

### 3.II.3.3 Tailings Mineralogy

X-ray Fluorescence and X-ray Diffraction analyses were carried out on the tailings streams to assess their chemical and mineralogical compositions, respectively. The result of the X-ray Fluorescence analysis is presented on Table 3.II.3-1 (PasteTec 2010).

**Table 3.II.3-1: Chemical Composition of Tailings**

| **Compound** | $SiO_2$ | $Fe_2O_3$ | CaO | $Al_2O_3$ | MgO | $K_2O$ | $Na_2O$ | $Cr_2O_3$ | $TiO_2$ | MnO | $P_2O_5$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Composition** (%) | 47.00 | 26.20 | 8.93 | 7.55 | 3.61 | 3.09 | 0.91 | 0.01 | 0.31 | 0.22 | 0.06 |

Mineralogical (X-ray Diffraction) evaluation of tailings samples indicated the following:

- Actinolite [$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$] accounted for more than 50% of the total composition of the two tailings streams. The next most common mineral phase in tailings samples was biotite [$K(Mg,Fe)_3AlSi_3O_{10}(OH,F)_2$] (14 to 22%).
- Minor mineral phases in tailings samples included magnetite [$Fe_3O_4$] (2.5 to 10%), diopside [$MgCaSi_2O_8$] (4.6 to 8.2%), quartz [$SiO_2$] (3.3 to 5%) and calcite [$CaCO_3$] (1.4 to 2.2%).
- Claudetite [$As_2O_3$] occurred in minor concentrations (1.3 to 1.9%) in the rougher tailings.

### 3.II.3.4 Tailings Geochemistry

The details of the geochemical characterization tests carried out on the tailings streams are provided in Annex A of the DAR and summarized herein. Both the rougher and cleaner tailings streams have low potential for acid generation. However, the tailings streams have potential for metal leaching.

The results of the laboratory and field leach tests can be summarized as follows:

- Aluminum, arsenic, cobalt, iron, antimony, and selenium concentrations were elevated relative to the site-specific water quality objectives (SSWQO) in weakly acidic, short-term leach tests. Parameters that occurred at elevated concentrations (relative to SSWQO) in oxidizing conditions included aluminum, arsenic, cobalt, and antimony.
- Laboratory kinetic tests indicate that, after the initial flushing of the samples, the primary metals leaching over a longer-term are arsenic and selenium.
- Dissolved concentrations of arsenic, selenium, uranium, nitrate, and nitrite were elevated relative to the SSWQOs in the rougher tailings decant water after static storage over 12 months.

## 3.II.4 MINE ROCK CHARACTERISTICS

### 3.II.4.1 Physical and Geotechnical Characteristics

The main geological formations at the NICO Project are feldspar porphyry, rhyolite, breccias, ironstone (including black rock schist and wacke) and siltstone. Table 3.II.4-1 summarizes the geotechnical characteristics of the major rock types.

**Table 3.II.4-1: Geotechnical Characteristics of Mine Rock**

| Rock Type | Density ($g/cm^3$) | Young's Modulus (GPa) | Poisson's Ratio | UCS (MPa) |
|---|---|---|---|---|
| Dykes | 2.66 to 2.71 | 27.15 to 43.86 | 0.10 to 0.12 | 95 to 204 |
| Rhyolite | 2.52 to 2.57 | 19.08 to 43.05 | 0.11 to 0.12 | 67 to 238 |
| Siltstone | 2.69 to 2.73 | 18.50 to 34.48 | 0.16 | 55 to 131 |

$g/cm^3$ = grams per cubic centimetre; GPa =Gigapascal; MPa = Megapascal

## 3.II.4.2 Mine Rock Geochemistry

Geochemical characterization tests carried out on the Mine Rock streams (see Annex A of the DAR) conclude the following:

- 10% of Mine Rock has acid generation potential (> 0.3% sulphide-sulphur);
- 45% of sub-economic mineralized rock is potentially acid generating according to sulphide-sulphur content; and
- both the Mine Rock and the sub-economic mineralized rock have metal leaching potential.

The results of the laboratory and field leach tests carried out on the Mine Rock can be summarized as follows:

- Metals, including aluminum, arsenic, cobalt, copper, iron, lead, antimony, selenium, and zinc, occurred at concentrations in excess of the SSWQOs in neutral pH, short-term leachates from Mine Rock and sub-economic mineralized rock.
- Net acid generation test leachate analysis indicated that aluminum, arsenic, cadmium, cobalt, copper, iron, molybdenum, antimony, selenium, uranium, and zinc could leach from low pH, oxidized solutions from sub-economic mineralized Mine Rock.
- Concentrations of arsenic, cadmium, molybdenum, antimony, selenium, and uranium exceed the SSWQOs in field cell leachates.
- Nitrate and nitrite, the products of the break-down of blasting residuals, were present in the run of Mine Rock.

## 3.II.4.3 Mine Rock Classification

Appendix 3.I and Golder (2010) classified the Mine Rock according its potential to generate acidity or to leach metals. Table 3.II.4-2 summarizes the proposed categories.

**Table 3.II.4-2: Preliminary Mine Rock Management Criteria**

| Classification | Criteria | Description |
|---|---|---|
| Type 1 | < 0.3 % sulphide sulphur<br>< 50 ppm bismuth<br>low arsenic leaching potential | Rock with a low potential for acid generation and metal leaching to be used for construction of Surge Pond dams, Contingency Pond dams (if required), Seepage Collection Pond dams, roads, rock pads and lay down areas. |
| Type 2 | < 0.3% sulphide sulphur<br>< 1000 ppm arsenic | Rock with a low potential for acid generation, to be used for construction of perimeter dykes within the CDF. |
| Type 3 | > 0.3% sulphide sulphur<br>> 50 ppm bismuth<br>> 1000 ppm arsenic | Potentially acid generating and metal leaching rock, to be contained within the CDF. For the purposes of preliminary planning, Type 3 rock should be placed with a minimum 20m offset from the exterior of the perimeter dyke of the CDF. |
| Sub-economic Mine Rock | Classified according to Fortune's grade control cut-offs | Sub-economic Mine Rock will be placed in the CDF along with the Type 3 Mine Rock, using a minimum 20 m offset from the exterior of the Perimeter Dyke of the CDF. |

CDF = Co-Disposal Facility; m = metres; ppm = parts per million

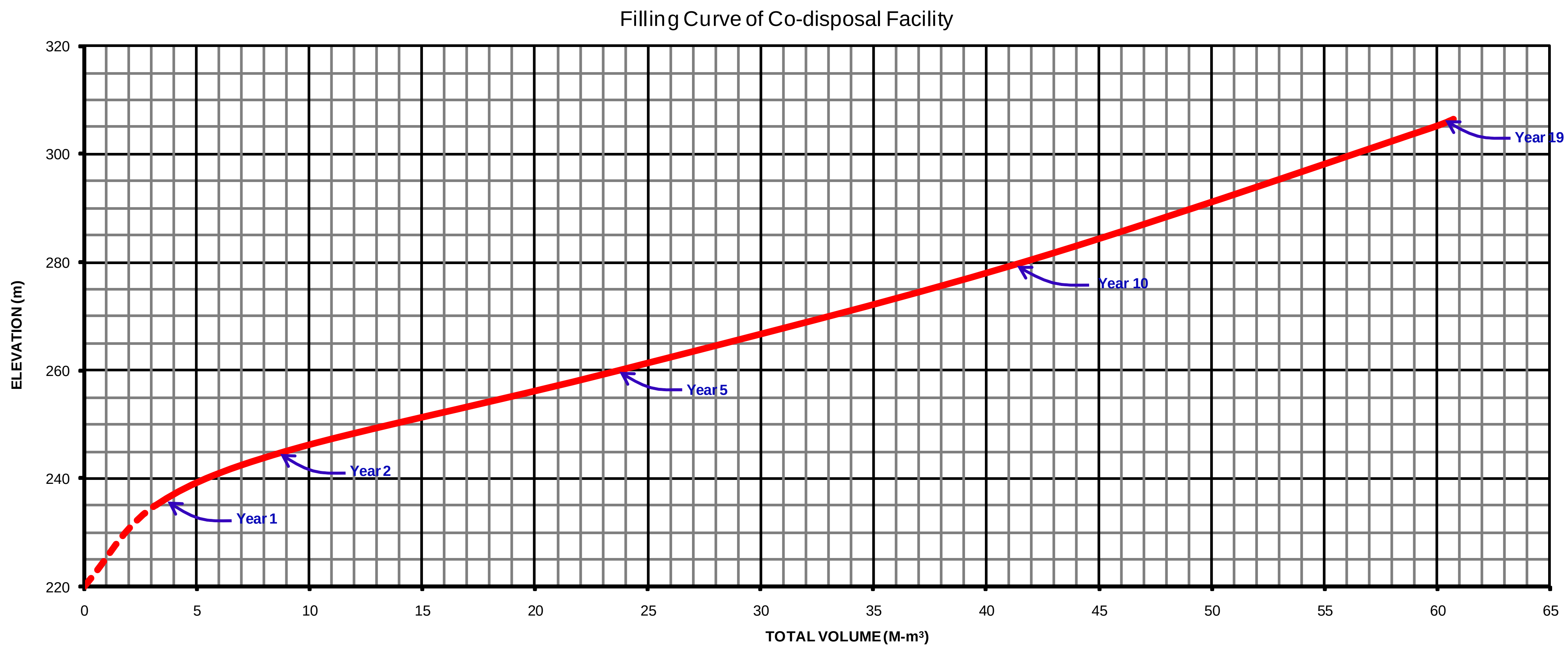
## 3.II.5 TAILINGS AND MINE ROCK CDF CONCEPTUAL DESIGN

### 3.II.5.1 Tailings and Mine Rock Production Schedule

Based on the current estimate, 2.2 Mt of the ore reserve will be accessed via underground and the remainder 28.9 Mt of ore will be accessed via an Open Pit. During the first 2 years of operations, mining will be a combination of Open Pit and underground mining. Starting from Year 3 of mine operations, the mine will switch to an Open Pit operation only. The predicted life of the mine is about 18 years.

Processing of the ore is expected to generate approximately 29.9 Mt of tailings. It is estimated that approximately 38.3% of the tailings generated will infiltrate into the voids between the mine rocks. (This arbitrarily assumes that 50% of the void space in the Mine Rock will be infilled.). The remainder of the tailings will remain as discrete layers of tailings within individual tailings disposal cells that will be created within the CDF.

The yearly tailings production and co-disposal plan of the NICO Project is given in Figure 3.II.5-1 and Table 3.II.5-1.




| Year | Mine Rock ($m^3$) | | | | Thickened Tailings ($m^3$) | | | Total Co-disposal Facility ($m^3$) | | Co-Disposed Mine Rock to Tailings Ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| | Co-disposed with Tailings | CDF Dyke Construction | Cemented Rock Backfill | Sub-economic Mineralized Rock | Total Tailings generated | Co-disposed with Mine Rock | Disposed in Cells | Yearly | Cumulative | |
| 0 | 218,225 | 308,500 | 0 | 32,515 | 176,697 | 32,734 | 143,963 | 670,688 | 670,688 | 1.24 |
| 1 | 2,281,950 | 223,300 | 69,023 | 61,557 | 942,669 | 342,292 | 600,376 | 3,105,626 | 3,776,314 | 2.42 |
| 2 | 4,263,907 | 479,763 | 23,008 | 172,414 | 942,668 | 639,586 | 303,082 | 5,046,752 | 8,823,066 | 4.52 |
| 3 | 4,724,985 | 403,156 | 0 | 341,542 | 942,668 | 708,748 | 233,920 | 5,362,062 | 14,185,128 | 5.01 |
| 4 | 4,890,583 | 403,156 | 0 | 130,171 | 942,668 | 733,587 | 209,080 | 5,502,820 | 19,687,947 | 5.19 |
| 5 | 3,126,003 | 403,156 | 0 | 158,147 | 942,668 | 468,900 | 473,767 | 4,002,927 | 23,690,874 | 3.32 |
| 6 | 2,519,633 | 568,381 | 0 | 216,391 | 942,668 | 377,945 | 564,723 | 3,652,737 | 27,343,612 | 2.67 |
| 7 | 2,519,633 | 568,381 | 0 | 86,652 | 942,668 | 377,945 | 564,723 | 3,652,737 | 30,996,349 | 2.67 |
| 8 | 2,519,633 | 568,381 | 0 | 221,777 | 942,668 | 377,945 | 564,723 | 3,652,737 | 34,649,086 | 2.67 |
| 9 | 1,858,719 | 568,381 | 0 | 98,787 | 942,668 | 278,808 | 663,860 | 3,090,960 | 37,740,047 | 1.97 |
| 10 | 2,881,990 | 183,272 | 0 | 165,928 | 942,668 | 432,298 | 510,369 | 3,575,631 | 41,315,678 | 3.06 |
| 11 | 2,463,598 | 183,272 | 0 | 288,122 | 942,668 | 369,540 | 573,128 | 3,219,998 | 44,535,675 | 2.61 |
| 12 | 2,463,598 | 183,272 | 0 | 172,375 | 942,668 | 369,540 | 573,128 | 3,219,998 | 47,755,673 | 2.61 |
| 13 | 2,287,140 | 183,272 | 0 | 203,586 | 942,668 | 343,071 | 599,597 | 3,070,008 | 50,825,681 | 2.43 |
| 14 | 2,022,453 | 183,272 | 0 | 368,415 | 942,668 | 303,368 | 639,300 | 2,845,025 | 53,670,706 | 2.15 |
| 15 | 681,373 | 183,272 | 0 | 217,919 | 942,668 | 102,206 | 840,462 | 1,705,106 | 55,375,812 | 0.72 |
| 16 | 681,373 | 183,272 | 0 | 138,777 | 942,668 | 102,206 | 840,462 | 1,705,106 | 57,080,918 | 0.72 |
| 17 | 681,373 | 183,272 | 0 | 111,040 | 942,668 | 102,206 | 840,462 | 1,705,106 | 58,786,025 | 0.72 |
| 18 | 769,895 | 183,272 | 0 | 153,134 | 942,668 | 115,484 | 827,184 | 1,780,350 | 60,566,375 | 0.82 |
| 19 | 74,849 | 0 | 0 | 21,522 | 83,633 | 11,227 | 72,406 | 147,255 | 60,713,630 | 0.89 |
| Total | 43,930,914 | 6,144,000 | 92,031 | 3,360,771 | 17,228,353 | 6,589,637 | 10,638,716 | 60,713,630 | | 2.42 |

**NOTES:**

1. MINE PLAN IS PROVIDED BY P&E ON 27 JANUARY 2010.
2. MILLING IS ASSUMED TO START ON YEAR 0.
3. THE DEPOSITED THICKENED TAILINGS IS ASSUMED TO ACHIEVE A VOID RATIO OF 0.9
4. THE MINE ROCK IS ASSUMED TO HAVE POROSITY OF 30%.
5. 50% OF THE VOID SPACE IN THE MINE ROCK IS ASSUMED TO BE FILLED WITH TAILINGS.

