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FIGURES

3.0 PROJECT DESCRIPTION

3.1 Introduction

3.1.1 Context

The Project Description of the Developer's Assessment Report (DAR) for the Fortune Minerals Limited (Fortune) NICO Cobalt-Gold-Bismuth-Copper Project (NICO Project) describes the NICO Project as it is proposed by Fortune. Sections 1 and 2 of the DAR provide supporting information to this section. A brief overview of the NICO Project is provided in Section 1.2 of the DAR, and the alternatives considered are described in Section 2. The impact assessment, presented as key lines of inquiry (KLOI) and subjects of note (SON) in accordance with the Terms of Reference (TOR) for the DAR (Sections 7 to 18), assesses the effects from the NICO Project, as described in this section, on components of the biophysical and socio-economic environments.

3.1.2 Purpose and Scope

The purpose of the Project Description is to meet the TOR for the NICO Project released by the Mackenzie Valley Review Board (MVRB) on 30 November 2009 (Appendix 1.I [MVRB 2009]), by providing details of all works and activities throughout construction, operation, closure and reclamation, and long-term monitoring phases.

Section 3 is intended to be the stand alone document providing sufficient information on the NICO Project Description for the TOR. The facility design, construction methods, and operating practices described in Section 3 are based on engineering studies including the Front End Engineering Design (FEED) for the Mineral Process Plant (the Plant), electrical distribution, fuel storage, truck shop, and other services (Golder 2010a). The Plant description is augmented by a detailed Mine Plan and a conceptual plan for a tailings and Mine Rock Co-Disposal Facility (CDF). Final designs, construction methods, and operating practices will be developed during the final engineering stage, and will benefit from feedback obtained through the DAR process. However, the designs, construction methods, and operating practices described herein are considered sufficient to assess potential effects and classify and determine the significance of impacts from the NICO Project on the environment. Changes to the NICO Project Description resulting from ongoing engagement and engineering optimization are expected to maintain or enhance environmental performance.

The scope of the development described in this section is defined as a mine site with Open Pit and underground mine operations, including processing facilities, tailings and Mine Rock storage areas, accommodations, waste management facilities, access roads to the property and within the property. Additional NICO Project components include a water intake pipeline, a bridge over the Marian River, an Airstrip, and site electric distribution corridors.

An initial NICO Project scope was presented in an Application Report as part of the Water License Application to the Wek'èezhìi Land and Water Board (Fortune 2007 a, b, and c). This DAR includes alternatives and any other changes to the proposed NICO Project since the 2007 submission.

3.1.3 Content

Section 3 provides a comprehensive description of the NICO Project as it is currently proposed. This description is organized according to the following topics:

- NICO Project overview;

- NICO Project schedule;
- NICO deposit;
- open pit and underground mining;
- ore processing;
- characterization of waste streams from processing;
- mine waste management, including Mine Rock, tailings and solid wastes;
- water management throughout the NICO Project, including tailings area and effluent treatment;
- site infrastructure that will be required, proposed access roads, and site electrical distribution;
- Airstrip construction;
- human resources that will be required for the NICO Project; and
- closure and reclamation of the site.

3.2 NICO Project Overview

The NICO Project is Cobalt-Gold-Bismuth-Copper mine that includes:

- an Open Pit and underground mine;
- processing facilities, which include crushing, grinding, flotation, and service components;
- a Mine Rock and tailings management area (CDF);
- Effluent Treatment Facility (ETF);
- Camp and Truck Shop; and
- site services infrastructure such as water lines, electrical distribution, site roads, power plant, sewage treatment, incinerator, and material sorting facilities (Figure 3.2-1).

The CDF will be placed in a single basin and will allow for more efficient management of tailings and Mine Rock and the water that comes into contact with these materials. The CDF was also located and designed as to not be visible from Hislop Lake and the Marian River. The NICO Project will re-cycle a substantial portion of the water that comes into contact with the mine thus reducing the need for large-scale water treatment and effluent discharges to the environment. Water and sewage treatment facilities will treat water prior to any discharges to the environment. Effluent volumes will be in the range of 320 to 800 cubic metres per day (m^3/day).

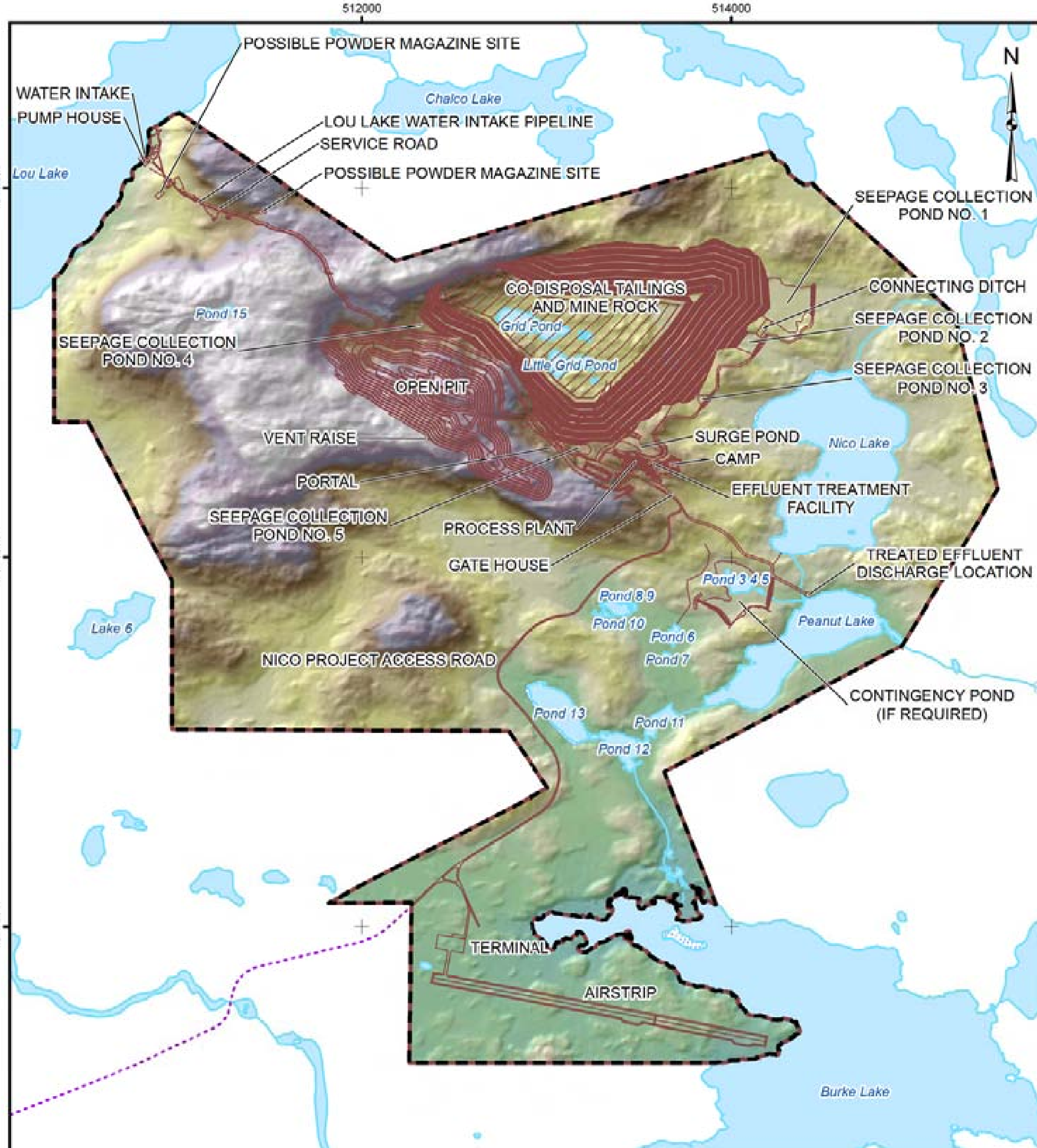
The mine will process ore at a rate of 4650 metric tonnes (t)/day for 18 years. The Plant is expected to produce 180 t of bulk concentrate per day for a total of 65 000 t/year for shipment via truck/rail to a processing facility in Saskatchewan. Elimination of concentrate processing substantially reduces the amount of chemicals, including cyanide, required to be shipped to and used at the NICO Project.

Over the 18-year operational life of mine, the mine will be in operation 24 hours a day, 365 days a year. The number of jobs will be reduced substantially by the end of Year 2, as the underground mining will be completed after 2 years into operations. The main workforce rotation will consist of 4 crews working a staggered 12-hour shift, in a 2 weeks on and 2 weeks off rotation, or some variation that provides continuous coverage.

The NICO Project includes the all-season transportation corridor into the NICO Project, via the NICO Project Access Road (NPAR), and use of the proposed Tłįchǫ Road Route to be built by others. As the final route of the proposed Tłįchǫ Road Route was unknown at the time of submission, Fortune has assumed that the start of the NPAR would be located approximately 19 kilometres (km) north along the proposed and recommended 146.6 km routing referred to as alignment D (the former Lupin Mine winter road alignment from the community of Whatì) (KAVIK-AXYS Inc. 2008). Access to Highway 3 would be via the NPAR to the proposed Tłįchǫ Road Route (Figure 3.2-2). Fortune recognizes that the route is subject to changes in alignment as knowledge from the Tłįchǫ Land Use planning process will be incorporated into the final designs.

The NPAR has been designed as a 6 metre (m) wide gravel-surfaced road, mostly constructed by fill, which widens to approximately 8 m at corners to allow for B-train transport trucks to pass each other. The anticipated freight haulage will consist of approximately 5 truckloads per day to transport concentrate, as well as 4 truckloads per day of diesel fuel, along with miscellaneous use for the purposes of employee transport and weekly transport of site consumables such as food.

The NICO Project requires year round access and proposes to use the proposed all-season Tłįchǫ Road Route during operations. During construction of the NPAR, for mobilization of construction equipment and supplies, the NICO Project will require use of the Whatì and Gamètì portions of the current Northwest Territory winter road network, and/or the intermediate component of an extended season winter road, referred to as the Seasonal Overland Road to the same communities. The Seasonal Overland Road would be the first phase of the Tłįchǫ Road Route, along the same route but built as an overland winter road that would be upgraded to all-season status if the Northwest Territories Department of Transportation (DOT) were to proceed with their plans to build the Tłįchǫ Road Route.



LEGEND

- PROJECT LEASE BOUNDARY
- PROPOSED NICO MINE SITE
- PROPOSED NICO PROJECT ACCESS ROAD
- WATERCOURSE
- WATERBODY
- WETLAND

1 0 1

SCALE 1:30,000 KILOMETRES

REFERENCE

Base data obtained from GeoGratis.
Projection: UTM Zone 11 Datum: NAD 83

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

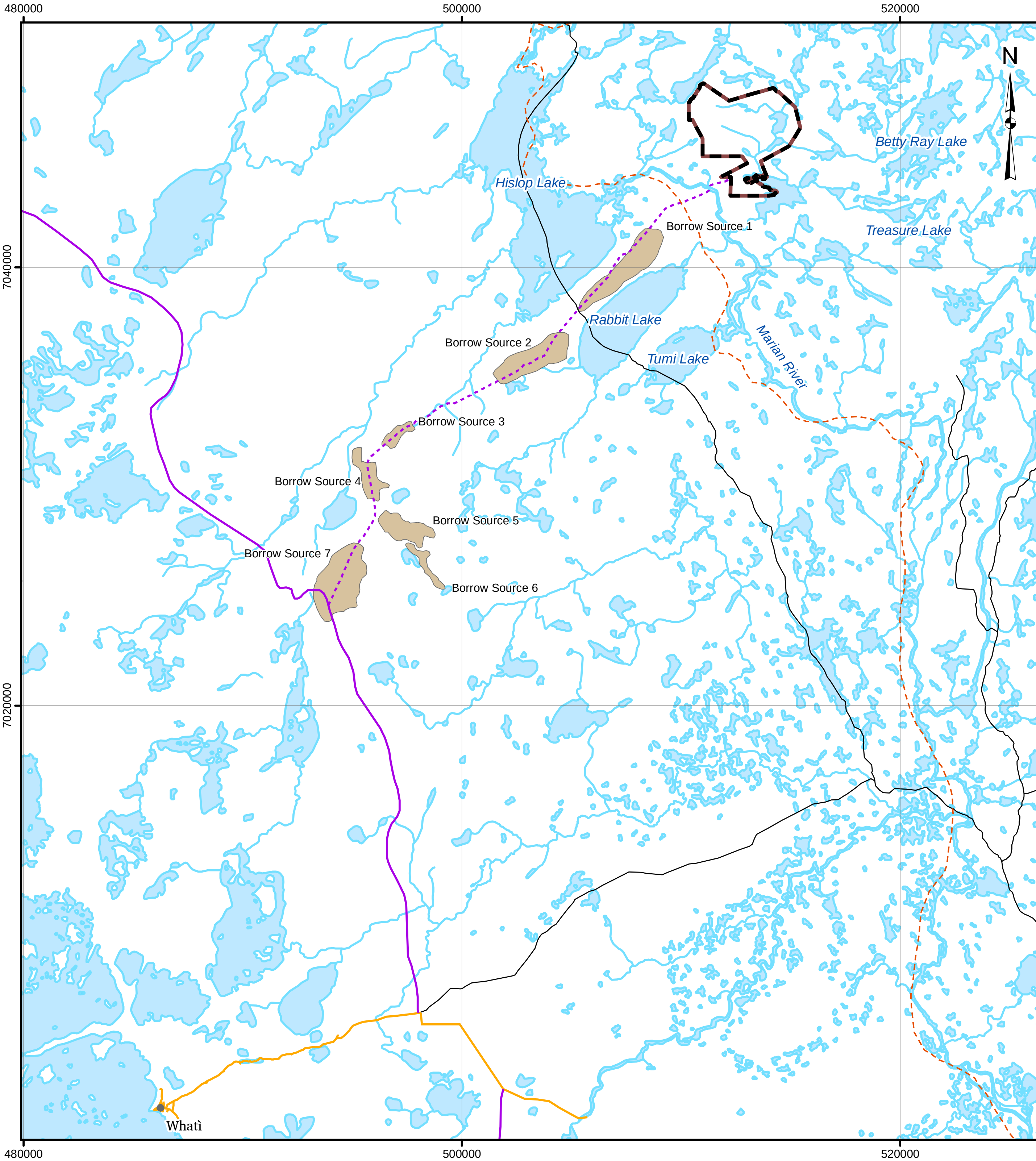
TITLE

PROPOSED SITE DEVELOPMENT FOR THE NICO PROJECT

Golder Associates
Edmonton, Alberta

File No. E-Section1-003-GIS			
PROJECT No. 09-1373-1004		SCALE AS SHOWN	REV. 0
DESIGN	JG	17 Jan. 2011	
GIS	BS	02 May 2011	
CHECK	JG	02 May 2011	
REVIEW	LY	02 May 2011	

FIGURE: 3.2-1



LEGEND

- PROJECT LEASE BOUNDARY
- POPULATED PLACE
- EXISTING ALL-WEATHER ROAD
- EXISTING WINTER ROAD
- PROPOSED NICO PROJECT ACCESS ROAD
- PROPOSED TŁĮCHO ROAD ROUTE
- WATERCOURSE
- WATERBODY
- ĮDAÀ TRAIL
- POTENTIAL BORROW AREA

5 0 5

SCALE 1:250,000 KILOMETRES

REFERENCE

Base data obtained from Atlas of Canada, DMTI, and GeoGratis.
Projection: UTM Zone 11 Datum: NAD 83

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE
PROPOSED **TŁĮCHO** ROAD ROUTE AND THE NICO PROJECT ACCESS ROAD

Golder Associates
Edmonton, Alberta

FILE No. E-Archy-001-GIS				
PROJECT No. 09-1373-1004			SCALE AS SHOWN	REV. 0
DESIGN	MT	15 Feb. 2011	FIGURE: 3.2-2	
GIS	BF	23 Feb. 2011		
CHECK	JG	13 May. 2011		
REVIEW	JG	13 May. 2011		

I:\CLIENTS\FORTUNE_MINERALS\08-1373-0017\Mapping\MXD\ProjectDescription\E-PD-015-GIS.mxd

3.2.1 NICO Project Visual Model

As stated in the TOR, the developer is strongly encouraged to visually represent the NICO Project and its surroundings using a 3-dimensional (3-D) landscape model to indicate scale, setting, and direct footprint (MVRB 2009). Fortune has built 2 detailed and precise 3-D models for use in community engagement and review of the NICO Project design with regulatory authorities. The first model focuses on the NICO Project footprint and can be modified to show pre-development, the end of operations, and closure scenarios. The second model is at a larger scale and shows the NICO Project in relation to Hislop Lake, the Marian River, and the Įdaà Trail. These models were presented to the elders during the 2010 site tours and will be made available for viewing in Yellowknife and in the communities during the DAR review period.

The TOR also asks for a plan view of the site and an illustration of visual impacts on the viewshed as seen from Marian River, Hislop Lake, and other points along the Įdaà Trail (MVRB 2009). Fortune used the 3-D models and actual photographs from the points of interest listed in the TOR to illustrate how there will be minimal visual impact due to the NICO Project. As outlined above in Section 3.2, the CDF (largest and highest single structure associated with the mine) was specifically built to be lower than the surrounding terrain and subsequently not visible from Hislop Lake or the Marian River. The remainder of the NICO Project will also be lower than the surrounding hills. However, the bridge across the Marian River, which will be part of the NPAR will be visible from the Marian River at close range.

Photographs 3.2-1 to 3.2-4 visually show the NICO Project from various perspectives. Photograph 3.2-1 was purposely taken in winter so that deciduous trees would not be obstructing the view. From this location, the hills where the NICO Project is located are barely visible due to the distance and the coniferous trees blocking the view. The NICO Project would not be visible from this location because of the hills between Hislop Lake and the NICO Project site. Photograph 3.2-2 was purposely taken in winter so that deciduous trees would not be obstructing the view. From this location, the hills block the view of the NICO Project. Photographs 3.2-3 and 3.2-4 use the 3-D model described above. All components of the NICO Project are in the 3-D model. The photograph represents an elevated view from Hislop Lake towards the NICO Project site. Photograph 3.2-4 is a view from a position on the Marian River/Įdaà Trail downstream of the confluence of Burke Creek and the Marian River (facing north) using the 3-D model described above. The photo represents an elevated view from the Marian River towards the NICO Project site. From this artificially elevated location, only the top of the CDF is visible. At the level of the Marian River, it is unlikely the CDF would be visible.

Photo 3.2-1: Taken from the north end of Hislop Lake towards the NICO Project site (facing east northeast) from the ice road.

Photo 3.2-2: Taken from the south end of Hislop Lake towards the NICO Project site (facing east southeast) from the ice road.

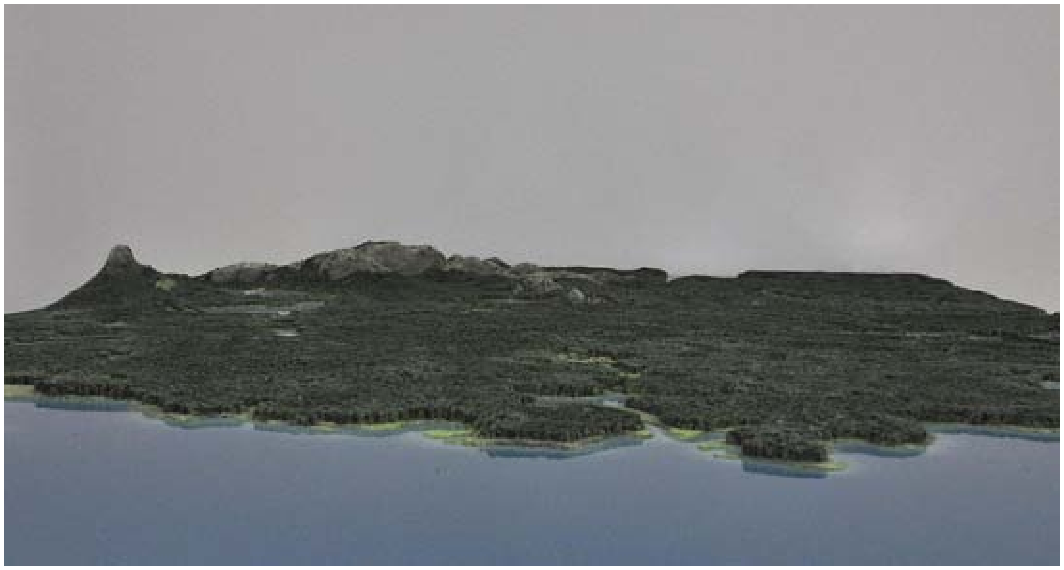


Photo 3.2-3: NICO Project as seen from the centre of Hislop Lake with artificial elevation. Photograph is looking east from Hislop Lake.

Photo 3.2-4: NICO Project as seen from an artificially elevated position above the Marian River/Įdaà Trail. Photograph is looking north from the Marian River.

3.3 NICO Project Schedule

Once Fortune has obtained the necessary environmental assessment approval, permits, and licences, construction will take approximately 12 to 18 months to complete (Table 3.3-1). The commissioning of the Plant is subject to permitting, financing, and an agreement with the Tłįchǫ for use of the Tłįchǫ Road Route, as well as an agreement to access and construct the NPAR. The construction period will be followed by an 18 year operational period during which ore will be mined and processed. Closure will occur within 2 years following the end of operations. Most of the site infrastructure will be removed during that time. The final closure condition will not be reached until approximately 120 years after closure, which is the time required for the Open Pit to fill with water and begin a small discharge

For the purposes of this submission, the schedule does not have a start date. Fortune will not initiate construction of the NICO Project until it receives confirmation that the Tłįchǫ Road Route will be built and a schedule for construction has been prepared.

Table 3.3-1: Overview of the NICO Project Timelines and General Activities

Schedule	Phase	General Activity
-1.5 to -1	Construction	Building of NICO Project Access Road
-1.5 to 0	Construction	Site Preparation
-1 to 0	Construction	Building CDF
-1 to 0	Construction	open pit mining of 1.3 Mt of Rock for CDF construction
-1 to 0	Construction	Building Site Infrastructure, including Plant
-1 to 2	Operation	Underground mining
0	Plant Commissioning	Start-up of Plant Operations
0 to 18	Operation	open pit mining
1 to 18	Closure and Reclamation	Progressive reclamation of the CDF
19 to 20	Closure and Reclamation	Interim closure and removal of most site infrastructure
19+	Closure and Reclamation	Natural filling of the Open Pit starts

CDF = Co-Disposal Facility; Mt = million tonnes

3.3.1.1 Construction

The construction of the NPAR and the site infrastructure would occur concurrently. Site construction would begin in the autumn of the year that Fortune receives its Water License, assuming that construction of the proposed all-season Tłįchǫ Road Route is approved around the same time; or delayed until there is a firm commitment for construction of the all-season road by the Tłįchǫ and/or the DOT. Therefore, for much of the site construction period, it is assumed that the proposed Tłįchǫ Road Route would be constructed at the same time as the NICO Project.

Initial site preparation would be completed for the Plant, Truck Shop, Camp, and fuel storage areas to allow for delivery of large modules by the existing winter road using equipment available from the exploration program. The initial year of site construction would be facilitated by the mobilization of building supplies and equipment across the NWT and existing Whatì and Gamètì winter roads. In this situation, the initial pre-mobilization work would include site preparation to facilitate the construction of an Airstrip that would be used during construction. The initial ice road mobilization would prioritize delivery of modular camp components, service and fuel modules, as well as building materials to facilitate the construction of foundations, major physical equipment components such as tanks, as well as building structural steel, walls and roofing.

This schedule would be facilitated by the presence of the interim seasonal overland road, made possible by the construction completed towards the all-season Tłįchǫ Road Route. The seasonal overland route would be an interim transportation corridor built along the Tłįchǫ Road Route, which would allow for the transport of equipment following freeze-up; utilizing bridges constructed over open water during the first year of construction (particularly a bridge over Rivière La Martre) and along the new alignment that bypasses numerous lakes (particularly Marian Lake) and marshy areas. The seasonal overland road will likely be in operation for a longer period of time than the existing winter road that traverses several lakes and thus would allow for a longer mobilization period. The seasonal overland route would need to be available from November through May subsequent to the year that Tłı̨chǫ Road Route construction starts.

A large amount of equipment, consumables, and reagents will need to be stored on-site for a period of 6 to 8 months, depending on winter road access. Construction of a minimum 1067 m runway, to serve as an Airstrip for the transportation of construction personnel and supplies will be required when there is no road access to the mine. Concurrent NPAR and infrastructure construction will require a large amount of temporary fuel storage onsite. Fortune estimates that the construction of a 3 million litre (L) temporary fuel storage site with containment, in addition to the proposed 2 million L permanent storage facility at the Camp site will be needed to support construction. Following construction, the temporary tanks may be removed. The mine start-up would occur upon completion of the all-season Tłı̨chǫ Road Route.

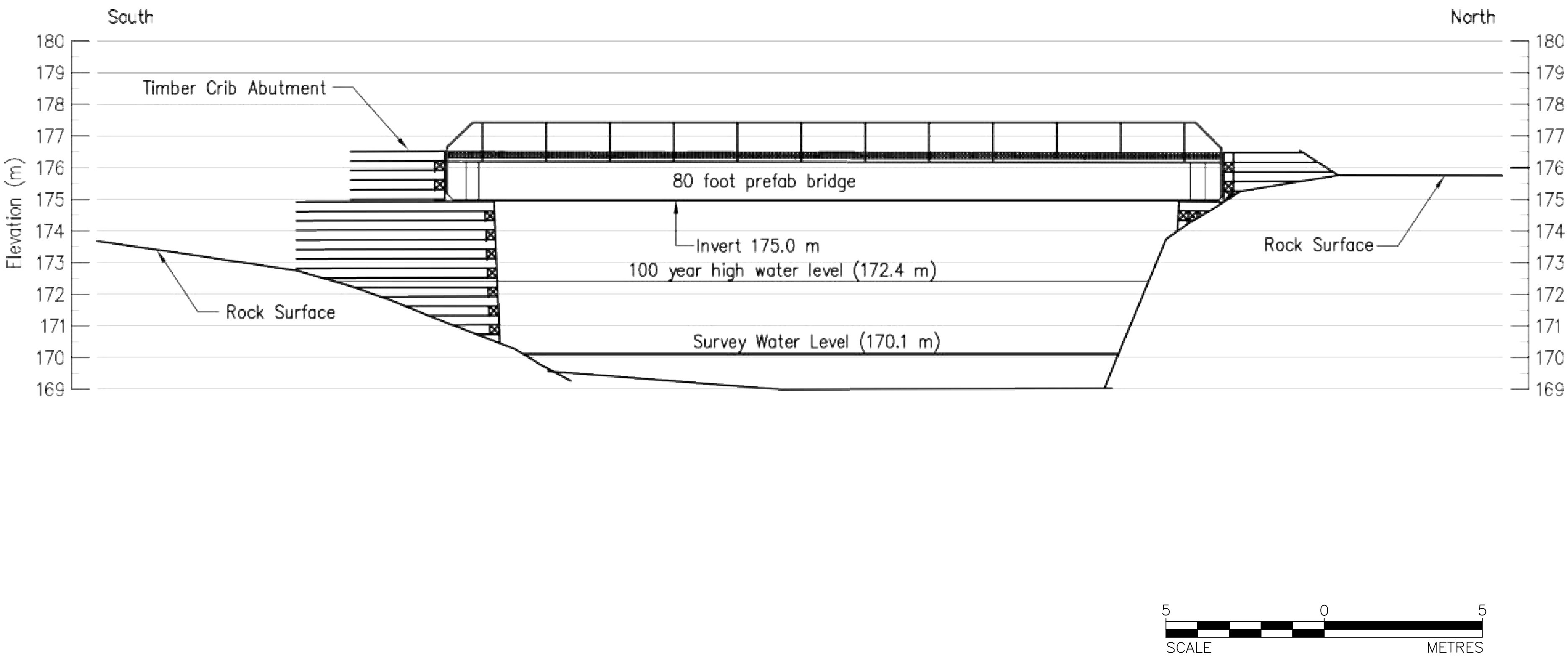
3.3.1.2 NICO Project Access Road

During construction of the 27 km long NPAR, the NICO Project will require use of the Whatì and Gamètì portions of the existing NWT winter road network and/or the proposed interim seasonal overland component of Tłı̨chǫ Road Route, for mobilization of construction equipment and supplies.

The proposed design route crosses many minor diffuse drainage paths, usually topographic lows, and most are dry for most of the year (Figure 3.2-2). At a minimum 600 millimetres (mm) culverts will be installed along these drainage paths, and sediment control structures will be installed to prevent the mobilization of sediment from the erosion of disturbed areas. These structures will be inspected and maintained following construction until revegetation of disturbed areas can be completed. There are 5 minor water crossing proposed along the route that will make use of larger 800 mm culverts, one major crossing at the Marian River that will use a girder-type bridge structure, and an additional 60 ephemeral topographic lows that the route will cross.

The eastern flank of the road will be constructed using the existing NICO Project exploration camp. The road will be developed to the Marian River during the winter, using the borrow sources located north of Ponds 8, 9, 10, as well as the area west of Ponds 12 and 13 to augment the fill requirement that cannot be met through cut and fill construction methods.

To minimize disturbance of the Marian River through the generation of sediments, it is proposed that the installation of the 80 metric tonne capacity Marian River Bridge be completed during the winter. The bridge will be modular and prefabricated and consist of a design similar to that shown in Figure 3.3-1 (EBA 2007).



FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

MARIAN RIVER BRIDGE ELEVATION VIEW

Golder Associates
Edmonton, Alberta

PROJECT 09.1373.1004.9000			FILE No. E-PD-013-CAD
DESIGN	CW	10/05/05	SCALE AS SHOWN REV. 0
CADD	GMF	11/05/11	FIGURE: 3.3-1
CHECK	JG	12/05/11	
REVIEW	JG	12/05/11	

REFERENCE

DRAWING OBTAINED AS A PDF. ORIGINAL DRAWING PRODUCED BY EBA ENGINEERING CONSULTANTS LTD. FILE No. 1700127005Figure3.dwg. DATED FEB. 6, 2007

3.3.1.3 Site Infrastructure

The construction of the site infrastructure will be scheduled so that the Plant is ready to receive ore when both the underground and Open Pit development has reached a stage that will support continuous operation. It is anticipated that construction of the site infrastructure will begin once the NPAR is complete.

3.3.1.3.1 Early Construction

Early construction supported by the existing exploration camp at the NICO Project, will focus on providing the requirements needed to support a larger construction crew. Use of this camp will eliminate the need for the construction of a new initial camp. To limit camp numbers, site preparation will likely follow only on substantial completion of the NPAR.

Therefore, once the NPAR has reached a suitable level of completion, the permanent Camp will be the immediate priority to allow for greater number of construction employees onto the site. Early work that will be supported by use of the existing exploration camp, or temporary accommodations in the community of Whatì, when the winter road is operational, will include:

- NPAR construction and maintenance;
- site preparation, including cut and fills required at the Camp site;
- site roads;
- Airstrip ;
- temporary mobile crushing plant and concrete batch plant;
- permanent Camp and kitchen;
- Lou Lake fresh water treatment module, water pipeline, and electrical distribution;
- potable water treatment module;
- modular Sewage Treatment Plant (STP); and
- back-up camp power supply, and back-up camp heating boiler.

To produce concrete, Fortune will temporarily install a concrete batch plant following the completion of the NPAR. After construction, the batch plant will be removed from the site.

To produce aggregate for the batch plant Fortune will mobilize a mobile jaw crusher, cone crusher, and screening plant. Following construction, the mobile cone crusher and screening plant will be demobilized. The mobile jaw crusher will be purchased and used for perimeter dyke construction at the CDF on an annual basis.

3.3.1.3.2 Construction Camp

The Plant and mining infrastructure will be constructed once the construction Camp and the related services are completed.

The construction Camp will consist of the same buildings and orientation as shown by the permanent Camp. This Camp will have the capacity to house 231 construction personnel. The Camp design has allowed for the current exploration camp to be moved to the permanent site to allow for reuse of the structure as overflow accommodation. This would allow for up to 278 construction personnel to be based at the mine site, if necessary. The need for additional construction personnel will be dictated by the progress of NPAR construction.

Because the electrical distribution system (and the individual generator units) will be too large to support interim use during the construction period, the back-up camp power plant and boiler (modules located at the site service complex/truck shop) will be used to provide camp heating and electricity during the construction period:

The remaining construction activities are listed below in order of priority:

- permanent fuel storage;
- Materials Sorting Facility;
- Recreational Facility;
- truck shop (including offices);
- Dry and Assay Laboratory;
- Mineral Process Plant building shells including all foundation work, structural construction, interior cranes, and the placement of the major equipment pieces and large bins;
- Effluent Treatment Facility;
- placement of small process and service equipment within the Plant;
- completion of electrical and instrumentation, telecommunications, mechanical piping, HVAC systems within the Plant; and
- commissioning of the Plant.

3.3.1.4 Mine Rock and Tailings Co-Disposal Facility

The majority of the CDF would require construction in the summer prior to start-up of the Plant. Construction of the CDF perimeter dykes is required to take place during the construction phase and prior to Mine Rock placement and the production of tailings during the commissioning of the Plant.

Because of the need for construction of water containment dykes and the starter perimeter dyke prior to commissioning, some limited open pit mining and borrow sources will occur to generate Type 1 Mine Rock (Appendix 3.I) for use in construction. This Mine Rock may also be used for plant site fill and site roads. These activities may need to be augmented by the storage of some ore and minor amounts of Mine Rock to allow for the generation of the required construction materials. The generation of Mine Rock suitable for construction purposes from the Open Pit will be optimized using mine modelling. Storage of limited amounts of ore or Mine Rock outside of containment is warranted based on the storage of approximately 60 000 t of ore generated during bulk sampling in 2006 and 2007.

On completion of the CDF, the balance of pre-production mining of the Open Pit will commence approximately 3 months before Plant start-up. Due to the need to dewater the underground operation, underground dewatering activities will commence approximately 6 months before the commissioning. It follows that Fortune anticipates that the water collected from underground dewatering will not initially require treatment and can be discharged. This assumption is merited due to the results of ongoing monitoring.

It is anticipated that the CDF components would be constructed in the summer season prior to start-up, and would be augmented by pre-production mining of Mine Rock in the Open Pit and other borrow pits as required. Construction of the CDF would include the following components:

- tree and brush removal;
- site preparation;
- installation of temporary sediment control structure;
- internal temporary retention dams for the Grid Ponds (as required);
- seepage collection dams 1 to 3 that are water retaining structures at the CDF;
- Surge Pond;
- Seepage Collection Ponds (SCPs) No. 1 to 3, and Surge Pond solution collection piping, for return of water to the ETF;
- perimeter dyke of the CDF; and
- vegetation established on impacted areas that are not structural.

During the summer period prior to the Plant commissioning, the CDF SCPs, along with the initial ring dyke structure, will be constructed.

Following commissioning of the Plant, construction of the CDF will be a continuous process during summer operations as this facility expands throughout the life of the mine (Appendix 3.II).

3.3.1.5 Mine Development

During the construction phase, 1.3 million tonnes (Mt) of Mine Rock and ore will be mined from the Open Pit during pre-production mining. The reference to pre-production mining is used by Fortune to distinguish between pre-strip operations that Fortune considers to be related to Open Pit development. The NICO Project will not require a pre-stripping period. Pre-production mining are the activities related to the targeted mining of rock from the Open Pit to be used for construction to limit the amount of borrow pit material required. This rock (approximately 400 000 cubic metres [m^3]) excavated during this phase will be used to construct site roads, Plant and Camp site fill, and CDF components such as water retention dykes and the perimeter dyke.

Mine Rock will be mined from strategic areas within the Open Pit and augmented from borrow sources for the construction of the CDF. The material used for construction materials will be optimized using mine modelling techniques to characterize and target Mine Rock suitable for construction.

Open pit mining will begin 3 months prior to the commissioning of the Plant with pre-strip development. Approximately 1.3 Mt of rock will be mined during the pre-production mining phase, and the rock types will consist of ore, as well as Types 1, 2, and 3 Mine Rock.

A decline was constructed for the purposes of bulk sampling in 2006 and 2007 that has subsequently flooded. While the water currently flooding the underground decline at the surface meets the water quality objectives, at some point during rehabilitation the underground water will need to be directed to the ETF for treatment, or to the

Surge Pond and SCPs for use as start-up water in ore processing. Dewatering of the pre-stripping components of the Open Pit may generate water that will require storage.

Underground mining will begin 6 months before the Plant is commissioned, requiring 1 to 2 months for dewatering and rehabilitation of the decline. Facilities and service systems related to underground and Open Pit dewatering, fuel storage, ammonium nitrate storage, and mobile plant maintenance (truck shop) will be constructed as needed during the construction phase to support the construction and pre-production mining activities.

Mine development will commence as follows:

- installation of temporary power and pumping;
- rehabilitation of ventilation and dewatering components of the underground, re-installation of electrical and communications components, road surfacing;
- pipeline to the Surge Pond and/or the ETF;
- installation of the Fresh Air Raise;
- underground mine development commencing approximately 4 months prior to plant commissioning, but following completion of CDF containment structures;
- open pit mining commencing with the mining of 1.3 Mt of Mine Rock and ore as per Phase 1 and 1A of the Mine Plan (see definition Section 3.3.3); and
- Open Pit mobile dewatering pumps and pipelines (as required).

3.3.2 Operations

The construction period will be followed by an 18 year operational period during which ore will be mined and processed. Where possible, Fortune will complete progressive decommissioning and reclamation of the NICO Project components, particularly the side slopes of the CDF, over the life of the mine. The progressive reclamation of the CDF is complemented by the nature of the design of the perimeter dyke component, which represents an ongoing construction project that will be undertaken during June through September of each operating year (Appendix 3.II). The perimeter dyke is an engineered structure constructed so that tailings do not migrate through waste rock and breach the facility containment and are contained within the side slopes.

Mining of the underground and Open Pit will begin as construction nears completion (Table 3.3-1). A combination of underground and open pit mining will occur during the first 2 years of operations. Mining will switch to an Open Pit only operation in Year 3. The Plant will commissioned and begin operation as ore becomes available and the stockpile is adequate to feed the Plant uninterrupted. Ore currently stockpiled from the 2007 underground bulk sample will be processed at this time. Mining of the Open Pit is closely tied to the operation of the process facility as the capacity of the ore stockpile is limited to 130 000 t.

The Open Pit will be mined in 3 phases: 1A and 1, 2, and 3. Phase 1A and 1 is designed as a low stripping ratio “starter pit” that allows ore to be mined while deferring waste stripping to later in the operation. Phases 1A and 1, 2, and 3 begin as required to support a continuous operation. Mining in each phase is scheduled so the high stripping ratio Mine Rock can be removed while the previous phase supplies ore to the Plant.

With the operational start of mining and processing, the tailings and Mine Rock will be placed within the CDF, which has been designed for the containment of these materials. This material will be managed and placed so that the work required for the eventual final closure of the site will be minimized. The CDF will be active for the entire mine life. Of note, an additional water containment structure, SCP No. 4, will be constructed in the middle of mine life.

3.3.3 Closure

Closure will occur within 2 years after operations have been completed. Most of the site infrastructure will be removed during that time. Monitoring of the NICO Project will continue until it is shown that it meets all agreed closure conditions.

Fortune has developed a conceptual closure plan that will continue to evolve with input from the communities and regulators. Closure is anticipated to take 2 years, but most of the infrastructure will be removed and buried within a year after mining is complete. Facilities remaining for up to 10 years after the 2-year closure period will be those required for water treatment (if required) and site maintenance activities.

The final closure condition will not be reached until approximately 120 years after closure, which is the time required for the Open Pit to fill with water and begin a small discharge. Progressive reclamation on the CDF will take place from Year 1 through Year 18 when mining and processing cease. Further details on closure and reclamation can be found in Section 3.15 and Section 9 (KLOI: Closure and Reclamation).

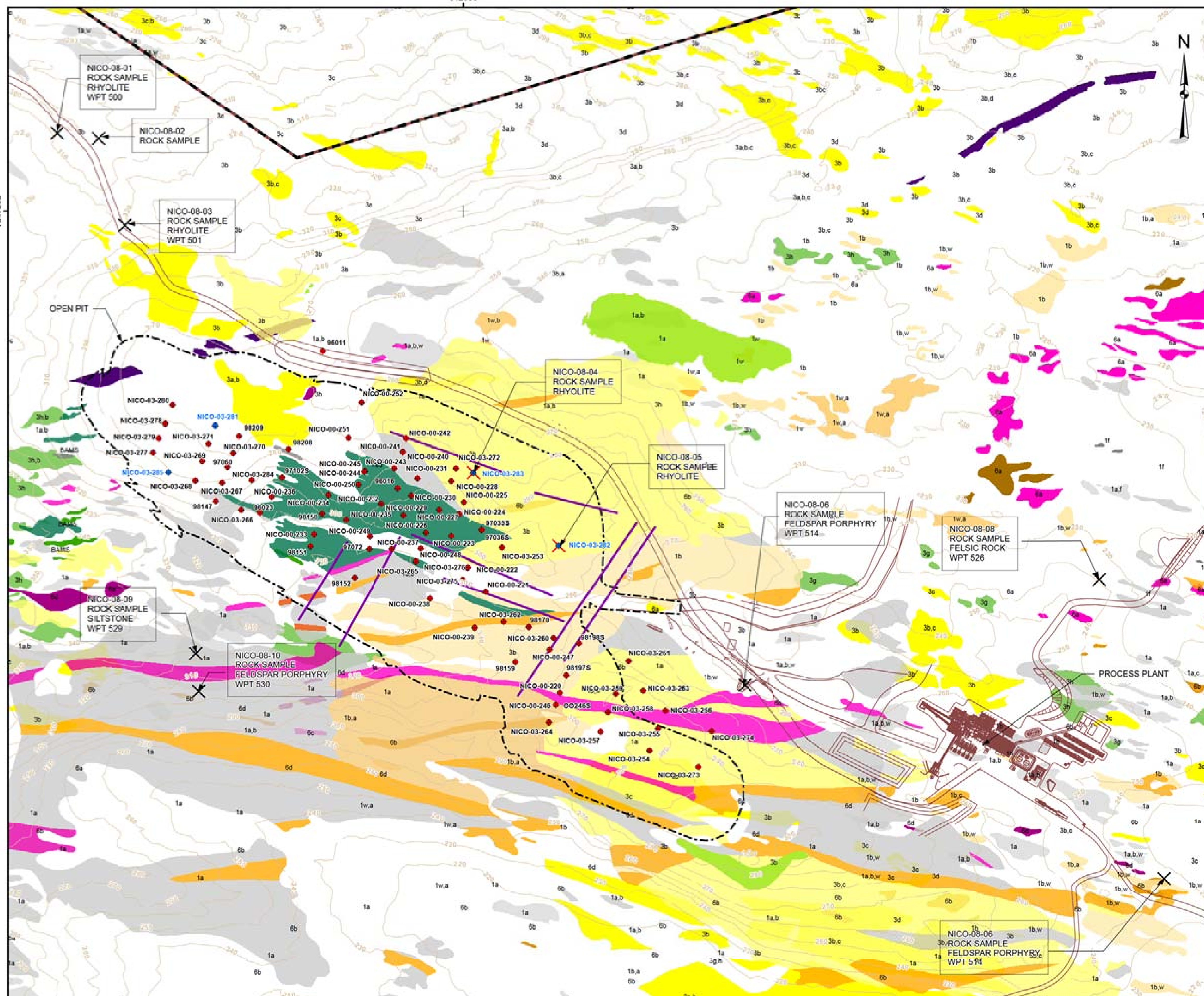
3.4 Geology and Geochemical Characterization

3.4.1 Geological Setting

3.4.1.1 Geological Formations

The NICO Project ore body is a Hydrothermal Iron Oxide-Hosted Replacement Deposit, also known as an IOCG type deposit. Ore occurs in 3 sub-parallel layers of highly altered meta-sedimentary rock, which are contained within a 200 m thick package of northwest-striking and northeast-dipping meta-sedimentary rocks, including ironstone and wacke (Figure 3.4-1). The ironstone is defined as a meta-sedimentary rock that consists of minerals including iron rich biotite and amphibole, magnetite, hematite, and feldspar, with some chlorite and carbonate. Ironstone is referred to as “Black Rock Schist” at the NICO Project (Figure 3.4-1).

The meta-sedimentary rocks are overlain by rhyolite (a volcanic rock). Coarse-grained porphyritic dykes (feldspar porphyry and quartz-feldspar porphyry) crosscut the ore zone and surrounding rocks. Minor rock types at the ore deposit are siltstone and breccia. The metasedimentary siltstone occurs in the footwall of the ore deposit. Breccia, which consists of a fragmental mixture of siltstone, wacke and volcanic rock, is found at or near the contact between the volcanic and meta-sedimentary rocks.



LEGEND

- INCLINED EXPLORATION HOLES WITH GEOCHEMISTRY SAMPLES
- INCLINED GEOTECHICAL HOLES WITH GEOCHEMISTRY SAMPLES (GOLDER ASSOCIATES)
- OUTCROP ROCK SAMPLE LOCATION WITH GEOCHEMISTRY TESTING
- OUTCROP ROCK SAMPLE LOCATION WITH GEOCHEMISTRY TESTING AND SAMPLES FROM OUTCROP AT DRILLHOLE COLLARS
- PROJECT LEASE BOUNDARY
- PROPOSED NICO MINE SITE
- OPEN PIT
- CONTOUR (10 m INTERVAL)
- FAULTS

GEOLOGY

- QUARTZ VEINING
- 1B SUBARKOSIC ARENITE
- 1F CORDIERITE SCHIST
- 1W SUBARKOSIC WACKE
- 1A SILTSTONE
- BAMS BIOTITE-AMPHIBOLE-MAGNETITE SCHIST

FABER LAKE VOLCANIC SEQUENCE

FELSIC (RHYOLITE-RHYODACITE)

- 3A APHYRIC FLOWS
3B TUFF, < 2MM
3C LAPILLI TUFFS
3D LOCALLY BRECCIATED
- 3H,G HETEROLITHIC BRECCIAS, DEBRIS FLOW

GREAT BEAR MAGMATIC ZONE

SUBVOLCANIC INTRUSIONS

- 6D FLEDSPAR-AMPHIBOLE PORPHYRY
- 6C QUARTZ PORPHYRY
- 6B QUARTZ-FELDSPAR PORPHYRY
- 6A FELDSPAR PORPHYRY

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)

Outcrop Bedrock Geology and Fault Lineation Interpretations provided by Fortune Minerals (2004).

Projection: UTM Zone11 Datum: NAD 83

100 0 500

SCALE 1:7,500 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

LOCATION OF GEOCHEMICAL SAMPLING SITES

Golder Associates
Edmonton, Alberta

FILE No. E-PD-001-GIS.mxd			
PROJECT NO. 09-1373-1004		SCALE AS SHOWN	REV. 0
DESIGN	SC	16 Feb. 2011	FIGURE: 3.4-1
GIS	SC	9 May. 2011	
CHECK	KS	9 May. 2011	
REVIEW	MR	9 May. 2011	

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The main geological formations at the NICO Project are:

- feldspar porphyry;
- rhyolite;
- breccia;
- fault zone;
- ironstone, including black rock schist and wacke; and
- siltstone.

3.4.1.2 Sequence of Mineralization

The NICO Project ore deposit was formed by metasomatism of the iron-rich, metasedimentary host rocks. Metasomatism is a type of metamorphism resulting from chemical alteration of a rock by a hydrothermal fluid. The mineralogy of the ore and waste zones was influenced by the sequence of mineral formation that occurred during five stages of metamorphic alteration.

During the first stage of alteration, metamorphism of the host rock (amphibolite wacke) resulted in the formation of sulphide minerals (including pyrite [FeS_2] and pyrrhotite [$Fe_{1-x}S$]) and iron oxide minerals (including magnetite [Fe_2O_3]). Iron oxide minerals that were formed during the first stage of metamorphic alteration form up to 20 percent (%) of the mineralized zones.

The formation of copper and gold–bearing minerals occurred during the second stage of alteration. Copper occurs in chalcopyrite [$CuFeS_2$] and copper sulphosalts. Gold occurs as native gold, and in association with bismuth telluride, bismuthinite [Bi_2S_3], and feldspar [$KAlSi_3O_8$].

Cobalt mineralization occurred during the third and fourth stages of alteration. Initially, cobalt was accumulated in cobaltite [(Co, Fe)AsS]. During the fourth stage of alteration, cobaltite reacted with metasomatic alteration fluids rich in arsenic. Widespread precipitation of cobalt-bearing arsenopyrite [FeAsS] and bismuthinite also took place. In the fifth stage of alteration, arsenopyrite became the primary sulphide precipitating from the metamorphic fluids.

As a result of the sequence of metamorphic alteration, certain minerals occur within restricted zones of higher grade mineralization within the ore deposit, including native gold and native bismuth, and bismuth tellurides. Native gold and native bismuth occur as both disseminations, and as components of sulphide minerals. Similarly, the occurrence of cobalt-bearing minerals is not widespread. Minerals that are widespread throughout the ore and waste zones include arsenopyrite, chalcopyrite, pyrrhotite, and pyrite. Arsenopyrite occurs both in zones of higher grade mineralization and zones of weaker (i.e., non-ore grade) mineralization outside the ore body. Arsenopyrite and cobaltite are commonly aligned along foliation planes in the rock. Chalcopyrite, pyrrhotite, and pyrite occur as localized fracture fillings and disseminations.

3.4.1.3 Ore Deposit

The ore deposit is located on the northern slope of a bowl shaped depression, referred to as the “Bowl Zone”. Ore generally occurs in 3 sub-parallel zones of ironstone, referred to as the Upper, Middle, and Lower Zones.

The ore zones range in thickness from 20 to 60 m thick, occurring below an area 1.4 km long and 300 m wide (Figure 3.4-1). The 3 ore zones strike to the northwest and dip to the northeast at moderate angles.

Gold mineralization is restricted to the Middle and Lower zones. The extent of cobalt-bismuth mineralization is much greater, extending throughout the Upper, Middle, and Lower zones. The Lower/Middle zone and Middle/Upper zone boundaries are marked by units of less altered wacke. Small lenses of mineralization also occur in the rhyolitic rock and altered quartz-feldspar porphyry dykes.

Minerals that occur in mineralized zones include native bismuth, bismuth telluride, native gold and sulphide minerals including pyrrhotite [FeS], pyrite [FeS_2], chalcopyrite [$CuFeS_2$], bismuthinite [Bi_2S_3], cobaltite [CoAsS], and arsenopyrite [FeAsS]. The dominant sulphide minerals in the ore body are pyrite, pyrrhotite, and arsenopyrite.

3.4.1.4 Mineral Resource and Grade

The NICO Project mineable reserve is estimated at 31.0 Mt. Ore will be processed at an average rate of 4650 metric tonnes per day and this equates to a mine life of 18.3 years. Taking into consideration both construction and closure of the mine and facilities, the NICO Project will last slightly longer that 20 years. Site monitoring will be in addition to this time period.

The NICO Project deposit averages 3.6 pounds of bismuth per tonne with lesser values in cobalt, copper, and gold. The sulphides are typically disseminated (as opposed to concentrated and massive) and represent 3 to 10% (averaging 5%) of the mineralized zones. The arsenopyrite-cobaltite grains are commonly aligned along the foliation planes. Bismuth typically occurs as bismuthinite and native bismuth. Gold occurs as grains of native gold ranging from less than 1 to greater than 100 microns (µm) in size attached to various sulphide and gold-bismuth telluride grain boundaries, as inclusions with sulphide minerals and associated with silicate gangue minerals. Chalcopyrite, pyrrhotite, and pyrite are present as local fracture fillings or localized disseminations.

Table 3.4-1: NICO Project Proven Mineral Reserves

Average gold content	0.91 g/t
Average cobalt content	0.12%
Average bismuth content	0.16%
Average copper content	0.04%

g/t= grams per tonne; %= percent; t= tonne

3.4.2 Geochemical Characterization Program

The results of geochemical characterization of Mine Rock, ore, and tailings at the NICO Project are presented in the Geochemical Characterization Report, Annex A. The geochemical characterization program was designed to evaluate the potential for generation of acid rock drainage and metal leaching from the major geological formations of Mine Rock, sub-economic mineralized Mine Rock and ore, and the main tailings materials that will be produced during operations at the NICO Project. The geochemical characterization program was based on standard and site-specific geochemical test procedures, including analyses of solids and leachates (DIAND 1992; Price 1997; MEND 2009; INAP 2009). The results of geochemical characterization of Mine Rock, sub-economic mineralized Mine Rock, ore, and tailings are a key component of the management plans that have been developed for the NICO Project.

The geochemical characterization program developed in a staged approach, in response to changes to the NICO Project description and the availability of material for sampling and analysis. Table 3.4-2 provides a chronological overview of the development of the geochemical characterization program for the NICO Project. Four types of samples were collected during the various stages of geochemical characterization at the NICO Project:

- exploration drill core samples, including composite sub-samples of exploration drill core collected over a defined sample interval;
- outcrop samples, consisting of rock broken from exposed outcrop using a rock hammer;
- run-of-mine rock samples, including grab samples collected from stockpiled ROM rock excavated during the collection of the bulk sample; and
- tailings samples, consisting of the products of laboratory metallurgical testing that were submitted for geochemical evaluation.

Table 3.4-2: Chronologic Overview of the NICO Project Geochemical Characterization Program

	Task	Sample Analysis
Mine Rock, Sub-economic Mineralized Mine Rock and Ore		
Pre-2004	Exploration drill core program and collection of over 17 000 drill core samples by Fortune Geologists for the purpose of chemical assay and resource definition.	Trace metal analysis.
2004	Collection of 8 composite samples of exploration drill core by Fortune geologists for the purpose of geochemical characterization	Acid base accounting (ABA), trace metal, and whole rock analysis and short-term leach testing on all samples.
2004	Collection of 169 samples of exploration drill core and 4 samples of outcrop for the purpose of geochemical characterization.	ABA, trace metal, and whole rock analysis on all samples, and short-term leach testing and humidity cell testing of select samples.
2008	Collection of 65 samples from stockpiles of run-of-mine sub-economic mineralized rock and ore placed on surface during the excavation of the underground bulk sample; including 5 larger samples for the construction of field scale tests. Three samples of exploration drill core and 10 samples of outcrop were also collected.	ABA, net acid generation (NAG) testing (including comprehensive analysis of NAG leachates), trace metal analysis, whole rock analysis, and mineralogical analysis on select samples; short-term leach testing on all samples; and construction of field scale tests at the NICO Project site using 5 large samples collected from the bulk sample stockpiles.
2009	Select samples of run-of-mine rock (collected in 2008) and split samples of exploration drill core held in storage since the 2004 geochemical testing program submitted for follow-up analysis.	Select samples submitted for short-term leach testing; all samples submitted for trace metal analysis and total sulphur analysis.
2010	Samples of aggregate collected from potential borrow sites by Fortune.	Samples submitted for ABA, trace metal analysis and short-term leach testing.
Tailings		
2007 and 2008	Tailings generated at SGS Lakefield as part of pilot plant and bench scale metallurgical testing under the direction of Fortune.	Samples submitted for testing in 2009.

Table 3.4-2: Chronologic Overview of the NICO Project Geochemical Characterization Program (continued)

	Task	Sample Analysis
2009	Samples of select tailings products submitted for geochemical testing in January 2009.	ABA, NAG testing (including comprehensive analysis of NAG leachates), trace metal and whole rock analysis, mineralogical analysis, short-term leach testing, evaluation of decant water quality (including aging tests), humidity cell testing and construction of field scale tests at the Project site.
2010	Supplemental samples of tailings and process water generated at SGS as part of a pilot plant operation.	Process water submitted for comprehensive chemical analysis. Geochemical testing of tailings ongoing.

The geochemical stability of mine wastes can be broadly categorized into acid rock drainage and metal leaching. These 2 aspects are generally related; however, metal leaching can occur independently from acid generation. Sulphide minerals represent the main source of ‘acid generation potential’ in the geological materials at the NICO Project. The acid producing nature of the sulphide minerals can be balanced, or ‘neutralized’ by the dissolution of other minerals. The ‘neutralization potential’ of a geological material is largely represented by the carbonate mineral content. Acidity, neutralization potential, and metals can be released during the weathering of Mine Rock, sub-economic Mine Rock, ore, and tailings that are exposed during mining. The objective of the geochemical characterization program was to determine the acid generation and metal leaching potential of Mine Rock, sub-economic mineralized Mine Rock, ore and tailings at the NICO Project.

3.4.2.1 Geochemical Characterization of Mine Rock and Sub-Economic Mineralized Mine Rock

The geochemical characterization program included samples that were collected from all geological formations expected to be encountered during construction and operation, including:

- Siltstone;
- Wacke;
- Rhyolite;
- Quartz-Feldspar Porphyry;
- Feldspar Porphyry;
- Breccia;
- Black Rock Schist + Magnetite (BRS + mt);
- Black Rock Schist ± Magnetite (BRS ± mt); and
- Fault Zone.

The geochemical characterization program included several testing methods that were used to classify the acid generation potential of Mine Rock and sub-economic mineralized Mine Rock, including acid base accounting, net acid generation testing, long-term humidity cell testing, and field scale tests. The following discussion summarizes the results of the evaluation of acid generation potential presented in Annex A of the DAR.

The nature of the ore deposit at the NICO Project is such that sulphide minerals tend to occur in higher concentrations near the mineralized zone. The results of the geochemical test program show that most Mine Rock had a low potential for acid generation, because most Mine Rock samples had a low sulphur content (<0.01 to 1.6%; median 0.05%). Sub-economic, mineralized Mine Rock, which occurs in close proximity to the ore zone, has a greater potential for acid generation than Mine Rock. Sub-economic, mineralized Mine Rock had a higher sulphur content than Mine Rock (0.06 to 0.63% sulphur, median 0.38%).

The acid generation potential of Mine Rock, sub-economic mineralized Mine Rock and ore was defined based on the sulphide-sulphur content of the samples. Table 3.4.3 summarizes the acid generation potential of samples in each of the main geological formations in the geochemical dataset.

Table 3.4-3: Summary of the Acid Generation Potential of Mine Rock and Sub-Economic Mineralized Mine Rock

Lithology	Number of Samples (ABA)	Percent of Potentially Acid Generating Samples (Sulphide-Sulphur > 0.3%)
Mine Rock		
Feldspar Porphyry	34	0%
Rhyolite	40	13%
Breccia	9	11%
Fault Zone	1	100%
BRS (+ magnetite)	25	16%
BRS (± magnetite)	42	19%
Sub-Arkosic Wacke	25	4%
Siltstone	18	0%
Mine Rock	***194***	***10%***
Sub-economic Mineralized Rock		
BRS (± magnetite)	16	56%
Feldspar Porphyry	4	0%
Ore		
BRS (± magnetite)	17	76%

ABA = acid base accounting; BRS = black rock schist

The solid phase concentrations of metals can affect the metal leaching potential of geological materials. A detailed evaluation of the results of geochemical characterization of Mine Rock and sub-economic mineralized Mine Rock indicated that many metals occurred in association with sulphide mineralization, including arsenic, copper, cobalt, nickel and zinc. Other metals, such as selenium, antimony (and to a lesser extent, silver) occur in association with bismuth mineralization.

The metal leaching potential of Mine Rock and sub-economic mineralized Mine Rock was evaluated based on the results of geochemical leach tests. Laboratory and field scale leach tests were completed to evaluate the metal leaching potential of Mine Rock and sub-economic mineralized Mine Rock. Key leachate parameters in Mine Rock included aluminum, arsenic, iron, cobalt, copper, molybdenum and antimony. Key leachate parameters in sub-economic, mineralized Mine Rock were aluminum, arsenic, cadmium, cobalt, copper, iron, molybdenum, antimony, selenium, uranium, and zinc. Many of the metals are capable of leaching from Mine Rock and sub-economic mineralized Mine Rock in both neutral and acidic pH conditions. The results of the geochemical tests suggest a potential for short-term and long-term metal leaching.

The rate of reaction of sub-economic mineralized Mine Rock from the NICO Project is currently being evaluated using field tests ('field cells') that were constructed at the NICO Project site in 2008. Acidity has not been generated in the field cell leachates after 3 years of monitoring. Elevated concentrations of some trace metals have been measured in field cell leachates, including arsenic, cadmium, molybdenum, antimony, selenium, and uranium. Field cell monitoring is ongoing. A co-mingled mine rock and tailings field test will be constructed in 2011 to evaluate the acid generation and metal leaching characteristics of the co-mingled Mine Rock and tailings that will be placed in the CDF.

The acid generation and metal leaching potential of Mine Rock and sub-economic mineralized Mine Rock were considered in the development of the Mine Rock Management Plan (Appendix 3.I), and as part of the overall management plan for the site. As outlined in Section 3.4.3, the results of geochemical characterization of Mine Rock and sub-economic mineralized Mine Rock were used to develop criteria for Mine Rock management at the NICO Project. The objective of the Mine Rock management criteria is to limit the use of potentially acid generating, potentially metal leaching rock for the purpose of construction at the NICO Project site. All rock with a potential for acid generation and/or metal leaching will be managed to limit release of acidity and metals through containment within the CDF. Appendix 3.I includes a detailed discussion of how the results of geochemical testing were used to develop operational criteria for Mine Rock management.

3.4.2.2 Geochemical Characterization of Ore

Ore will be processed at the Plant after it is mined from the underground mine and Open Pit. During the mineral processing, most of the sulphide and bismuth minerals in the ore will be concentrated and filtered for shipment to the Saskatchewan Metals Processing Plant.

Ore will not be placed into long-term storage at the NICO Project site during operations; however, ore may be placed in temporary stockpiles at the Plant site. The sulphide content of ore is higher than Mine Rock and sub-economic mineralized Mine Rock. Ore samples in the geochemical characterization dataset contained 0.04 to 2.47% total sulphur. The results of laboratory leach tests identified several key leachate parameters associated with ore, including aluminum, iron, cadmium, cobalt, copper, arsenic, selenium, antimony, uranium, and zinc.

According to the results of geochemical characterization of ore, the ore has a high potential for acid generation and metal leaching if not handled appropriately. Approximately 60 000 t of ore grade material were stored in uncovered, surface stockpiles following mining of the bulk sample in 2006 and 2007. The sub-economic mineralized Mine Rock and ore in the run-of-mine stockpiles was exposed to atmospheric conditions for up to 2 years, including both freeze-up and freshet conditions. The stockpiles were moved into a single area and covered with a geomembrane liner to prevent the ingress of water in 2009. A visual inspection of the exposed stockpiled ore material that took place prior to cover installation identified no visible signs of acid generation. Therefore, the stockpiling of ore for treatment in the mineral processing plant within routine timeframes is not foreseen to be an issue with respect to acid generation.

The rate of reaction of ore is currently being evaluated with an on-site field test. Acidity had not been generated in the ore field cell after 3 years of monitoring, but elevated concentrations of sulphate, arsenic, cadmium, molybdenum, selenium, and uranium have been measured. Field cell monitoring is ongoing.

3.4.2.3 Geochemical Characterization of Tailings

Three samples of tailings were submitted for geochemical characterization, including 1 sample of bulk rougher tailings, 1 sample of bulk cleaner-scavenger tailings, and a sample of the combined flotation tailings.

Most sulphide minerals are removed from ore in the Plant. Bulk rougher tailings and combined flotation tailings had a total sulphur content of 0.08%, and the total sulphur content of bulk cleaner-scavenger tailings was 0.43%. It is expected that the combined tailings products consisting of secondary rougher tailings and secondary cleaner-scavenger tailings will have less than or similar levels of sulphur as the bulk cleaner-scavenger tailings previously tested.

Silicate minerals (actinolite and biotite, with lesser diopside and quartz) were the main mineral phases identified in the tailings samples produced in 2007. Oxide minerals, including the iron oxide mineral magnetite and the arsenic oxide mineral claudetite were detected in all 3 tailings samples. Carbonate minerals were present in minor quantities.