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**FILLING CURVE OF CO-DISPOSAL FACILITY**

Golder Associates
Edmonton, Alberta

| | | | |
|---|---|---|---|
| FILE No: E-AP3-005-CAD | | | |
| PROJECT No: 09-1373-1004 | | SCALE AS SHOWN | REV. 0 |
| DESIGN | KH | 10 May 2011 | |
| CAD | TDR | 10 May 2011 | |
| CHECK | KH | 10 May 2011 | |
| REVIEW | KAB | 10 May 2011 | |

FIGURE 3.II.5-1


PLOT DATE: May 13, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\-JC-\10111180046JC3II5-1.dwg

**Table 3.II.5-1: Tailings Production and Co-Disposal Schedule**

| Year | Ore | Total Tailings Generated | | Tailings Infiltrating into Mine Rock | Tailings as Discrete Layers within CDF |
|---|---|---|---|---|---|
| | (t/y) | (t/y) | ($m^3$/y) | ($m^3$/y) | ($m^3$/y) |
| 0 | 318 355 | 306 894 | 176 697 | 32 734 | 143 963 |
| 1 | 1 698 410 | 1 637 267 | 942 669 | 342 292 | 600 376 |
| 2 | 1 698 409 | 1 637 266 | 942 668 | 639 586 | 303 082 |
| 3 | 1 698 408 | 1 637 265 | 942 668 | 708 748 | 233 920 |
| 4 | 1 698 408 | 1 637 265 | 942 668 | 733 587 | 209 080 |
| 5 | 1 698 408 | 1 637 265 | 942 668 | 468 900 | 473 767 |
| 6 | 1 698 408 | 1 637 265 | 942 668 | 377 945 | 564 723 |
| 7 | 1 698 408 | 1 637 265 | 942 668 | 377 945 | 564 723 |
| 8 | 1 698 408 | 1 637 265 | 942 668 | 377 945 | 564 723 |
| 9 | 1 698 408 | 1 637 265 | 942 668 | 278 808 | 663 860 |
| 10 | 1 698 408 | 1 637 265 | 942 668 | 432 298 | 510 369 |
| 11 | 1 698 408 | 1 637 265 | 942 668 | 369 540 | 573 128 |
| 12 | 1 698 408 | 1 637 265 | 942 668 | 369 540 | 573 128 |
| 13 | 1 698 408 | 1 637 265 | 942 668 | 343 071 | 599 597 |
| 14 | 1 698 408 | 1 637 265 | 942 668 | 303 368 | 639 300 |
| 15 | 1 698 408 | 1 637 265 | 942 668 | 102 206 | 840 462 |
| 16 | 1 698 408 | 1 637 265 | 942 668 | 102 206 | 840 462 |
| 17 | 1 698 408 | 1 637 265 | 942 668 | 102 206 | 840 462 |
| 18 | 1 698 408 | 1 637 265 | 942 668 | 115 484 | 827 184 |
| 19 | 150 682 | 1 637 265 | 83 633 | 11 227 | 72 406 |
| **Total** | **31 040 384** | **29 922 930** | **17 228 353** | **6 589 637** | **10 638 717** |

CDF = Co-Disposal Facility; t/y = tonnes per year; $m^3$/y = cubic metres per year

Of the expected total 96.9 Mt of Mine Rock, 6.5 Mt is classified as sub-economic mineralized rock that may become economic if parameters used in the reserve estimate change. Approximately 0.3% of the Mine Rock will be used for dam construction and another 0.2% will be used for backfilling underground stopes as cemented rockfill. The remaining Mine Rock will be co-disposed with the tailings in the CDF. A breakdown of the distribution of Mine Rock by operations year is provided in Table 3.II.5-2.

**Table 3.II.5-2: Mine Rock Production Schedule**

| Year | Mine Rock | Sub-economic Mineralized Rock | Mine Rock for CDF Perimeter Dyke Construction | Mine Rock for Cemented Rock Backfill | Mine Rock for Seepage Collection Dams Construction | Mine Rock for Co-Disposal with Tailings |
|---|---|---|---|---|---|---|
| | (t/y) | (t/y) | (t/y) | (t/y) | (t/y) | (t/y) |
| 0 | 1 187 553 | 62 592 | 593 863 | 0 | 236 200 | 420 082 |
| 1 | 4 836 979 | 118 496 | 429 853 | 132 869 | 0 | 4 392 753 |
| 2 | 8 843 957 | 331 897 | 923 543 | 44 290 | 0 | 8 208 021 |
| 3 | 9 214 204 | 657 469 | 776 076 | 0 | 0 | 9 095 597 |
| 4 | 9 939 869 | 250 579 | 776 076 | 0 | 0 | 9 414 372 |
| 5 | 6 489 199 | 304 433 | 776 076 | 0 | 0 | 6 017 556 |
| 6 | 5 527 876 | 416 552 | 1 094 134 | 0 | 0 | 4 850 294 |
| 7 | 5 777 623 | 166 805 | 1 094 134 | 0 | 0 | 4 850 294 |
| 8 | 5 517 507 | 426 921 | 1 094 134 | 0 | 0 | 4 850 294 |
| 9 | 4 482 004 | 190 164 | 1 094 134 | 0 | 0 | 3 578 034 |
| 10 | 5 625 017 | 319 411 | 352 798 | 0 | 43 800 | 5 547 830 |
| 11 | 4 540 589 | 554 635 | 352 798 | 0 | 0 | 4 742 426 |
| 12 | 4 763 402 | 331 822 | 352 798 | 0 | 0 | 4 742 426 |
| 13 | 4 363 639 | 391 903 | 352 798 | 0 | 0 | 4 402 744 |
| 14 | 3 536 821 | 709 199 | 352 798 | 0 | 0 | 3 893 222 |
| 15 | 1 244 946 | 419 494 | 352 798 | 0 | 0 | 1 311 642 |
| 16 | 1 397 294 | 267 146 | 352 798 | 0 | 0 | 1 311 642 |
| 17 | 1 450 688 | 213 752 | 352 798 | 0 | 0 | 1 311 642 |
| 18 | 1 540 064 | 294 783 | 352 798 | 0 | 0 | 1 482 049 |
| 19 | 102 654 | 41 431 | 0 | 0 | 0 | 144 085 |
| **Total** | **90 381 885** | **6 469 484** | **11 827 200** | **177 159** | **280 000** | **84 567 005** |

CDF = Co-Disposal Facility; t/y = tonnes per year

## 3.II.5.2 Rationale for Tailings and Mine Rock Co-disposal

The co-disposal of tailings and Mine Rock was the preferred mine waste management system for the NICO Project for the following reasons:

- **Reduces the footprint area requirement**: About 38.3% of the thickened tailings is anticipated to infiltrate into the void space of the Mine Rock, hence reducing the area of disturbance.
- **Maximizes the rate of consolidation of the tailings**: Tailings will be placed between Mine Rock layers. The coarse Mine Rock layers will act as drainage paths for tailings consolidation water.
- **Improves the stability of the disposal facility**: The presence of Mine Rock will increase the overall stability of the facility, reducing operational and post-closure risk of the facility.

- **Reduces metal leaching and acid mine drainage**: Filling of the Mine Rock void space with thickened tailings will tend to reduce infiltration, maintain saturation and reduce the rate of oxygen ingress into the co-disposed mass, thus reducing the rates of infiltration, mass transfer of solutes, sulphide oxidation and acid generation.
- **Minimizes dust generation:** The co-disposal process will significantly reduce the tailings that can be exposed for extended period of time. The tailings will not segregate on deposition and will remain saturated for extended period of time. These 2 characteristics of the tailings will minimize susceptibility to freeze-drying during winter months and wind erosion during the summer months.
- **Reduces the mine hauling distance and tailings pumping length:** The consolidation of the 2 mine waste streams in a facility close to the open pit and the Plant significantly reduces cost.
- **Allows progressive closure:** The deposition scheme developed for the facility allows progressive closure to begin shortly after the start of operations.

## 3.II.5.3 Co-Disposal Facility Design Criteria

The CDF was designed based on the following criteria:

| | |
|---|---|
| ■ Life of mine | 18 years |
| ■ Tailings average in situ dry density | 1.74 t/m$^3$ |
| ■ Mine Rock average dry density | 1.93 t/m$^3$ |
| ■ Mine Rock porosity | 0.3 |
| ■ Mine Rock void available for co-disposal | 50% |
| ■ Total tailings | 17.2 M-m$^3$ |
| – *Tailings expected to fill Mine Rock voids* | *6.6 M-m$^3$* |
| – *Excess tailings deposited in cells* | *10.6 M-m$^3$* |
| ■ Total Mine Rock | 50.3 M-m$^3$ |
| – *Mine Rock required for CDF dike construction* | *6.1 M-m$^3$* |
| – *Mine Rock required for SCP dams construction* | *0.2 M-m$^3$* |
| – *Mine Rock for cemented rock backfill* | *0.1 M-m$^3$* |
| – *Mine Rock available for co-disposal* | *43.9 M-m$^3$* |
| ■ Total CDF storage capacity | 60.7 M-m$^3$ |
| ■ CDF Perimeter Dyke class | High consequence |

- Design floods for CDF
  - *Environmental design flood (EDF)* — *1:100-year return period 30-day rainfall plus snowmelt event*
  - *Inflow design flood (IDF)* — *Store Probable Maximum Precipitation (PMP) during years of operations and spillway to convey the 1:10,000-year storm event for post-closure*
- Design Earthquakes for CDF — 1:2,500-year return

## 3.II.5.4 Co-Disposal Facility Design Concept

### 3.II.5.4.1 Layout and Geometry

The general arrangement of the CDF and associated water management facilities is shown in Figure 3.II.2-1. The CDF alone occupies a total footprint area of 136 hectares. The key components of the facility are:

- CDF Perimeter Dyke;
- Tailings and Mine Rock Co-Disposal area;
- Reclaim Pond and movable pump station;
- reclaim water pipeline system;
- thickened tailings delivery and distribution system; and
- water management facilities.

The layout of the CDF has been determined by the following boundaries:

- ridges of the existing topography in the north;
- Nico Lake in the east;
- the Plant in the south; and
- the Open Pit in the west.

As shown in Figure 3.II.2-1, the ridge surrounding the CDF reaches its peak elevation of approximately 330 m in the northwest corner and slopes towards the east reaching as low as 230 m in the northeast corner. The configuration of the facility is developed to optimally utilize this ridge to reduce the perimeter dyke requirement. The facility will be raised to higher elevations (maximum of 310 m) to minimize its footprint area. The maximum elevation of the facility, however, will be maintained below the peak elevation of the surrounding ridge to reduce visual impact.

Except small areas adjacent to the bottom of the surrounding ridges, the CDF will be developed on gently sloping ground with less than 3% gradient and localized low-lying areas including the Grid Pond and Little Grid Pond. The facility will occupy the western watershed of Nico Lake (Figure 3.II.2-2). Surface drainage from this watershed naturally feeds into the Nico Lake through a narrow low-lying area in the northeast. Adequate buffer zone is kept between the CDF and the Nico Lake. The CDF will be operated to slope towards northwest to facilitate runoff and to minimize seepage towards the Nico Lake watershed. Five seepage collection ponds (SCPs) will be constructed downstream of the CDF on topographic lows to intercept both contact runoff and seepage from the CDF.

### 3.II.5.4.2 Perimeter Dyke

The bulk of the CDF will comprise inter-mixed layers of tailings and Mine Rock. The sloped perimeter dyke of the CDF will comprise a discrete zone of mine rock without tailings. The perimeter dyke will be raised continually in 5 m lifts using the upstream construction method, ultimately to a maximum elevation of 310 m. A typical cross-section showing 5 m lifts is shown on Figure 3.II.5-2. As shown in the figure, the perimeter dyke will have an overall crest width of 25 m, an interior slope of 1.5H:1V (Horizontal:Vertical) and an exterior slope of 3H:1V. The final exterior slopes of the perimeter dyke will have 10 m wide benches on every second 5 m lift (i.e., at 10 m of intervals of height to achieve an overall slope of 3.8H:1V. This configuration will allow concurrent reclamation of the exterior slopes.

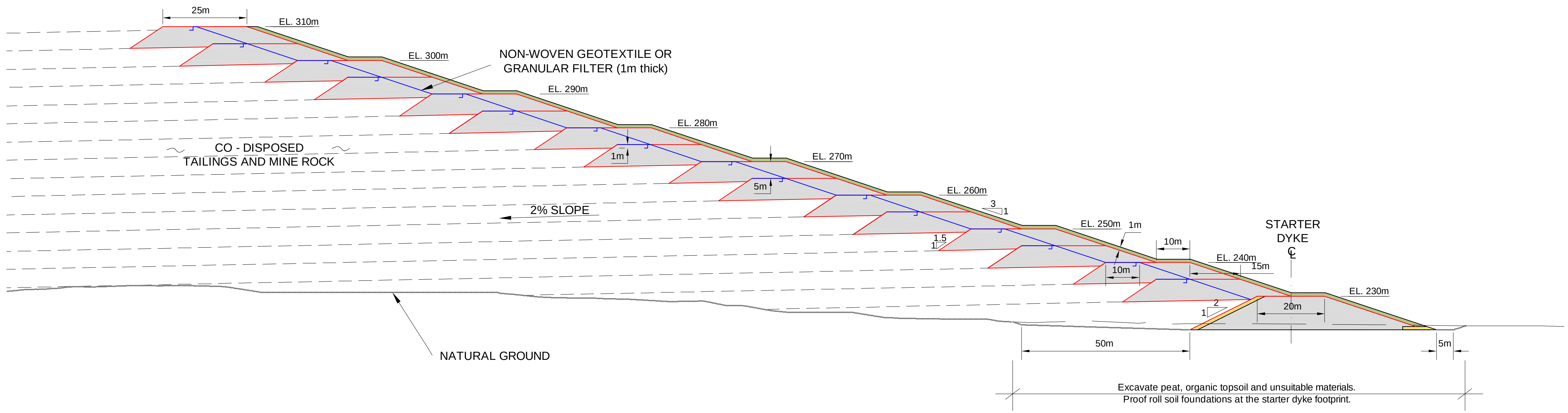
The perimeter dyke lifts will have three zones: an interior zone, a central filter zone, and a exterior zone. The interior zone will be constructed earlier to provide containment for either tailings or co-disposed tailings and mine rock using select (i.e., Type 2 as defined in Table 3.II.4-2) Mine Rock. Construction of the exterior zone, as well as the filter zone, could follow slightly behind if sufficient select mine rock is not readily available. The interior zone will have a crest width of 10 m, an interior slope of 1.5H:1V, and a filter zone side slope of 3H:1V.

The filter zone will prevent tailings from passing through the perimeter dyke to the downstream face. The filter could comprise Type 2 Mine Rock crushed down to a gravelly sand size range, or natural sand and gravel material, or a heavy weight non-woven geotextile (≥600 g/m$^2$). Crushed Mine Rock would be the most expensive of the three alternatives. The natural pit run sandy gravel material would be viable if a suitable deposit can be found within a reasonable distance. During winter months, however, it would likely not be possible to borrow and place such materials due to freeze-up. Geotextile is easy to install in many weather conditions. While synthetic products like geotextile will degrade slowly over the long-term, the presence of perched water tables in the CDF is anticipated to diminish before such degradation occurs. The granular filter and geotextile can be used alternatively, depending on availability. When a granular filter is used its thickness will be 1 m.

The downstream zone will be constructed of select (i.e., Type 2) Mine Rock. The zone will reliably depress the phreatic water level of the CDF. The zone will be 15 m wide and its exterior slope will be 3H:1V.

The construction schedule of the perimeter dyke will be planned to be ahead of the co-disposal area to provide containment, not only for the tailings and Mine Rock, but also for the design storm event.

As a first step, a perimeter starter dyke will be constructed across the low-lying area at the east end of the CDF. Type 2 mine rock available during the pre-production period will be used to construct the perimeter starter dyke. The dyke will be constructed to a crest elevation of 230 m. Based on the current mine plan, this dyke will provide tailings and Mine Rock storage capacity for approximately half a year. The dyke will have a crest width of 20 m to accommodate 2-way haul traffic by mine vehicles. The interior and exterior slopes of the dyke will be 2H:1V and 3H:1V, respectively. A 1 m thick granular filter will be provided on the interior face of the dyke to retain tailings solids while allowing seepage water to pass through.




## TYPICAL CROSS SECTION OF PERIMETER DYKE OF CO-DISPOSAL FACILITY

25 0 25 50

SCALE 1:1250 METRES

**LEGEND:**

- TILL COVER
- SELECT TYPE 2 MINE ROCK
- GRANULAR FILTER

**NOTES:**

1. EXTERIOR BENCHES TO BE PROVIDED EVERY 10m VERTICALLY. BENCH ELEVATIONS WILL VARY AROUND PERIMETER DUE TO LONGITUDINAL GRADING.
2. GRANULAR FILTER MUST BE USED ON THE UPSTREAM FACE AND DOWNSTREAM TOE OF THE STARTER DYKE, ELSEWHERE EITHER GRANULAR FILTER OF NON-WOVEN GEOTEXTILE
MAY BE USED.

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**PERIMETER DYKE OF CO-DISPOSAL FACILITY**

Golder Associates
Edmonton, Alberta

FILE No: E-AP3-006-CAD

| | | | | |
|---|---|---|---|---|
| PROJECT No: 09-1373-1004 | | | SCALE AS SHOWN | REV. 0 |
| DESIGN | KH | 10 May 2011 | FIGURE 3.II.5-2 | |
| CAD | TDR | 10 May 2011 | | |
| CHECK | KH | 10 May 2011 | | |
| REVIEW | KAB | 10 May 2011 | | |

PLOT DATE: May 13, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\-JC-\10111180046JC3II5-2.dwg

### 3.II.5.4.3 Perimeter Dyke Hazard Classification

The selection of geotechnical and flood protection design criteria for dykes follows industry standards by first classifying the dyke based on its failure consequences. Potential consequences of failure of the perimeter dyke of the CDF were assessed with the approach suggested in the Canadian Dam Safety Guidelines (CDA 2007).

Under the guidelines, dykes are classified according to incremental consequences resulting from a presumed dyke failure. The consequences considered as a result of dyke failure included the potential for loss of life, environmental and cultural losses, as well as infrastructure and economic losses.

The co-disposal of Mine Rock and tailings will form a structure which is inherently stable. As a result, a loss of tailings containment is very unlikely to occur, whether it is due to seismic liquefaction of tailings or due to extreme climatic events. If it is assumed that a loss of containment would occur, the consequences would nonetheless be limited. A reasonable worst case scenario would be a breach of the perimeter dyke adjacent to a deposition cell which had been recently filled with a 5 m thickness of thickened tailings (i.e., a discrete layer of up to about 200 000 $m^3$ of tailings). Because the tailings will be thickened, there should be relatively little free water in the cell, which would limit the flushing of tailings through the breach. If the tailings liquefy to a residual angle of friction of 4 degrees, an inverted half cone of tailings will flow through the breach. The estimated volume of tailings that can flow through the breach by this mechanism is less than 15 000 $m^3$. Once through the breach, the tailings would flow down the slope of the perimeter dyke and would eventually wash into one or more of the SCP ponds, where it would settle out in the standing water. This could displace a similar volume of untreated water out of the SCPs through the spillway(s) and into the Nico Lake. It is unlikely that any tailings would flow off-site. There could be a short term environmental impact resulting from the displaced turbid water flowing into Nico Lake. There would also be an operational financial consequence related to the repair of the perimeter dyke and the transport of tailings out of the SCPs and back into the CDF.

The highest foreseeable consequence resulting from failure of the CDF perimeter dyke will then be of an environmental nature due to the proximity to the natural water courses. No loss of life is anticipated, as the areas downstream of the CDF are not inhabited.

Considering the above, the failure consequence rating of the Perimeter Dyke is considered to be “High”. According to the guidelines, a “High” category would require the facility to be capable of sustaining an Inflow Design Flood (IDF) rainfall storm of 1/3 between 1:1000 and PMP return periods. The guidelines also require that the CDF Perimeter Dyke be stable under a 1:2500 return period earthquake, at the minimum.

The CDF will be operated with sufficient freeboard to provide storage for an Environmental Design Flood (EDF) during operation and post-closure. The selected EDF is represented by a 1:100-year return period 30-day rainfall plus snowmelt event, which amounts to 215 millimetres (mm).

In the early stages of operations, the CDF will be operated with sufficient freeboard to provide capacity to store a flood up to the Probable Maximum Flood, which amounts to 241.7 mm, on top of the EDF.

In the final years of operations and post-closure, a spillway will be provided at the northwest corner of the CDF which will be capable of safely conveying a 1:10 000-year storm event, which amounts to 115.4 mm. The implication of this would be that SCP 4 and the Open Pit could be partially flooded if a storm event greater than the EDF occurs.

The CDF Perimeter Dyke is designed to remain stable under a 1:2500 return period earthquake, under which the peak horizontal ground acceleration is predicted to reach 0.06g.

### 3.II.5.4.4 Stability Analyses

The Mine Rock improves the overall stability of the CDF. The tailings will be confined within cells constructed of Mine Rock. The external face of the facility will be Mine Rock that will improve the overall stability of the structure and enable upslope deposition. As deposition advances, some of the perimeter dyke will be founded on tailings or co-disposal areas. In order to provide an understanding of the general stability of the CDF, stability analyses were carried out on the cross sectional area considered to be the most critical. The section is taken at the eastern dyke where the CDF has the maximum thickness.

The tailings are the lowest strength material that will be placed in the CDF. Continuous layers of tailings within the perimeter dykes of Mine Rock will be the worst case scenario for stability and as such all the co-disposed tailings and Mine Rock behind the perimeter dyke was modelled to have the strength characteristics of tailings. This is a conservative assumption because it ignores the stabilizing effect of the Mine Rock layers placed under the tailings layers and the Mine Rock berms around the tailings disposal cells.

Two-dimensional stability analyses were performed using the commercially available limit equilibrium slope stability program SLOPE/W (Version 2007), applying the Morgenstern-Price Method of analysis. Table 3.II.5-3 provides a summary of the strength properties that were used in the stability analyses for the foundation soils, Mine Rock and tailings materials. These values are based on Golder's experience on similar materials.

**Table 3.II.5-3: Material Properties for Slope Stability**

| Materials | Unit Weight ($kN/m^3$) | Friction Angle (degrees) | Cohesion (kPa) |
|---|---|---|---|
| Peat | 12 | - | 10 |
| Glacio-lacustrine deposits | 16 | 22 | 0 |
| Glacial till | 18 | 28 | 0 |
| Perimeter dyke Mine Rock | 19.5 | 40 | 0 |
| Co-disposed tailings and Mine Rock | 18.5 | 30 | 0 |

$kN/m^3$= Kilonewton per cubic meters ; kPa=Kilopascal

Based on the guidelines from the Canadian Dam Association (CDA 2007), the minimum acceptable Factors-of-Safety under static and pseudo-static conditions are 1.5 and 1.0, respectively. The ultimate configuration of the CDF has been assessed for slope stability based on these criteria.

Earthquake induced seismic loads were incorporated in the pseudo-static analyses, which consists of conventional limit equilibrium static analysis completed with pseudo-static acceleration coefficients that act upon the critical failure mass. As discussed above, the PGA selected for the design analysis of CDF Perimeter Dyke is 0.06 grams (g). A horizontal pseudo-static coefficient of one-half of the PGA ($k_h$ of 0.03g), and a vertical coefficient equal to zero were used to evaluate the long term seismic stability of the ultimate configuration of the CDF as per the recommendation of Hynes-Griffin and Franklin (1984).

The results of the stability analyses of the ultimate configuration under static and pseudo-static conditions are presented in Figure 3.II.5-3. The result shows that the CDF is stable under both conditions. The minimum Factors-of-Safety of the perimeter dykes are 2.2 and 1.8 for the static and pseudo-static scenarios, respectively.

Detailed analyses, however, should be carried out to confirm these preliminary findings in the subsequent stages of the project once site specific strength parameters are available. The rate of rise of the CDF is going to be relatively quick during the early stages of the NICO Project when the deposition area is small. The undrained conditions should be evaluated to identify the maximum thickness of unconsolidated tailings that can be placed without affecting the overall stability of the CDF. During construction, piezometers can be installed within freshly deposited tailings to monitor pore pressure response and consolidation of the tailings. The rate of placement of tailings and Mine Rock and the use of different areas could be controlled based on the results of the pore pressure monitoring in order to maintain a stable CDF.

## 3.II.5.5 Co-Disposal Facility Drainage and Water Management

The Water Management Plan for the entire project site is described in Appendix 3.III and Figure 3.II.5-4 shows a typical water management flow logic during the operational years of the mine.

The water management facilities required by the CDF include the following:

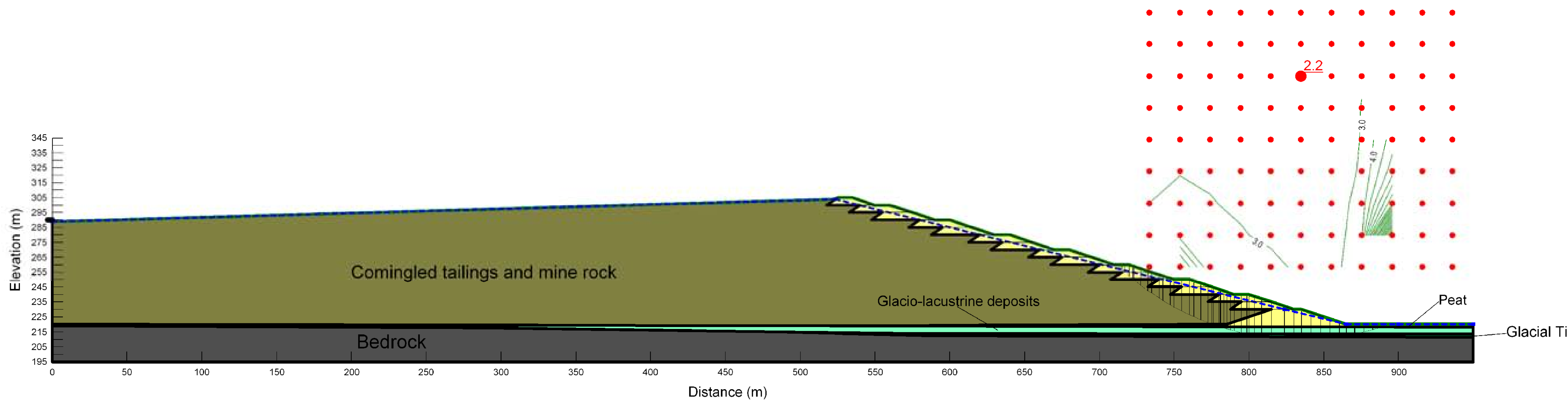
- Reclaim Ponds on the CDF;
- SCPs Nos.1 to 5;
- drainage ditch; and
- Surge Pond;

Reclaim Pond will be created within the CDF to collect supernatant and runoff water for continuous pumping back to the surge pond for re-use by the Plant. The pond will be form upstream of the CDF and it will migrate to the west throughout operations as the CDF is filled. In some instances, the decision may be made to temporarily store water in active and inactive tailings disposal cells, as required.