Laboratory tests and field tests were used to evaluate the rate of reaction and metal release from the tailings. Kinetic tests (i.e., humidity cell tests) were used to determine the rates of acid generation, acid neutralization, and metal leaching from tailings in laboratory conditions. Neutral to weakly alkaline pH conditions were maintained in the tailings kinetic tests over time, which confirms that that the tailings have a low long-term acid generation potential.

The rate of reaction of tailings in site-specific climatic conditions is currently being evaluated using on-site field tests. The tailings field cells have been monitored for 1 year, during which neutral pH conditions were maintained in field cell leachates. Field cell leachates had elevated concentrations of arsenic, cobalt, copper, iron, lead, selenium, uranium, and zinc. A combined tailings and Mine Rock field cell will be constructed in 2011 to evaluate the affects of co-disposing tailings and Mine Rock.

In addition to the tailings solids, process water will be discharged as a component of the tailings slurry. The composition of process water was evaluated using samples of water decanted from tailings that had been stored for 2 years after the operation of the 2007 pilot plant. Tailings process water sampled were also collected during the operation of the 2010 pilot plant. Decant water and process water samples had elevated concentration of arsenic, selenium, molybdenum, and uranium.

As described in Section 3.8, all tailings will be contained within the CDF. Based on the results of geochemical characterization of the key tailings types from the NICO Project, tailings have a low potential for acid generation. The results of laboratory and field scale testing suggest that tailings have a potential for metal leaching, which has been addressed in the context of the overall tailings and water management plans for the NICO Project.

3.4.2.4 Geochemical Characterization of Overburden

Overburden may be used for construction of the closure cover. Several potential overburden borrow sources have been identified at the NICO Project site. Samples collected from the potential borrow sources were submitted for acid base accounting, metals analysis, and short-term leach testing. Based on the results of geochemical testing, the material from the potential borrow sources has a low potential for acid generation and metal leaching.

The sequencing of potential borrow sources and suitability for closure cover construction will be evaluated as part of the detailed engineering for the NICO Project. Detailed geochemical characterization of the potential borrow sources will be carried out as part of the detailed engineering evaluation.

3.4.3 Mine Rock and Sub-Economic Mine Rock Classification

Identification of rock with a potential for acid generation and metal leaching is required during all stages of mine development for the purpose of short-term and long-term mine planning. Mine Rock classification criteria were developed based on the results of geochemical characterization of Mine Rock and sub-economic Mine Rock (Annex A). In addition, over 17 000 samples were submitted for solid phase analysis during the exploration stage of the NICO Project. The results of solid phase analysis in the exploration dataset were used to support the assessment of acid generation and metal leaching potential. Using the combined geochemistry and exploration datasets allowed for direct comparison of the Mine Rock classification criteria to the mine block model for the NICO Project.

The results of geochemical characterization were used to develop operational classification criteria based on the solid phase content of Mine Rock and sub-economic mineralized Mine Rock. Appendix 3.I provides a detailed explanation of the rationale for the operational Mine Rock classification criteria.

Rock samples will be routinely submitted for solid phase analysis during mining. Rock will be classified based on solid phase sulphide-sulphur, arsenic and bismuth concentrations to minimize the acid generation and metal leaching of material used for construction at the NICO Project. Table 3.4-4 summarizes the rationale for the Mine Rock classification criteria.

Preliminary Mine Rock classification criteria were then established as part of the Mine Rock Management Plan, based on the rationale outlined in Table 3.4-4. Table 3.4-5 summarizes the preliminary Mine Rock classification criteria. The geochemical dataset was evaluated with respect to the samples that were analyzed for solid phase arsenic, sulphide-sulphur and bismuth to estimate the percentage of samples in each Mine Rock classification category.

Table 3.4-4: Summary of Rationale for Mine Rock Classification Criteria

	Parameter	Criterion	Rationale	Total Number of Samples	Number of Samples with Proposed Characteristics[a]	% of Available Dataset
Acid Generation Potential	Sulphide-sulphur	0.30%	Rock containing greater than 0.3% sulphide-sulphur has a confirmed potential for acid generation based on the results of net acid generation testing and humidity cell testing.	293	237	81%
Metal leaching potential	Arsenic	1000 ppm	Rock containing greater than 100 ppm arsenic leaches arsenic concentrations greater than the MMER average monthly criterion (0.5 mg/L) and background concentrations in the Grid Ponds.	6921	3334	48%
	Selenium	50 ppm bismuth	Solid phase selenium concentrations correlate well with solid phase bismuth concentrations. The results of leach testing demonstrate that rock samples containing less than the site specific water quality objective (0.005 mg/L).	17393	9902	57%
	Cobalt, Copper, Nickel, Zinc		No obvious criterion exists to classify rock with a high cobalt, copper, nickel and zinc potential.			

[a] Total number of samples with concentrations less than the potential Mine Rock classification criteria.

MMER = Metal Mining Effluent Regulations; mg/L = milligram per Litre; ppm = parts per million; % = percent

Table 3.4-5: Preliminary Mine Rock Management Criteria

Classification	Criteria	Description	Percent of Samples in Geochemical Database with Defined Mine Rock Management Characteristics[a]
Type 1	Samples that contain: < 0.3 % sulphide sulphur < 50 ppm bismuth < 1,000 ppm arsenic	Rock with a low potential for acid generation and metal leaching to be used for construction of Surge Pond dams, Seepage Collection Pond dams, roads, lay down areas, or for the production of aggregate for the Perimeter Dyke or concrete.	12%
Type 2	Samples that contain: < 0.3% sulphide sulphur < 1000 ppm arsenic	Rock with a low potential for acid generation, to be used for construction of perimeter dykes within the CDF.	56%
Type 3	Samples that contain either: > 0.3% sulphide sulphur > 50 ppm bismuth > 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 20 metres offset from the exterior of the perimeter dyke of the CDF.	32%
Cover Construction Material	Glacial till from borrow sources	Glacial till with a low potential for acid generation and metal leaching and the required grain size characteristics to meet the objectives of the closure cover.	

[a] 229 samples in the geochemical dataset were submitted for analysis of sulphide-sulphur, bismuth, and arsenic

CDF = Co-Disposal Facility; ppm = parts per million; < = less than; > = greater than; % = percent

3.5 Mining

3.5.1 Overview

The ore bodies described in Section 3.4 generally lie in 3 sub-parallel zones in a poly-metallic, IOGC type deposit, also referred to as an “Olympic Dam” type deposit. The zones range in thickness from 20 to 60 m and occur below an area 1.4 km long by 300 m wide. Both open pit and underground mining methods will be utilized during the life of mine. Ore will be mined from underground mine workings during the first 2 years of mining. Open pit mining will commence at the same time as underground mining. Open pit mining will take place in 3 stages (Phase 1 & 1A, Phase 2, and Phase 3). Phase 1 of the Open Pit will occur in the central part of the designed Open Pit with Phase 1A being mined as a northwest extension of this initial phase of the pit. Phase 1A is a low stripping ratio area that allows the NICO Project to be mined without a pre-stripping program prior to mining and milling. Phase 2 mines to the southeast of Phase 1 to the final designed pit walls and to the same depth as Phase 1. Phase 3 mines to the northwest of Phase 1 to the final pit walls. Phase 3 mines to the depth of Phase 1 and then the entire Open Pit is mined deeper to the final design.

Excavation from the surface with heavy earth-moving machinery will create one large, Open Pit. The rock excavated from the pit will be stored in the CDF directly northeast of the pit (Figure 3.2-1). It will consist of host and country rock and potentially mineralized Mine Rock co-mingled with the mill tailings.

The ultimate depth of the underground mine workings at the termination of underground mining will be approximately 170 m below ground surface at the portal elevation. At the end of operations, the Open Pit will be approximately 1450 m long by 500 m wide by 230 m deep (Figure 3.5-1). Typically, the gold grade increases with depth in the deposit. Therefore, the mine will process more high-grade gold during underground operations than during the Open Pit operations. The Open Pit will mine through the completed underground workings.

3.5.2 Mine Plan

The ore bodies have been delineated by an extensive drilling program that began in 1996 by Fortune to establish the dimensions and size of the deposit.

Ore reserves total 31 Mt, of which, 2.2 Mt will be mined by underground mining methods and 28.8 Mt will be mined by open pit mining methods. Mining will be primarily by open pit with a combination of open pit and underground during the first 2 years of the mine operation. At the end of Year 2 of mining, the mine will be open pit only. Figure 3.5-1 illustrates the Open Pit and underground mines upon completion of mining. The expected operational life is estimated at just over 18 years.

The underground mine portion will include the following:

- extension of a 5 m x 5 m decline and lateral development on the 80/85 m, 105/110 m, 142/155 m, 179 m, and 217 m levels; plus 2 small stope areas located off the decline;
- development of a connecting exhaust raise system/escapeway between the 105 m level and 179 m level; and
- development of access cross-cuts, stopes, refuge stations, safety bays, sumps, and powder and cap storage magazines.

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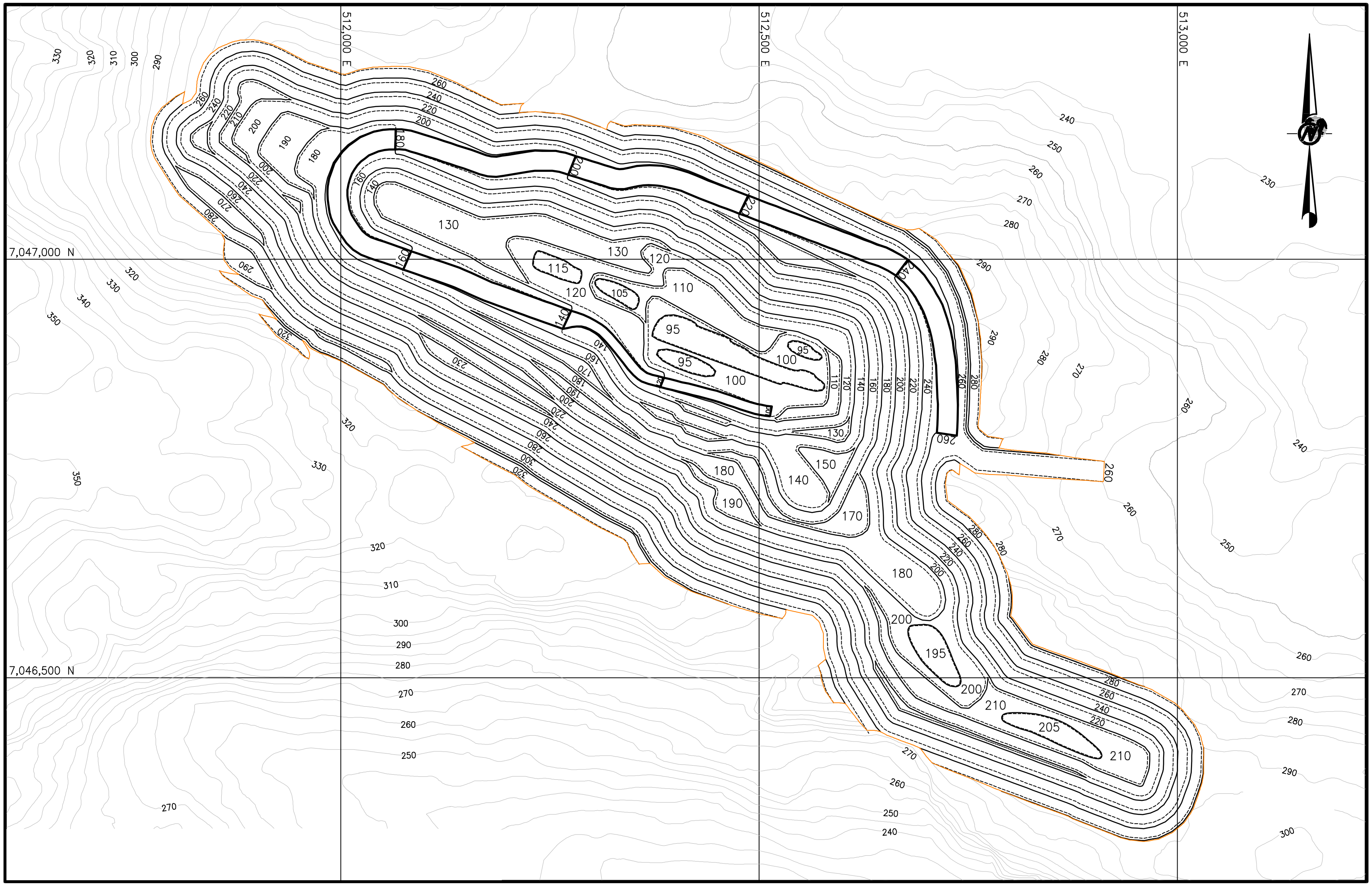

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SCALE METRES

REFERENCE

ORIGINAL DRAWING PRODUCED BY P & E MINING CONSULTANTS INC. BRAMPTON, ONTARIO.
End of 2031-Year.dwg. ORIGINAL SCALE 1:4,000.

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

FINAL OPEN PIT CONFIGURATION

Golder Associates
Edmonton, Alberta

PROJECT	09.1373.1004.9000		FILE No.	E-PD-014-CAD
DESIGN	CW	10/05/05	SCALE AS SHOWN	REV. 0
CADD	GMF	11/05/11		
CHECK	JG	12/05/11	FIGURE: 3.5-1	
REVIEW	JG	12/05/11		

Information from the drilling program has been used to calculate the optimum design for the safe excavation of the ore body. The Open Pit at maximum size is expected to have a surface length of 1450 m, surface width of 500 m, and depth of 230 m. The walls of the pit will be sloped to prevent the pit walls from collapsing while the Open Pit mine is being excavated. Open Pit wall stability is a priority safety issue and is the focus of specific geotechnical engineering design requirements. The final Open Pit design equates to a 50° overall pit slope angle and a 75° batter (bench face angle) slope angle, with a 24 m wide pit ramp at a 10% gradient.

The Open Pit walls will consist of a series of horizontal benches, blasted into the rock. The vertical height of each bench will be 10 m high in the ore and waste zones. The width of the benches will vary with a minimum working width of 60 m for efficient mining. Minimum berm width (catch benches) varies between 8.0 and 9.0 m depending on the overall steepness of the design of the pit walls based on the geotechnical parameters incorporated into the pit design. A 12 m wide (single lane), 15% gradient ramp will be used to access the 4 bottom benches.

A road into the pit is required so that heavy equipment can access the pit and the haul trucks can transport the broken rock from the bottom of the pit. The design for the pit has one road into the pit. The haul road access will consist of a ramp along the hanging wall of the pit, which will be extended deeper into the pit and along the footwall as mining progresses. The final ramp configuration will be oriented in such a way as to minimise the travel distance between the pit, crusher, and the developing CDF ramp.

3.5.3 Mining Method

3.5.3.1 Underground

The underground mine will be operated on a continuous basis with two, 12-hour shifts per 24-hour period. The underground equipment is anticipated to include:

- two electric-hydraulic drill jumbos;
- two in-the-hole type drills;
- three 6 m^3 load-haul-dump units;
- up to four 50 t underground haul trucks;
- one cable bolting machine for crown pillar support;
- one scissor-lift;
- one ammonium nitrate fuel oil (ANFO) charger (explosive loading vehicle);
- two blasting tractors;
- one underground fuel and lube truck;
- one boom truck, carrying a crane, and shotcrete pump;
- one diesel underground personnel carrier;
- four diesel underground mine service vehicles; and
- mine pumps, fans, and portable compressor.

Actual underground mine equipment may vary because Fortune is considering using a mining contractor for the underground work and will depend what is available in the company's fleet.

The principal mine levels (i.e., the 80/85 m, 105/110 m, 142/155 m, 179 m, and 217 m levels) will be accessed from surface via the mine ramp. The underground mining method will be retreat-transverse and longitudinal blast hole, open-stoping, and generally mined from the bottom up, and from east and west to the center of the ore body, without backfill. There are a total of 90 blast hole stopes.

Typical underground mining will consist of development mining, drifting, and stope development, followed by stope production and ore haulage to the surface. Stope development entails crosscut mining off the main drifts, drilling and blasting these crosscut drifts to the final stope width, and then followed by long hole drilling and blasting of the ore. Stope production consists of loading ore into the underground haul trucks and transporting to the surface crusher. Mining rates from the underground will vary depending on the amount of stopes in production. However, the maximum production rate from the underground will be 3150 t per day.

Most stope access drifts and cross-cuts will be driven in ore. Stopes will be separated by sill and rib pillars, and left unfilled. As the Open Pit advances towards the underground, stopes will be backfilled with broken ore from the pit floor via drop raises or as they are exposed, and as the pit will advance through the ore body, and all remnant ore left by underground mining will be recovered.

The underground mine equipment maintenance shop will be located on surface. Due to the short life of the underground mine, the underground shop constructed for bulk sampling will be used for underground operations.

Power supply to the underground mine will be provided using a dedicated electrical distribution power line. During dewatering of the mine as part of the rehabilitation of the decline, temporary mobile diesel generators will be used.

3.5.3.2 Open Pit

The Open Pit design includes 3 phases denoted Phase 1 & 1A, Phase 2, and Phase 3. Surface and underground blasting activities will be coordinated with underground blasts initiated from surface when the Open Pit and the underground workplaces are unoccupied.

Open Pit Mine Rock will be blasted, loaded, and hauled by truck to the CDF located northeast and adjacent to the pit. During the production phases, the Open Pit will be operated up to two, 12-hour shifts, 7 days per week, as required, with ore haulage primarily on a single shift to minimize re-handling at the crusher that is scheduled to operate during day shift, 12 hours per day.

The main production equipment includes the following:

- two self-propelled blast hole drills designed for nominal 170 mm holes;
- one 15 m^3 hydraulic face shovel;
- one 13 m^3 wheel front end loader;
- one 7 m^3 wheeled front end loader, dedicated to the crusher during 24 hour underground operations;
- initially, three 91 t capacity rock haul trucks; increasing to a maximum of 6 haul trucks;

- one 433 kilowatt (kW) bulldozer;
- one dedicated surface grader;
- one ANFO loading (explosives truck);
- portable light stands;
- light duty service trucks; and
- mobile diesel-driven pit dewatering pumps.

Explosives and blasting agents, and the related delivery and blast hole loading equipment will be provided by an explosives supplier. The explosives supplier will provide an on-site ANFO and emulsion storage facility that will be located 0.6 km from the Open Pit, between the pit and Lou Lake along the Lou Lake pump house service road.

The explosive and detonator magazines already on-site will be re-located and re-used, with the final installation conforming to NRCan 2010.

Mining rates from the Open Pit will vary based on the mill feed requirements and the stripping ratio in the pit during that period. Overall ore tonnage will average 4650 metric tonnes per day from the combined Open Pit and underground operation. All ore will be from the Open Pit after underground mining is complete. Waste tonnage will vary based on the stripping ratio, with a range between 29 000 t/day (Year 3) and 3000 t/day (Year 15). Blast hole drilling and blasting will be based on the tonnage requirements and drilling requirements will be 30 to 50 holes per day with up to 600 m drilled.

3.6 Processing

3.6.1 Overview

The Plant consists of 4 main components:

- primary crusher and transfer tower;
- secondary and tertiary crushing building and fine ore bin;
- grinding bay; and
- chemical processing.

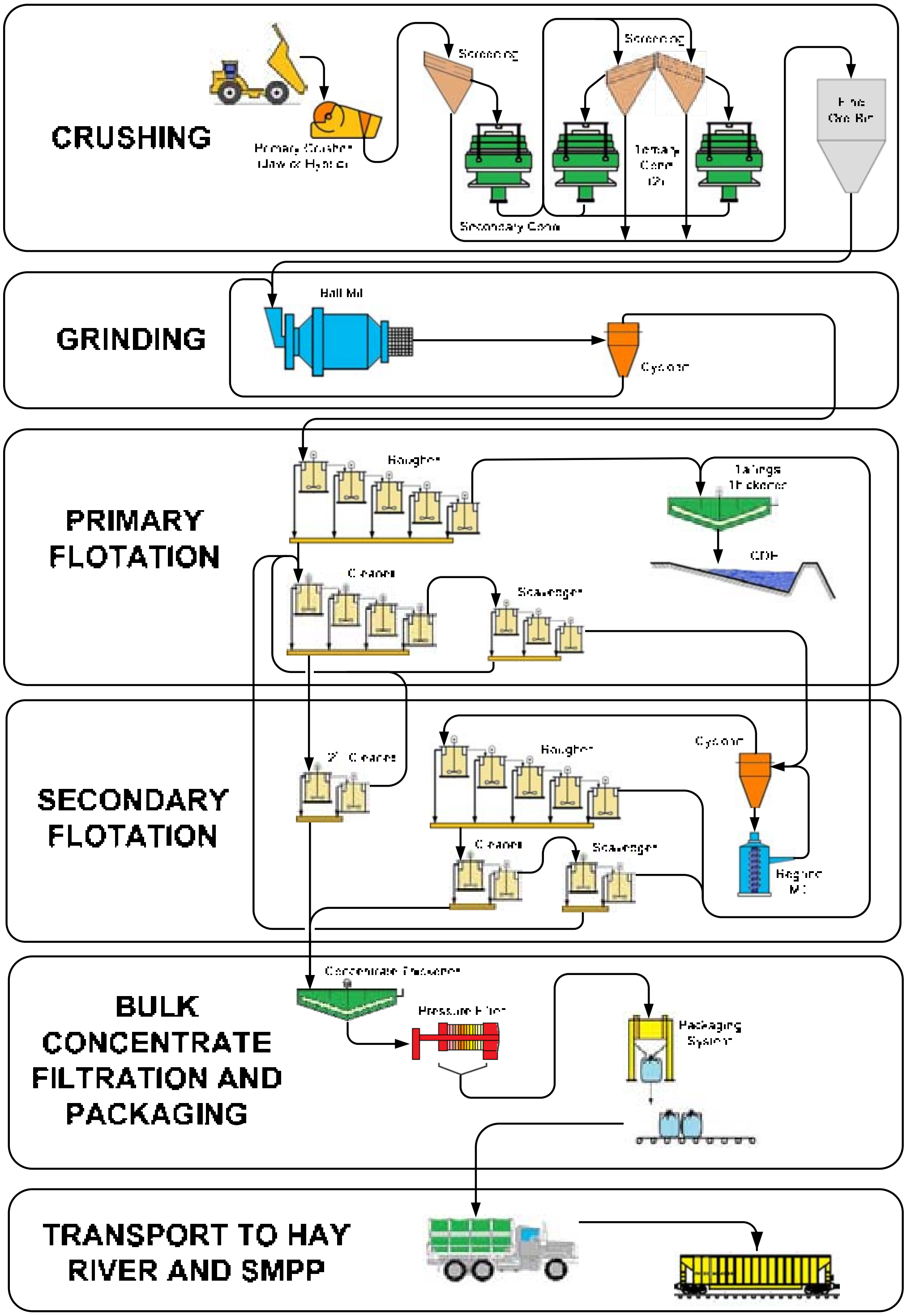
Ore processing at the NICO Project will be limited to crushing, grinding, and flotation consisting of primary and secondary stages to produce bulk concentrate. The resulting bulk concentrate will be thickened and filtered, packaged, and shipped to a second site, the Saskatchewan Metals Process Plant, in Langham, Saskatchewan to be processed into high value metal products.

The NICO Project is expected to produce 4650 metric tonnes per day of run of mine ore from underground and Open Pit workings. This ore may be stored in temporary surface stockpiles adjacent to the primary crushing plant to be blended together, or direct dumped, for feed into the Plant. The main unit operation components of the Plant will consist of:

- primary crushing using a jaw crusher or hybrid crusher;

- secondary crushing using a standard head cone crusher;
- tertiary crushing using parallel short head cone crushers;
- ball mill grinding incorporating gravity centrifugal separation;
- primary bulk flotation consisting of rougher, cleaner, and scavenger stages;
- regrinding of primary cleaner tailings;
- secondary flotation consisting of rougher, cleaner, and scavenger stages of the primary cleaner tailings;
- production of thickened tailings to approximately 75 weight percent solids pumped to the CDF;
- thickening and filtration of concentrate to approximately 8 weight percent moisture prior to packaging in bags suitable for transport.

The Plant is expected to produce 180 t of bulk concentrate per day. A process overview is shown in Figure 3.6-1. A more detailed diagrammatic flow sheet is shown in Figure 3.6-2. The major steps in processing, chemical use, and waste streams from the Plant are described below.



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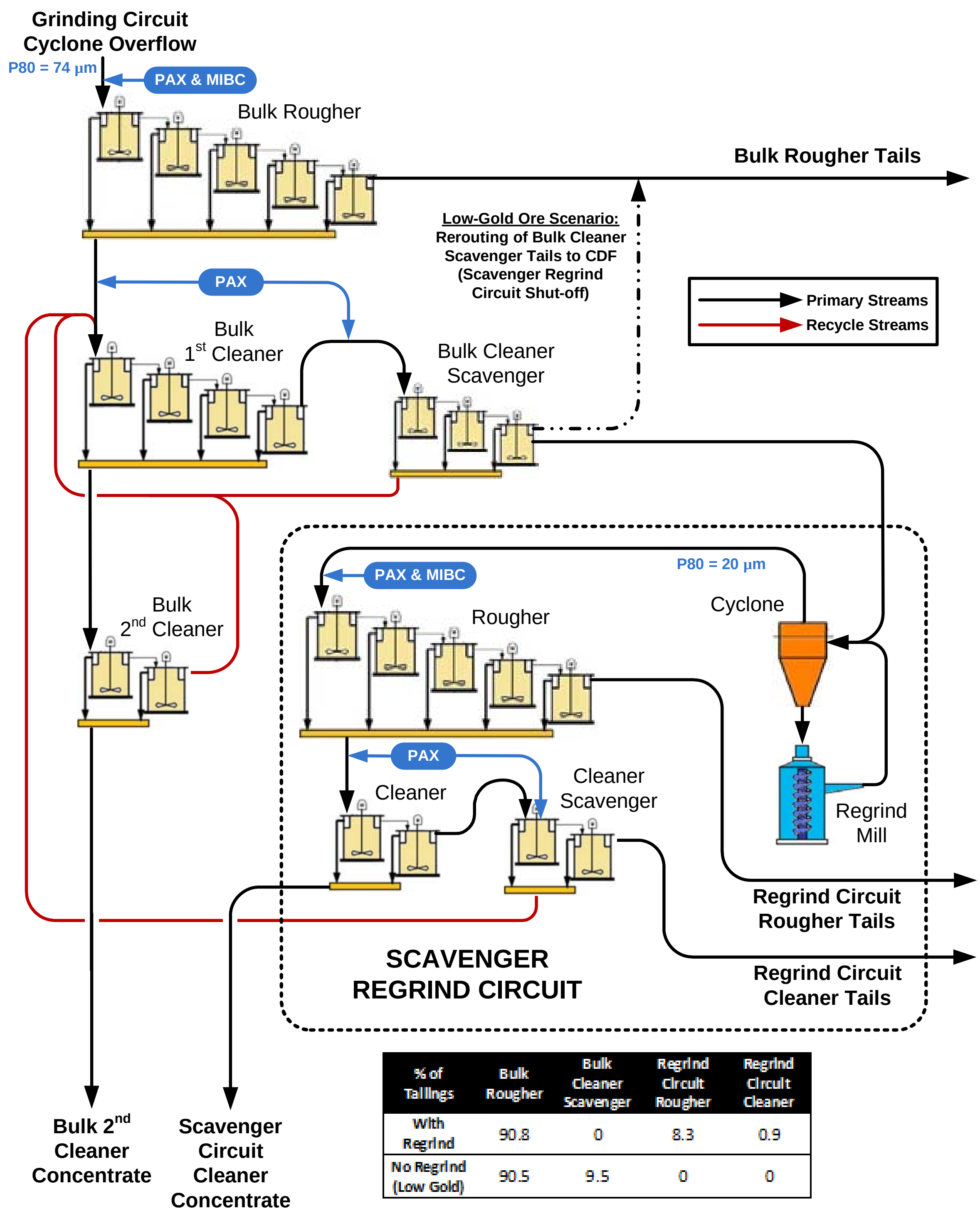
NICO PROJECT PROCESS OVERVIEW

Golder Associates

Figure 3.6-1



% of Tailings	Bulk Rougher	Bulk Cleaner Scavenger	Regrind Circuit Rougher	Regrind Circuit Cleaner
With Regrind	90.8	0	8.3	0.9
No Regrind (Low Gold)	90.5	9.5	0	0

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NICO PROJECT FLOW SHEET

Golder Associates

Figure 3.6-2

3.6.2 Processing Details

3.6.2.1 Crushing

Run-of-mine (ROM) ore will be delivered by haul trucks from underground and the Open Pit mine. The ore will usually be dumped directly into the dump pocket of the primary crusher, but can also be dumped on the ROM receiving pad.

The dump hopper has a capacity of 180 t, which corresponds to 2 truck loads, and has only one access side. Truck dumping is controlled by the crusher operator using a system of traffic lights.

A heavy-duty, hydraulic rock-breaker is provided to break up oversize boulders. Run-of-mine ore discharges from the dump hopper onto an apron feeder and is fed into a jaw crusher. It is equipped with a self cleaning tramp metal magnet located over the head pulley. The tramp metal magnet will remove any magnetic metal emanating from either the Open Pit, or more specifically, the underground.

The primary jaw crusher is capable of crushing large ROM ore up to 500 mm in diameter. The crusher will operate at a nominal open side setting of 150 mm to produce a product with a P80 of approximately 120 mm, at an average throughput rate of 516 t per hour (t/h). The jaw crusher discharges the crushed ore onto the primary crushed ore conveyor.

Ore dumped on the ROM receiving pad will be reclaimed by front end loader and loaded in the primary crusher dump hopper. The primary crushed ore conveyor discharges crushed ore onto the vibrating screen 1, ahead of the secondary cone crusher. The screen undersize is final crushed product and discharges onto the product conveyor. This conveyor transfers the screen undersize product to the fine ore bin conveyor.

The screen oversize from both decks feeds the secondary cone crusher by gravity via a small feed bin. The secondary standard cone crusher is a standard 2.135 m cone crusher driven by a 261 kW electric motor. The secondary crusher discharges onto a conveyor that transfers product onto a conveyor that feeds the tertiary short head cone crushers via the transfer tower.

Secondary crushed ore from transfer house feeds the tertiary cone crusher feed bin. That material is extracted with two vibrating feeders and each feeder discharges onto a vibratory sizing screen ahead of a tertiary cone crusher. The tertiary cone crushers are short head 2.135 m cone crushers driven by 261 kW electric motors. The screen undersize is final crushed product and discharges onto the product conveyor, which in turn feeds the fine ore bin conveyor.

A bag house dust collection system is provided to pick up dust from ore transfer chutes located inside the secondary and tertiary crushing building. Dust extracted from the bag house will be discharged to a dust collector bin and sent back to the Plant. The bag house dust collection system will be installed in an enclosure to be kept warm in winter. The dust collection system at the transfer tower will consist of a cartridge filter.

The fine ore bin provides crushed ore surge capacity so that the process plant can be supplied with a continuous source of feedstock. The total live capacity of the fine ore bin is 3000 t, representing about 14 hours of operation at the design throughput rate of 215 t/h. This will also allow for the crushing plant to be shut down at night.

3.6.2.2 Grinding and Gravity Gold Recovery

The fine ore bin has 2 ore belt feeders located on the bottom, resulting in 2 discharges so that the material does not freeze up. The fine ore bin will be located within the main grinding building and heated by convection. The ball mill feed conveyor is a high-angle sandwich, or snake conveyor.

A bag house dust collector system at the top of the fine ore bin will be provided to pick up dust from discharge of the fine ore into the bin. Dust extracted from the bag house will be discharged into the fine ore bin. The fine ore bin extraction systems are provided with an air-atomized fogging dust suppression unit for control of dust emission from belt feeders and belt conveyor transfer points.

The discharge underflow product from the ball mill trommel is directed by gravity via a launder into the cyclone feed pump box. From this pump box, the slurry is pumped to the grinding cyclone cluster. The underflow is collected in a rubber-lined launder from which a portion flows by gravity to the gravity gold circuit and the rest to the ball mill feed spout.

The gravity gold circuit will consist of a gravity centrifugal concentrator. The centrifugal concentrator separates gold from the slurry by applying a centrifugal force to separate small gold particles. The gravity concentrator tails returns by gravity to the cyclone feed pump box and the gravity concentrator concentrate is pumped to the bulk concentrate for shipment. The lower floor of the grinding area is sloped in order to remove solid spillage with a sump.