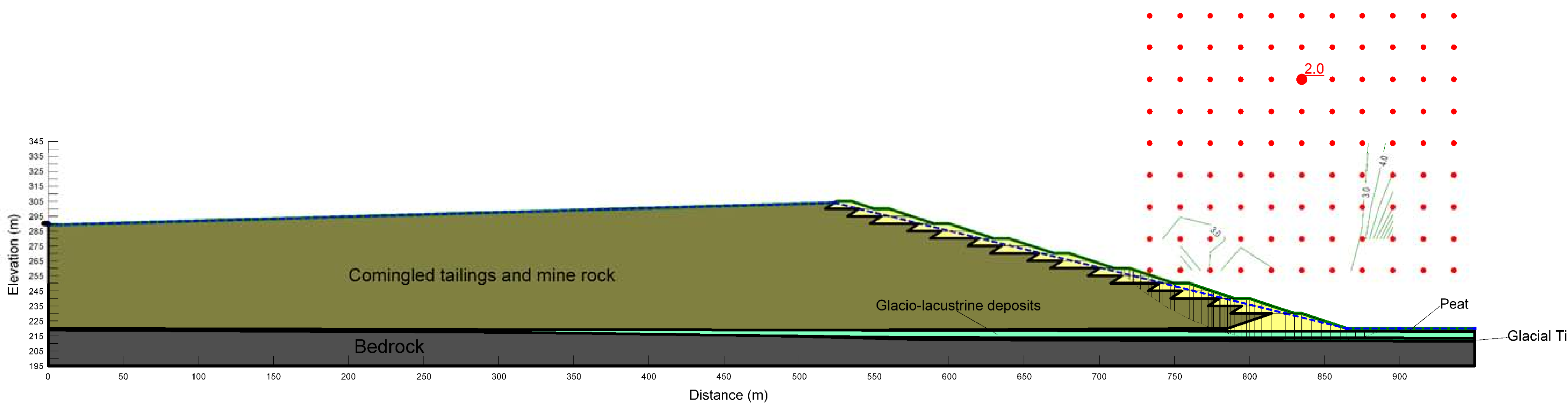
Seepage Collection Ponds Nos. 1, 2, and 3 will be located in three low lying areas adjacent to the eastern end of the CDF to intercept seepage and runoff from the CDF which would otherwise flow to Nico Lake. Seepage Collection Ponds Nos. 4 and 5 will be located north and southeast of the Open Pit, to collect runoff and seepage from CDF and the surrounding watersheds.

A drainage ditch will be constructed on the northeast corner of the CDF to divert runoff collected north of the CDF to SCP No. 1.

The Surge Pond will be located in the low lying area north of the plant to temporarily store contact water pumped back from the SCPs and the tailings reclaim pond. Water will be pumped from the surge pond through the mill for reuse, or pumped on to the Effluent Treatment Facility (ETF) for treatment and release to the environment. Treated water from the ETF will be pumped through a diffuser directly into Peanut Lake.




STATIC SLOPE STABILITY ANALYSIS




PSEUDO-STATIC SLOPE STABILITY ANALYSIS

| MATERIALS | UNIT WEIGHT ($kN/m^3$) | FRICTION ANGLE (Degrees) | COHESION (kPa) |
|---|---|---|---|
| PEAT | 12 | - | 10 |
| GLACIO-LACUSTRINE DEPOSITS | 16 | 22 | 0 |
| GLACIAL TILL | 18 | 28 | 0 |
| CDF PERIMETER DYKE MINE ROCK | 19.5 | 40 | 0 |
| CO-DISPOSED TAILINGS AND MINE ROCK | 18.5 | 30 | 0 |

**NOTE:**
A HORIZONTAL GROUND ACCELERATION OF 0.03g HAS BEEN USED FOR THE PSEUDO-STATIC STABILITY ANALYSIS.

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**STABILITY ANALYSES OF CO-DISPOSAL FACILITY**

Golder Associates
Edmonton, Alberta

FILE No: E-AP3-007-CAD

| PROJECT No: 09-1373-1004 | | SCALE AS SHOWN | REV. 0 |
|---|---|---|---|
| DESIGN | KH | 10 May 2011 | |
| CAD | FG | 10 May 2011 | |
| CHECK | KH | 10 May 2011 | |
| REVIEW | KAB | 10 May 2011 | |

FIGURE 3.II.5-3

PLOT DATE: May 13, 2011
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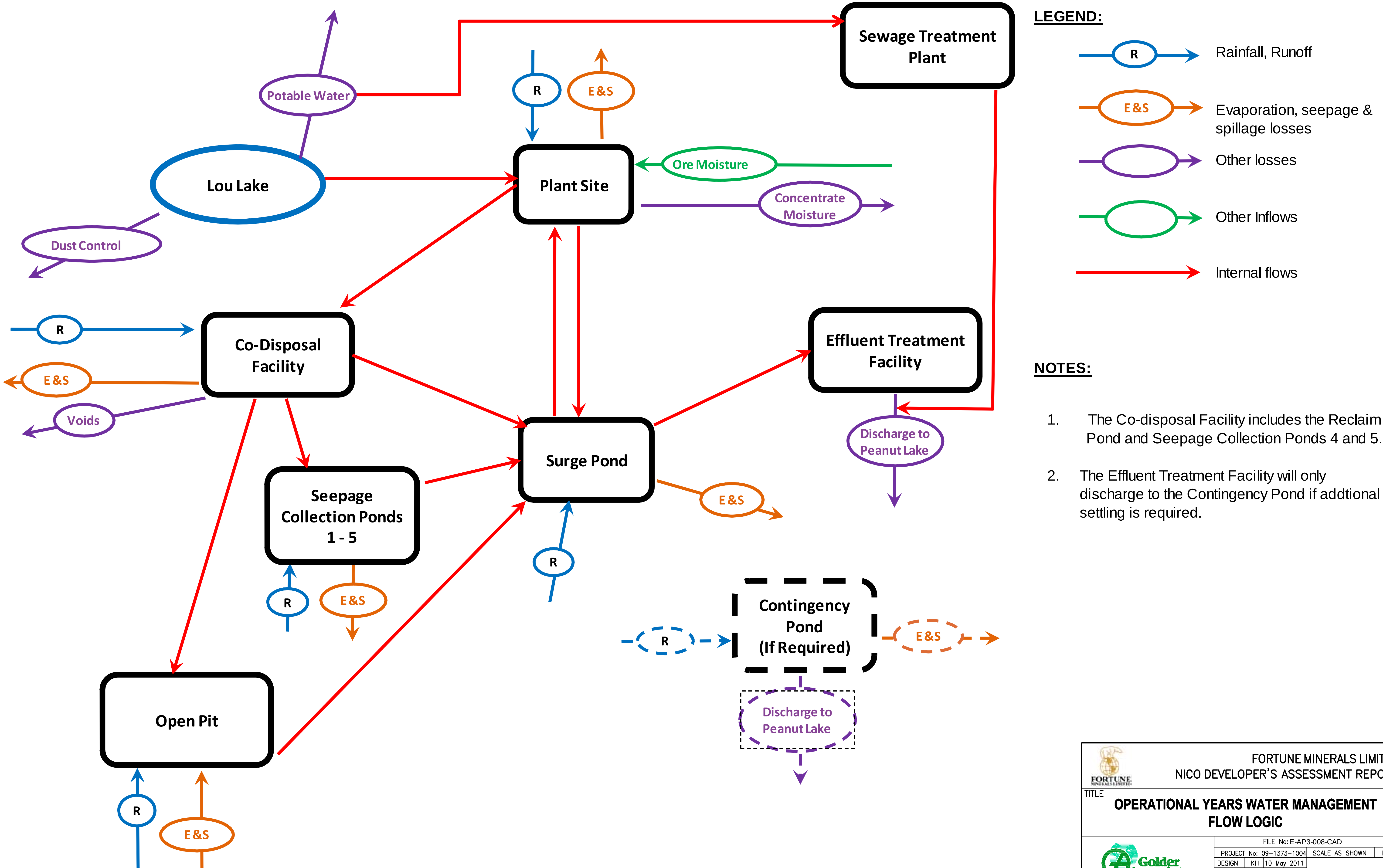



**NOTES:**

1. The Co-disposal Facility includes the Reclaim Pond and Seepage Collection Ponds 4 and 5.
2. The Effluent Treatment Facility will only discharge to the Contingency Pond if addtional settling is required.

| | | | | |
|---|---|---|---|---|
| FORTUNE MINERALS LIMITED<br>NICO DEVELOPER'S ASSESSMENT REPORT | | | | |
| TITLE<br>**OPERATIONAL YEARS WATER MANAGEMENT FLOW LOGIC** | | | | |
| Golder Associates<br>Edmonton, Alberta | FILE No: E-AP3-008-CAD | | | |
| | PROJECT No: 09-1373-1004 | | SCALE AS SHOWN | REV. 0 |
| | DESIGN | KH | 10 May 2011 | FIGURE 3.II.5-4 |
| | CAD | FG | 10 May 2011 | |
| | CHECK | KH | 10 May 2011 | |
| | REVIEW | KAB | 10 May 2011 | |

### 3.II.5.6 Co-Disposal Facility Construction

The CDF starter dyke and the water management facilities (except SCPs Nos. 4 and 5) will be constructed to their ultimate heights prior to start-up by an earthworks contractor. The CDF Perimeter Dyke will be raised progressively, as required by the deposition schedule, during the operating period using the upstream raise method. Construction of the lifts will be carried out by mine personnel using mining equipment.

In areas where there is swamp and stream flow, coffer dam construction will be required upstream of the perimeter starter dyke or water management dams to maintain dry and stable working ground for construction of the foundations of the CDF perimeter dyke or the SCP dams. Pumping of the excess water stored behind the coffer dam will also be required. Surface water will be directed away from the excavations. Groundwater, when encountered in open-cut excavations, can be adequately controlled by diverting the existing drainage paths to promote runoff away from or around the proposed construction areas and by pumping from properly filtered sumps. Water pumped from the coffer dams and from the excavations will be discharged downstream of the dams, using appropriate silt control techniques.

The footprint area of the CDF will be cleared of trees. When possible, the large trees will be made available to the local community for use as a firewood. The footprints of the perimeter dyke, including the dyke foundation and a 10 m width on either side for construction access, will be grubbed and stripped of all organics. The average depth of stripping will be approximately 1 m. The CDF clearing, grubbing, and stripping will take place in stages as the facility develops to minimize erosion.

The CDF perimeter dyke will be constructed using Type 2 Mine Rock with a nominal maximum size of 0.3 m. To facilitate proper drainage and to prevent the build-up of pore pressure, the fines content should be less than 5% by weight. The Mine Rock will be placed in loose lift thicknesses not greater than 1 m. This material will be placed in a manner that will minimize segregation or nesting of coarse particles. To reduce settlement, each lift will be compacted either by using 10 to 20 ton steel drum vibratory rollers, or by routing heavy equipment such as loaded haul trucks over the surface. Boulders greater than 0.5 m in size will be removed from the fill.

A filter material will be used to act as a separator between the Mine Rock of the outer perimeter dyke and the co-disposed material. The filter material will be well-graded sand and gravel with a 75 mm maximum aggregate size and a fines content (i.e., that passing the 0.075 mm sieve size) limited to 15%. The filter material will be placed without compaction. A heavy-weight non-woven geotextile may be used in the perimeter dyke instead of the sand filter material, except for the starter dyke.

### 3.II.5.7 Geotechnical Instrumentation

The following geotechnical instrumentation will be installed, as required, over the life of the mine to monitor the performance of the CDF:

- Vibrating Wire Piezometers: They will be required on the CDF and around the CDF to provide data on the piezometric conditions of the overburden soil underlying the CDF and the tailings layers on the co-disposal area of the CDF.
- Borehole Inclinometers: They will be installed on the CDF perimeter dyke and on the overburden soil to check for horizontal movement on selected sections.

- Settlement Plates: They will be required to measure the amount and rate of settlement. The settlement plates will be placed on the CDF Perimeter Dyke.
- Thermistors: They will be required to assess trends in temperature changes in the CDF and the subsurface soils.

## 3.II.6 TAILINGS AND MINE ROCK CO-DISPOSAL STRATEGY

### 3.II.6.1 Tailings and Mine Rock Deposition Plan

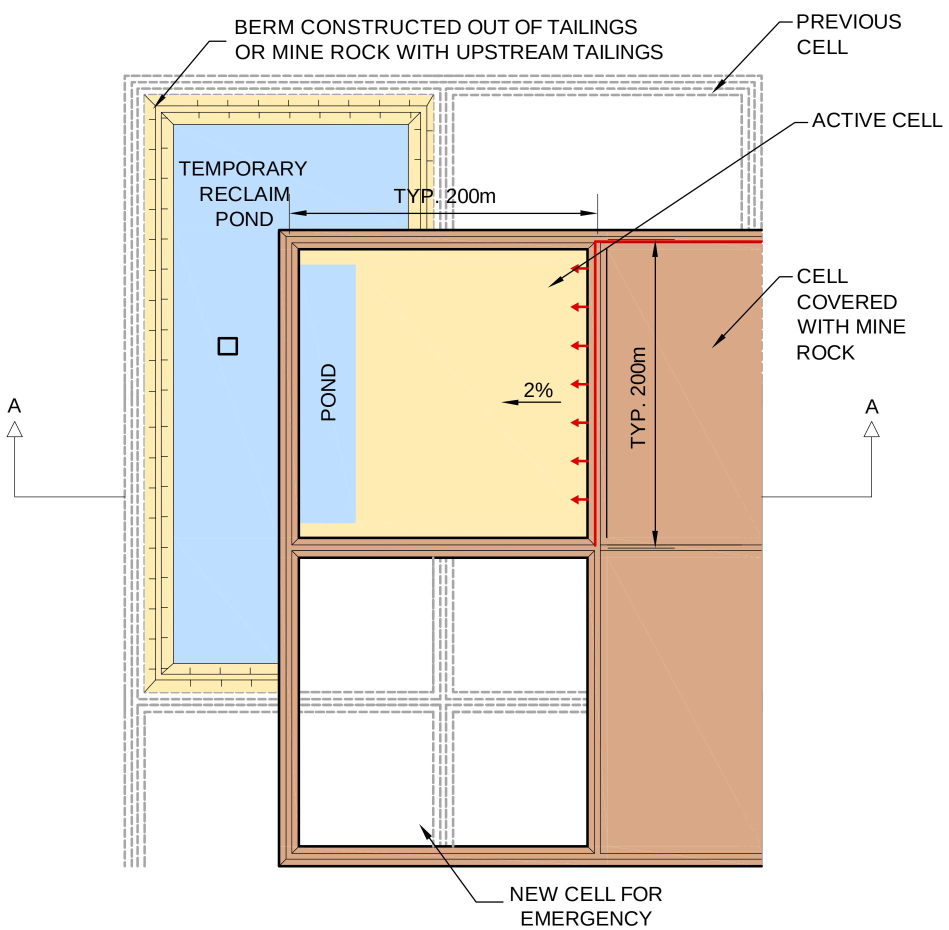
The co-disposal area will be developed by depositing alternating layers of tailings and Mine Rock. The thickness of the tailings and the Mine Rock layers will be dictated by the Mine Rock to tailings ratio. The deposition of the tailings and Mine Rock layers will aim to maintain a 2% slope toward the northwest throughout the operational stages of the mine.

The tailings layers will be created by constructing a series of tailings disposal cells. Typically, each tailings disposal cell will be a nominal square of 200 m by 200 m (Figure 3.II.6-1). The cell perimeter berms will be constructed by end dumping Mine Rock (Type 2 or 3). The berm will have a nominal crest width of 6 m to allow vehicle access. The downstream and upstream slopes will be at the angle of repose of the Mine Rock, which is approximately 1.5H:1V.

The thickened tailings will be discharged through a series of spigot discharge points from the eastern berms of the tailings disposal cells. To maximize the infiltration of tailings into the Mine Rock, the basin of each tailings disposal cell may require ripping using a bulldozer prior to tailings disposal, and the Mine Rock layer will be pushed over the freshly deposited tailings.

Since the cell perimeter berms will be permeable, tailings bleed water and runoff will seep through them. In the early stages of operation, a reclaim pond will develop at the northwest corner against the natural topography. During the later years of operation, when the reclaim pond is close to the permeable perimeter dyke of the CDF, the basin and the perimeter of the pond area will be covered with tailings to reduce seepage losses.

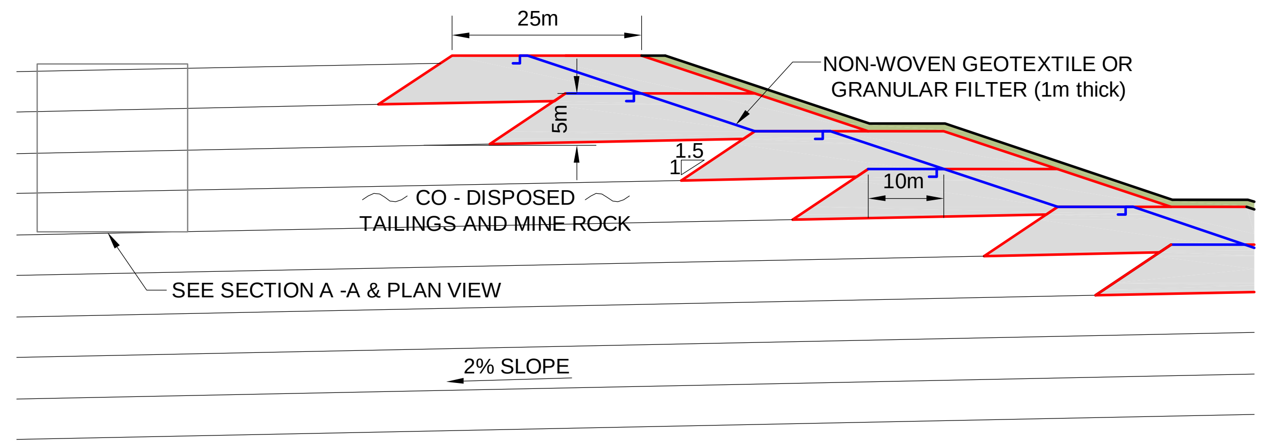
Snapshots showing the staged development of the CDF are presented in Figure 3.II.6-2. The filling cure of the CDF is presented in Figure 3.II.5-1. The facility will be developed progressively in layers from east to west.




## PLAN VIEW

100 0 100

SCALE 1:5000 METRES




## CROSS SECTION OF PERIMETER DYKE

20 0 20

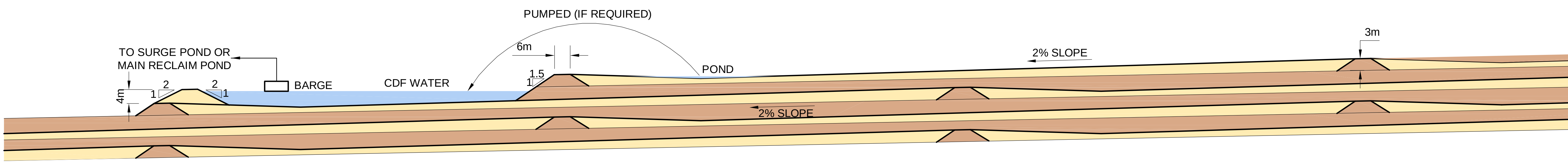
SCALE 1:1000 METRES

**LEGEND:**

- TAILINGS SPIGOT / DISCHARGE POINT
- TAILINGS
- TAILINGS POND
- RANDOM (TYPE 3) MINE ROCK
- SELECT (TYPE 2) MINE ROCK
- SOIL COVER

**NOTES:**

1. EXTERIOR BENCHES TO BE PROVIDED EVERY 10m VERTICALLY. BENCH ELEVATIONS WILL VARY AROUND PERIMETER DUE TO LONGITUDINAL GRADING.
2. GRANULAR FILTER MUST BE USED ON THE UPSTREAM FACE AND DOWNSTREAM TOE OF THE STATER DYKE, ELSEWHERE EITHER GRANULAR FILTER OF NON-WOVEN GEOTEXTILE MAY BE USED.
3. IF DESIRED TO FACILITED RECLAIM, WATER CAN BE IMPONDED WITHIN A CELL BY BACK SPIGOTTING OFF THE LOWER (WESTERN) BERM AND/OR BY RAISING A BERM WITH TAILINGS.




## TYPICAL SECTION A-A

20 0 20

SCALE 1:1000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

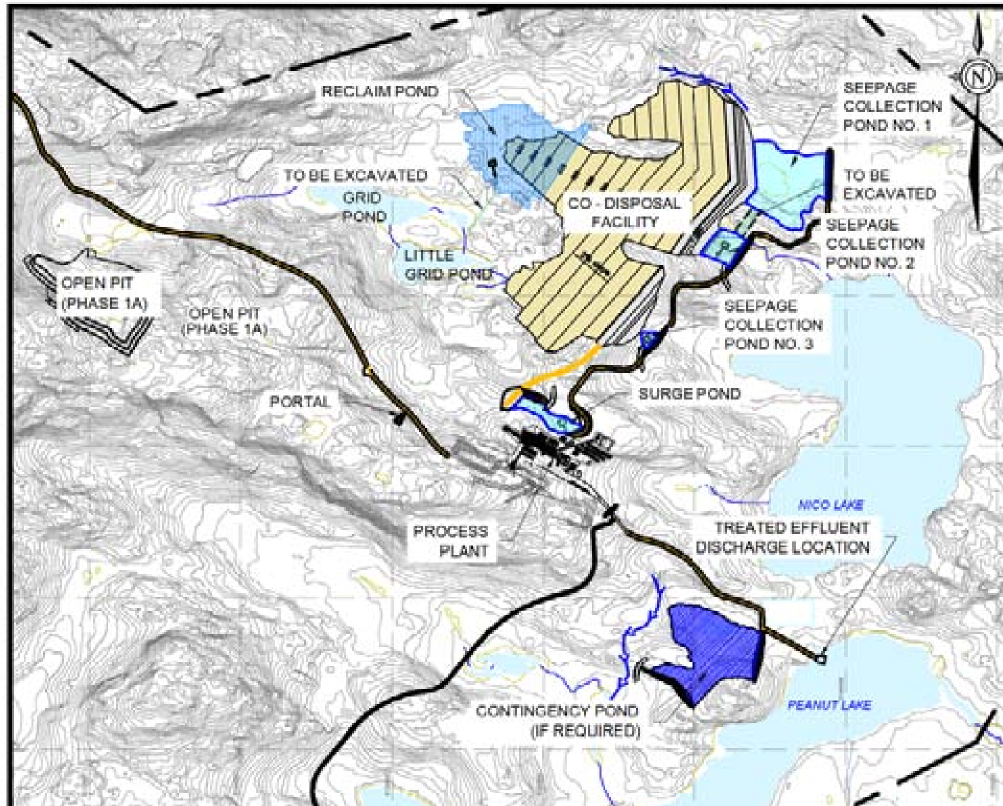
**TYPICAL DEPOSITION STRATEGY OF THE CO-DISPOSAL FACILITY**

Golder Associates
Edmonton, Alberta

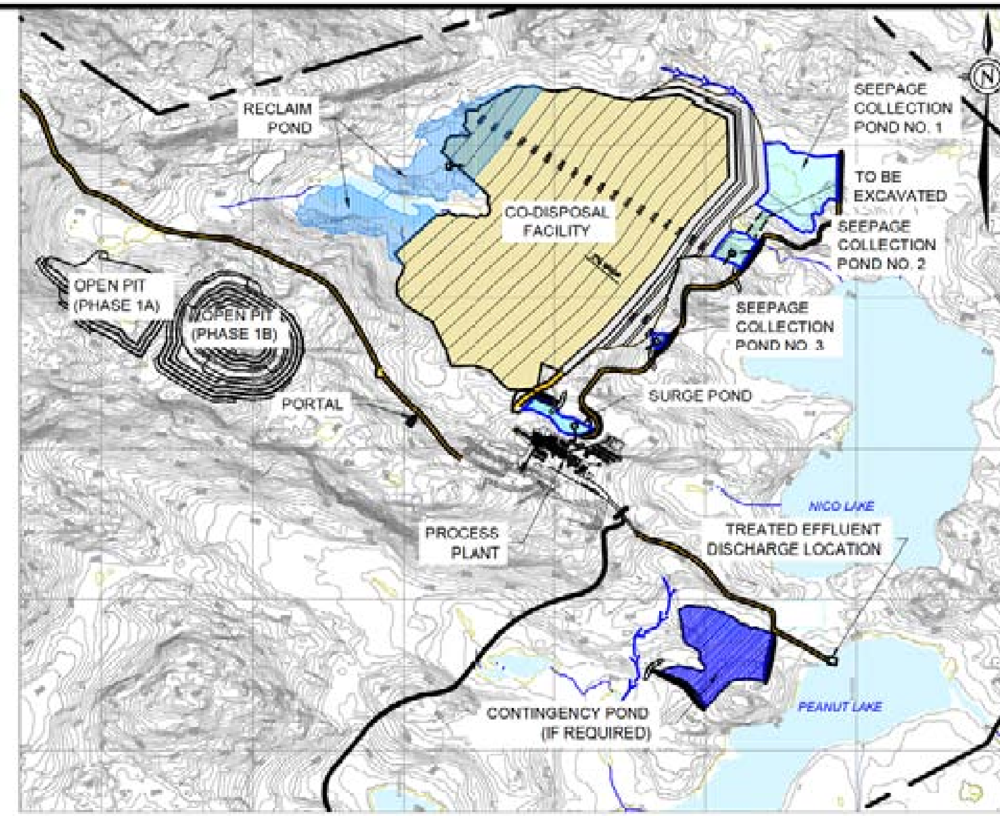
FILE No: E-AP3-009-CAD

| PROJECT No: 09-1373-1004 | | SCALE AS SHOWN | REV. 0 |
|---|---|---|---|
| DESIGN | KH | 10 May 2011 | FIGURE 3.II.6-1 |
| CAD | TDR | 10 May 2011 | |
| CHECK | KH | 10 May 2011 | |
| REVIEW | KAB | 10 May 2011 | |

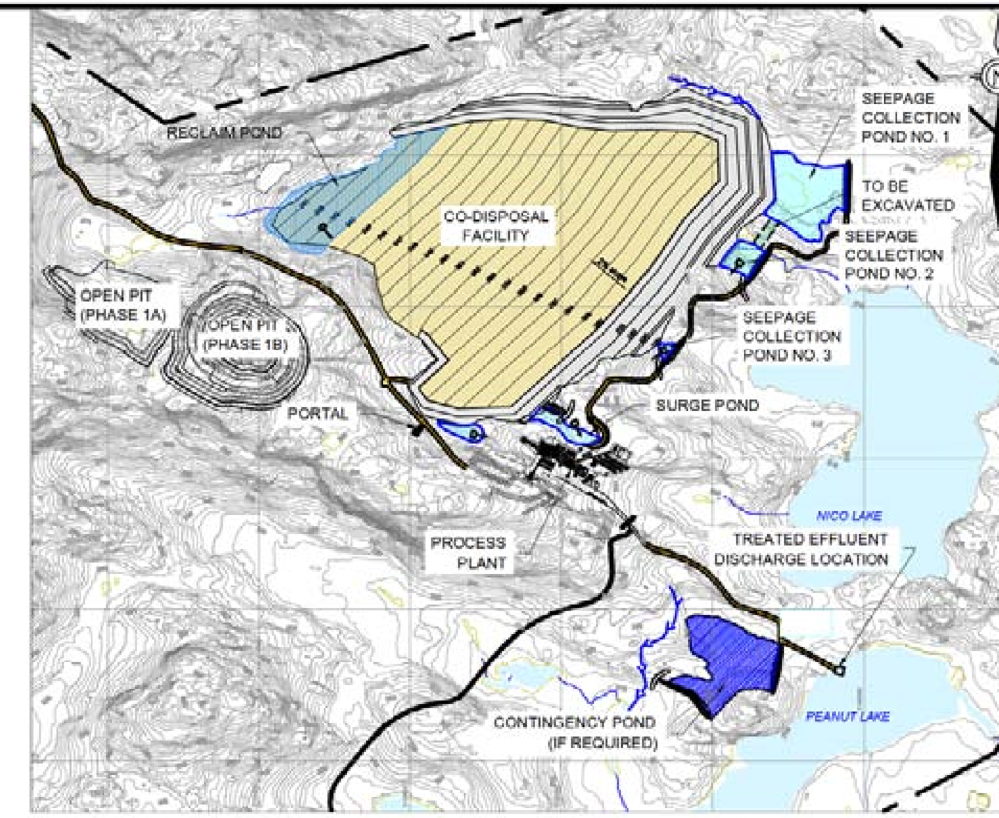
PLOT DATE: May 13, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\-JC-\1011180046JC3II6-1.dwg