3.6.2.3 Primary Flotation

Flotation segregates sulphide minerals from the ground slurry into a concentrate in a series of stages using reagents called *collector* and *frother* in the presence of air, forming a froth, or a layer of bubbles that contain the target minerals. The overall flotation flow sheet is shown in more detail in Figure 3.6-1.

Cyclone overflow slurry from the grinding circuit is first pumped to the primary flotation circuit. During the primary rougher flotation stage, bulk rougher concentrate (a concentrate containing sulphide minerals including arsenopyrite, cobaltite, bismuthinite, and chalcopyrite) will be generated by flotation of the ore with potassium amyl xanthate (PAX - the collector) and methylisobutyl carbinol (MIBC - frother). The rougher flotation results in a rougher concentrate froth that is collected from one side of the flotation cells and fed to the primary cleaner-scavenger stage. The tailing from this first stage is called the primary rougher tailings (1RT) and represents approximately 90.8% of the total tailings that will be dewatered and sent to the CDF for disposal.

The primary second cleaner concentrate is collected and directed to the concentrate thickener where it is thickened. The primary second cleaner tails is pumped as feed into the first tank of the primary cleaner circuit. The thickened primary second cleaner concentrate product is then fed to a filter where the concentrate is dewatered to 9% moisture. The concentrate is subsequently bagged in FIBC (flexible intermediate bulk container) bags for transport.

3.6.2.4 Primary Cleaner Tails Regrind and Secondary Flotation

The primary cleaner tails regrind circuit consists of a cyclone cluster ahead of a regrind stage operating in closed circuit. The tailing from the primary cleaner-scavenger flotation is pumped to the regrind cyclone cluster. Cyclone underflow is piped to a regrind mill. The cyclone overflow product, with a particle size target of 80% passing 20 microns, is collected and fed to the secondary rougher flotation circuit.

The benefit of this approach is that gold recovered to concentrate at the NICO Project is subject to hydrometallurgical processes in Langham, Saskatchewan that eliminate the refractory nature of the gold. A second benefit of this addition is that there is incremental recovery of cobalt, bismuth, and gold to the bulk concentrate at a marginal increase to the overall bulk concentrate.

The regrind mills are proposed to be Stirred Media Detritors (SMD-185) type, operating in parallel, and driven by a 186 kW motor. Other alternatives for the regrind could be vertical mills or the IsaMill™. The SMD was selected because it is the most energy efficient option. The mill is equipped with a rubber liner for the body and media retention screens.

The secondary rougher concentrate froth flow is pumped to a separate secondary cleaner flotation stage to be treated in a similar manner as described earlier in the primary cleaner-scavenger flotation stage, but at the finer grind. The last secondary rougher cell discharges a tailings product (2RT) that is combined with the secondary cleaner scavenger tails (2CST). This tailings product, representing approximately 9.2% of the overall tailings product to the CDF, is further combined with the primary first rougher tails (1RT).

The secondary cleaner and secondary cleaner scavenger section consists of a bank of 4 circular tank-type flotation cells. The flotation bank is configured such that secondary cleaner flotation is carried out in the first 2 cells, while secondary cleaner-scavenger flotation is undertaken in the final 2 cells. Potassium amyl xanthate collector is added to the first secondary cleaner and first secondary cleaner-scavenger cells. Secondary cleaner concentrate and secondary cleaner scavenger froths are collected from one side of the flotation cells, where the secondary cleaner concentrate froth (at a finer grind) is combined with the primary second cleaner concentrate and pumped to the concentrate thickener. The secondary cleaner-scavenger concentrate froth is pumped back to the regrind cyclone feed tank. Fresh water is piped along the flotation cell banks for use as spray water for froth control and dilution. The combined secondary cleaner concentrate and primary second cleaner concentrate represent approximately 3.8% of the combined mass of the ore fed to the plant, where the secondary flotation circuit represents between 0.2 to 0.5% of the overall plant feed.

3.6.2.5 Overall Flotation Summary

Flotation segregates sulphide minerals from the ground slurry into a concentrate in a series of stages using reagents called *collector* and *frother* in the presence of air, forming a froth, or a layer of bubbles that contain the target minerals. The overall simplified flotation flow sheet is shown in Figure 3.6-2.

A forced-air system, consisting of low-pressure blowers in the service building and distribution piping, supplies air to each flotation cell. The flotation air required for the bulk flotation cells is provided by one of two 45 kPag air blowers, while the air for the other flotation circuits is provided by one of two 25 kPag low-pressure air blowers. The lower floor of the flotation area is divided into 3 bermed areas: bulk flotation, regrind, and secondary-scavenger flotation floors. Three floor sump pumps return wash water and spills back to their respective dedicated flotation process circuit. As a sulphide concentrate, the concentrate contains substantial concentrations of metals and is very valuable; therefore, spillages of concentrate will be cleaned up and returned to the circuit as a priority. Fresh water is piped along the flotation cell banks for use as spray water for froth control and dilution.

During periods of very low gold levels fed to the plant (high levels of cobalt and/or bismuth), the regrind circuit can be turned off. In this situation the primary cleaner-scavenger tails (1CST) is combined with the primary rougher tailings. To operate in this fashion, it would be necessary to campaign the feed to the Plant over a number of days, and require strict stockpile control of the low grade material. To increase mass pull to recover additional gold, the primary second cleaner cells can be turned off. In this case, the primary first cleaner concentrate will be combined with the secondary cleaner concentrate to produce an overall concentrate. The combined secondary cleaner concentrate and primary second cleaner concentrate represent approximately 3.8% of the combined mass of the ore fed to the Plant, where the secondary flotation circuit represents between 0.2 to 0.5% of the overall plant feed.

3.6.2.6 Filtration and Packaging

The concentrate produced by flotation and by gravity gold concentration will be combined, thickened, and presented to a pressure filter for dewatering to 8% moisture. Concentrate thickening will occur in a 5.8-m-dia bulk concentrate thickener. Thickener overflow is first directed by gravity into a thickener overflow tank and then pumped by to the concentrator process water tank. Thickener underflow is pumped by a horizontal centrifugal pump into the bulk concentrate thickener underflow tank. This underflow tank can provide a total of 12 hours surge capacity.

The thickened bulk concentrate is then pumped by 1 of 2 horizontal centrifugal pumps to feed the bulk concentrate pressure filter. The filtrate collected in the filtrate pump box is pumped to the concentrator process water tank. The filter cake is discharged onto the concentrate load out conveyor.

Under normal operation, the belt conveyor conveys forward to feed the concentrate packaging system. The packaging system is of dual-bag design, and a flop gate within the system is used to divert the feed from one bulk bag to another. The reversible conveyor is stopped automatically when a both bulk bags are filled and no empty bag is available.

A bulk bag is prepared so that the bottom flap or duffle is tied close, inserting a polyethylene liner and affixing it to the sides of the bag. A skid is placed under the bag and secured with ties. Four lift straps are manually placed onto support hooks to open up the bag. The bag is filled to approximately 1.5 m^3 capacity and the weight is recorded on a platform scale. The load out conveyor is paused while the flaps are tied closed, the filled bag is moved out of the way and a new bag is brought in by the operator. A roller conveyor and forklift move skidded bulk bags to product storage in the warehouse, until a trailer is ready at the loading area.

The technical name for this sort of container is flexible intermediate bulk container, and this type of container is suitable for shipping of material containing arsenical dust, designate UN 1562: Packing Group II, Hazard Class 6.1. This system was selected to other forms of bulk shipment due to:

- the value of the concentrate;
- the potential release of loose concentrate containing heavy metals into the environment;
- review of other operations using similar systems for transport of heavy metals such as lead concentrates;
- ease of transport by flat deck trailer, enclosed trailer, or sea containers;
- resistance to degradation from UV;
- the need to transfer the concentrate onto rail at Hay River;
- the need to store product temporarily onsite, in Hay River, and in Langham, Saskatchewan; and

- the projected ability to rep-use the outer shell up to 3 times.

3.6.2.7 Tailings Thickener

Bulk rougher tails, secondary rougher tails, and secondary cleaner-scavenger tails from the flotation circuit are pumped to the 12.0-m-dia tailings thickener. The thickener is of high-rate paste thickener design with a bridge-mounted drive mechanism. The thickener is located within the plant, and the main plant sump will be sized to ensure the full containment of the thickener contents. The thickener rake, can be raised by means of an automatic motorised lifting device, if the torque exceeds a preset value. Thickener underflow is pumped by 1 of 2 positive displacement pumps to the CDF, or recycled to the thickener feed using 1 of 2 redundant centrifugal pumps.

Thickener overflow is first directed by gravity into a thickener overflow tank and then pumped to the concentrator process water tank. Thickener performance is aided by the addition of flocculant to the thickener. The thickener has been designed to produce tailings at 75 ± 2%, resulting in the recycle of approximately 79.8% of the overall process water requirement.

3.6.2.8 Processing Chemicals

The main processing reagents used by the Plant are the flotation reagents, potassium amyl xanthate (collector) and methyl isobutyl carbinol (frother), as well as flocculant utilized for settling. The proposed chemicals expected to be used during milling and processing and estimated annual consumption of each are listed in Table 3.6-1.

Table 3.6-1: Processing Chemicals and Estimated Consumption

Reagent (Chemicals)	Process Use	Consumption Rate	
		kg/t of Ore	t/y
Base Consumption			
Steel grinding balls	Grinding	0.454	769
Potassium Amyl Xanthate (PAX)	Bulk Flotation of ground slurry	0.320	542
Methylisobutyl Carbinol (MIBC)	Bulk flotation of ground slurry	0.055	93
Colorado Sand (or equivalent)	Re-grinding of primary Cl-Scav Tailing	0.032	190
Flocculant polymer (Anionic)	Tailings and concentrate thickening	0.112	54

kg/t ore = kilograms per dry tonne of ore fed to the plant; t/y = dry tonnes per year

Steel Grinding Balls

A grinding ball storage pit will be located adjacent to the ball mill. The capacity of this ball storage bunker is 150 t for 50 mm balls. Balls will be delivered to the site by bulk truck, and the trucked tipped into the ball mill storage pit. Balls will be transferred into the ball kibble from the storage pit, and will be lifted up into the ball feed chute of the grinding mill.

Flotation Reagents

Potassium amyl xanthate and MIBC are used in the flotation area of the concentrator. Potassium amyl xanthate is used as collector in the rougher and scavenger flotation stages, while MIBC is used as a frother. Potassium amyl xanthate will be delivered as pellets in bulk 1 t bags, and an agitated mixing tank and a day tank are provided for PAX preparation. The flotation reagent preparation area and the secondary flotation area will share the 1 t overhead crane to facilitate the lifting of PAX bags. Fresh water will be added to the mixing tank to dissolve the pellets, and a pump will transfer the solution from the tank to the day tank. Metering pumps are included to deliver PAX to the cyclones feed box and flotation cells.

Methylisobutyl carbinol will be delivered in drums. A drum pump will transfer MIBC from the drum to a distribution tank, where it will be distributed by metering pumps to the bulk rougher and secondary rougher flotation cells.

SMD Grinding Media

SMD grinding media is typically 1 to 4 mm. Generally the media is uniformly spherical in shape, which increases grinding efficiency and reduces media consumption. Typically it has a target density of 2.6 to 2.8 grams per cubic centimetre (g/cm^3).

These materials will be delivered in bulk 1 t bags. The SMD is installed with a grinding media feed chute to increase the charge while operating. An overhead crane will be supplied in the regrind area to facilitate addition of the grinding media.

Flocculant

Flocculant will be delivered in bulk 1 t bags. The flocculant mixing system has the capacity to service all the thickeners in the Plant. The system for preparing 0.5% weight (wt). flocculant solution consists of a dosing unit, a wetting unit, mixing tank, storage tank, one operating metering pump, and their corresponding in-line mixers. Fresh water will be added to the wetting unit and the mixing tank for solids wetting and dissolution. The in-line mixers are provided to further dilute the flocculant solution down to 0.1% wt. with fresh water, before delivering to the respective thickeners. A very high molecular weight 46% anionic flocculant, such as CIBA Magnafloc, was recommended.

3.6.2.9 Analytical Laboratory

The mine will operate an on-site assay laboratory to generate assays of pit and underground samples, as well as processing products.

Typical operating equipment that will be installed in the Analytical Laboratory will be as follows:

- Sample Preparation – drying ovens, laboratory jaw crusher, puck pulverisers with grinding bowls, dust hoods with bag house, and a ro-tap (and screens);
- Fire Assay Laboratory – crucible furnace, cupellation furnace, balances, ventilation ducts and fume hood, fire assay tools;
- Wet Laboratory – precision balance, centrifuge, fume hoods, shower/eyewash station, vacuum pump, chemical storage cabinet, fire cabinet (hydrocarbons), lab-scale flotation machine, and industrial sinks;
- Instrumentation Laboratory – ICP-OES machine, AAS machine, LECO sulphur analyzer, Malvern particle size analyzer, micro-balance, eye wash station, and ventilation ducts; and
- Environmental Laboratory – fume hood, balances, chemical storage cabinets, eye wash station, and industrial sinks.

3.7 Mine Rock Management

Solid wastes that will be produced by the NICO Project include the following:

- sediment and overburden from pre-stripping above the ore body and from preparation of the mine site;
- Mine Rock that has been excavated from the Open Pit and underground mine;
- tailings from the processing of ore; and
- incinerator ash, and non-recyclable inert waste products such as gypsum, concrete, and type 7 polymers (FRP, acrylic) that are generated as part of normal NICO Project operations.

The CDF is both the Mine Rock management area and the tailings management area to limit the footprint of Mine Rock and tailings management. Most Mine Rock will be stored in the CDF. Type 1 Mine Rock will be used for construction of site facilities, including dams for the Water Management Ponds, roads, building foundations, and rock pads. The proposed Mine Rock Management Plan is based on the preliminary engineering design of the CDF described in Section 3.8 and will be evaluated in the context of detailed engineering undertaken during the permitting process.

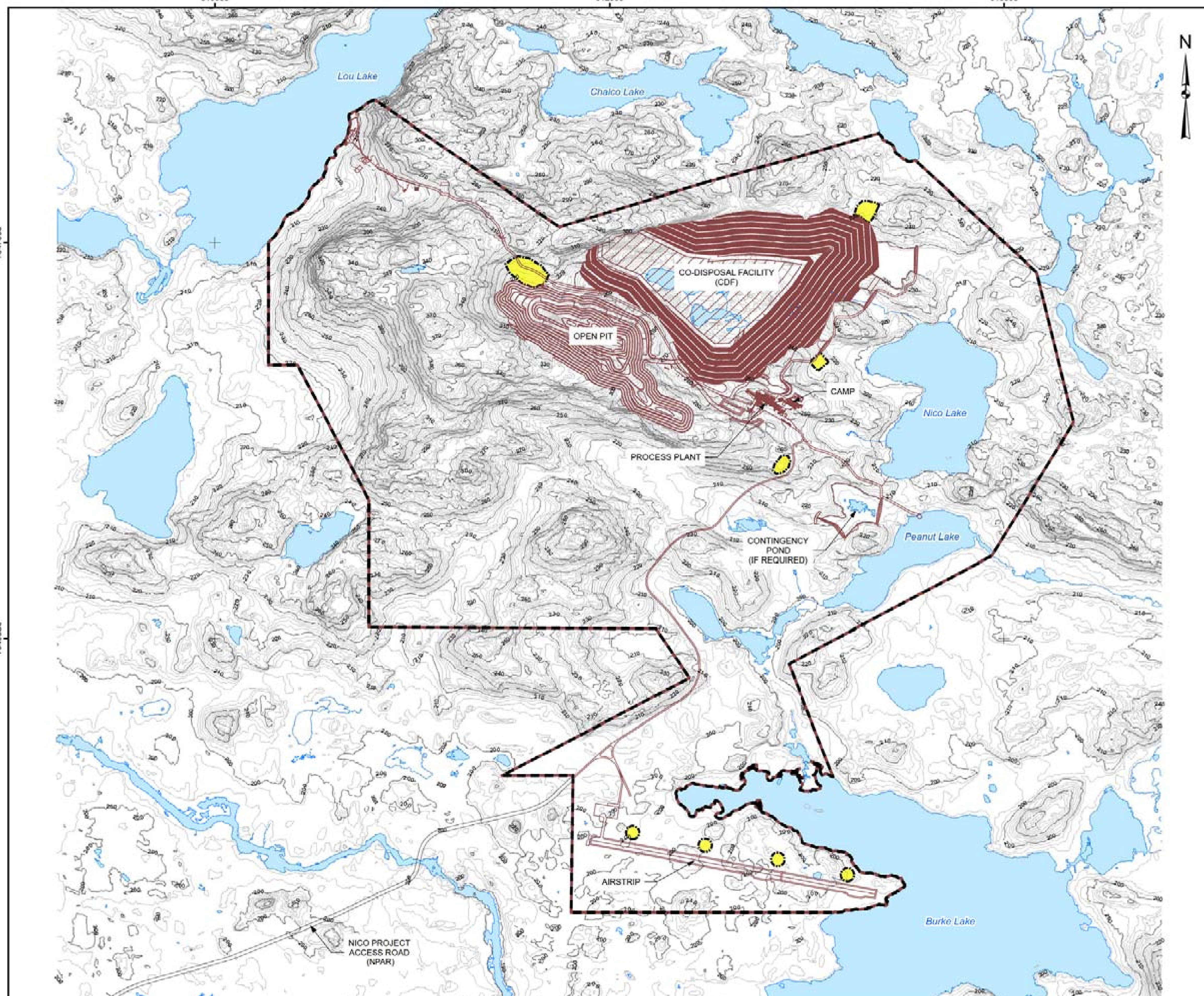
This section discusses the deposition and containment of the solid waste streams resulting from development and mining at the NICO Project. Mine Rock and tailings containment is provided in the CDF, as described in Section 3.8. Handling of wastes other than mine waste at the NICO Project site is also described in Section 3.11.

3.7.1 Sediment and Overburden

The NICO Project site has rugged topography. Rocky outcrops are common in hilly parts of the NICO Project site. Overburden is common in the valley bottoms, consisting of the following stratigraphic sequence:

- organics (peat and organic soils);
- silts and clays (glacio-lacustrine deposits); and
- granular deposits including beach sediment, glacial till or cobble and boulder materials.

The CDF footprint area will be cleared of trees; however, no attempt will be made to strip organics off the surface. The footprints of the CDF perimeter dyke and the water management facility dams will be cleared, grubbed, and stripped of vegetation. The areas of the Open Pit, Plant and Camp, site roads, NPAR borrow sources, water management facilities, and remote infrastructure sites will be cleared, grubbed, and stripped of vegetation prior to site development. Growth media will be stockpiled for use for future reclamation and closure. The proposed locations of the Growth Media Stockpiles are presented in Figure 3.7-1. The Growth Media Stockpiles will be contoured to achieve gentle side slopes and shallow depths to provide stability.



LEGEND

- PROJECT LEASE BOUNDARY
- PROPOSED NICO MINE SITE
- WATERCOURSE
- CONTOUR - *(2 m INTERVAL)*
- CONTOUR - *(10 m INTERVAL)*
- HAUL ROAD
- WATERBODY
- PROPOSED GROWTH MEDIA STOCKPILE

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

1 0 1

SCALE 1:25,000 KILOMETRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

PROPOSED LOCATIONS OF THE GROWTH MEDIA STOCKPILES

Golder Associates
Edmonton, Alberta

FILE No. E-PD-002-GIS.mxd				
PROJECT NO. 09-1373-1004			SCALE AS SHOWN	REV. 0
DESIGN	SC	16 Feb. 2011	FIGURE: 3.7-1	
GIS	SC	9 May. 2011		
CHECK	KS	9 May. 2011		
REVIEW	MR	9 May. 2011		

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Fortune will also survey any potential large sources of organic soils prior to operation of the CDF, and this material will be stockpiled where possible. Other smaller stockpiles of organic soils may also be constructed on an opportunity basis along site roads, the Airstrip, the NPAR, and the NPAR road borrow pits. In these situations, the location of the growth media stockpiles will be recorded by GPS survey and mapped.

It is anticipated that pre-production mining will provide the materials required for the initial construction of the CDF Perimeter Dyke and the SCP and Surge Pond Dams. In addition, unsuitable overburden will be excavated from key trench zones in the SCP and Surge Pond Dams. Borrow pits will also be developed as necessary for additional material required for construction. Several potential overburden borrow locations have been identified at the NICO Project site.

The sequence of construction of the CDF Perimeter Dykes and SCP dams is described in more detail, as the CDF Perimeter Dykes and SCP dams will be a source of organic material. The foundations of these structures will first be stripped of organics material, which will be stockpiled as growth media. Next, unsuitable overburden will be excavated from key trench zones. The criteria in Section 3.4.3 will be used to determine the suitability of overburden soils for construction of site facilities.

Table 3.7-1: Placement and Quantities of Overburden

Deposition Location	Total Volume
SCP dams (bedding, road surface, filter, and key trench – excludes rock fill)	67 500 m^3
Site road construction	0.15 M-m^3
CDF Perimeter Dyke starter filter	16 700 m^3
Till stockpiled for CDF cover	1.11 M-m^3
Sand for CDF cover capillary break	0.14 M-m^3

CDF = Co-Disposal Facility; SCP = Seepage Collection Pond; M-m^3 = million cubic metres; m^3 = cubic metres

3.7.2 Mine Rock

3.7.2.1 Quantity and Distribution of Mine Rock

The NICO Project is expected to generate approximately 96.9 Mt of Mine Rock during the predicted mine life. Of this total, 6.5 Mt is classified as sub-economic mineralized rock that may become economic if parameters used in the reserve estimate change. Parameters that may positively affect the reserve estimate are an increase in metal pricing, particularly the historic variability in the price of gold and cobalt, a decrease in operating costs, or increases in the projected recovery.

Fortune will make decisions on the cut-off grades of the ore during operations. These decisions will be made on an ongoing basis. Rock will be classified first as ore or Mine Rock/sub-economic mineralized Mine Rock based on cut-off grade. If the mined rock cannot be classified as ore, the rock will be classified according to the operational Mine Rock classification criteria described in Section 3.4.3.

A breakdown for the distribution of Mine Rock by operations year is provided in Table 3.7-2.

Table 3.7-2: Distribution of Mine Rock by Operations Year

Year	Mined Ore and Mine Rock				Mine Rock for Dyke/dam Construction and Backfilling				Mine Rock for Co-disposal	Total Tailings Generated		Tailings Filling Mine Rock Void	Tailings Disposed in Cells	CDF Total Storage Capacity
	Mined Ore	Mine Rock	Sub-economic Mineralized Mine Rock	Total	Mine Rock for CDF Perimeter Dyke Construction	Mine Rock for Cemented Rock Backfill[a]	Mine Rock for Seepage Collection Dams Construction	Total						
	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(m^3/y)	(m^3/y)	(m^3/y)	(m^3/y)
0	318 355	1 187 553	62 592	1 568 500	593 863	0	236 200	830 063	420 082	306 894	176 697	32 734	143 963	670 688
1	1 698 410	4 836 979	118 496	6 653 885	429 853	132 869	0	562 722	4 392 753	1 637 267	942 669	342 292	600 377	3 105 626
2	1 698 409	8 843 957	331 897	10 874 263	923 543	44 290	0	967 833	8 208 021	1 637 266	942 668	639 586	303 082	5 046 752
3	1 698 408	9 214 204	657 469	11 570 081	776 076	0	0	776 076	9 095 597	1 637 265	942 668	708 748	233 920	5 362 062
4	1 698 408	9 939 869	250 579	11 888 856	776 076	0	0	776 076	9 414 372	1 637 265	942 668	733 587	209 080	5 502 820
5	1 698 408	6 489 199	304 433	8 492 040	776 076	0	0	776 076	6 017 556	1 637 265	942 668	468 900	473 767	4 002 927
6	1 698 408	5 527 876	416 552	7 642 836	1 094 134	0	0	1 094 134	4 850 294	1 637 265	942 668	377 ,945	564 723	3 652 737
7	1 698 408	5 777 623	166 805	7 642 836	1 094 134	0	0	1 094 134	4 850 294	1 637 265	942 668	377 945	564 723	3 652 737
8	1 698 408	5 517 507	426 921	7 642 836	1 094 134	0	0	1 094 134	4 850 294	1 637 265	942 668	377 945	564 723	3 652 737
9	1 698 408	4 482 004	190 164	6 370 576	1 094 134	0	0	1 094 134	3 578 034	1 637 265	942 668	278 808	663 860	3 090 960
10	1 698 408	5 625 017	319 411	7 642 836	352 798	0	43 800	396 598	5 547 830	1 637 265	942 668	432 298	510 369	3 575 631
11	1 698 408	4 540 589	554 635	6 793 632	352 798	0	0	352 798	4 742 426	1 637 265	942 668	369 540	573 128	3 219 998
12	1 698 408	4 763 402	331 822	6 793 632	352 798	0	0	352 798	4 742 426	1 637 265	942 668	369 540	573 128	3 219 998
13	1 698 408	4 363 639	391 903	6 453 950	352 798	0	0	352 798	4 402 744	1 637 265	942 668	343 071	599 597	3 070 008
14	1 698 408	3 536 821	709 199	5 944 428	352 798	0	0	352 798	3 893 222	1 637 265	942 668	303 368	639 300	2 845 025
15	1 698 408	1 244 946	419 494	3 362 848	352 798	0	0	352 798	1 311 642	1 637 265	942 668	102 206	840 462	1 705 106
16	1 698 408	1 397 294	267 146	3 362 848	352 798	0	0	352 798	1 311 642	1 637 265	942 668	102 206	840 462	1 705 106
17	1 698 408	1 450 688	213 752	3 362 848	352 798	0	0	352 798	1 311 642	1 637 265	942 668	102 206	840 462	1 705 106
18	1 698 408	1 540 064	294 783	3 533 255	352 798	0	0	352 798	1 482 049	1 637 265	942 668	115 484	827 184	1 780 351
19	150 682	102 654	41 431	294 767	0	0	0	0	144 085	145 257	83 633	11 227	72 406	147 255
Total	**31 040 384**	**90 381 885**	**6 469 484**	**127 891 753**	**11 827 205**	**177 159**	**280 000**	**12 284 364**	**84 567 005**	**29 922 930**	**17 228 354**	**6 589 637**	**10 638 717**	**60 713 631**

[a] Amount of Mine Rock for backfill may change as a function of mine plan.

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

Mine Rock will then be strategically used for construction or placed within the CDF, as described in Section 3.7.2.2. Sub-economic mineralized Mine Rock has greater sulphide and metals concentrations than most Mine Rock; thus, this rock will be strategically placed within the interior of the CDF, away from the exterior perimeter dykes. No long-term stockpiling of ore or sub-economic mineralized Mine Rock will be undertaken. Any long-term fluctuation in ROM stockpiles will reflect the difference in mining rate versus the processing rate achievable by the Plant. A limited amount of Mine Rock will be used for the production of aggregate used for cemented backfill for the underground mine workings.

3.7.3 Mine Rock Management

A preliminary Mine Rock Management Plan has been prepared as part of the engineering design of the CDF (Appendix 3.I). Mine Rock and tailings from the Plant will be contained within the CDF. A small portion of the Mine Rock will be used for the purpose of site construction outside of the CDF (e.g., Surge Pond dam, SCP dams, site roads, mine road, and service road, and other lay down areas).

Mine Rock will be classified according to the mine rock classification criteria in Section 3.4.3.

- Type 3 Mine Rock has a high potential for acid generation and metal leaching. Type 3 Mine Rock will be stored within CDF, away from the perimeter dykes and side slope boundaries. This rock will be placed in areas that will be filled with tailings. The objective of co-disposing Mine Rock and tailings is to reduce infiltration of water and oxygen through the mixed Mine Rock and tailings matrix.
- Type 2 Mine Rock with a low potential for acid generation will be used for the purpose of perimeter dyke construction of the CDF Perimeter Dyke, either as filter media or structural fill within the dyke wall structure, or rip rap.
- Type 1 Mine Rock with a low potential for acid generation and metal leaching will be used for the purpose of site construction including SCP dam construction, site roads, the mine road, the service road, as well Plant and Camp construction requirements such as for use as fill, or in the production of aggregate for concrete. If excess Type 1 rock is available, it can also be used in place of Type 2 rock for construction of the perimeter dyke.

All contact water from the CDF will be pumped to the Surge Pond for re-use in the Plant or for treatment in the ETF and release.

3.8 Tailings and Mine Rock Co-Disposal Facility

Tailings and Mine Rock will be co-disposed in a single facility. The design of the CDF described in this section is based on a pre-feasibility level of study. While used elsewhere in the world, a CDF is new technology for the NWT. Fortune will continue to refine waste management protocols and facilities during the permitting process and will produce an Operating Manual for the CDF prior to entering into the water licensing phase of the permitting process. A preliminary CDF Management Plan is provided in Appendix 3.II.

The final design of the CDF will be developed from more detailed engineering to be undertaken during the engineering phase for construction, and for water licensing purposes. The final design will be consistent with the environmental protection measures of the preliminary design.

This section provides an overview of the quantity and distribution of tailings, tailings geochemical characteristics, and the basic design features of the CDF. Section 3.7 provides information relating to the quantity and distribution of Mine Rock, and the geochemical characteristics of Mine Rock. The deposition and containment of waste streams other than Mine Rock at the NICO Project site will be discussed in Section 3.9.

3.8.1 Quantity and Distribution of Tailings

The NICO Project is projected to generate approximately 30 Mt of flotation tailings. Approximately 92% of the tailings stream will consist of primary rougher tailings, and the remaining 8% will be represented by products from the secondary flotation circuit following regrind at less than 20 µm.

The tailings slurry will be dewatered using a deep cone thickener to produce non-segregating slurry with a solids content range of 73 to 77%. Thickened tailings will be discharged through a series of spigot discharge points in the CDF. All tailings will be placed in the CDF, which is described in more detail in Section 3.8.3. Conservatively, approximately 50% of the total volume of tailings is expected to occupy voids in the Mine Rock. The remaining 50% of the tailings will be deposited as thin layers within the CDF cells.