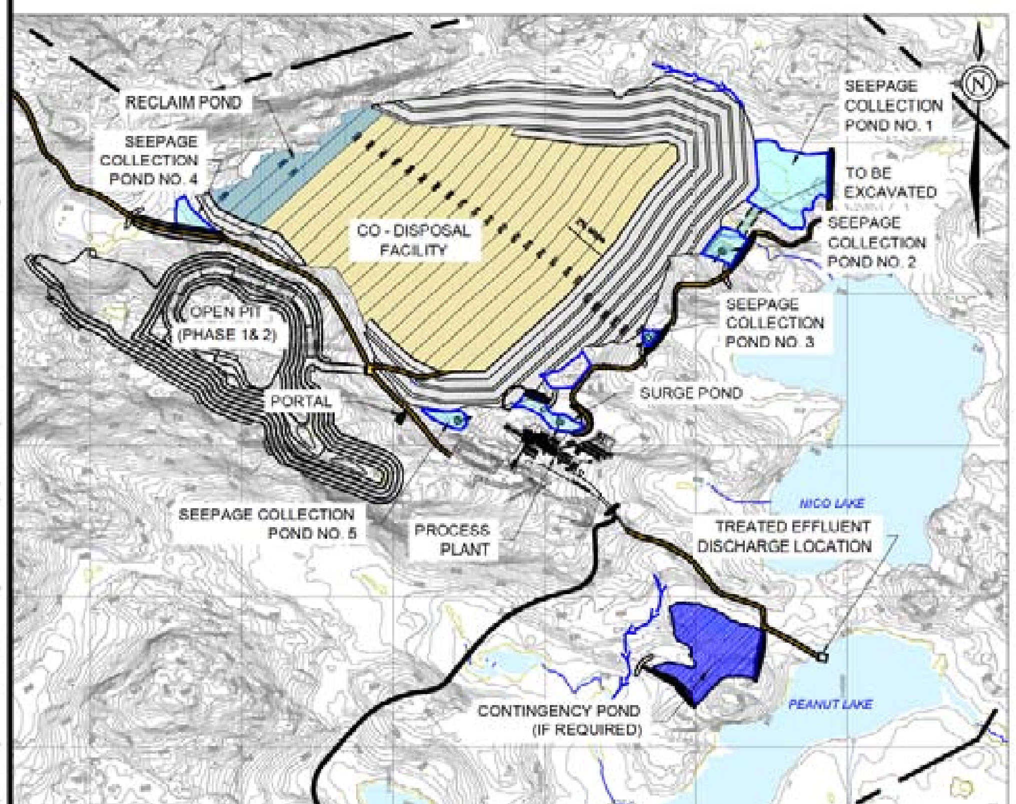

YEAR 1



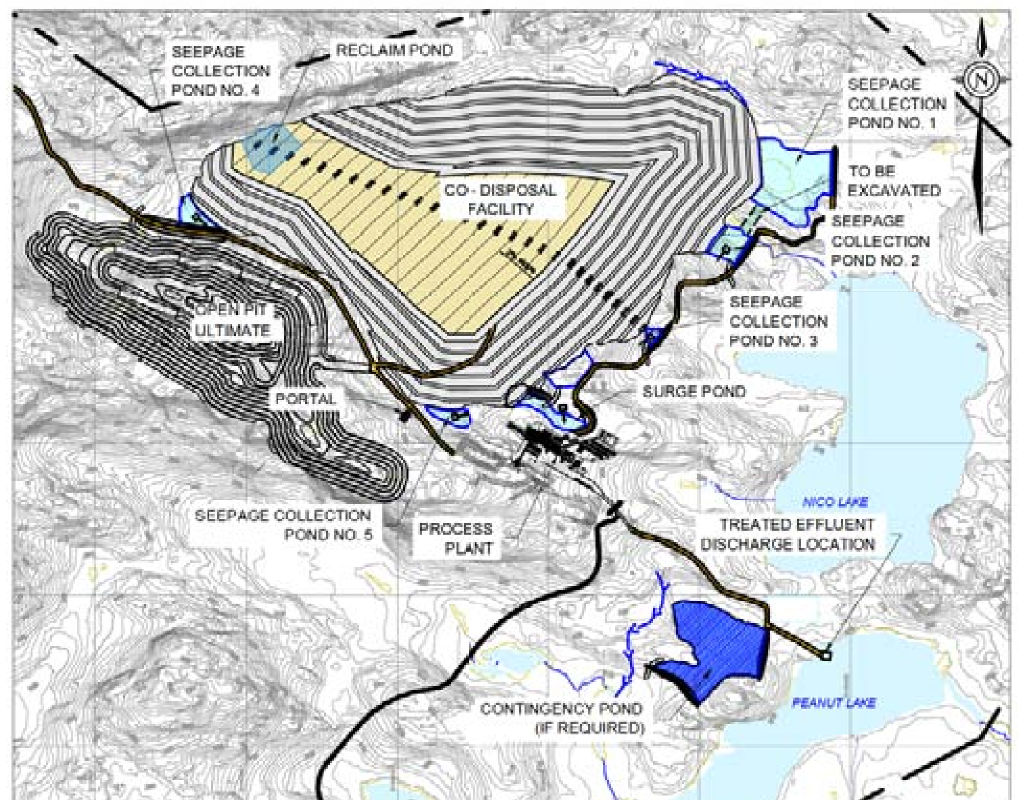

YEAR 2




YEAR 5




YEAR 10




YEAR 19

**LEGEND**

- TAILINGS DELIVERY AND DISTRIBUTION
- WATER RECLAIM LINE
- DIVERSION DITCH
- DITCH EXCAVATED
- PROJECT LEASE BOUNDARY
- AIRSTRIP / ACCESS ROAD
- EMERGENCY SPILLWAY
- SEEPAGE COLLECTION / SURGE POND
- CO-DISPOSED TAILINGS AND MINE ROCK
- PERIMETER DYKE
- CONTINGENCY POND
- WATER BODY

**NOTES:**

1. ALL ELEVATIONS (GEODETIC DATUM) AND GRID COORDINATES (UTM NAD83, ZONE 11) SHOWN IN THIS DRAWING ARE IN METRES.

**REFERENCE**

Base mapping provided in digital format by Fortune Minerals Limited received 20 February 2004.

Process plant and mine infrastructure provided by Aker Solutions filename 0000g001d (plant site oct252010).dwg provided 26 October 2010.
Revised pits provided by P & E Mining Consultants, ultimate pit and topo.dxf on 26 January 2010.

Project lease boundary provided by Fortune (8 October 2008) with comments provided 19 December 2009.

500 0 500 1000

SCALE 1:25000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**CO-DISPOSAL FACILITY DEPOSITION PLAN**

Golder Associates
Edmonton, Alberta

FILE No: E-AP3-010-CAD

| PROJECT No: 09-1373-1004 | | SCALE AS SHOWN | REV. 0 |
|---|---|---|---|
| DESIGN | KH | 10 May 2011 | FIGURE 3.II.6-2 |
| CAD | TDR | 10 May 2011 | |
| CHECK | KH | 10 May 2011 | |
| REVIEW | KAB | 10 May 2011 | |

PLOT DATE: May 13, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\-JC-\10111180046JC3II6-2.dwg

## 3.II.6.2 Co-Disposal Facility Adaptive Management

### 3.II.6.2.1 Normal Layered Co-disposal

The co-disposal concept ties disposal of Mine Rock to the disposal of tailings. The CDF operational schedule is, therefore, planned based on a consistent proportion of Mine Rock to tailings, and a Mine Rock production schedule. The Mine Rock to tailings ratio will be high in the early years of production; however, the ratio will become small in the final years of production. This trend is beneficial from geotechnical and geochemical points of view. The bottom of the CDF will be predominantly Mine Rock which will improve the stability of the facility. The top layers of the CDF will be primarily tailings resulting in the Mine Rock being covered with low permeability material that will minimize the infiltration rate and hence, the long-term seepage generation rate.

Careful planning will be required to construct the tailings disposal cells well ahead of tailings placement. One of the major factors that will affect the dimensions of the cells is the deposited beach angle of the tailings. Ideally, it would be preferable to produce non-segregating thickened tailings that easily penetrate the Mine Rock and form a 2% beach angle upon deposition. The extent to which these objectives are achieved will be assessed at the start up of co-disposal with adjustments made to the tailings thickening and/or placement procedures to improve performance.

Tailings deposition will be from discharge points located at the eastern end of the active tailings disposal cells. For the summer months, eleven discharge points will be operational. To avoid freeze-up during the winter months, the number of active discharge points will be reduced to 3, and the solids content of the tailings could also be reduced slightly. For the winter months, multiple cells will be constructed to reduce the need for changing discharge points. Space remaining in the winter cells can be filled during the following summer months. For the summer months, it may be sufficient to have only two empty tailings disposal cells available at a time; one active cell and one standby cell. Once the active cell is filled with tailings, the standby cell will become the active cell.

### 3.II.6.2.2 Contingency Plan

Contingency plans are required to allow operational flexibility and to adjust for temporary changes in the proportions of produced waste streams (tailings and Mine Rock). Contingency planning against foreseeable scenarios for mine waste disposal are described below. Scenarios include production of Mine Rock and tailings in proportions that differ from the mine plan (i.e., excess rock or excess tailings), differences in material properties of the tailings and water management.

The production of Mine Rock is defined on an annual basis in the mine plan (Table 3.II.5-1). Within a given year, the availability of Mine Rock at the CDF will vary with the blasting schedule, haul distance, number of trucks, and cycle times. Production of excess Mine Rock can be accommodated by the placement of rock to build additional tailings disposal cells to contain future tailings, by pre-building the perimeter dyke, or by the temporary stockpiling of Mine Rock at the CDF. Production shortfalls of Mine Rock can be managed by creating larger sized tailings disposal cells, or by using stockpiled Mine Rock.

Tailings will be produced at a nearly constant rate based on the Plant throughput rate. The Plant availability is estimated at about 90%, meaning that it will operate on a 24 hour per day basis for about 328 days per year. Plant equipment, including the grinding circuit, pumps, tanks, piping, and extraction circuit, all have a design rate that is not easily exceeded without major changes in infrastructure. While excess tailings production is unlikely, temporary tailings shortfalls could result from periods when the plant goes off-line, for planned maintenance, from unscheduled shut-down due to power outage, or other situations. Production of tailings at less than the design plant throughput rate can be accommodated by constructing multiple tailings disposal cells ahead of schedule that will be filled later, when tailings are again being produced.

The tailings disposal cells are sized based on the assumption that the thickened tailings will be delivered at solids content in the range of 73 to 77% and that it will form a 2% beach slope on deposition. When the plant or thickeners go off line for scheduled or unscheduled maintenance, the properties of the tailings may vary. Typically, this would involve the short term production of a tailings material that has solids content less than 73%. In the early years of operation, the basin upstream of the perimeter dyke will provide ample contingency storage for partially thickened tailings during plant commissioning and operations. The perimeter dyke can be raised as required until the upset condition is put back to the normal operation condition. During the later years of operations, multiple cells or larger tailings disposal cells can be created that will allow thin deposition of tailings.

## 3.II.7 TAILINGS DISTRIBUTION SYSTEM

### 3.II.7.1 Pumps, Pipeline, and Discharge System

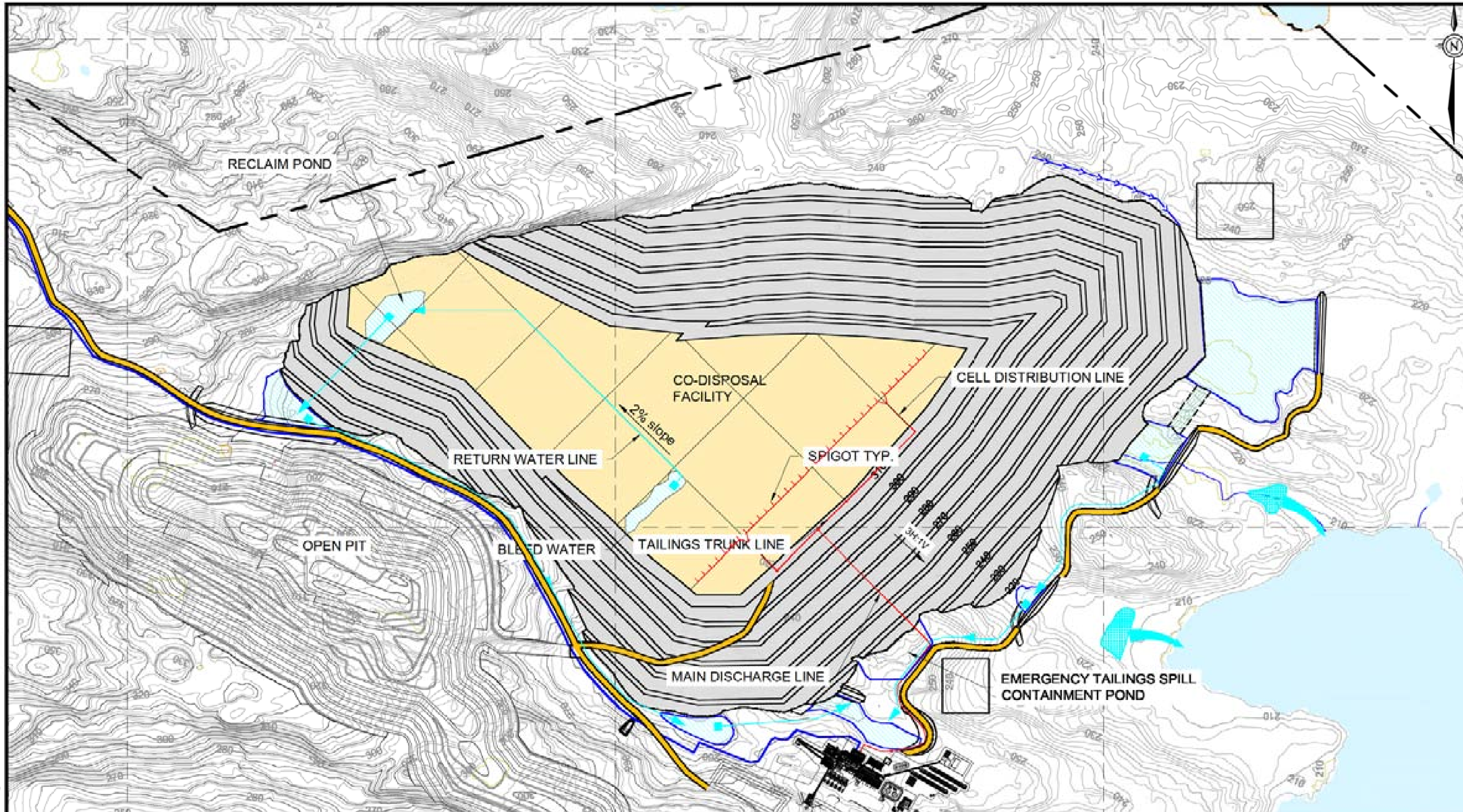
The tailings dewatering and disposal system incorporates the following major components (Figure 3.II.7-1):

- a deep bed thickener (13 m diameter) complete with a thickener feed box;
- two PD pumps (one operating, one stand-by rated at 80 Bar discharge pressure) receiving tailings thickener underflow discharge via gravity;
- a carbon steel main discharge line running from the pump discharge to the top of the perimeter dyke at the CDF. The trunk line on the crest of the perimeter dyke and all distribution lines within the CDF will be HDPE. All pipelines within the discharge system will be 200 mm in diameter;
- HDPE cell distribution lines within the CDF to the cells;
- 50 mm diameter spigot attached to 200 mm diameter headers at the upstream side of the co-disposal cells to distribute tailings within the waste rock; and
- all instrumentation and control components associated with the dewatering system (e.g. flow and density meters, pressure transducers, air actuated valves, etc.).