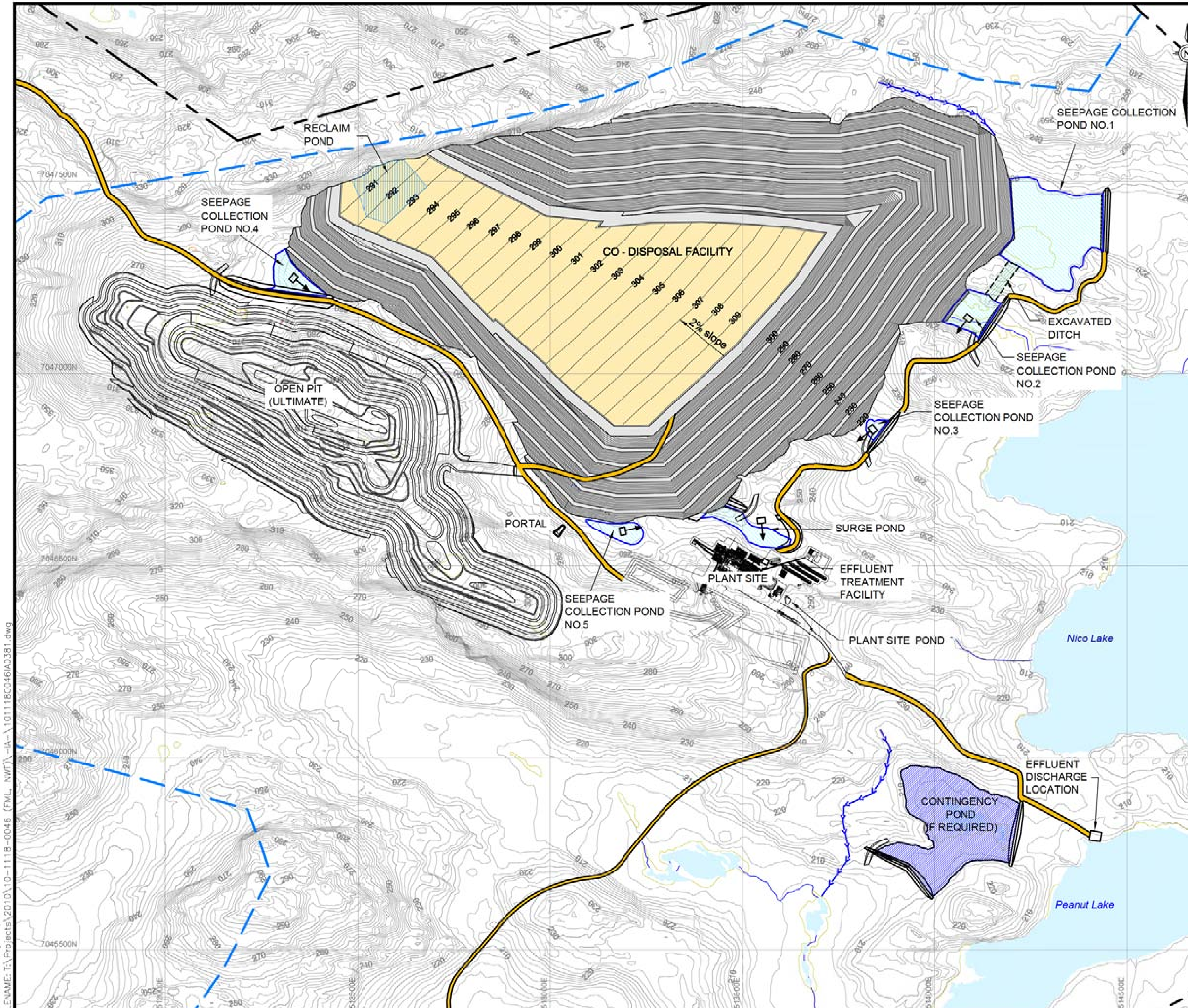
3.8.2 Tailings and Mine Rock Co-Disposal Facility

The tailings and Mine Rock CDF will be located immediately north of the ore body and portal and within 1.5 km of the proposed mill site. Figure 3.8-1 illustrates the general arrangement plan of the CDF. The CDF will be developed on gently sloping ground in sub-watershed BL2 of Nico Lake, incorporating the Grid Pond and Little Grid Pond. The configuration of the facility is developed to deposit the tailings and Mine Rock within the topographic highs of the ridges surrounding the CDF.

3.8.2.1 Co-Disposal Facility Perimeter Dyke

Co-disposed tailings and Mine Rock will be contained by a perimeter dyke of non-erodible Type 2 Mine Rock that will be constructed around the perimeter of the CDF. The perimeter dyke is designed to prevent fine tailings from mobilizing through the dyke wall and to protect the tailings and Mine Rock from erosion. The perimeter dyke will be constructed in several stages. A starter dyke will be constructed using Type 2 Mine Rock at the east end of the CDF during the construction period. Type 2 rock represents Mine Rock that has low potential for acid generation potential and a limited potential for metals leaching. Type 1 Mine Rock will be used for construction materials outside of the CDF.

The starter perimeter dyke will have a maximum elevation of 230 m, which will provide sufficient storage capacity for start-up for approximately one year until the subsequent construction season. The upstream and downstream slopes of the starter dyke will be 2H:1V and 3H:1V, respectively. A 1 m thick granular filter will be provided on the upstream face of the perimeter dyke to retain tailings solids, while allowing water to seep into the SCPs. The perimeter dyke will be continuously raised throughout the operating period to a maximum elevation of 310 m. Above the starter dyke, either aggregate or non-woven geotextile will be used as the filter.



LEGEND

- PUMP STATION (MOTHBALLED, CONTINGENCY ONLY)
- DIVERSION DITCH
- PROJECT LEASE BOUNDARY
- WATERSHED
- ACCESS ROAD
- CO-DISPOSED TAILINGS AND MINE ROCK
- CONTINGENCY POND
- PERIMETER DYKE OF CO-DISPOSAL FACILITY
- RECLAIM POND
- SEEPAGE COLLECTION POND / SURGE POND
- WATER BODY

NOTES

1. All elevations (geodetic datum) and grid coordinates (UTM NAD83, Zone 11) shown in this drawing are in metres.
2. Configuration shown assumes sub-economic ore is not processed.

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 (October 8, 2008) with comments provided 19 December 2009.

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SCALE 1:10,000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

GENERAL ARRANGEMENT PLAN OF THE CO-DISPOSAL FACILITY

Golder Associates
Edmonton, Alberta

FILE No: E-PD-003-CAD.dwg

PROJECT No: 09-1373-1004			SCALE AS SHOWN	REV. 0
DESIGN	IM	10 May 2011	FIGURE: 3.8-1	
CAD	TDR	10 May 2011		
CHECK	IM	10 May 2011		
REVIEW	KAB	10 May 2011		

PLOT DATE: May 11, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML_NWT)\-IA-\10111180046IA0381.dwg

The CDF perimeter dyke components that will be constructed during each raise will include the following 3 zones:

- The upstream zone that will be constructed to provide containment for tailings and Mine Rock. This zone will be constructed using Type 2 Mine Rock (Table 3.7-4), and will have a crest width of 10 m, an upstream slope of 1.5H:1V and a downstream slope of 3H:1V.
- The filter zone will comprise either aggregate (i.e., either natural aggregate or crushed mine rock), or a non-woven geo-textile (with a weight of at least 600 grams per square metre [g/m^2]).
- The downstream zone will be constructed of Type 2 Mine Rock. The downstream zone will be 15 m wide, and will have an inter-bench slope of 3H:1V.

3.8.2.2 Tailings and Mine Rock Co-Disposal Facility

The CDF will be constructed progressively in layers from east to west. The ultimate configuration of the CDF will slope towards the northwest to facilitate runoff to SCP No. 4 and to reduce seepage into Nico Lake. The CDF will be developed by depositing alternating layers of Mine Rock and thickened tailings. The thickness of the Mine Rock and tailings layers will be dictated by the mass ratio of Mine Rock to tailings. Mine Rock will be used to construct a typical 4 hectare (ha) polygonal tailings cell, approximately 200 m x 200 m. The Mine Rock will be placed by end-dumping from a haul truck to create a berm having an angle of repose of approximately 1.5H:1V. After a series of tailings cells are constructed, the thickened tailings slurry will be discharged from a series of discharge spigot points from the eastern berms of the tailings cells. To maximize the mixing of the tailings and Mine Rock, the basin floor of each tailings cell will be ripped using a bulldozer prior to tailings disposal. Later, a layer of Mine Rock layer will be dumped over freshly deposited tailings.

Tailings cells will be constructed and filled continuously to create the alternating Mine Rock and tailings layers. Careful planning will be required so that the tailings cells are constructed well ahead of tailings placement, and the contiguous zones of Mine Rock do not extend through large portions of the pile. The operational schedule for tailings cell construction and tailings deposition thickness will be planned based on the Mine Rock production schedule. During the first 5 years of operation, the Mine Rock to tailings ratio will be high due to the higher stripping ratio in the Open Pit. The ratio of Mine Rock to tailings will become lower in the subsequent years of operations; therefore, the base of the CDF will be predominantly Mine Rock. The top of the CDF will be predominantly tailings, and consequently the Mine Rock will be dressed with lower permeability material.

The tailings cell construction schedule will also vary seasonally during operations. During the summer months, tailings could be spigotted from any one of a number of discharge points that can be operated as needed. To avoid freeze-up during the winter months, the discharge points will be reduced to a maximum of 3 operating spigots and the solids content of the tailings may also be reduced by up to 2% to provide better deposition of tailings. Furthermore, multiple cells can be constructed prior to the winter months to reduce the need for constructing or altering the main discharge headers. In the summer months, it may be sufficient to have only 2 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 be turned into an active cell.

3.8.2.3 Water Management in the Co-Disposal Facility

Runoff and water that separates from the tailings slurry will seep through the tailings cell berms. As a result, a Reclaim Pond will form at the northwest corner of the CDF. The location of the Reclaim Pond will move progressively westwards as deposition in the CDF proceeds. In later years, it may be necessary to dress inside surfaces of the perimeter dyke with tailings to reduce seepage losses and to maintain a suitably sized Reclaim Pond (Appendix 3.II).

Water from the Reclaim Pond will be pumped to the Surge Pond. Any water that seeps through the perimeter dyke will be captured in 5 SCPs. Seepage Collection Ponds No. 1, 2, and 3 will be located in the 3 topographic lows adjacent to the southeast end of the CDF and they are designed to intercept seepage from the CDF that would otherwise flow to Nico Lake; therefore, the dams forming these SCPs will be water retaining structures, and lined with a geomembrane. Seepage Collection Ponds No. 4 and 5 are located north and southwest of the CDF, and will collect surface runoff and seepage from the CDF. Seepage Collection Pond No. 4 will be a water retaining structure and will be lined with a geomembrane. Seepage Collection Pond No. 5 is a natural depression.

Water will be pumped from the SCPs to the Surge Pond using a floating barge pump or a barge placed on a trolley. Water not recycled to the Plant from the Surge Pond will be treated at the ETF (Section 3.9.6).

3.8.2.4 Closure of the Co-Disposal Facility

A closure cover will be placed over the entire surface of the CDF, effectively encapsulating the co-disposed tailings and Mine Rock. The objective of the closure cover is to limit wind and water erosion, and infiltration into the CDF so that the volume of water that will seep from the CDF and report to the SCPs is reduced. The selected cover design for the top surface of the CDF will comprise 2 layers of soil: overburden on the exposed surface, underlain by a layer of sand. The lower layer will act as a “capillary break” that will prevent vegetation on the surface from taking up arsenic and other metals from the underlying tailings pore water. Mine Rock used to construct the exposed CDF perimeter dyke wall will not be a large source of pore water, so the cover on the sloped perimeter dyke will consist of a single 0.5 m thick layer of overburden, without a capillary break layer.

The surface layer of the cover will be constructed using glacial till, which testing has shown to have a low potential for acid generation and metal leaching, as well as the required grain size characteristics to meet the objectives of the closure cover. The top of the CDF will be graded towards the west at an approximate 2% slope to promote the travel of runoff water in contact with the closure cover to SCP No. 4. From SCP No. 4, runoff and seepage will be directed into the Open Pit at closure. Seepage water that collects in SCPs No. 1, 2, and 3, and the Surge Pond, will be passively treated in constructed Wetland Treatment Systems, and then released into Nico Lake.

3.9 Site Water Management

Water management at the NICO Project site includes managing water that comes into contact with the mine facilities during construction, operations, and closure. Water released from the site during construction, operations or closure must meet the site-specific water quality objectives (SSWQO). The NICO Project Water Management Plan is found in Appendix 3.III.

3.9.1 Water Management Facilities

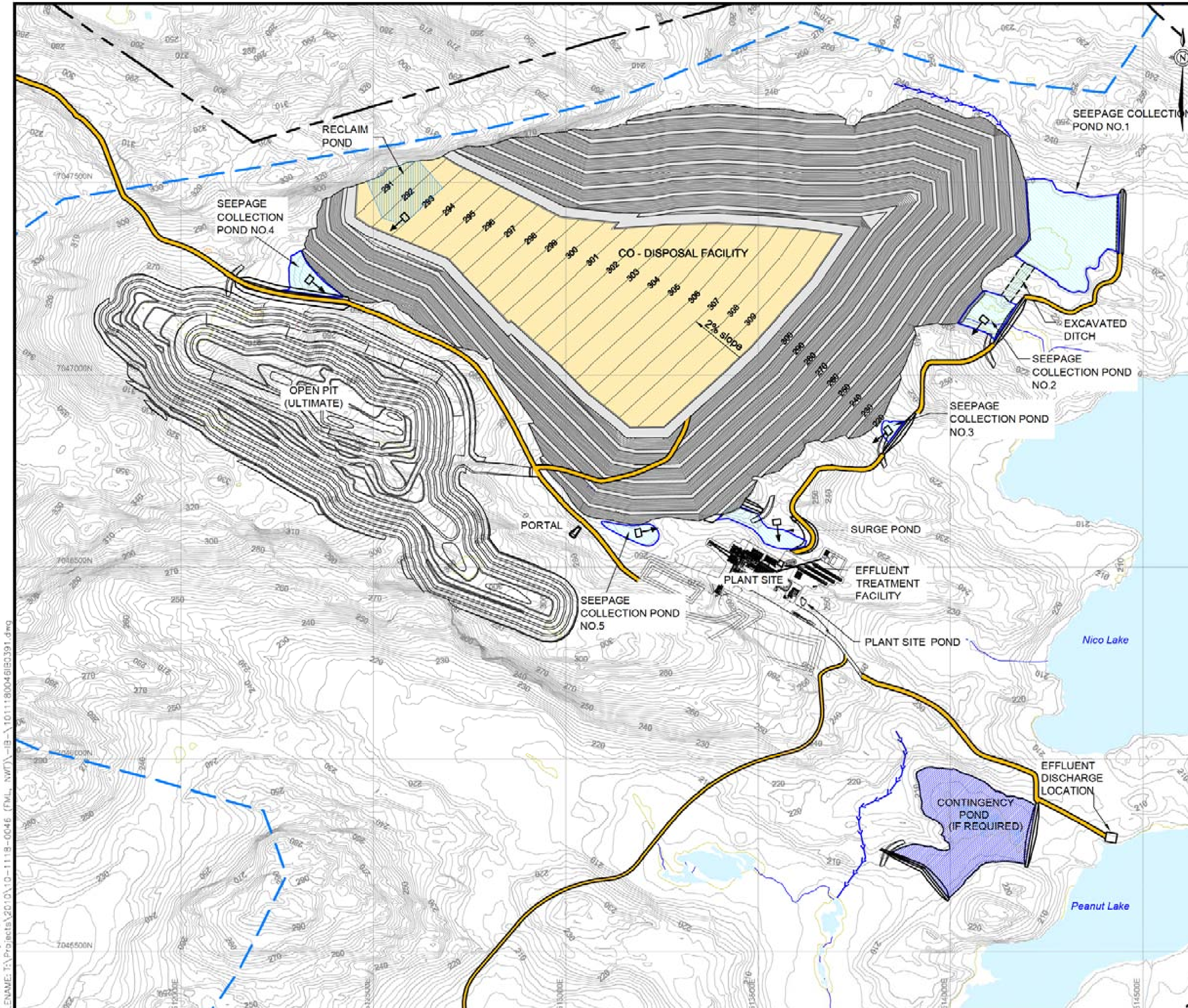
Figure 3.9-1 shows the general arrangement of the CDF and associated site water management facilities. The CDF alone occupies a total footprint area of 139 ha. The key components of the water management facilities are:

- Co-Disposal Facility perimeter dyke;
- Co-Disposal Facility (for permanent storage of tailings and Mine Rock);
- Reclaim Pond and movable pump station;
- thickened tailings distribution system;
- 5 SCPs and pump stations;
- SCP dams and emergency spillways;
- Surge Pond and pump station; and
- return water pipeline system.

Other site water management components include:

- Lou Lake modular pump house;
- fresh water pipeline;
- fresh water storage tank;
- potable water treatment module;
- process water tank;
- Plant Site Surface Runoff Pond;
- Sewage Treatment Plant; and
- Effluent Treatment Facility.

During operations, the decision may be made to also construct a Contingency Pond on the western shore of Peanut Lake. This would only be constructed if it became apparent that post-treatment polishing or flow balancing would be advantageous. If it is built and only when required, then water from the ETF would be discharged into the Contingency Pond prior to release into Peanut Lake.



LEGEND

- PUMP STATION (MOTHBALLED, CONTINGENCY ONLY)
- DIVERSION DITCH
- PROJECT LEASE BOUNDARY
- WATERSHED
- ACCESS ROAD
- CO-DISPOSED TAILINGS AND MINE ROCK
- CONTINGENCY POND
- PERIMETER DYKE OF CO-DISPOSAL FACILITY
- RECLAIM POND
- SEEPAGE COLLECTION POND / SURGE POND
- WATER BODY

NOTES

1. All elevations (geodetic datum) and grid coordinates (UTM NAD 83, Zone 11) shown in this drawing are in metres.
2. Configuration shown assumes sub-economic ore is not processed.

REFERENCE

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

200 0 200 400
SCALE 1:10,000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE **GENERAL ARRANGEMENT PLAN OF THE CO-DISPOSAL FACILITY AND ASSOCIATED WATER MANAGEMENT FACILITIES AT THE END OF OPERATIONS**

Golder Associates
Edmonton, Alberta

FILE No: E-PD-004-CAD.dwg			
PROJECT No: 09-1373-1004		SCALE AS SHOWN	REV. 0
DESIGN	IM	10 May 2011	FIGURE: 3.9-1
CAD	TDR	10 May 2011	
CHECK	IM	10 May 2011	
REVIEW	KAB	10 May 2011	

PLOT DATE: May 11, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\-IB-\10111800461B0391.dwg

3.9.2 Water Management Plan

3.9.2.1 Construction

3.9.2.1.1 Pre-Construction Flows and Water Uses

The construction water balance incorporates water consumption and surface runoff into the system for the period from the start of the construction the permanent Camp (start of infrastructure construction) through Plant commissioning and the first full year of operations.

Flows that will require management during construction include the following:

- **Underground Dewatering**: It is estimated that 50 000 m^3 will be pumped from the currently flooded underground workings in the 2 months before underground mining starts. It is estimated that the quality of the first 20 000 m^3 of the pumped water will likely be good enough to discharge because it is not in contact with the ore. However, monitoring will be required to confirm that water can be directly discharged, as concentrations of a few metals could occur at concentrations greater than the SSWQO. For water management planning purposes it has been assumed that that the full dewatered volume will be impounded until start-up when it can either be directed to the process water tank or pumped to the ETF and discharge to the environment.
- **Potable water**: Potable water requirements are estimated based on the camp population, assuming a usage of 0.27 m^3/person/day. Potable water estimates were based on the following variables.
  - exploration camp at Lou Lake, base case (up to 28 people): 7.6 m^3/day
  - permanent Camp, construction phase (up to 250 people): 67.5 m^3/day
    - with the exploration camp moved to the plant Site: (up to 278 people): 75.1 m^3/day
  - operations Camp (up to 125 people): 33.8 m^3/day
    - with the additional use of the present exploration camp moved to the permanent Camp site (up to 158 people): 42.7 m3/day

The re-use of the exploration camp at the permanent Camp site will be to address overflow requirements, but it is not expected to be continuously occupied.

- **Sewage/Grey Water**: Sewage/grey water flows are estimated to be 90% of the potable water values. The following estimates were used for operation of the camps at maximum capacity.
  - exploration camp: 6.8 m^3/day
  - permanent Camp, construction phase: 60.8 m^3/day
    - with exploration camp at Plant Site: 67.6 m^3/day
  - permanent Camp, operations phase: 30.4 m^3/day
    - with exploration camp at Plant Site: 33.8 m^3/day

All sewage and grey water will be treated. A description of the sewage treatment facility is found in Section 3.9.7.

- **Dust Control/Drilling :** Operations: 8.3 m^3/hr (from May to September).
- **Water for the Concrete Plant**: Assuming 2500 t of concrete mix used for construction, 1250 t of water is required (2:1 concrete mix to water ratio).
- **Runoff from site:** This was calculated using long term average monthly precipitation and evaporation statistics from climate data, calculated runoff areas, runoff and infiltration coefficients that are documented by Golder (2010b, Appendix B).
- **Plant Site Surface Runoff pond:** During construction, prior to site preparation, a storage pond will be built south of the Plant site to collect suspended solids generated by disturbance impacts such as cut and fill activities and construction equipment moving across site roads and yards. Suspended solids will be allowed to settle in the pond before runoff is released into local natural drainage courses.

3.9.2.1.2 Construction Water Management

In creating the NICO Project construction Water Management Plan, the following was considered:

- Sewage from the construction Camp will be treated using a pair of rotary biologic contactors installed in parallel. The effluent flows from the STP will be discharged directly into Peanut Lake. Following construction, the discharge rates will be nearly halved for the operational period.
- During construction, the foundations of the CDF perimeter dyke and the SCP dams need to be maintained in a dewatered condition for the initial period of construction. Normal construction practices will be followed, including the construction of temporary cofferdams upstream of the work areas and the pumping of water from the upstream watershed around the dewatered areas. The pumping will continue until the CDF perimeter dyke and the SCP dams have sufficient freeboard to contain the upstream runoff plus a design storm. It is not intended to materially lower the water levels in the Grid Ponds, only to divert the net runoff around the construction areas. The total volume of water pumped will be roughly equal to the net runoff from the Grid Pond watershed over the period of initial construction. At the end of the construction period, the inventory of water in the Grid Pond watershed will be roughly the same as that which occurs under natural conditions.
- Once the SCP dams have been constructed, the water flowing from the Grid Ponds area will be impounded. The water will initially collect behind the SCP containment dams and eventually behind the CDF perimeter dyke, impounding runoff in the wetland that is present east of the Grid Ponds. The volume of impounded water (which will comprise the estimated 42 450 m^3 volume of the Grid Ponds themselves, plus runoff over the impoundment period) will have to be stored either until the ETF is operational, or until the water can be used within the Plant as process water. During the construction period, any water which cannot be released will be impounded in the Water Management Ponds in the following sequence:

  1) In the Surge Pond;

  2) In SCP No. 3; and

3) In SCP No. 1 and 2, which, at that time, will be combined into a single pond at their upstream end.

The construction water modelling indicated the following results.

- To limit the volume of water retained behind the SCPs, the commissioning of the dams should roughly coincide with the pre-stripping of the Open Pit, approximately 1 year before Plant commissioning.
- Water generated from underground dewatering and Open Pit mining operations will be pumped to the Surge Pond or the SCPs for retention.
- At its Normal Operating Water Level, SCP No. 3 will have a storage capacity of 4500 m^3. This capacity will be exceeded in its first month of operation.
- Combined, SCP No. 1 and 2 will have a capacity of 246 000 m^3. This is sufficient capacity to contain all anticipated flows up to the Plant start-up; therefore, the ETF will only be needed for the start-up of the Plant.
- Because of the large capacity of SCP No. 1 and 2, if the dams can be completed by the September in the summer season that precedes start-up, then there will be sufficient contingency between SCP No. 1, 2, 3, and the Surge Pond to receive the winter precipitation accumulation, runoff, and the contingency volume required to collect underground and Open Pit dewatering activities without commissioning the ETF.

To contain the anticipated flows from construction phase watersheds, additional site flow components, and a possible design flood, the various Water Management Ponds will have to be built by the dates shown in Table 3.9-1 (assuming site construction schedule shown in Table 3.9-2).

Table 3.9-1: Results of Construction Water Modelling

Water Management Component	Year
Surge Pond	-1
Seepage Collection Pond 3	-0.7
Seepage Collection Ponds 1 and 2	-0.7
Effluent Treatment Facility	1 (Start-up)
Total Volume Retained (m^3)	69 777

m^3 = cubic metres

3.9.2.1.3 Dewatering of the Mine

It is estimated that approximately 50 000 m^3 of water will be pumped from the currently flooded underground workings that were developed during bulk sampling. This pumping will take about 2 months and will be undertaken prior to the commencement of underground mining.

A water quality monitoring program will be established during the underground mine dewatering stage. If water meets the SSWQO, then it can be discharged to the environment. Water that does not meet the SSWQO will be impounded in either the constructed Surge Pond or SCP No. 1, 2, or 3. This water will be treated and released once the ETF is commissioned.

After the dewatering of the underground workings is completed, there will still be steady state inflows from groundwater into the workings. It is anticipated that an additional 10 000 m^3 of water will be pumped from underground mine workings during the underground mining period. Underground mining will cease after 2 years and the decline (the sub-horizontal passage leading into the mine) and fresh air raise (used for mine ventilation) will be sealed using a concrete plug structure called a bulkhead.

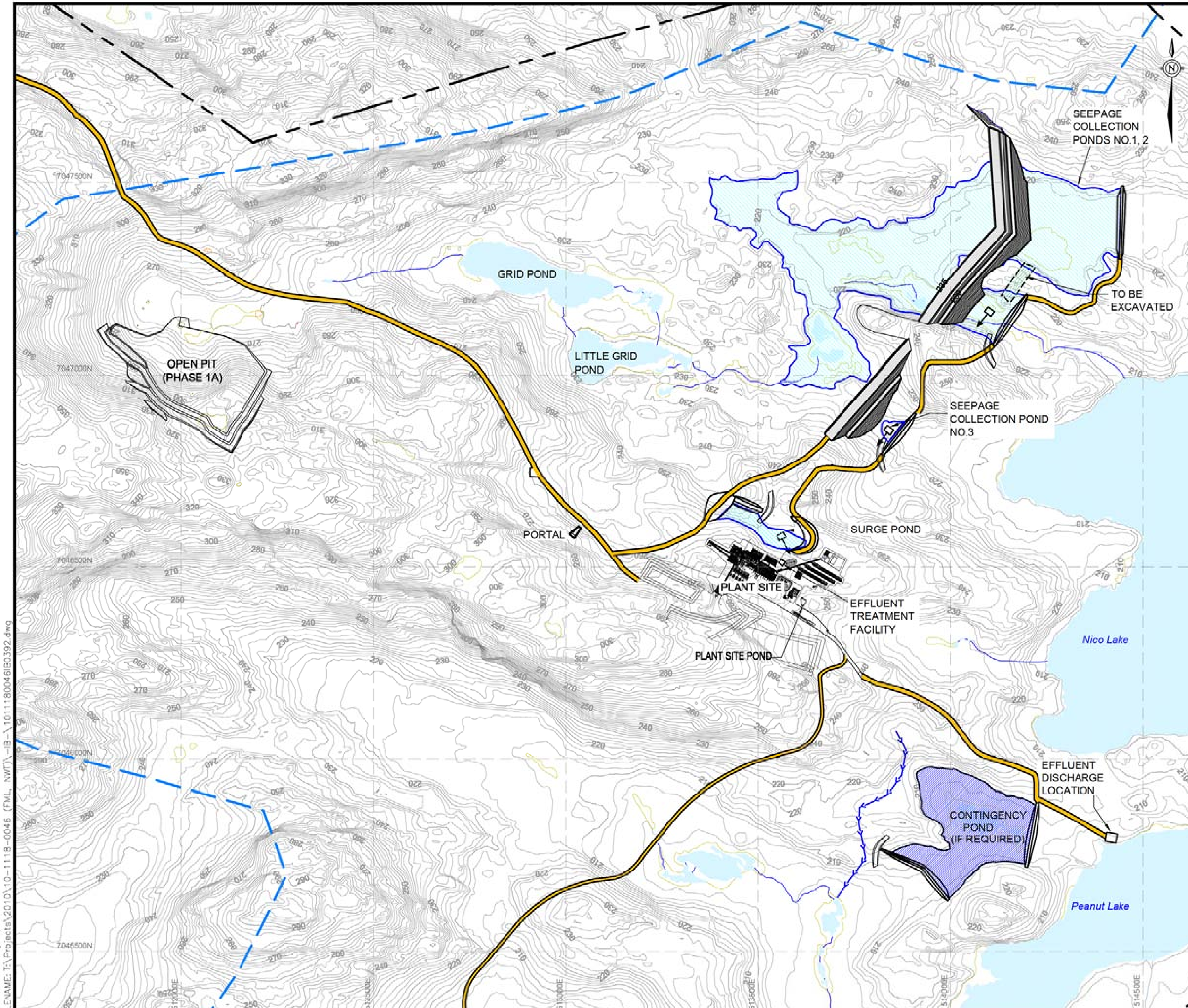
Water will also be pumped from the base of the Open Pit. Pumping will begin with the start of the pre-stripping activities and will continue throughout the mining period. The volume of water pumped will be the equal to the sum of the groundwater inflow and runoff from surface water flows into the pit, less evaporation. This volume will increase progressively over the years as the Open Pit becomes deeper and the Open Pit watershed area increases. It is estimated that the volume pumped will be about 130 000 m^3 during the start-up year, increasing to about 285 000 m^3 during the final year of mining.

3.9.2.2 Operations

The major components of the Water Management Plan during operations are:

- **Underground Mine:** During 2 years of underground mining operations, mine water will be collected in sumps and pumped to the Surge Pond for treatment or use in the Plant. Underground mining will cease in Year 3, and open pit mining will continue for the balance of the mine life.
- **Open Pit**: During operations, the Open Pit will collect direct precipitation, surface run-off, and groundwater seepage. The mine water will be collected in sumps that will move with the mining schedule and pumped to the Surge Pond for treatment or use in the Plant.
- **Mineral Processing Plant:** The Water Management Plan (Appendix 3.III) indicates the fresh water requirement of the Plant under a variety of climatic conditions. The projected steady state requirement under average climatic conditions is 3.1 m^3/hr (27 156 m^3/year).
- **Co-Disposal Facility:** During operations, the CDF will collect tailings water and precipitation as surface runoff. This water will be stored in the Reclaim Pond that will be created within the CDF. The Reclaim Pond will be relocated throughout the operating life as the CDF develops. A movable pump barge will be used to pump the decanted supernatant and runoff water back to the Surge Pond for re-use by the Plant.
- **Seepage Collection Ponds (SCP 1 to 5):** SCP No. 1, 2, and 3 will be located in topographic lows below the southeast end of the CDF collecting seepage produced from the perimeter dykes by gravity. Seepage Collection Pond No. 4 and 5, located north and southeast of the Open Pit relative to the CDF downstream of the CDF are constrained by natural topography and are bounded by the service road to Lou Lake;
- **Surge Pond:** The Surge Pond, located at the topographic low north of the Plant, is the main site process water management pond, returning water from the Reclaim Pond, SCP containment ponds, Open Pit sumps, and underground dewatering to the process water tank.
- **Process Water Tank:** Water is recycled to the process water tank from the tailings thickener overflow, concentrate thickener overflow, concentrate filtrate, and water pumped from the Surge Pond. Excess water that accumulates in the Surge Pond can bypass the process water tank and be sent to the ETF for treatment and release into Peanut Lake.
- **Plant Site Surface Runoff Pond**: During operations, surface contact water containing suspended solids will be collected by the pond for recycle back to the tailings thickener.

- **Lou Lake pump house**: Fresh water will be pumped from Lou Lake utilizing using a modular pump house feeding a 150 mm insulated and heat-traced 150 mm pipeline. The fresh water tank will be located within the service complex and will distribute water to the modular potable water production facility, as well as dust control and dedicated process use such as gland water and hose water. When the return of water from the CDF and other sumps to the Surge Pond is less than 52.0 m^3/hour, fresh water will need to be utilized as make up water to the process water tank.
- **Freshwater Intake:** The water intake will be set in Lou Lake to provide water for the Plant and the proposed Camp location southeast of the mine. The intake is anticipated to require a working, or nominal, capacity of approximately 12.8 cubic metres per hour (m^3/h) to accommodate both plant and domestic uses during operations with a fully-staffed camp. The intake structure will be designed to meet Department of Fisheries and Oceans Canada (DFO) guidelines for water intakes.
- **Effluent Treatment Facility:** The ETF will treat excess mine water prior to discharge to the environment. The ETF is described in more detail in Section 3.9.7.
- **Additional Water Management Components:** Drainage ditches, emergency spillways, and floating pump stations.
- **Diffuser:** Treated water from the ETF and STP will be pumped through a diffuser directly into Peanut Lake. The diffuser will have a single port located at a depth of 8.5 m in Peanut Lake (Appendix 7.IV).



LEGEND

- RECLAIM BARGE / PUMP STATION (for start-up)
- DIVERSION DITCH
- PROJECT LEASE BOUNDARY
- WATERSHED
- ACCESS ROAD
- CONTINGENCY POND
- PERIMETER DYKE OF CO-DISPOSAL FACILITY
- SEEPAGE COLLECTION POND / SURGE POND
- WATER BODY

NOTES

1. All elevations (geodetic datum) and grid coordinates (UTM NAD 83, Zone 11) shown in this drawing are in metres.

REFERENCE

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

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

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

200 0 200 400

SCALE 1:10,000 METRES

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

LAYOUT OF WATER MANAGEMENT FACILITIES AT END OF CONSTRUCTION PHASE

Golder Associates
Edmonton, Alberta

FILE No: E-PD-005-CAD.dwg

PROJECT No: 09-1373-1004			SCALE AS SHOWN	REV. 0
DESIGN	IM	15 Feb. 2011	FIGURE: 3.9-2	
CAD	TDR	15 Feb. 2011		
CHECK	IM	15 Feb. 2011		
REVIEW	KAB	15 Feb. 2011		

PLOT DATE: May 9, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\-IB-\1011180046IB0392.dwg

3.9.2.3 Closure

3.9.2.3.1 Open Pit

At closure, pumping of water out of the Open Pit will cease and the Open Pit will slowly fill with water. Flooding of the Open Pit is beneficial in that higher water levels will reduce any localized areas of potentially acid generating rock that will be exposed to atmospheric conditions, thus reducing the total metal loading from the pit wall runoff over time. The rate of flooding will be increased by directing runoff from the top surface of the CDF into the Open Pit. This will be accomplished by trenching through the SCP 4 dam.