### 3.II.7.2 Operation and Flushing

The key components involved with the monitoring of the dewatering system's operating characteristics are:

- density and flow meters measuring the slurry density feeding the thickener;
- thickener rake drive torque sensor;
- density and flow meters measuring the thickener underflow density; and
- flow and pressure measurement instruments on the tailings discharge line downstream of the discharge of the positive displacement pump. This will include differential flow metering to detect pipeline leakage.




## PLAN VIEW OF TAILINGS DELIVERY AND DISTRIBUTION SYSTEM

500 0 500 1000

SCALE 1:25000 METRES

## LEGEND

- TAILINGS DELIVERY AND DISTRIBUTION
- WATER RECLAIM LINE
- DIVERSION DITCH
- DITCH EXCAVATED
- PROJECT LEASE BOUNDARY
- ACCESS ROAD
- EMERGENCY SPILLWAY
- SEEPAGE COLLECTION / SURGE POND
- CO-DISPOSED TAILINGS AND MINE ROCK
- PERIMETER DYKE
- WATER BODY

## NOTES:

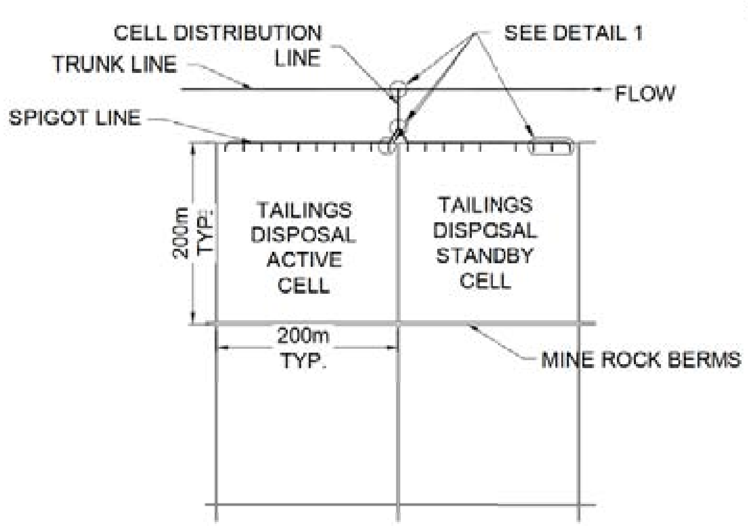
1. ALL ELEVATIONS (GEODETIC DATUM) AND GRID COORDINATES (UTM NAD83, ZONE 11) SHOWN IN THIS DRAWING ARE IN METRES.
2. SPIGOT POINTS SHOWN ARE FOR SUMMER DEPOSITION.
3. THE SPIGOT LINES (SUMMER OR WINTER) WILL BE REMOVED FOR REUSE ONCE THE CELLS ARE FILLED.
4. TRUNK LINE VALVE STATIONS TO BE ENCLOSED AND DESIGNED TO ALLOW HEATING FOR WINTER OPERATION.
5. TRUNK AND CELL DEPOSITION LINE TO BE INSULATED AND HEAT TRACED.

## REFERENCE

Base mapping provided in digital format by Fortune Minerals Limited received 20 February 2004.

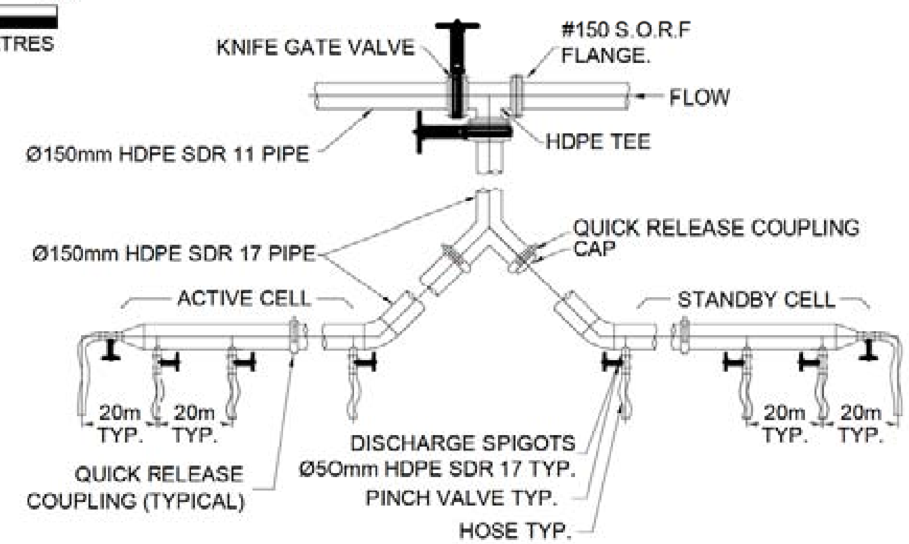
Process plant and mine infrastructure provided by Aker Solutions filename 0000g001d (plant site oct252010).dwg provided 26 October 2010. Revised pits provided by P & E Mining Consultants, ultimate pit and topo.dxf on 26 January 2010.

Project lease boundary provided by Fortune (8 October 2008) with comments provided 19 December 2009.




## TYPICAL PLAN VIEW OF SPIGOT LAYOUT

N.T.S.




## DETAIL 1 SPIGOT PIPING

N.T.S.

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**TYPICAL TAILINGS DELIVERY AND DISTRIBUTION SYSTEM**

Golder Associates
Edmonton, Alberta

FILE No: E-AP3-011-CAD

| | | | |
|---|---|---|---|
| PROJECT No: 09-1373-1004 | | SCALE AS SHOWN | REV. 0 |
| DESIGN | KH | 10 May 2011 | |
| CAD | TDR | 10 May 2011 | |
| CHECK | KH | 10 May 2011 | |
| REVIEW | KAB | 10 May 2011 | |

FIGURE 3.II.7-1

PLOT DATE: May 13, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML. NWT)\-JC-\10111180046JC3II7-1.dwg

The normal operating ranges and set points for annunciating alarms for process control variables will be established during the commissioning and start-up phase of the dewatering system and verified against the design criteria of the system's major components.

Process monitoring data will be transmitted to the Plant's central control room where abnormal operating conditions would alarm. In response, corrective action would be initiated and /or emergency systems would be activated as per the plant's operating control strategy.

Under normal operating conditions, the tailings discharged to the CDF will have non-segregating properties. That is, the tailings can remain idle in the pipeline for a period of time before experiencing excessive water bleed and consolidation. (This is unlike the characteristics of conventional slurry which bleeds water and segregates rapidly when allowed to remain at rest.)

The flushing of the discharge system can occur in 2 different circumstances, normal and emergency modes.

The starting point of the flushing system is considered to be at the discharge valve of the thickener and continuing up to the spigot discharge points in the CDF. A full clean out of the thickener is envisioned only as part of a major scheduled plant wide maintenance shutdown.

The system shutdown and flushing in either circumstance would begin with the injection of flush water into the active outlet pipe of the thickener followed by closure of the valve on the thickener outlet.

### 3.II.7.2.1 Normal Shutdown

Process water will be injected into the active pipe leading from the outlet of the thickener, flushing tailings from the active PD pump and pipeline discharging to the CDF. The PD pump's pressure will be required to effectively flush the discharge pipeline since the pressure required to move the tailings through the line is greater than that available from the process water pumps in the Plant. Water flushing of the system will continue until relatively clean water is noted at the discharge point in the CDF. Compressed air flushing of the pipeline is recommended to remove residual water from low points in the discharge line, especially during cold weather operation. Compressed air flushing would cease when only a small quantity of water is noted being discharged at the end of the pipeline. Depending on the configuration within the CDF, the residual tailings within the pipeline could be allowed to discharge into the active disposal cell until the observed solids concentration drops. This could be followed by opening a downstream discharge point to allow the remainder of the flush water to enter an area where active co-disposal is not occurring, thereby minimizing the dilution of the tailings concentration in the co-disposal cell.

### 3.II.7.2.2 Emergency Shutdown

The methods for dealing with emergency situations will be developed and the operators will be trained in their use. The central control room operator will be the first in most situations to detect deviations and alarms resulting from abnormal conditions and will be responsible for coordinating the activities of the plant personnel to fix a problem. A full description of the operator's procedures for dealing with emergency situations will be issued in the Mill Operating Manual.

In the event of a power failure, the thickener is connected to the emergency power supply and a transfer switch would be activated to supply power to keep the thickener rakes in operation, thus avoiding sanding out of the thickener. The system's design is such that one of the 2 PD pumps can be operated via the emergency back-up power supply. As with the thickener, a transfer switch would be activated to supply emergency power to the operating PD pump. At least one mill process water pump is required to be connected to the emergency power supply. All instrumentation associated with the tailings discharge system will be connected to an uninterruptible power supply and, therefore, would continue to provide operational data during a power outage. Once the pump is re-energized, water would be injected into the active discharge pipeline from the thickener leading to the active PD pump. The thickener underflow would be stopped with closure of the valve on the active outlet to the thickener. The PD pump would deliver flush water to clean out the pipeline and negate the possibility of a blockage developing.

#### 3.II.7.2.3 Prolonged System Shutdown

Once the system has been flushed clean with water, residual water will be contained within the pipeline. Depending on weather conditions and the preference of the operating personnel, an auxiliary discharge valve located upstream of the surge pond can be opened and water contained within the pipeline allowed to discharge into the emergency spill containment pond (Figure 3.II.7-1).

In the circumstance where the pipeline cannot be flushed clean with water, the valve near the emergency spill containment pond can be opened and residual tailings allowed to drain from the pipeline. The tailings within the pond would be reclaimed and transferred to the CDF right after the incident.

#### 3.II.7.2.4 Relocating Spigot Points

The operating strategy in the CDF is to have one active spigot location where co-disposal of tailings and Mine Rock is underway, as well as one spigot area on standby ready for use. Repositioning of the spigot piping to a new disposal cell will be facilitated through the use of quick disconnect couplings joining easily manageable sections of the spigot piping.

One spigot location can be changed to another by flushing the active system and then reactivating tailings delivery to the new location via valves on the trunk line. This process may be safely accomplished by drawing down the thickener bed level, initiating a flush, completing the spigot change and allowing the thickener bed level to return to steady state operating levels, before restarting the pumping system.

### 3.II.7.3 Spill Containment and Cleanup

A preliminary description of the spill management plan for the tailings thickener and the tailings delivery and distribution system is provided here.

An emergency spill containment pond will be constructed downhill from the process plant to temporarily store spills from the tailings delivery pipeline. The pond will be located north of the Surge Pond. The tailings delivery pipeline will run up the outer slope of the CDF Perimeter Dyke. Along this alignment, the pipeline will be placed on the surface within twin soil berms to provide containment for leaks and/or spills. Liner will be placed inside the twin berms and spillage will drain by gravity back to the emergency spill containment pond. The pipe will be anchored at selected intervals to prevent excessive movement due to expansion and contraction. The emergency spill containment pond will be periodically cleaned out to maintain sufficient storage capacity should another spill occur.

The tailings trunk line and the tailings distribution pipeline will be located within the co-disposal area of the CDF. Leakage from these tailings pipelines will not result in the external discharge of tailings and water and can be dealt with as an operational matter. Depending on the circumstances, it may be possible to leave the "spilled" tailings in place to be incorporated into the co-disposed mass.

Circumstances that could potentially develop, such as blockage, rupture or leakage of the pipeline resulting in a measurable difference in the flow and pressure monitoring system of the PD pumps would annunciate an alarm and allow for rapid intervention and an orderly shutdown of the pumping system.

The non-segregating and viscous nature of the tailings would limit the movement of the spilled material away from leak or pipeline rupture areas. Spilled material could, therefore, be easily reclaimed with mobile equipment and deposited back within the CDF. The thickened tailings will release relatively little bleed water, compared to dilute slurry.

## 3.II.8 CO-DISPOSAL FACILITY OPERATION AND SURVEILLANCE PLAN

An Operations, Maintenance, and Surveillance manual will be prepared for the CDF and associated water management facilities as per the Mining Association of Canada (MAC 2005) guidelines. The Operations, Maintenance, and Surveillance manual will explicitly list the responsibilities of the operators, and will state the requirements and schedule for inspections of the CDF and associated water management facilities.

After closure, physical inspections of the closed CDF and associated water management facilities will continue on a regular basis. The schedule and program for the post-closure physical inspections are set out in the Closure and Reclamation Plan.