Modelling indicates that it will take approximately 120 years for the pit water level to rise to elevation (Elev.) 260 m, at which time the Flooded Open Pit will begin to overflow through the former haul road ramp, which will be the low point on the pit rim. Prior to pit overflow, the water quality at the top of the Flooded Open Pit will be evaluated, and a decision will be made about post-overflow treatment.

Several alternatives were considered for the treatment of the overflow water, including the following:

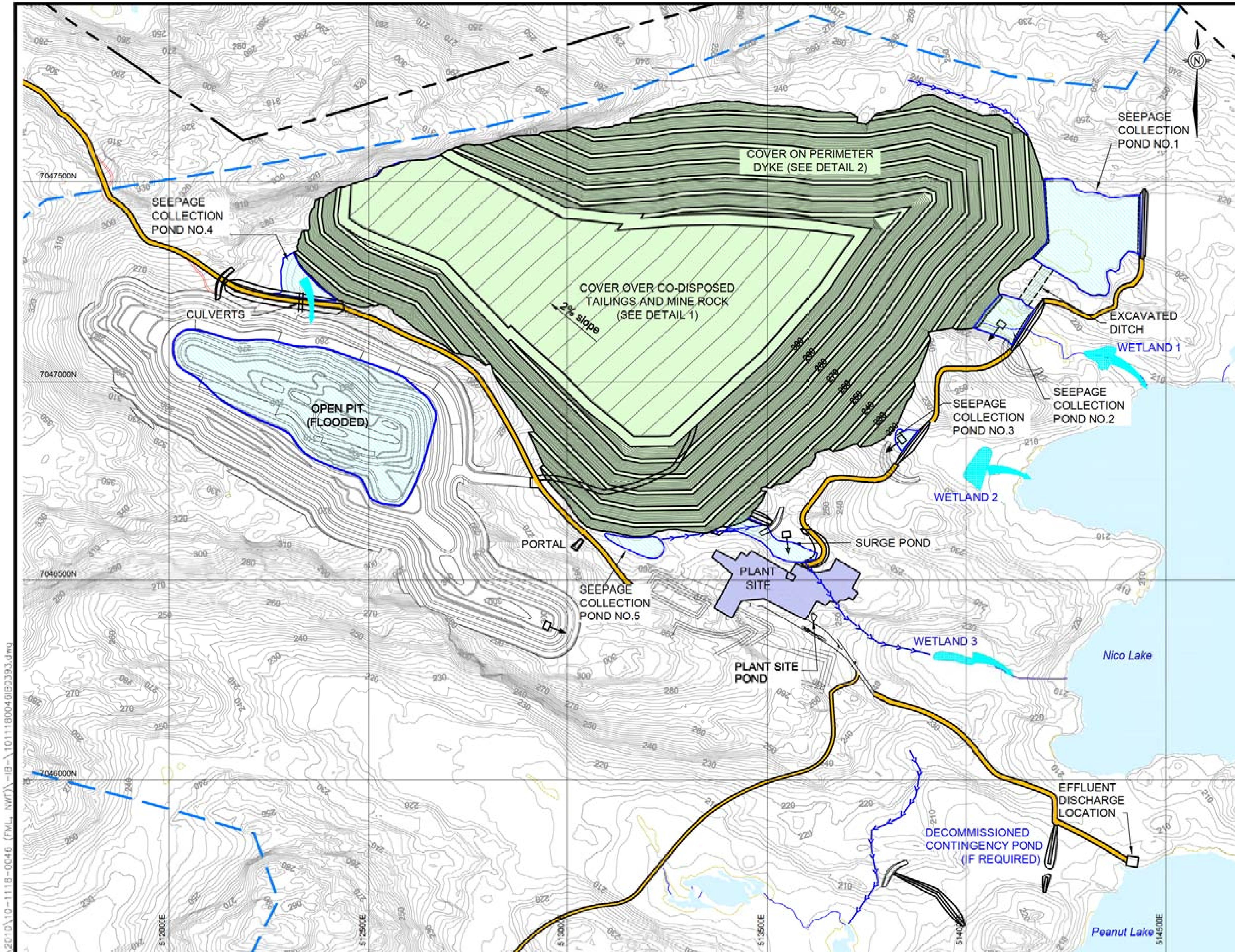
1) relying on the stratification of water in the Flooded Open Pit, (i.e., the development of a chemocline and thermocline), to establish surficial water quality that is suitable for discharge to Peanut Lake;

2) *in situ* treatment of the water in the Flooded Open Pit prior to overflow by chemical or biological means;

3) building a new ETF for active treatment prior to discharge into Peanut Lake (i.e., the same general type of treatment as during the operational period of the mine); and

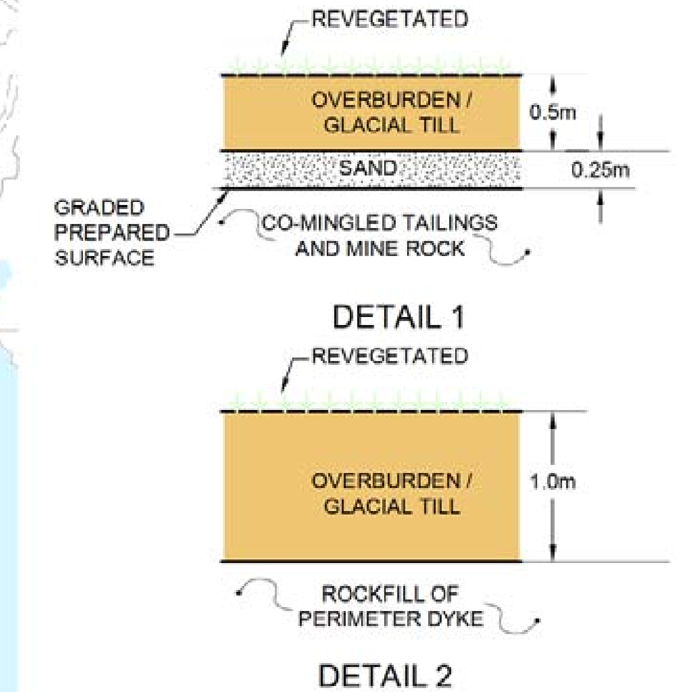
4) passive treatment of the overflow water in a Wetland Treatment System, prior to discharge into Peanut Lake.

The fourth alternative was selected as the base case because it is a “passive” approach that requires less human intervention than the other alternatives. Use of a Wetland Treatment System will be subject to on-site testing during operations to demonstrate that it will achieve the desired results. Wetland Treatment System No. 4 would be constructed on the western shore of Peanut Lake. Figures 3.9-3 and 3.9-4 show the layout of the post-closure water management, respectively before and after pit overflow occurs. The corresponding conceptual water management plans are shown on Figures 3.9-5 and 3.9-6.



LEGEND

- PUMP STATION (MOTHBALLED FOR 10 YEARS THEN REMOVED)
- DIVERSION DITCH
- PROJECT LEASE BOUNDARY
- WATERSHED
- ACCESS ROAD
- CONSTRUCTED WETLAND TREATMENT SYSTEM
- DEMOLISHED AND REVEGETATED
- OVERBURDEN COVER
- WATER BODY



REFERENCE

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

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

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

200 0 200 400
SCALE 1:10,000 METRES

NOTES

1. All elevations (geodetic datum) and grid coordinates (UTM NAD 83, Zone 11) shown in this drawing are in metres.
2. Water which accumulates in seepage collection ponds 1, 2, 3, and 5 and the surge pond will be passively treated in wetlands and released directly to Nico lake.Tthis is subjected to demonstration of the technical feasibility of wetland treatment. if not feasible, the water will be pumped to the open pit.

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

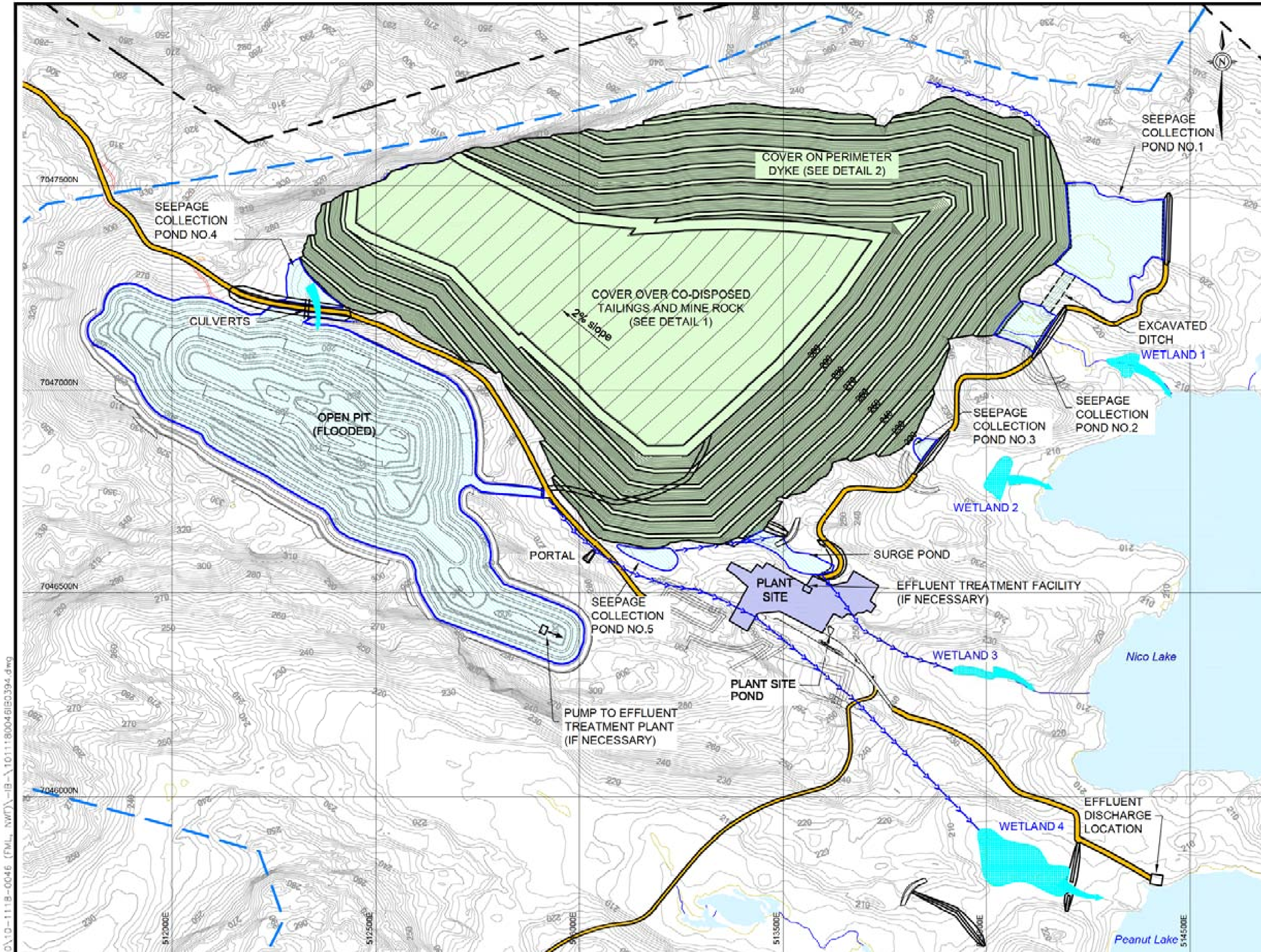
LAYOUT OF POST-CLOSURE WATER MANAGEMENT BEFORE PIT OVERFLOW

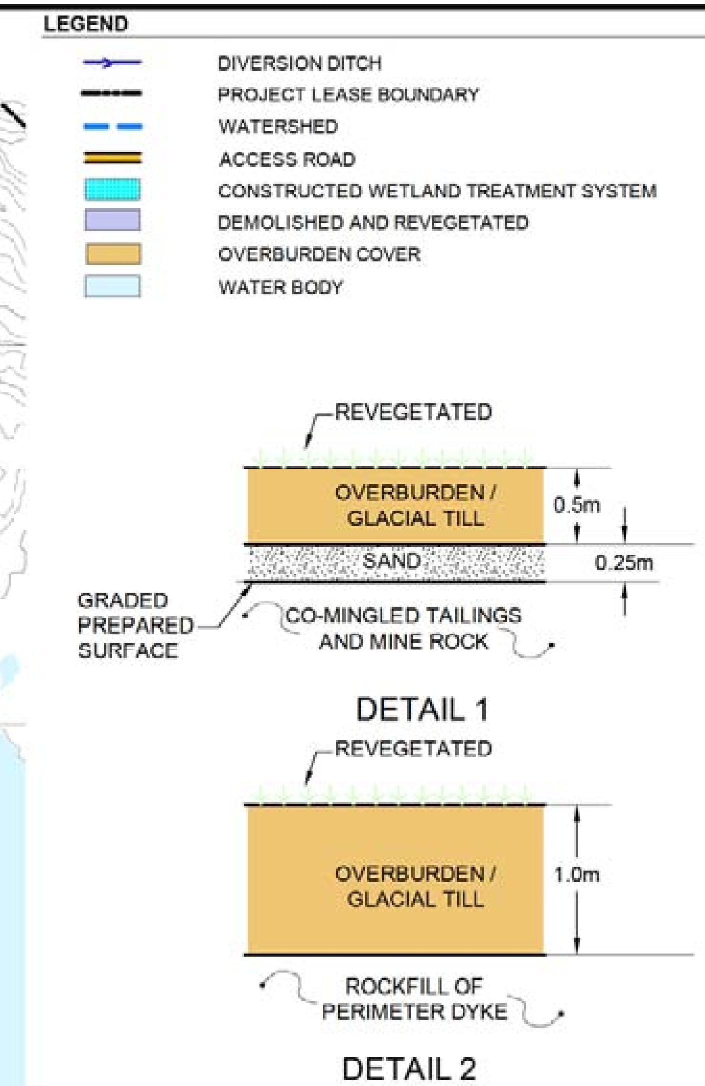
Golder Associates
Edmonton, Alberta

FILE No: E-PD-006-CAD.dwg

PROJECT No: 09-1373-1004			SCALE AS SHOWN	REV. 0
DESIGN	IM	15 Feb. 2011	FIGURE: 3.9-3	
CAD	TDR	15 Feb. 2011		
CHECK	IM	15 Feb. 2011		
REVIEW	KAB	15 Feb. 2011		

PLOT DATE: May 9, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)\-IB-\10111800461B0393.dwg





REFERENCE

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

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

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

200 0 200 400

SCALE 1:10,000 METRES

NOTES

1. All elevations (geodetic datum) and grid coordinates (UTM NAD 83, Zone 11) shown in this drawing are in metres.
2. Water which overflows from the open pit together with water which collects in seepage collection ponds 1, 2, 3, and 5 and the surge pond, will be passively treated in wetlands and released directly to Nico lake. This is subject to demonstration of the technical feasibility of wetland treatment. If not feasible, the water will be pumped to the surge pond and then to the effluent treatment facility for treatment and release through the polishing pond to Peanut Lake.
3. Once wetland treatment is demonstrated, the effluent treatment facility and the polishing pond will be decommissioned and removed.

PLOT DATE: May 5, 2011
FILENAME: T:\Projects\2010\10-1118-0046 (FML, NWT)_IB_\1011180046IB0394.dwg

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

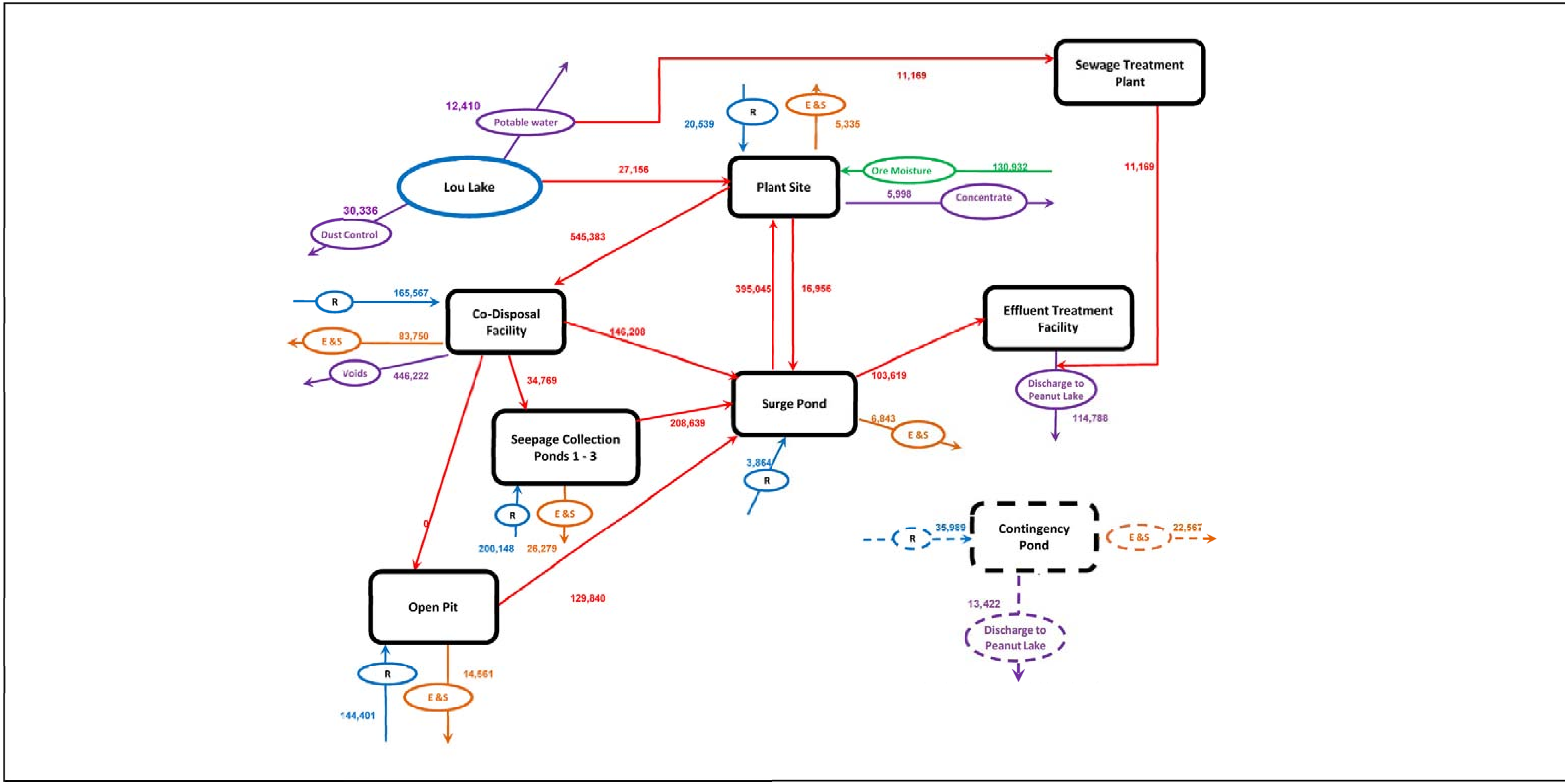
TITLE

LAYOUT OF POST-CLOSURE WATER MANAGEMENT AFTER PIT OVERFLOW

FILE No: E-PD-007-CAD.dwg

Golder Associates
Edmonton, Alberta

PROJECT No. 09-1373-1004			SCALE AS SHOWN	REV. 0
DESIGN	IM	15 Feb. 2011	FIGURE: 3.9-4	
CAD	TDR	15 Feb. 2011		
CHECK	IM	15 Feb. 2011		
REVIEW	KAB	15 Feb. 2011		



LEGEND

- Rainfall, Runoff
- Evaporation, Seepage and Spillage Losses
- Other Losses
- Other Inflows
- Internal Flows
- Conditional Flows
- Conditional Operations

NOTES

1. Flows are all in m^3/year and they take into account 90% availability for all facility flows.
2. The Co-disposal Facility includes the Reclaim Pond and Seepage Collection Ponds No. 4 and 5.
3. Slurry water flow assumes a solids content of 75%. If a lower solids content were used, this flow would increase; however, the reclaim would increase by the same amount.
4. The fresh water requirement of the plant is 3.1t/hr at 90% availability, which is based Aker Solutions Water Balance, Revision D, dated November 15, 2010.
5. Runoff and evaporation assume long term average values.
6. In the event that adequate storage is available at the ETF, treated effluent can be used for dust control instead of fresh water.
7. It is not currently planned to construct the Contingency Pond. A decision to construct would be made during operations if it is deemed advantageous to do so.

REFERENCE

Drawing Provided by Golder Associates Ltd (February 2011)

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

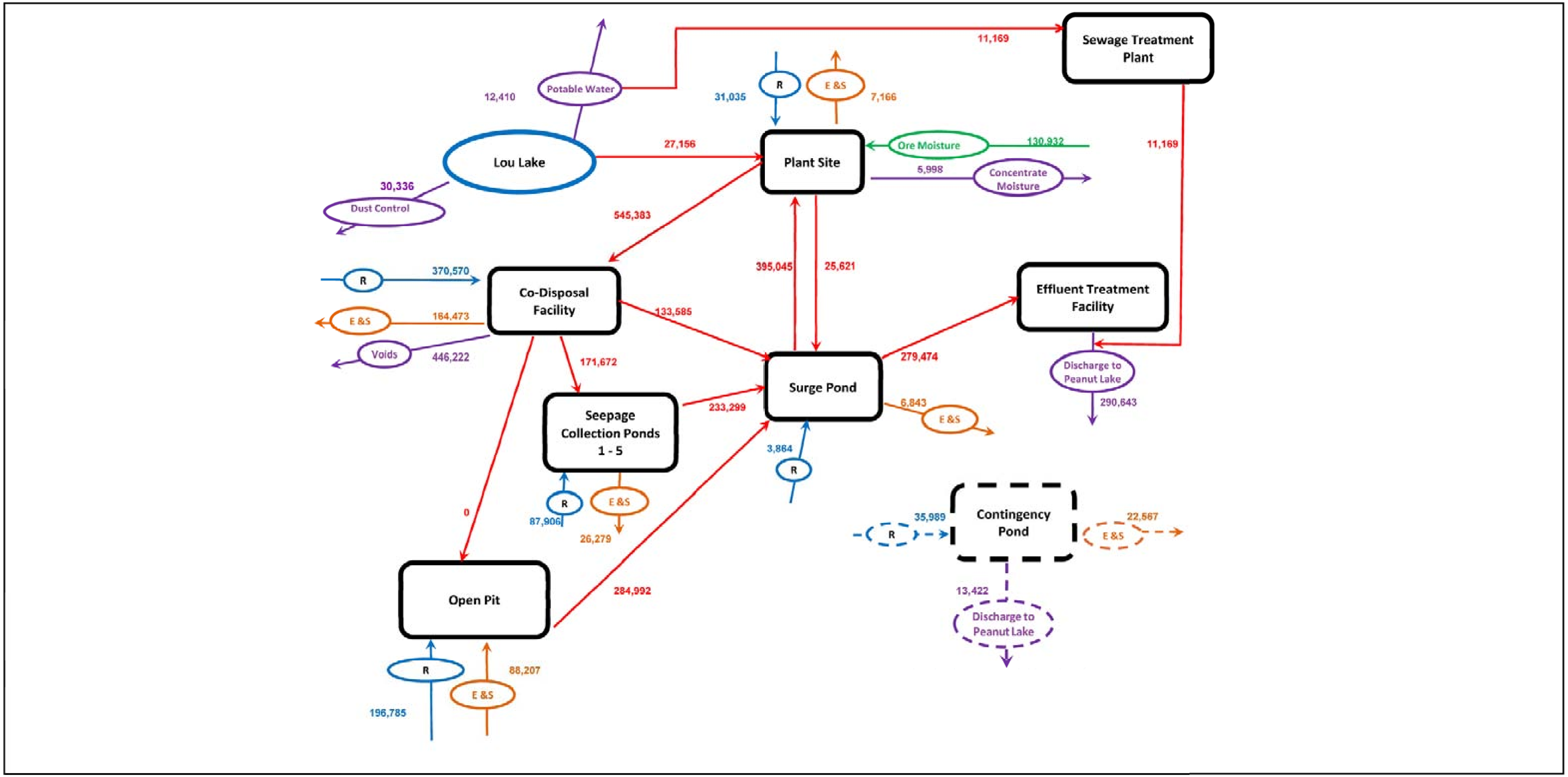
TITLE

START-UP WATER BALANCE

Golder Associates
Edmonton, Alberta

FILE No. E-PD-008-GIS.mxd				
PROJECT NO. 09-1373-1004			NO SCALE	REV. 0
DESIGN	SC	25 Feb. 2011		
GIS	SC	26 Apr. 2011		
CHECK	AC	26 Apr. 2011		
REVIEW	KAB	26 Apr. 2011		

FIGURE: 3.9-5



LEGEND

- Rainfall, Runoff
- Evaporation, Seepage and Spillage Losses
- Other Losses
- Other Inflows
- Internal Flows
- Conditional Flows

NOTES

1. Flows are all in m^3/year and they take into account 90% availability for all facility flows.
2. The Co-disposal Facility includes the Reclaim Pond and Seepage Collection Ponds 4 and 5.
3. Slurry water flow assumes a solids content of 75%. If a lower solids content were used, this flow would increase; however, the reclaim would increase by the same amount.
4. The fresh water requirement of the plant is 3.1t/hr at 90% availability, which is based Aker Solutions Water Balance, Revision D, dated November 15, 2010.
5. Runoff and evaporation assume long-term average values.
6. In the event that adequate storage is avaliable at the ETF, treated effluent can be used for dust control instead of fresh water.
7. It is not currently planned to construct the Contingency Pond. A decision to construct would be made during operations if it is deemed advantageous to do so.

REFERENCE

Drawing Provided by Golder Associates Ltd (February 2011)

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

END OF OPERATIONS WATER BALANCE

Golder Associates
Edmonton, Alberta

FILE No. E-PD-009-GIS.mxd

PROJECT NO. 09-1373-1004			NO SCALE	REV. 0
DESIGN	SC	25 Feb. 2011	**FIGURE: 3.9-6**	
GIS	SC	28 Apr. 2011		
CHECK	AC	28 Apr. 2011		
REVIEW	KAB	28 Apr. 2011		

3.9.2.3.2 Seepage Collection Ponds

It is assumed that water that accumulates in SCP No. 1, 2, 3, and 5, as well as the Surge Pond, will be passively treated in a Wetland Treatment System and then released directly into Nico Lake. Once the Flooded Open Pit overflows, it will discharge to Wetland Treatment System No. 4 and discharge into Peanut Lake. This is subject to the demonstration of the technical performance of the Wetland Treatment Systems during mine operations.

The volumes of water that will require treatment through the Wetland Treatment Systems at various climatic conditions is summarized in Table 3.9-2. It is proposed that the wetlands shown on Figures 3.9-3 and 3.9-4 be constructed and tested during the operating life of the mine. If the technical feasibility of wetland treatment is not demonstrated prior to closure, then the contingency will be to continue to pump water from SCP No. 1, 2, 3, and 5, as well as from the Surge Pond, into the Open Pit, or treat the water through the existing ETF.

Table 3.9-2: Discharge from Wetland Treatment Systems during Closure Years

Month	Total Water Volume (m^3)					
	Prior to Pit Overflow			After Pit Overflow		
	25-Year Dry	Average	25-Year Wet	25-Year Dry	Average	25-Year Wet
January	0	0	0	0	0	0
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	0	0	0	0	0	0
May	37 300	52 688	76 133	82 878	122 710	183 395
June	40 654	59 327	87 776	83 390	127 147	193 814
July	3 805	8 889	16 635	40 265	68 540	111 619
August	6 415	11 939	20 354	44 420	73 236	117 139
September	6 458	11 093	18 153	46 068	73 824	116 112
October	4 893	8 105	12 998	45 169	71 045	110 469
November	0	0	0	0	0	0
December	0	0	0	0	0	0
Annual Discharge (m^3/year)	**99 525**	**152 041**	**232 049**	**342 190**	**536 502**	**832 548**

m^3 = cubic metres

3.9.3 Water Balance for the NICO Project

3.9.3.1 Water Balance during Operations

Annual flows under average climatic conditions are summarized in Tables 3.9-3 through 3.9-5. Figures 3.9-7 and 3.9-8 provide graphical summaries of annual flows during operations. The following observations were made from the operational water balances.

- The operational discharge to Peanut Lake will range from 115 500 m^3/y (316 m^3/day) to 291 000 m^3/y (797 m^3/day) under average conditions (Table 3.9-3). This volume assumes water is discharged directly from the ETF into the lake and is not recycled for any purpose (such as for dust control).

- If it becomes apparent during operations that regular post-treatment polishing or flow balancing would be advantageous, the decision may be made to construct a Contingency Pond on the western shore of Peanut Lake. If a Contingency Pond was constructed, then the flow from the ETF would be routed through the pond prior to discharge into Peanut Lake, only when it is necessary to do so. At all other times, the ETF effluent would discharge directly through the diffuser into Peanut Lake. The net runoff to the Contingency Pond would be discharged along with the treated effluent.
- Under average climatic conditions, the annual Plant fresh water requirements are not expected to change during operations (Table 3.9-4), equal to a nominal operating rate of 3.1 m^3/h.
- In the last year of operations, the volume of discharge will be equal to the fresh water intake into the Plant plus approximately 220 000 m^3 per year (for a total of 290 643 m^3/yr). Increasing the fresh water intake would increase the discharge by a similar volume
- On an annualized basis, there is ample water reporting to the Surge Pond under normal climatic conditions to supply the Plant reclaim requirements.
- Under average climatic conditions, the mineral process plant will utilise up to 45.1 m^3/h of water sourced through the Surge Pond. In most cases, the amount of water returning to the Surge Pond will exceed 45.1 m^3/h, and the excess water will need to be treated by the ETF and released.
- The predicted discharge to the environment is relatively small, indicating that the water management system has been optimized in terms of internal recycling within the Plant by using unit operations that thicken the tailings, thicken and filter the concentrate, and the use of decant water reporting from the CDF to the Surge Pond from the reclaim water pond and the SCPs.
- It will be important that water in the CDF be carefully managed so that water can be reclaimed to the Surge Pond and onto the mineral process plant throughout the winter season. If not, it would be necessary to increase the intake of fresh water during the winter, which would correspondingly increase the effluent volume that will need to be treated from the Surge Pond during freshet in the spring.

In Table 3.9-4, the value for fresh water requirements for the plant in Year 18 is projected to be 27 156 m^3 and is independent of the annual precipitation. This reflects increased flows from the Open Pit as mining progresses.

The ETF will operate on a year round basis, the monthly treatment rate is nominally the same over all 12 months of operation. This assumes that the SCPs are utilized as a form of surge volume over longer periods of time. In reality, the treatment rate will be increased during periods of heavy precipitation and decreased during periods of low precipitation.