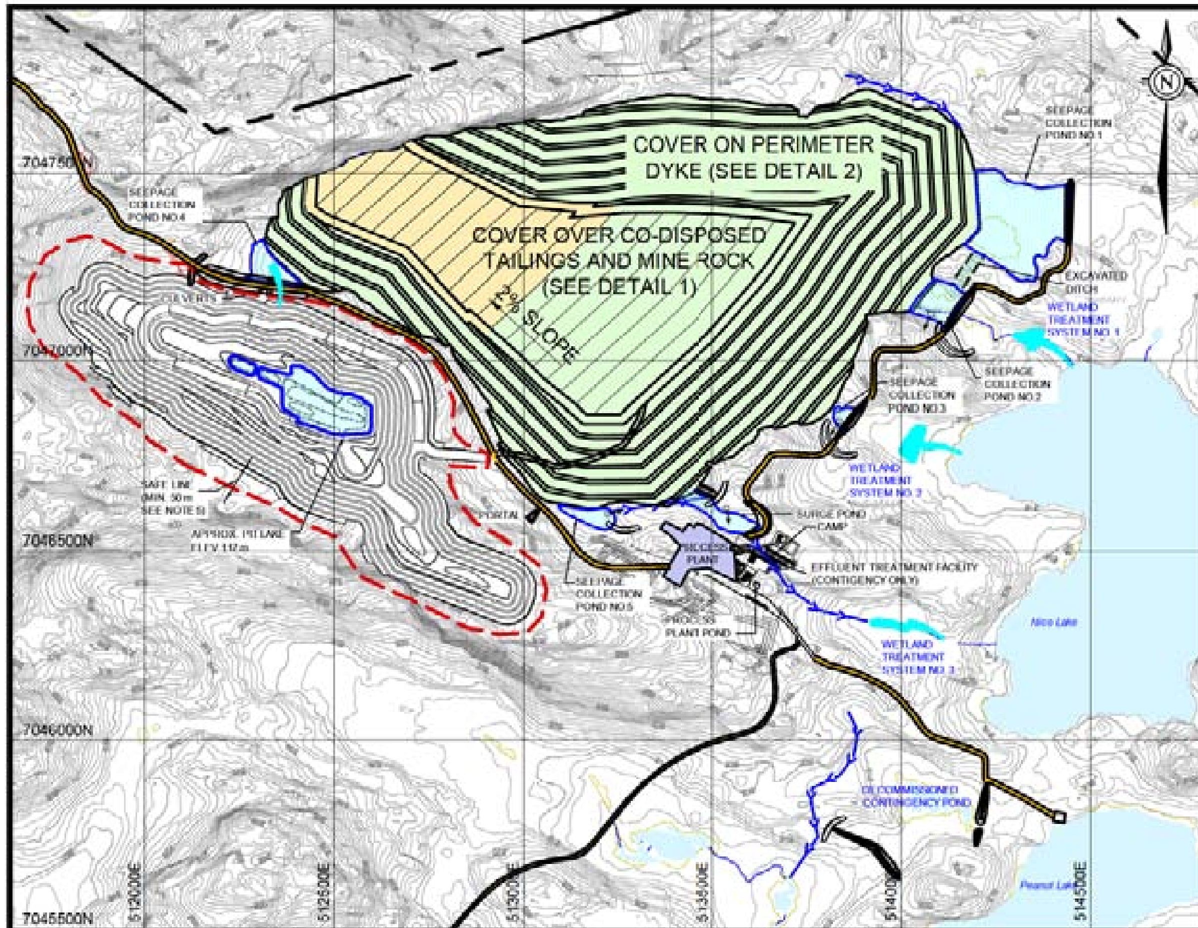
Whenever the inspections indicate that it is necessary, maintenance or corrective measures will be scheduled and implemented.

## 3.II.9 CO-DISPOSAL FACILITY CLOSURE AND REHABILITATION PLAN

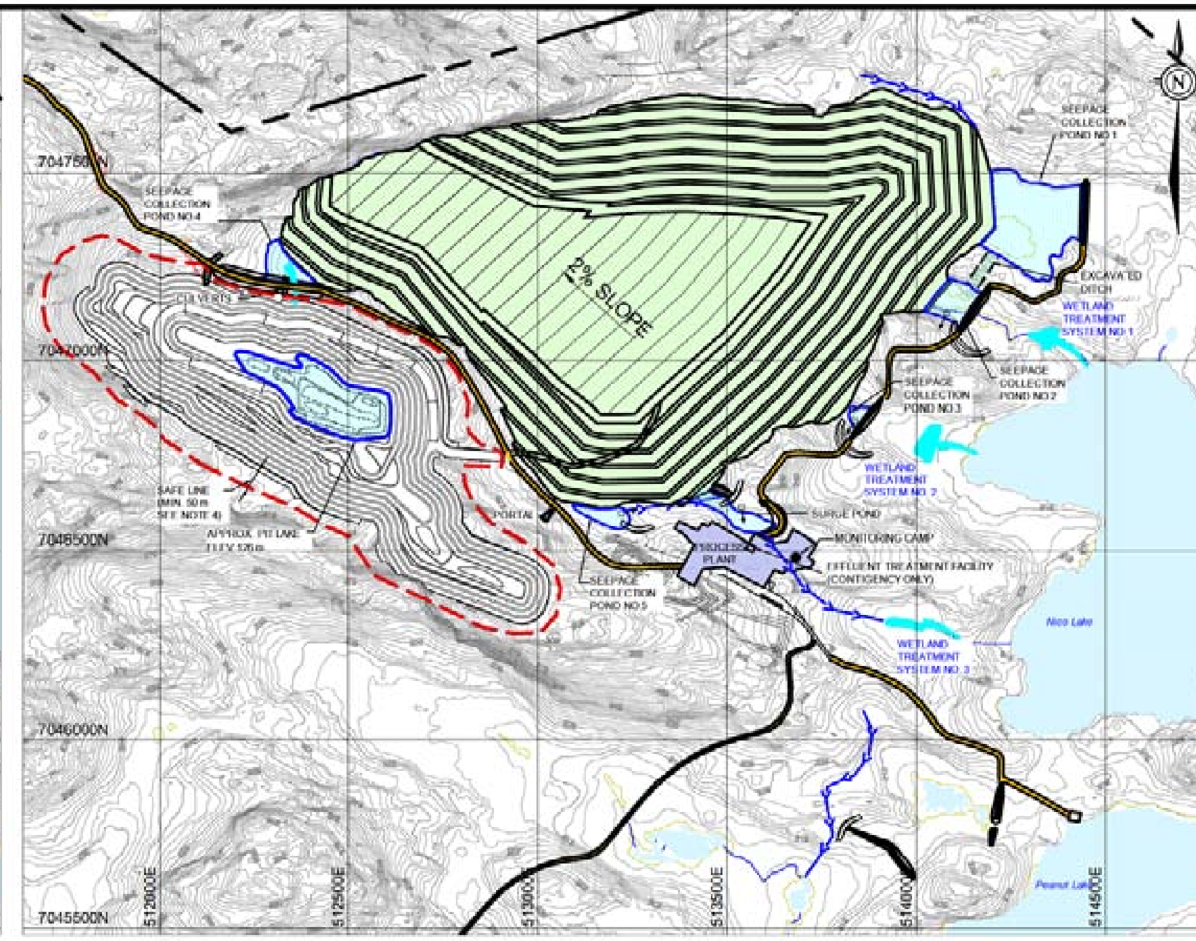
Sections 3 and 9 provide a detailed description of the Closure and Rehabilitation Plan for the NICO Project. Closure and reclamation of the CDF will be progressive and will begin during the operating life of the mine. Most of the active closure measures in the CDF will be completed within 2 years after operations cease. This period will be followed by post-closure monitoring and maintenance, which will extend 10 years after mine closure (Figure 3.II.9-1). The need for monitoring beyond 10 years after closure will be decided based on the results of the monitoring up to that time.

The closure and reclamation plan for the CDF includes the following:

- Progressive grading of the CDF during operations to promote runoff into the open pit after closure;
- Progressive placement of the closure cover over the perimeter dyke during operations;
- Placement and vegetation of closure covers over the top surface of the CDF;
- Drainage of runoff water from the surface of the CDF into the open pit to increase the rate of pit filling (i.e., flooded open pit formation); and
- Collection and management of water that seeps out of the toe of the CDF.



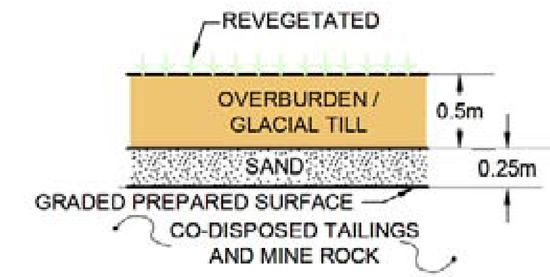

CLOSURE YEAR 1



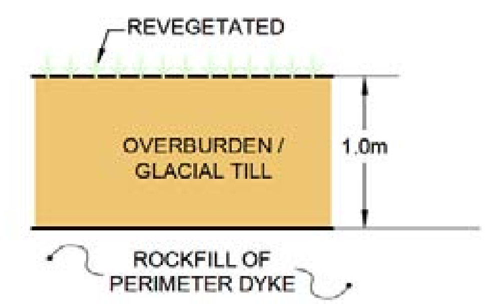

CLOSURE YEAR 2

**LEGEND**

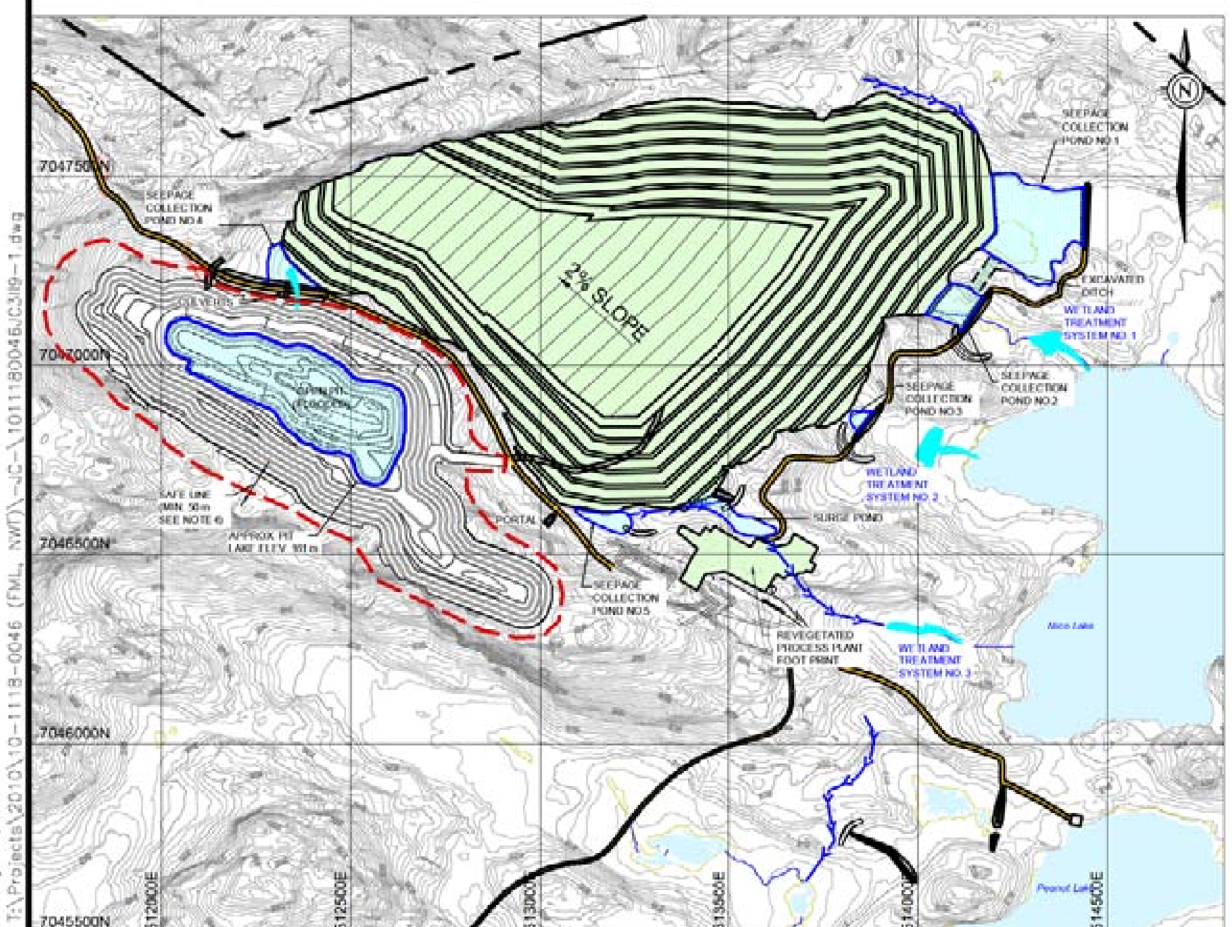
- PUMP STATION (CONTINGENCY ONLY)
- BOULDER WALL
- DIVERSION DITCH
- PROJECT LEASE BOUNDARY
- ACCESS ROAD
- SEEPAGE COLLECTION POND DAM
- EMERGENCY SPILLWAY
- CO-DISPOSED TAILINGS AND MINE ROCK
- CONSTRUCTED WETLAND TREATMENT SYSTEM
- DEMOLISHED AND REVEGETATED PROCESS PLANT
- RE-VEGETATED COVER OVER CDF
- WATER BODY




DETAIL 1




DETAIL 2




CLOSURE YEAR 10

**NOTES:**

1. ALL ELEVATIONS (GEODETIC DATUM) AND GRID COORDINATES (UTM NAD83, ZONE 11) SHOWN IN THIS DRAWING ARE IN METRES.
2. WATER THAT ACCUMULATES IN SEEPAGE COLLECTION PONDS NO.1, 2, 3, AND 5 AND THE SURGE POND WILL BE PASSIVELY TREATED IN WETLAND TREATMENT SYSTEMS AND RELEASED DIRECTLY TO NICO LAKE.
3. SEE SECTION 9.4.1.2 OF THE DEVELOPERS ASSESSMENT REPORT FOR WATER TREATMENT ADAPTIVE MANAGEMENT RESPONSES IN CASE WETLAND TREATMENT SYSTEM DOES NOT OPERATE AS PLANNED.
4. A BOULDER WALL WILL BE CONSTRUCTED AROUND THE OPEN PIT FOR SAFETY REASONS (TO PREVENT INADVERTENT HUMAN ACCESS) A MINIMUM SAFE LINE OF 50 m HAS BEEN ASSUMED, THIS WILL BE CONFIRMED IN THE OPEN PIT STABILITY AND SET-BACK STUDY TO BE CARRIED OUT BY THE END OF THE MINE LIFE OPERATION.

**REFERENCE**

Base mapping provided in digital format by Fortune Minerals Limited received 20 February 2004.

Process plant and mine infrastructure provided by Aker Solutions filename 0000g001d (plant site oct252010).dwg provided 26 October 2010.
Revised pits provided by P & E Mining Consultants, ultimate pit and topo.dxf on 26 January 2010.

Project lease boundary provided by Fortune (8 October 2008) with comments provided 19 December 2009.

400 0 400
SCALE 1:20000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

**CLOSURE PLAN**

Golder Associates
Edmonton, Alberta

FILE No: E-AP3-012-CAD

| PROJECT No. 09-1373-1004 | | | SCALE AS SHOWN | REV. 0 |
|---|---|---|---|---|
| DESIGN | KH | 10 May 2011 | FIGURE 3.II.9-1 | |
| CAD | TDR | 10 May 2011 | | |
| CHECK | KH | 10 May 2011 | | |
| REVIEW | KAB | 10 May 2011 | | |

PLOT DATE: May 13, 2011
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