Table 3.9-3: Summary of Annual Water Balance for Operational Years

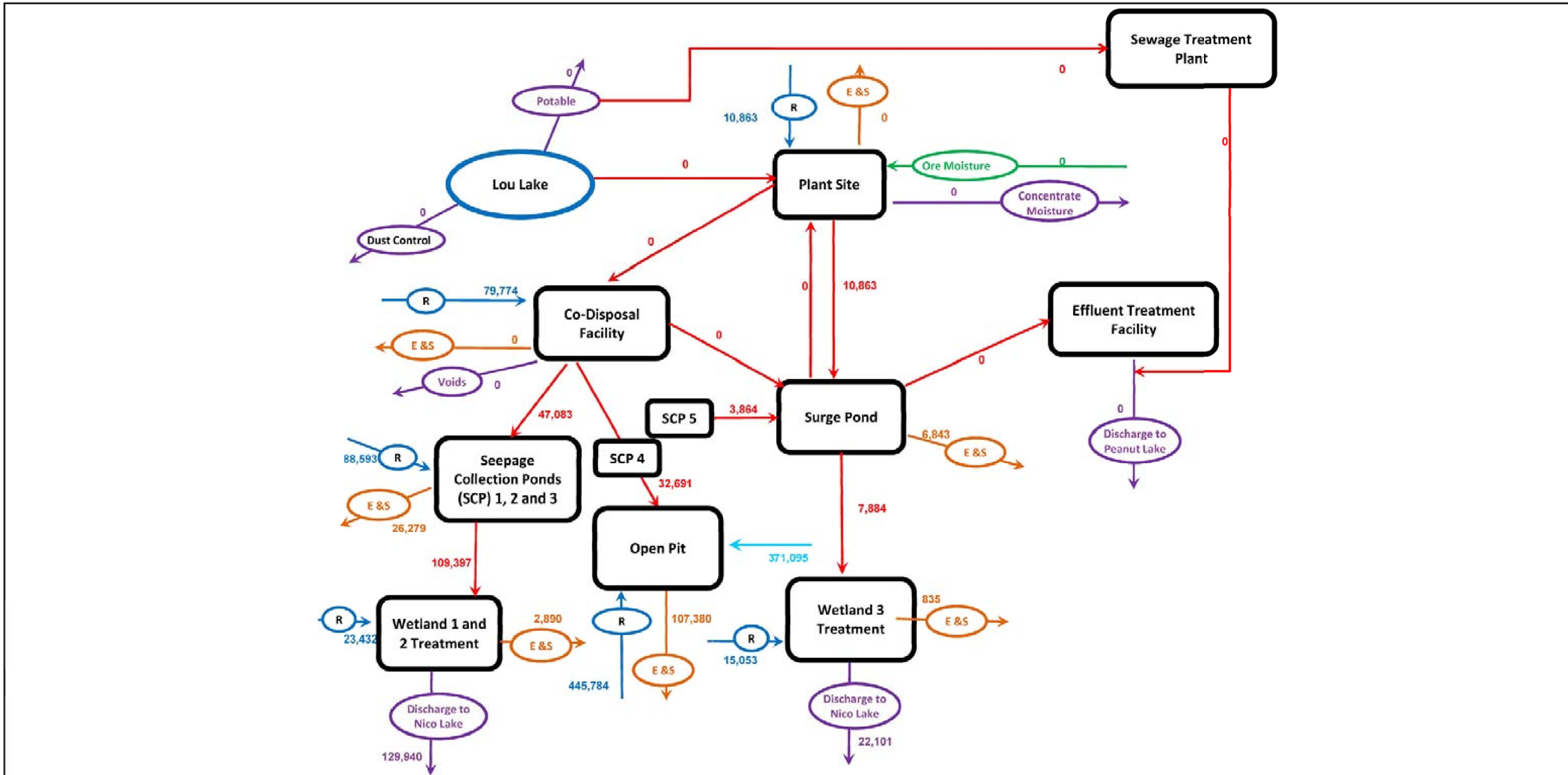
Source of Water	Total Water Volume (M-m^3)					
	Start-up			End of Operations		
	25-Year Dry	Average	25-Year Wet	25-Year Dry	Average	25-Year Wet
Inflows						
Precipitation	0.386	0.535	0.761	0.498	0.690	0.982
Seepage into Open Pit	0.009	0.009	0.009	0.110	0.110	0.110
Fresh water from Lou Lake	0.114	0.070	0.070	0. 070	0. 070	0. 070
Ore moisture content	0.131	0.131	0.131	0.131	0.131	0.131
Net Inflows	**0.640**	**0.745**	**0.971**	**0.820**	**1.001**	**1.293**
Losses						
Water retained in tailings void	0.446	0.446	0.446	0.446	0.446	0.446
Spillage in plant area	0.002	0.002	0.002	0.002	0.002	0.002
Evaporation losses	0.132	0.132	0.132	0.212	0.212	0.212
Seepage losses	0.012	0.012	0.012	0.012	0.012	0.012
Dust control	0.030	0.030	0.030	0.030	0.030	0.030
Potable water loss (10%)	0.001	0.001	0.001	0.001	0.001	0.001
Moisture of concentrate	0.006	0.006	0.006	0.006	0.006	0.006
Discharge from the ETF to Peanut Lake	0.000	0.104	0.330	0.088	0.280	0.572
Discharge from STP to Peanut Lake	0.011	0.011	0.011	0.011	0.011	0.011
Total Discharge to Peanut Lake	0.011	0.115	0.341	0.099	0.291	0.583
Net Losses	**0.640**	**0.745**	**0.971**	**0.820**	**1.001**	**1.293**

EFT = Effluent Treatment Facility; STP = Sewage Treatment Plant; M-m^3 = million cubic metres

Table 3.9-4: Annual Freshwater Requirements of Plant from Lou Lake

Operational Year	Total Water Volume (m^3)						
	25-Year Wet	Average	5-Year Dry	10-Year Dry	25-Year Dry	50-Year Dry	100-Year Dry
Start-up	27 156	27 156	27 156	32 966	70 976	78 093	126 332
End of Operations	27 156	27 156	27 156	27 156	27 156	27 156	27 156

m^3 = cubic metres



LEGEND

- Rainfall, Runoff
- Evaporation, Seepage and Spillage Losses
- Other Losses
- Other Inflows
- Internal Flows
- Conditional Flows

NOTES

1. Flows are all in m^3/year.
2. The diagram represents the intial post closure period when the open pit is filling (i.e., prior to spill over).
3. Water which accumulates in Seepage Collection Ponds 1, 2, 3, 5 and the Surge Pond will be passively treated in wetlands and released directly to Peanut and Nico Lakes. This is subject to demonstration of the technical feasibility of wetland treatment. If not feasible, adaptive measures, as described in Section 3.III.10.5 may be considered.

REFERENCE

Drawing Provided by Golder Associates Ltd (February 2011)

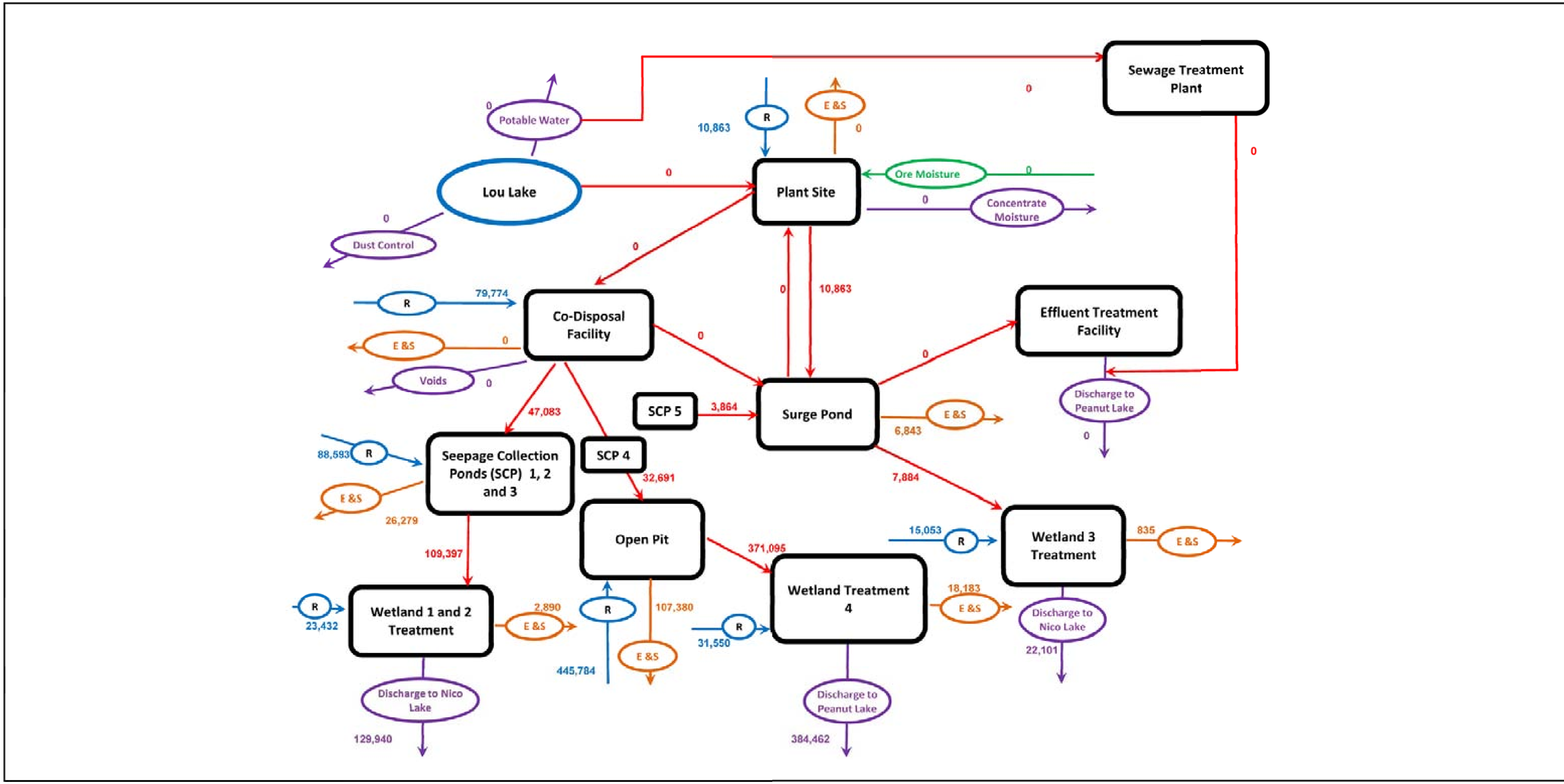
FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

WATER BALANCE AFTER CLOSURE BEFORE TO PIT OVERFLOW

Golder Associates
Edmonton, Alberta

FILE No. E-PD-010-GIS.mxd				
PROJECT NO. 09-1373-1004			NO SCALE	REV. 0
DESIGN	SC	25 Feb. 2011	FIGURE: 3.9-7	
GIS	SC	28 Apr. 2011		
CHECK	AC	28 Apr. 2011		
REVIEW	KAB	28 Apr. 2011		



LEGEND

- Rainfall, Runoff
- Evaporation, Seepage and Spillage Losses
- Other Losses
- Other Inflows
- Internal Flows

NOTES

1. Flows are all in m^3/year.
2. The diagram represents the final post closure period after the open pit spills over.
3. Water which overflows from the open pit, plus water which accumulates in Seepage Collection Ponds 1, 2, 3, 5 and the Surge Pond will be passively treated in wetlands and released directly to Peanut and Nico Lakes. This is subject to demonstration of the technical feasibility of wetland treatment. If not feasible, adaptive measures, as described in Section 3.III.10.5 may be considered.

REFERENCE

Drawing Provided by Golder Associates Ltd (February 2011)

FORTUNE MINERALS LIMITED
NICO DEVELOPER'S ASSESSMENT REPORT

TITLE

WATER BALANCE AFTER CLOSURE AFTER PIT OVERFLOW

Golder Associates
Edmonton, Alberta

FILE No. E-PD-011-GIS.mxd

PROJECT NO. 09-1373-1004			NO SCALE	REV. 0
DESIGN	SC	25 Feb. 2011		
GIS	SC	11 Apr. 2011		
CHECK	KS	11 Apr. 2011		
REVIEW	MR	11 Apr. 2011		

FIGURE: 3.9-8

Projected ETF treatment requirements at the start of operations and end of operations for 25-year Dry, Average, and Wet scenarios are shown in Table 3.9-5.

Table 3.9-5: Inflow to Effluent Treatment Facility during Operational Years

Design Criteria	Total Water Volume (m^3)					
	Start-up			End of Operations		
	25-Year Dry	Average	25-Year Wet	25-Year Dry	Average	25-Year Wet
Monthly inflow (m^3/month)	0	8 635	27 503	7 300	23 290	47 651
Annual inflow (m^3/year)	**0**	**103 619**	**330 031**	**87 595**	**279 474**	**571 812**
Average Hourly Inflow (m^3/hour)	**0**	**11.8**	**37.7**	**10.0**	**31.9**	**65.3**

m^3 = cubic metres

Climate Variability Considerations

The above results assume average climate conditions. Tables 3.9-3 through 3.9-5 also summarize the potential effects of climate variability on the operational water balances.

For the year of Plant start-up, if the climatic conditions are normal or wetter than the 5-year dry period, the fresh water requirement for the Plant will remain minimal, which is about 27 160 m^3 per year (or 69 659 m^3 per year if potable water and dust control requirements are included). When the climatic conditions are drier than the 5-year dry period, the reclaim water from the CDF will not be able to meet all of the water requirements of the Plant. In such dry periods, the deficit in the water requirement of the Plant will need to be replaced with additional fresh water from Lou Lake (Table 3.9-4). The ETF may not be operational during such dry periods as there will no be excess reclaim water from the NICO Project.

By about Year 10, however, for climate conditions up to the 100-yr dry year, the fresh water requirements will remain the same (Table 3.9-4). This is due to the annual runoff into the Open Pit (due to the large disturbed area), which will be collected in the pit sump and pumped to the Surge Pond, even under dry conditions.

3.9.3.2 Water Balance at Closure

Post-closure results for average conditions are summarized in Table 3.9-6. Graphical summaries of annual closure flows under average climate conditions, as shown in Figure 3.9-7 and 3.9-8. The volumes of water that require treatment through the Wetland Treatment System under various climatic conditions are summarized in Table 3.9-6. The following observations were made:

- Post-Closure Prior to Pit Overflow:
  - While the Open Pit is flooding (prior to overflow), the only discharge to the environment will be about 152 000 m^3 per year into Nico Lake through Wetland Treatment Systems No. 1, 2, and 3.
  - If a Contingency Pond is used during operations, then it will be decommissioned as part of closure. Therefore, the only discharge into Peanut Lake will come from local runoff, and there will be no effluent discharged to Peanut Lake.
  - Between a 25-year dry period and a 25-year wet period, annual inflows to the Wetland Treatment Systems No. 1, 2, and 3 are expected to range from 100 000 to 232 000 m^3.

- Post-Closure after Pit Overflow:
  - After the Open Pit overflow occurs, the discharge into Peanut Lake through the Wetland Treatment System No. 4 will vary from 242 000 to 601 000 m^3 per year (average 385 000 m^3 per year) for the climatic scenarios evaluated. The high discharge rate is primarily due to precipitation on the Open Pit surface, which would result in high dilution of the overflow water.

Table 3.9-6: Summary of Annual Water Balance for Closure Years

Source of water	Total Water Volume (M-m^3)					
	Closure – Prior to Pit Overflow			Closure – After Pit Overflow		
	25-Year Dry	Average	25-Year Wet	25-Year Dry	Average	25-Year Wet
Inflows						
- Precipitation	0.482	0.667	0.950	0.505	0.699	0.995
- Seepage into Open Pit	0.110	0.110	0.110	0.110	0.110	0.110
Net Inflows	**0.591**	**0.777**	**1.060**	**0.614**	**0.808**	**1.104**
Losses						
- Evaporation losses	0.243	0.243	0.243	0.261	0.261	0.261
- Seepage losses	0.011	0.011	0.011	0.011	0.011	0.011
- Water stored in/lost from Open Pit	0.238	0.371	0.574	0	0	0
- Discharged to Nico Lake	0.100	0.152	0.232	0.100	0.152	0.232
- Discharged to Peanut Lake	0	0	0	0.242	0.385	0.601
Net Losses	**0.591**	**0.777**	**1.060**	**0.614**	**0.808**	**1.104**

M-m^3 = million cubic metres

3.9.4 Effluent Treatment Facility

3.9.4.1 Design Basis during Construction

Except for sewage, there is no planned treatment of site water during the construction period. Sewage treatment is discussed in Section 3.9.5. Other site flows during construction will be impounded until start-up when they will either be pumped to the process water tank or treated in the ETF.

3.9.4.2 Design Basis during Operations

The purpose of the proposed treatment process is to reduce concentrations of aluminum, ammonia, antimony, arsenic, cadmium, cobalt, iron, lead, selenium, and uranium. The end of pipe effluent treatment goals are based on the SSWQO.

During operations, contact water will collect in sumps and SCPs. Water will ultimately report to the Surge Pond, and will either be then recycled to the Plant for use as process water, or pumped to the ETF for treatment. Treated effluent will be discharged to Peanut Lake during operations.

The following assumptions made regarding the treatment process and preliminary design basis for the ETF.

- The hydraulic basis of design for equipment was a predicted flow volume of 1567 m^3/day, which is the maximum design flow rate based on a 25 year wet return at the end of operations.
- The average ETF influent (0.192 M-m^3 or 525 m^3/day) used for the estimation of operations and maintenance costs was the average of the start-up (284 m^3/day) and end of operations (766 m^3/day) flows to the ETF.
- The ETF design assumes that water will be treated and released 12 months per year.
- The composition of the influent reporting to the ETF was based on a range of “worst case” and “early operation” conditions (Table 3.9-7). The influent design was based on the results of geochemical predictions of mine water quality during operations.
- Chemicals used in the treatment process for ion exchange regeneration assumed that the mine life average treatment rate of 555 m^3/day includes 35% hydrochloric acid (1.47 m^3/year) and 50% sodium hydroxide (1.06 m^3/year). Ion exchange regenerant rates will be 563 m^3/year (hydrochloric acid), and 222 m^3/year 50% sodium hydroxide. Note that regenerant rates are based on the flow rates required during a regeneration cycle, which is typically several minutes to a few hours. This is the reason that the regenerant rate is higher than the total annual quantity of each chemical required on an annual basis.

Table 3.9-7: Influent Water Quality

Parameter	Worst Case Values	Early Operations Values
pH	6.2	5.4
Aluminum (mg/L)	6.0	3.0
Ammonia (mg/L)	15.0	15.0
Arsenic (mg/L)	0.7	0.37
Cadmium (mg/L)	0.0007	0.0007
Cobalt (mg/L)	0.3	0.25
Iron (mg/L)	10.0	8.0
Lead (mg/L)	0.02	0.0074
Selenium (mg/L)	0.1	0.046
Uranium (mg/L)	0.1	0.07

mg/L = milligrams per litre

3.9.4.2.1 Treatment Process and System during Operations

Figure 3.III.8-1 in the Water Management Plan provides a schematic diagram of the process to be used in the ETF. The process steps are as follows:

- equalization;
- micro-filtration, at approximately 5 microns, for reduction of total suspended solids; and
- conventional anion and cation exchange for gross contaminant removal followed by polishing with specialty media or ion exchange resins.

Raw effluent from the Surge Pond will be pumped to the ETF where the solution will be filtered. Micro-filtration is necessary for the optimum operation of the ion exchange system to prevent suspended solids from clogging or blinding the ion exchange system. After filtration, water will undergo treatment in the ion exchange and polishing systems. Conventional cation exchange resin (hydrogen form) and anion exchange resin (hydroxide form) will be used in the ion exchange process. The cation exchange resin will be regenerated using hydrochloric acid, and the anion exchange resin with sodium hydroxide. The final stage of treatment will be a polishing step, using a speciality polishing media. It is assumed that the projected ETF effluent will achieve the SSWQO at the end-of-pipe for all parameters (except selenium) during operations. The projection of the ETF effluent quality is based on standard practise theoretical calculations. The actual removal of parameters from the ETF water matrix will be confirmed with treatability studies during detailed design.

Ion exchange will create a secondary waste in the form of the spent regenerant solutions. The projected average regenerant volume during the highest flow conditions will be 2.7 m^3/day. Evaporation of the regenerant could reduce the spent regenerant solution by approximately 75%, with subsequent disposal of the concentrated waste at an appropriate off-site disposal facility.

3.9.4.3 Effluent Treatment Rate

The predicted volumes to the ETF during operations for average and wet year conditions are shown in Table 3.9-8. The values assume the annual operating schedule for the ETF will be 12 months.

Table 3.9-8: Predicted Effluent Flow Volumes

	Average Flow (m^3)		**25 Year Wet Flow (m^3)**	
	Start-up	**End of Operation**	**Start-up**	**End of Operation**
Monthly Operating	8 600	23 000	27 500	47 500
Annual Operating	103 600	279 000	330 000	572 000

m^3 = cubic metre

3.9.4.4 Post Closure Passive Treatment

Fortune’s strategy of proposing constructed passive treatment is based on the assumption that the ecological process of removing metals, already demonstrated to be taking place in the Grid Pond – Nico Lake watershed for millennia will continue during closure for effective metal removal. Fortune is proposing to passively treat the site seepage and runoff via treatment wetlands, similar to the natural system. This system will be further studied during the operational period by using water collected from the SCPs to provide a demonstration study of the concept, prior to construction of permanent passive treatment options approximately 3 to 4 years before closure.

Passive treatment was specifically identified to be a post-closure water treatment strategy that would be implemented prior to closure to treat water in the SCPs. Passive treatment may also be implemented to treat discharge from the Flooded Open Pit, if it is necessary and appropriate. Passive treatment options could include anaerobic treatment in biochemical reactors, and/or aerobic wetlands. Passive treatment options have been developed for the purpose of initial evaluation.

Field trials, based on actual site conditions, will take place during the early stages of mine operations and will be incorporated into mine operational plans, likely starting in Year 3, following the completion of plant commissioning and the cessation of underground mining. If passive treatment proves to be an unsustainable option for post-closure treatment of site discharge, then alternative treatment methods will be investigated.

A brief overview of the 2 main passive treatment options is provided below. It is probable that the design of the passive treatment options for the NICO Project will be based on a combination of anaerobic (biochemical reactors) and aerobic (wetlands) treatment.

Biochemical reactors use a combination of biological, chemical, and physical processes to reduce metals concentrations. Metal removal can occur via biological sulphate reduction to sulphide and subsequent precipitation of metal sulphides, hydroxide precipitation, and sorption to iron and aluminum hydroxides. Metal removal in biochemical reactors is well documented, and design criteria have been established.

Typical biochemical reactors are designed as geomembrane-lined ponds, which are filled with a mixture of locally available organic carbon sources such as peat and wood chips; and a buffering agent such as limestone, and growth media such as crushed rock. The mixture is usually selected based on site-specific bench and/or pilot scale test results.

Influent typically flows downward through the biochemical reactor, passing through the organic media mixture in the process. In this mode, treated water is typically collected via a network of piping and inert gravel in the bottom of the cell, which enables the system to operate under a gravity flow regime. The metal precipitates remain in the cell. Over time, biological processes in the biochemical reactors will consume the organic carbon supply, the limestone will dissolve, and metal precipitates may reduce the hydraulic conductivity of the cell. As a result, biochemical reactors require periodic replacement of the organic media mixture every 10 to 20 years of operation. Biochemical reactor effluent water is typically anoxic, contains varying amounts of total suspended solids, and has elevated biochemical oxygen demand. Aerobic wetlands are frequently used to remove total suspended solids, reduce the biochemical oxygen demand load, add dissolved oxygen to the biochemical reactor effluent, and polish for any parameters that require aerobic rather than anaerobic treatment.

In an aerobic wetland, metal removal can occur via consumption by a microbial population, sorption to organic matter, plant uptake, oxidation in aerobic sections of the wetland, precipitation as metal sulphides in anaerobic wetland sediments, and sorption to iron and aluminum hydroxides. Selenium removal can occur via plant uptake, biological reduction in anaerobic sediments, and volatilization by algae and bacteria. Trace metal removal in wetlands is well documented, but design criteria are not well established and must be determined for each site. The relatively low velocity flows through a passive treatment system also allow for removal of suspended solids, if present. Constructed wetlands treatment is a relatively new technology and is generally applicable to lower flow rate waste streams at remote locations where power and operations personnel are not readily available. The key design parameters are the surface area and the contact time required to achieve the desired constituent removal level. Passive systems for constituent removal to very low levels may be prohibitively land intensive. Routine maintenance activities may be limited to occasional monitoring of the microbial populations and addition of micronutrients. Long-term maintenance activity may include periodic sludge or solids removal.

Aerobic wetlands typically include both vegetated cells with wetland plant species and free surface water cells, which resemble shallow mixing basins. Typical wetlands are constructed as a series of lined and bermed cells, with water depths of about 0.5 m (1.5 feet), and resemble natural vegetated wetlands. The discharge water from aerobic wetlands does not require polishing treatment and can be discharged directly to the environment.

3.9.5 Sewage Treatment Plant

The Camp and infrastructure sewage will be treated in a STP located adjacent to the mine incinerator. Sewage will be treated using a packaged rotary biologic contactors STP. The ability of the plant to deal with the increased treatment rate during the construction period will be facilitated by the purchase of 2 units. The chemistry of sewage effluent has been predicted by Biodisk Corp (2010). For the construction phase, two Biodisk BJ-250 units will be required to meet the effluent design criteria. Following the completion of construction, one of the modular units will be dismantled and sold.

The predicted ammonia effluent levels will be less than 2 milligrams per litre [mg/L], which is lower than the SSWQO of 4.16 mg/L NH_3. The effluent flows will be discharged directly into Peanut Lake. The installation will be a stand-alone modular package with all the necessary controls, designed for 133 permanent operational workers and up to 278 construction workers. The capacity of the STP may need to be augmented if the overflow exploration camp is used. The design inflow characteristics and predicted effluent quality (OEM RFP Package 2010) is shown in Table 3.9-9.

For optimum operability of the STP and adequate treatment of biochemical oxygen demand, a grease trap will be installed in the Camp kitchen facilities. Treated sewage sludge from the STP will be dewatered with a filter and then incinerated. Ash from the incinerator will be placed in the CDF.

Table 3.9-9: Rotary Biologic Contactors Sewage Treatment Plant Influent and Effluent Characteristics

	Influent	Effluent
Average Flow (m^3/day)	0 to 68.8	
BOD5, (mg/L)	250	<15
TSS (mg/L)	250	<15
NH_3-N (mg/L)	35	2
pH	6.5 to 8.5	
Fecal coliform, M.P.N./100 mL		<400
Fat, oils, and greases		Non-detect

m^3 = cubic metre; mg/L = milligram per litre

3.10 Supporting Site Infrastructure

3.10.1 Required Construction Infrastructure

The following infrastructure, presently on the exploration site, will be required during construction:

- maintenance shop at the underground portal to support of mobile maintenance activities;
- explosive magazines;
- Enviro-tank fuel storage farm consisting of 712 000 L of diesel storage;
- two mobile trailers utilized as construction offices (after being moved to the construction site);
- existing exploration camp;
- Lou Lake geology office and core storage areas;
- float plane dock;
- borrow sources for the NPAR;

- existing lay down areas; and
- geochemistry field cell testing area.

While not required for construction, the covered ore stock piles from bulk sampling during 2006 and 2007 will be maintained until approximately 2 months before the start of operations. A permanent accommodation complex will be required during the construction period for approximately 12 months.

The required infrastructure that will be completed within 4 months of the initial mobilization will be:

- construction Camp and permanent accommodations complex;
- modular STP;
- modular Potable Water Treatment Facility;
- incinerator and scrubber;
- modular component of the Service Complex (Truck Shop) that incorporates fresh water storage, power generation, and the temporary heating boiler;
- an additional mobile trailer to serve as a construction office;
- Lou Lake pump house and fresh water pipeline;
- permanent storage for fuel;
- sprung or fold-away type cold storage warehouse;
- Material Sorting Facility;
- laydown for the storage of glycol and oil, as well as waste materials generated by construction;
- mobile crushing and screening plant;
- concrete batch plant;
- site roads;
- additional site lay down areas; and
- Airstrip.

3.10.1.3 Infrastructure Removed from Site Upon Completion of Construction

Following construction, the infrastructure that is anticipated to be removed from site includes the following:

- exploration camp incinerator;
- exploration camp potable water and Dry Facility;
- concrete batch plant;
- screening and secondary crushing components of the mobile crusher; and

- temporary mobile construction offices.

3.10.2 Permanent Buildings/Facilities Used During Operations

The general layout of the site is shown Figure 3.2-1 and was based on the following criteria:

- compact footprint for limited land disturbance and maximum site operations efficiency;
- compact building sizes and layout for maximum energy efficiency;
- efficient facility access for personnel and vehicles during construction and operations;
- re-use of existing equipment that was available from Fortune's purchase of the Golden Giant process plant at Hemlo, Ontario;
- energy efficiency through reclamation of heat obtained from the power plant;
- the set back of the Camp from the Plant site to reduce noise and capture the views of Nico Lake and Burke Lake for staff;
- the establishment of the Plant site and Camp 400 m outside of the pit blast radius; and
- minimal impact of winter road truck traffic around the site.

3.10.2.1 Permanent Camp Accommodations

Permanent Camp facilities are planned to be constructed southeast of the mine operations and west of Nico Lake. It will have capacity for approximately 139 people during normal operations and approximately 231 people during construction. The final orientation and design of the accommodation, kitchen, and recreational facilities is subject to tender and award to a vendor. As such, Camp schematics represent a conceptual design and will be finalized once the contract for supply is awarded.

The Camp complex will be typical of the approach used at other remote mines in the NWT and Nunavut. The Camp will contain a kitchen, food storage areas, food preparation areas, dining room for approximately 50 people, wash cars, offices, and recreational areas consisting of a gymnasium and television and games rooms.

All the accommodation complexes will be of modular construction. The permanent accommodations complex will be a series of dormitory sections attached to a central core complex by means of ground level heated and insulated utilidors. Bedrooms will be single occupancy during operations and the rooms will be completely furnished. During construction, each room will be furnished with 2 beds to facilitate additional workers on-site. Washroom and shower facilities will be provided for blocks of rooms. LCD televisions will be installed in all of the rooms to promote energy efficiency and deter employees from bringing potential future electrical waste to the site.

3.10.2.2 Power Plant

During the construction phase, power to the construction Camp will be provided by a dedicated 550 kW generator. No heat recovery will be used. This generator will be located in the lean-to module to be constructed at the southeast side of the service complex. Following the construction phase, the 550 kW generator will be replaced by a 1200 kW generator. The increase in size is due to the backup power requirement in operations.

During operations the power plant will consist of eight 1450 kW(e) (electrical power) diesel fuelled, prime rated generator sets. These generators will produce 4160V at 1200 rpm, which is considered a medium speed generator.

The power plant will consist of 6 operating generators. During the 2 years that the underground operation is ongoing at the start of the mine life, 7 generators will operate. This early configuration allows for one spare generator early on in the mine life when the maintenance requirements of the generators will be minimal. Following closure of the mine, the 6 operating generators represent the more traditional *n+2* configuration where there is one hot spare generator, and one cold spare generator for the provision of maintenance.

The power plant will have a heat recovery loop. Heat produced by the generators will be reclaimed and used for heating purposes. The estimated heat recovery for the system at 100% load is 700 kW from the recovered exhaust heat, and 566 kW from the recovered jacket water heat, totalling 1266 kW. As a result, water will be delivered for plant heating requirements at 90ºC at a flow of 63 m^3 per hour from each operating generator set.

3.10.2.3 Service Complex (Truck Shop)

The mobile maintenance shop will consist of 2 maintenance bays and a wash bay. These maintenance bays are sized to handle 91 t haul trucks. Mine operations components within the Service Complex will consist of a garage for storage of the mine ambulance and mine rescue (fire truck) vehicles. There will also be dedicated facilities for mine rescue, first aid, conferencing, and offices on the second floor above the warehouse.

3.10.2.4 Dry/Assay Laboratory Modular Components

It is proposed that the Assay Laboratory and Dry will be built as modular components to facilitate early commissioning during the construction period. Both facilities will need to be operational prior to start of underground operations. The use of the Dry earlier will complement hygiene during the construction period. Additionally the laboratory will be used during construction for Mine Rock management.

The Dry will be sized for 125 employees, and includes separate men and women's facilities. Each Dry will contain showers, laundering facilities, toilets, lockers, and an elevated storage basket area.

The Assay Laboratory will consist of offices, sample preparation room, fire assay room, wet lab, instrumentation rooms (for installation of precision instrumentation such as AAS and ICP), as well as an environment lab.

3.10.2.5 Cold Storage

The sprung or foldaway type cold storage facility will be maintained after construction for storage of equipment and supplies that do not require heating. The cold storage area will be used for the storage of MIBC, PAX, and polymer flocculant, which are the main process plant chemicals.

Other equipment that may be stored in cold storage will be maintenance materials, electrical motors, building supplies, and other items that are not sensitive to storage in a cold climate.

3.10.2.6 Potable Water Treatment Facility

The Potable Water Treatment Facility will be attached to the utilidor between the Service Complex and the permanent Camp. The water treatment modules will be supplied water from the fresh water tank in the Service Complex, which will come from Lou Lake.

The potable water treatment modules will be fully automatic and designed to produce drinking water as per the *Canadian Drinking Water Quality Guidelines*. During the construction period where the Camp population will

231 persons, 2 separate potable water treatment modules will be installed. Following the completion of construction, one potable water treatment module will be dismantled and sold.

The potable treatment scheme will involve the following stages:

- multi-media filtration to remove all suspended solids larger than 10 microns in size;
- removal of Total Organic Carbon and other organics utilizing a granular activated carbon filter;
- chlorination of the water with sodium hypochlorite;
- storage of chlorinated water in polyethylene storage tanks under a pressure of 345 kiloPascals (kPa); and
- ultraviolet sterilization of the water before delivery to the end user.

3.10.2.7 Landfarm

To the northwest of the crushing building, Fortune will construct a landfarm for the reclamation of soils. The proposed location for the landfarm is between the portal and the Plant site (Figure 3.2-1). A conceptual design and operations plan is provided in the Waste Management Plan (Appendix IV). The landfarm (i.e., a bioremediation cell) will treat hydrocarbon contaminated soils. Remediated soils will be placed in the CDF.

3.10.2.8 Underground Mining Maintenance Shop/Co-Disposal Facility Maintenance Shop

Currently, an underground workshop is located on the surface at the underground. Within this area, for the 2 years of underground mine operations, it is anticipated that a number of small containers will remain for use as compressor housings and storage. The current settling pond used during exploration will be removed. The underground workshop will remain onsite following the completion of underground mining. The shop will be used to facilitate CDF operations, allowing for the storage of pipe, pipe fittings, valves, and other equipment that will be required for the spigotting of thickened tails.

3.10.2.9 Borrow Sources

Fortune has identified up to 10 borrow sources that may be used during construction. These locations were identified due to:

- accessibility (proximity to the alignment);
- potential quarry size (enough volume); and
- ease of excavation (relief and potential face).

The locations are shown on Figure 3.2-2. The size and final location of the quarries would be decided following determination of the Tłįchǫ Road Route, confirmation of the NPAR alignment, completion of geochemical and geotechnical investigations, and completion of consultation with the Tłįchǫ Government.

3.10.3 Hazardous Substance Storage

3.10.3.1 Reagents and Fuels

The onsite fuel management procedures are described in Appendix V in the Hazardous Substances Management Plan. The projected annual fuel consumption is presented in Table 3.10-1. Generally, the storage capacity assumes that a 1 to 3 month inventory would be stored on-site at any given time. This is rounded up for reagents that require delivery as a full truck loads for purchasing economics. Mining explosives will be stored east of Lou Lake (see Figure 3.2-1). Processing chemicals will be stored in either the cold storage warehouse or within the Plant. Diesel and gasoline will be stored in the fuel storage areas southeast of the Truck Shop. Other hydrocarbons utilized for mobile maintenance will be stored in the cold storage warehouse, or in the service complex.

Table 3.10-1: Projected Annual Chemical Consumption

Material	Consumption	Storage Capacity	Location
Mining	**(t/y)**	**(t)**	
Ammonium nitrate (NH_4NO_3)	500-2500	130	Bulk silo; explosives magazine area
Explosive Emulsion	500-1500	40	Bulk silo; explosives magazine area
Processing	**(t/y)**	**(t)**	
Flocculant polymer	55	10	FIBC bag; cold storage warehouse and plant
Potassium Amyl Xanthate (PAX)	545	80	FIBC bag; cold storage warehouse and plant
Methylisobutyl Carbinol (MIBC)	93	40	Bulk tote or drum; cold storage warehouse and plant
Colorado Sand	190	40	FIBC bag; plant lay down
Effluent Treatment Plant			
Biocide	1	2	Bulk tote; effluent treatment plant
Hydrochloric Acid (HCl), 35%	6	2	Bulk tote; effluent treatment plant
Ferric Chloride (FeCl3), 60%	14	4	Bulk tote; effluent treatment plant
Hydrated Lime (CaO)	6	2	FIBC bag; cold storage warehouse and effluent treatment plant
Fuel and Automotive Liquids	**(L/y)**	**(L)**	
Diesel	54 000 000	2 000 000	Fuel storage area, mobile tanks, day tanks for pumps, incinerator, and emergency generators
Gasoline	20 000	10 000	Enviro-tank in fuel storage area
Aviation Fuel	10 000	4 000	Drums inside insta-berm or similar; Lou Lake float plane dock or airstrip (if constructed)
Propane	10 000	5 000	Camp kitchen cylinder storage
Motor Oils	5 000	2 500	500 L totes/205 L drums in cold storage warehouse and service complex
Hydraulic Oils	5 000	3 000	500 L totes/205 L drums in cold storage warehouse and service complex
Waste Oils	4 500	950	950 L tank at Materials Sorting Facility, used with Incinerator
Antifreeze/Glycol	2 500	1 000	500 L totes/205 L drums in warehouse and maintenance areas

t/y = tonnes per year; t = tonnes; L/y = litres per year; L = litres

Plant reagents such as polymer flocculant will primarily be transported to site in 1000 kg lined FIBC bags, often referred to as "supersacs" or "bulky-bags." Alternatively, some reagents such as methyl isobutyl carbinol will be delivered in barrels or 1000 L tote tanks. Potassium amyl xanthate will be delivered as a solid prill in FIBC bags.

The storage area for diesel will be for 2 million litres and will use conventional vertical tanks. The tanks were selected due to the proximity of local supply and the size was selected to allow the tanks to be hauled into the site. A small 10 000 L gasoline enviro-tank will store a limited amount of gasoline for equipment that does not use diesel. It is planned that all of the light duty truck requirements will be fuelled by diesel to limit the amount of gasoline stored and used on the site. The enviro-tank was selected because it is already on-site due to exploration activities.

Diesel tanks will be designed and constructed according to the API 650 (American Petroleum Institute) standard. Construction and operations will conform to the *Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products* (CCME 2003) and the National Fire Code. Two 1 million litre diesel tanks and one 10 000 L gasoline tank will be placed in a geo-membrane-lined containment area. There will be 4 diesel integrated day tanks for the power plant facilities, a diesel day tank for the incinerator, and a diesel day tank for the emergency generator. The back-up diesel-fired fire water pumps within the Plant will also have a small day tank. Diesel tanks will also be installed on the 2 mobile service trucks, one for surface operations and the other underground.

An additional 2 million litres of fuel will be stored on the site during the year that the construction site is cut off from regular fuel delivery. Fortune proposes to construct 4 additional 500 000 L diesel tanks on a geomembrane-lined and bunded containment area that will be used as a future landfarm. These tanks will be augmented by use of the 720 000 L of enviro-tank capacity already on-site for the purposes of exploration activities. The use of the additional fuel storage would be for up to 2 years. At the completion of the NPAR, these tanks would be decommissioned and the tanks sold. The bunded containment would then be used as the landfarm, rather than be decommissioned.

3.10.3.2 Storage of Explosives

Explosive use will be managed with the primary goal of limiting loss of ammonia to the Mine Rock. Ammonium nitrate fuel oil will be used in underground and open pit mining operations, as well as during construction of surface facilities. Ammonium nitrate, high explosive detonators (sometimes referred to as ‘stick powder’), and blasting caps will be stored in separate magazines at the Explosives Storage area. Emulsion products will be used sparingly. Packaged explosives will be kept on-site where required. The following explosives facilities will be situated east of Lou Lake and west of the Plant site.

- Three powder magazines for caps (used to initiate explosions) and various packaged explosives. One of these facilities will be on the west end of the Open Pit. The other 2 magazines will be further west, between the Open Pit and Lou Lake. These magazines will meet all the applicable federal NRCan and NWT regulations.
- The ammonium nitrate will be stored in bulk with a small inventory of supersacs for use as back up for equipment maintenance. Ammonium nitrate bulk storage will be in two 65 tonne silos. This material will be brought in via the NPAR.

- Bulk emulsion will be stored at the explosives magazine area where spills will be 100% contained. Water used to wash the explosives trucks will be trucked to the CDF for disposal.

3.10.4 Telecommunications

A microwave communications tower including a communications room will be built to the south of the Camp. The microwave tower will be 46 m tall, providing a direct line of site to the connecting tower at the Snare Hydro Plant.

The communications system will incorporate the following components:

- a voice LAN system for the Plant and Service Complex Area;
- approximately 15 phones in the Camp for supervisors and management;
- pay phone access in the Camp for employee use;
- a public address system within the Camp;
- a mobile phone tower to provide mobile phone access across the site for access by all employees using their own mobile phones;
- cable internet access to the office, plant, and other areas within the site;
- wireless internet access in all Camp rooms; and
- mutli-channel cable television in all Camp rooms.

3.10.5 Access and Transportation

3.10.5.1 Site roads

Mine haul trucks carrying ore or waste will exit at the northeast side of the Open Pit. Access to the CDF will be by a haul ramp that will be constructed from the southern tip of the CDF moving northeast as subsequent lifts of the CDF are constructed. Haul trucks travelling to the crusher will pass the underground portal and access the ROM ore stockpile from the northwest.

The main access road is confined to the south side of the Plant site to limit conflict between mine haul trucks and trucks hauling fuel to site. The mine roads and service complex yard will be isolated from the access road by a gate that requires an access card to open so that non-mine light vehicle traffic cannot enter the site.

The accommodations complex will be east of the Plant to limit the visual and noise impact of mobile fleet operations on-site residents. Pick-up trucks and light service vehicles will generally access all site areas for operations and maintenance purposes via site service or haul roads.

3.10.5.2 NICO Project Access Road

The NICO Project requires the completion of an all-season road that Fortune refers to as the NPAR. It assumes that completion and use of the proposed all-season Tłįchǫ Road Route, prior to operations.

The NPAR has been designed as a 6 m wide gravel-surfaced road, mostly constructed by fill, which widens to approximately 8 m approximately every kilometre to allow pullouts for B-train transport trucks to pass each other. The anticipated freight haulage will consist of approximately 5 truckloads per day to transport concentrate, as well as 3 to 4 truckloads per day of diesel fuel, along with miscellaneous use for the purposes of employee transport and weekly transport of site consumables such as food.

During construction of the NPAR, for mobilization of construction equipment and supplies, the NICO Project will require use of the Whatì and Gamètì portions of the current NWT winter road network, and/or the intermediate component of an extended seasonal winter road, referred to as the Seasonal Overland Road to the same communities.

3.10.5.3 Airstrip

The purpose of constructing the Airstrip at the NICO Project is to provide alternate access to the site for the movement of people and equipment. Emergency response will be improved on the site with the addition of the Airstrip, where ill or injured people could be sent out for medical treatment faster than with road, helicopter, or float plane service.

The Airstrip will be designed to accommodate smaller aircraft, such as a Dash 7 on a gravel strip with a small apron and no passenger shelter. The Airstrip is proposed to be constructed west of Burke Lake within the NICO Project Lease Boundary. The location was chosen as it was the only site within the NICO Project Lease Boundary that could accommodate aircraft. The orientation of the Airstrip was based on natural terrain and wind data. Wind data collected between October 2004 and 2005 indicated that wind was predominantly from the south-southeast. However, seasonal variability was observed with frequent winds from the west-northwest in the fall and from the north in both spring and summer. The orientation of the airstrip is in an east-west direction.

Construction of the 3500 foot (1067 m) long x 100 foot (30 m) wide airstrip will be completed by clearing the trees and shaping the strip with a bulldozer. The apron will be 50 m long and 50 m wide. The total land use area for the Airstrip, including tree clearing around the sides and on the approach is estimated at 11 ha. The Airstrip will be constructed by cut and fill methods.

Aviation fuel will be stored on-site for emergency use by aircrafts and for helicopter refuelling. This fuel will be stored in sealed drums inside a lined berm at the helipad, or near the Airstrip.

3.11 Domestic and Industrial Waste Management

This section describes the management of wastes other than mine wastes from the NICO Project. Waste products discussed in this section include domestic solid waste (e.g., food waste) and sewage, hazardous waste, and non-hazardous industrial waste.

Management of wastes will be guided by human health and safety, and environmental responsibility. The Waste Management Plan (Appendix 3.IV) will meet the requirements of legislation and guidelines of the NWT and, as appropriate, the Government of Canada, in the context of the operating licences and permits administered by the Wek’èezhìı Land and Water Board.

The Waste Management Plan describes the handling of all wastes on-site including food and other domestic wastes, construction wastes, industrial wastes, used petroleum, and related materials, and potentially hazardous wastes. Some additional details with regard to potentially hazardous wastes are described in the Hazardous Substances Management Plan in Appendix V. The following is a general summary of the waste management plans for the NICO Project. The reader is directed to the appendices noted for specifics.

The 4Rs principles (reduce, reuse, recycle, and recover) will govern the waste management practices at the NICO Project, as they have during the exploration phases. The 4Rs are not equal. Recycling tends to garner most of the attention in waste management strategies as it diverts volume from disposal sites. However, it is properly considered the third level and essentially deals with materials that could not be addressed in the first 2 levels, namely reduction and reuse.

Purchasing controls will favour lower waste options, such as sourcing bulk quantities and using suppliers who accept returns of used materials and containers. Where practical, policies and procedures will be instituted to reduce source waste production, such as reusable containers and reducing paper consumption. Where practical, materials generated as waste in one area will be diverted to another area for re-use.

To the extent practical, wastes will be sorted at source to facilitate separation into waste streams at the material sorting facility. Domestic waste containers will be designated for food and incineration wastes (in exterior areas these will be wildlife resistant), paper and cardboard, and food containers. In work areas, separate bins will collect scrap metals, wood and other specific waste streams. Waste fluids will also be collected in separate containers, such as drums or totes. Other materials to be separated for off-site shipment include electronic and electrical wastes, synthetic materials (plastics, foam, rubber), aerosol cans, paints, tires, and vehicles.

Non-hazardous bulk wastes are typically deposited in a sanitary landfill facility and buried on-site. At the NICO Project site, these types of non-hazardous solid waste materials (left over after fully utilizing the 4Rs principles) will be incorporated for disposal within the CDF. In principle, the concept is similar to that of a landfill in which waste is buried. But instead of disturbing additional land area, the waste materials will be within the CDF and covered by Mine Rock and tailings. In addition to eliminating additional land disturbance for this purpose, it also centralizes waste disposal for monitoring.

Waste material deposited in this manner would include incinerator ash and other non-combustible, otherwise non-useful, waste materials, such as construction waste. Light, potentially wind-borne wastes will not be disposed without immediate cover to avoid litter in the surroundings. The wind-borne materials are typically such materials as paper, plastic film, and foam packaging. These types of materials, which cannot be diverted by recycling, will be incinerated prior to disposal.

3.11.1 Road Construction Wastes

Waste materials generated from road construction will be stockpiled in various locations depending on the nature of the waste. Foreign wastes will be collected and hauled out of the construction area for reuse, recycling, or disposal in accordance with legislation. Wastes may be temporarily stockpiled during construction until the NPAR is completed.

Locally generated wastes, such as soil spoils from road clearing, will be left at the location generated as these are considered natural materials. Organic soils will be stockpiled where possible for potential use in reclamation. Generally, these stockpiles will be surveyed and their locations recorded for the use in future reclamation activities.

Workers will be required to return food-related wastes, such as lunches, wrappings, beverage containers to the Camp for collection and disposal. Work sites will be inspected daily to check that this procedure is being effective. Portable sanitary facilities will be used to avoid sewage disposal in the construction zone. At the temporary construction Camp, sumps may be established in approved locations in accordance with Indian and

Northern Affairs Canada requirements. Trees and brush within the road corridor will be cut, bucked, and scattered or windrowed to decompose. Once the road is in operation, waste deposition will not be allowed at pull-out areas.

3.11.2 Fuel Impacted Soil

Although great effort will be put on prevention of spills, prudence requires being prepared to deal with spills, in particular petroleum spills. Soils from petroleum spill areas will be excavated and placed in a lined landfarm for bioremediation. The proposed location for the landfarm is between the portal and the Plant site. A conceptual design and operations plan is provided in the General Waste Management Plan.

3.11.3 Materials Sorting Facility

The materials sorting facility will be constructed southeast of the fuel storage area. The materials sorting facility will allow for the storage of materials that will be recycled as part of the Waste Management Appendix 3.IV.

The waste material sorting facility will be surrounded by fencing. Fencing is anticipated to be 2 m high, slatted-type, and partially buried to prevent animals from burrowing underneath. The materials sorting facility, built on a concrete pad, will be divided into separate areas for the storage of the materials generated from the site that will not be incinerated.

The materials sorting facility will be divided into separate areas for the storage of materials from the site. Cardboard, paper, metal cans, and plastics will be collected in plastic bins. When full, the recyclables within the bin will be compacted and bailed using a dedicated compactor machine. E-waste, light bulbs, glass, copper, and stainless steel will be packaged in wooden crates constructed on-site. Grease, waste oil, hydraulic oil, paints, aerosol cans, and glycol will be stored in drums and placed on pallets. Empty FIBC totes will be stacked empty for return to suppliers. Loose scrap steel will be hauled in bulk from the site in a large scrap steel bin.

The waste to be sorted and processed for recycling or incineration is characterized to be typical Camp waste, non-hazardous solid waste consisting of food packaging, cardboard, wood waste, kitchen grease, general refuse, and some combustible waste materials that are non-usable and non-recyclable. Intermittently, dewatered sewage treatment sludge will be processed during the construction and operations phases of the NICO Project. The STP is located at the north corner of the materials sorting facility to facilitate the incineration of filtered sludge produced from the sewage treatment modules.

3.11.3.1 Incinerator

Dual-chamber, diesel-fired incinerators be used to burn combustible waste, including kitchen waste and other non-recyclable, non-hazardous, combustible waste materials (soiled paper and cardboard, oily rags, plastic films). The incinerators may also be used to burn used oil. Incinerator ash will be collected and transported to the CDF for disposal. Sewage sludges will also be incinerated.

Incinerator feed waste materials will be collected each day and processed as a mixture. The characteristics of this waste have been assumed as follows:

- moisture content up to 30%;
- density of 160 to 240 kilograms per cubic metre (kg/m^3); and
- average heat value of 9900 to 14 300 BTU/kg.

Based on 2 to 3 kg of solid waste generated per person daily, the incinerator will need to handle up to 838 kg/day during construction and 420 kg/day of waste during operations. The proposed incinerator model can handle 340 to 500 kg per batch; therefore, during construction the incinerator will have to process more than one batch per day.

The incinerator will operate in 2 stages. The first stage is the general burn of the waste materials and the second stage completes the burn of the combustion gases to yield carbon dioxide and water. In the first stage, a diesel fired burner elevates the temperature of a primary combustion chamber to ignite the waste. Once the chamber reaches a temperature of 650 to 850ºC, the burn process will be self-fuelling and the burner will shut off. The burner will turn on periodically, and as necessary when the temperature drops. In the second stage, combustion gases from the first stage are cleansed by further combustion at 1000ºC utilizing a separate high output burner to maintain the required temperature. This stage is augmented by use of a blower that creates turbulence in the chamber to mix the gases and oxygenate them. The gases are not scrubbed before venting through the exhaust stack.

Incineration of the solid waste should reduce the volume by approximately 90% and the residual ash will be non-hazardous, non-leaching and essentially inert. Entrained metals and glass (which will have been separated from the incinerator feed to the extent possible prior to combustion) will remain intact after incineration and will either be recycled (if possible) or sent for disposal in the CDF.

3.11.4 Hazardous Waste

Most of the hazardous materials that will be used at the NICO Project are substances that will be consumed and result in no hazardous waste generation (Appendix 3.V). For instance, the largest imports of materials to site will be fuels and explosives, both of which are completely used. The main reason a site may end up with wastes of these materials is due to spillage. The NICO Project will have procedures and safeguards to prevent spill and to contain spills (Appendix 3.VI).

Perhaps the largest quantities of potentially hazardous waste that may be generated are lubricating and other oils and antifreeze (glycol-water mixtures). The oils will either be collected for shipment off site to a used oil receiver for reprocessing or consumed on-site through metered fuel additions or incineration. The used antifreeze will require shipment to an off-site receiver.

Other wastes that may contain potentially hazardous materials, like batteries (automotive, rechargeable or alkaline type), and crucibles and some chemicals from the assay lab will be collected, sorted in the material sorting facility, and shipped off site. Chemicals, hydrocarbons, and other hazardous, non-combustible waste and contaminated materials will be collected and stored in sealed, steel, or plastic drums in the materials sorting facility for transportation to off-site facilities. Containers that had contained potentially hazardous materials will either be returned to the supplier or sent for disposal at a hazardous waste site.

3.12 Safety, Health, and Environment Management System

This section describes Fortune's commitment to a safe workplace, which includes stringent standards, educating workers, reviewing systems and programs, setting continuous improvement targets, and measuring performance.

3.12.1 Safety, Health, and Environment Management Policy and Programs

Fortune has developed safety, health, and environment management programs to protect the employees and visitors to the NICO Project and to reduce the impacts of the NICO Project on the environment. The following programs have been developed by Fortune.

- Occupational Health and Safety Management Program.
- Emergency Preparedness and Response Program:

  Management of risks, including preparation for the unexpected (i.e., emergency response and spill contingency planning) is a key element to a safe workplace. Fortune is committed to having management systems in place to minimize the risk of accidents affecting people, the environment, and the facilities. The Emergency Response and Spill Contingency Plan (Appendix 3.VI) provides response actions on the part of the NICO Project.

- Environmental Protection Program

  Fortune is committed to conducting its business activities in an environmentally sound manner and takes responsibility to limit effects on the environment at all stages of development. Fortune, as a whole, seeks continuous improvement in environmental performance by establishing comprehensive environmental management programs so that environmental effects are being adequately addressed, controls are in place to comply with policies and procedures, environmental activities are supported by adequate resources, and plans are in place to protect the environment for future generations. Plans developed for the Environmental Protection Program are provided in Section 18 Biophysical Management and Monitoring Plans (i.e., Aquatic Effects Monitoring Program [Appendix 18.I], and Wildlife Effects Monitoring Program [Appendix 18.II]).

3.12.1.1 Employee Awareness and Training

A key objective for Fortune is to protect the safety of its workers and employees, Fortune will provide all employees with the proper training to meet job requirements. Training programs will cover all aspects of the operation and provide opportunities for career advancement. Employee awareness and training may include, but is not limited to, the following:

- environmental health and safety orientation (e.g., general health and safety requirements, personal protective equipment, and lockout procedures);
- transportation of dangerous goods;
- quality assurance training;
- standard first aid;
- mine rescue training;
- workplace hazardous materials information systems; and
- explosive safety.

Fortune is committed to maintaining a drug-free workplace and promoting high standards of health and safety. Fortune values its employees and recognizes the importance of a safe and healthy work environment. The

Company firmly believes that the use of illegal drugs and misuse of legal drugs, including alcohol, is a source of danger in the workplace and a threat to the Company's goal of maintaining a productive and safe work environment. Possession and/or consumption of any illicit or illegal drugs or alcoholic beverages on Fortune premises is prohibited. Bringing, using, or possessing any equipment, materials, and paraphernalia related to the consumption of illicit drugs on Fortune premises is forbidden.

Employees are also prohibited from carrying or bringing any weapon to their work site or any other location the employee may be required to be during the work day unless required for safety. This prohibition also applies to any employee who is licensed to carry a firearm or weapon. A weapon is defined as any loaded or unloaded firearm from which a shot may be discharged (e.g., pistol, revolver, shotgun, rifle, BB gun), a knife with a blade longer than 3 inches (including a switchblade-type knife and gravity knife), or billy, blackjack, bludgeon, metal knuckles, bow and arrow, or electronic stunning device. The Mine Manager will authorize entry of explosives and related materials to Fortune Minerals premises in accordance with accepted blasting certification.

3.12.1.2 Security

The success of Fortune's NICO Project security program is critical to maintaining an effective and productive mining operation. Fortune's security plan is based on a security risk assessment that includes proper control and storage of explosive items, access control, site security, emergency response, and technical security policies and procedures. Mining operations face numerous obstacles such as theft, vandalism, and illegal access and safety concerns. The NICO Project will have a security presence 24 hours a day, 7 days a week, augmented by closed circuit television. The security team will clear any unauthorized persons coming into the NICO Project Lease Boundary. The location of all visitors and employees must be known at all times to maintain safety and prevent theft and vandalism.

All employees will have successfully passed a complete background screening before becoming employed with Fortune. Strict control on access to high security areas, constant surveillance, and following security procedures will help to maintain security at the NICO Project. The main purpose of searching any individual is to reduce the risk of inappropriate items being brought on to site, to prevent unauthorized access and to reduce the risk of unauthorized removal of company property.

3.12.1.2.1 Purpose

Security is an important part of Fortune's operating procedures. The Security Team includes all employees, not only those dedicated to the Security Department. Security systems at the NICO Project are designed to protect the people who work there. The mission of the Security Department is to "Optimize the protection of all assets against hostile acts". People are Fortune's most important asset. In addition to personnel, it is necessary to protect assets, such as the mineral concentrate produced, intellectual property, and physical property like tools and equipment. The scope of this policy includes all personnel at the NICO worksite.

3.12.1.2.2 Security and Access Controls

Fortune reserves the right to refuse access and/or entry to its premises. "Fortune premises" includes, but is not restricted to, all land, property, structures, installations, vehicles and equipment owned, leased, operated or otherwise directly controlled by Fortune, or under Fortune operating authority.

This policy gives a security officer authority to search a person who is entering, leaving, or who is already on Fortune premises. It also allows a security officer to search any article in that person's possession. Security officers may also require the removal of a coat, jacket, headgear, gloves, or footwear. Security officers also have the authority to search the vehicle of anyone leaving or arriving on-site. Fortune reserves the right to conduct searches of what is being taken to/from and on Fortune premises, including personal or contractor property such as vehicles, bags, backpacks, and other containers.

Access to Fortune premises will be restricted to Fortune employees who have attended the health, safety, and environment orientation. Anyone on Fortune premises is required to report the loss, theft, damage or unauthorized use of Fortune assets to their Team Leader and Security personnel.

3.12.1.2.3 Refusal to be Searched Upon Entry to or Exit from the NICO Project

A visitor or employee entering Fortune lease may exercise their right to not enter the mine site by refusing to be searched. If a visitor or employee leaving the site refuses to be searched, then the visitor will be asked to wait at the gatehouse until the employee's supervisor can be contacted. Additionally, the security officer will identify him/herself as a security officer and explain their responsibilities.

3.12.1.2.4 Searching within the Precincts of the NICO Project

There must be reasonable grounds on which to undertake a search within the precincts of the NICO Project. These may include the following:

- the security officer has seen the visitor or employee with a prohibited item;
- the security officer has been given intelligence by a third party that the visitor or employee is carrying a prohibited item; and
- the employee/visitor has admitted that they are carrying a prohibited item.

If there are reasonable grounds to undertake a further search, the security officer must approach the individual, introduce themselves as a security officer, and the visitor/employee must then be asked to accompany the security officer back to the security office where they can be searched as above.

The same procedures for leaving a Fortune premises will be employed. If the employee/visitor refuses to be searched, then once again, the visitor/employee must be reminded that if they do not submit to a search, then they can be removed or excluded from the Fortune premises.

3.12.1.2.5 Mine Access

The mine department will offer a mine/pit driving course for those employees or contractors required to work in and around NICO Project site. Only authorized team members actively involved in mining activities shall be allowed unrestricted access to active mining areas. As such a site-specific driving license will be established.

Non-mining personnel required to enter or exit an active mine area must contact the mine shift team leader prior to entry and exit. The mine shift team leader has full control of who enters this work area.

A mining channel radio, an amber flashing light, and a 20 pound ABC fire extinguisher are required for all vehicles entering the mine area.

All heavy equipment operators and visitors to the mine area have a special responsibility to be aware of the restricted visibility around heavy equipment.

3.13 Human Resources

3.13.1 Introduction

This section discusses human resources needs and management required throughout the duration of the NICO Project (i.e., construction, operation, and closure and reclamation).

3.13.2 Employment and Workforce Schedule

The NICO Project is expected to provide direct employment to a total of 2867 full time equivalents (FTEs) over the construction, operations, and closure phases of the NICO Project, with the highest number of FTEs during the first 2 years of operations when both underground and open pit mining are occurring. During Year 1 of operations, approximately 233 FTEs (36 FTEs for underground mining per year) are anticipated. During the open pit mining only phase of operations (estimated at 16 years), 127 annual FTEs will be created annually from direct employment. Employment during closure and reclamation is expected to be fewer than 100 FTEs.

3.13.2.1 Construction

The workforce from direct employment during construction is expected to be 231 FTEs, consisting of earthworks, concrete, structural steel, mechanical, electrical, instrumentation, and piping jobs. The number of people on-site is determined by the size of the Camp(s), which is set at 278, to allow for additional staff, if required.

The construction phase will be broken down into 2 stages:

- early construction, including accommodation and NPAR construction; and
- mine infrastructure construction.

The work force will consist of 3 crews plus supervision, working a staggered 12-hour shift on a 4 weeks on and 2 weeks off rotation. Construction crews will operate 24 hours per day, with dayshift and nightshift construction crews working 12 hour shifts. This takes advantage of the light available during the summer season. Nightshift activities will be limited during the darker winter season.

3.13.2.2 Operations

The mine will be in operation 24 hours a day, 365 days a year. The operating mine life is estimated to be 18 years in duration. Full production is anticipated in Year 1 with production completed in Year 18. The number of FTEs will be reduced by the end of Year 2, as the underground mining will be completed. The main work force rotation will consist of 4 crews working a staggered 12-hour shift, on a 2 weeks on and 2 weeks off rotation. For the operations phase, the schedule could be flexible to be able to accommodate Aboriginal employees, where practicable.

Most operations jobs for the NICO Project will have minimum education requirements, including high school completion (or a General Equivalency Diploma) and technical or academic training. Some of the major qualifications for the NICO Project are as follows:

- about 24 jobs for professionals requiring a university degree (e.g., engineering, science);
- about 33 jobs requiring a trade certificate or journeyman qualification;
- about 27 jobs for those requiring a technical education; and

- about 78 jobs are expected to require a high school completion.

3.13.2.3 Closure and Reclamation

The work force during closure and reclamation is expected to be fewer than 100 FTEs. Fortune bases this number from its experience decommissioning the plant and mine surface infrastructure at the Golden Giant Mine in Hemlo, Ontario, which contained a much greater number of buildings and covered a larger surface area. Most of these positions would be associated with the dismantling and demolishing of site buildings such as the Plant. The work is anticipated to take place over summer months, and the workforce rotation will consist of 4 crews working a staggered 12-hour shift, on a 4 weeks on and 2 weeks off rotation.

Subsequent monitoring activities will consist of a small 1 to 2 person workforce based from Whatì; and augmented by the use of specialist consultants. The local employees will drive from Whatì daily, with a 10-hour shift scheduled 4 days per week.

3.13.3 Employee Benefits

Fortune will provide their employees with a competitive benefits package so that the NICO Project is competitively balanced in the NWT. Employees of the NICO Project will be offered a comprehensive benefits package which includes the following:

- group healthcare benefits, including dental care, optical care, and medical travel assistance;
- group registered retirement savings plan (defined contribution plan);
- group life insurance, including long and short-term disability for sickness or injury;
- education assistance program;
- site allowance (as a % of base salary);
- northern living allowance (as a % of base salary);
- vacation;
- sick and bereavement leave;
- northern relocation benefit;
- employee incentives;
- professional memberships; and
- employee assistance program.

3.13.4 Staffing the Mine

Fortune will make its best efforts to match the skills required for open positions with the skills of the local workforce. Hiring preference will be given to the following persons in order of priority:

- Tłįchǫ citizens from the communities of Behchokǫ̀, Whatì, Gamètì, and Wekweètì, and Tłįchǫ citizens residing in Yellowknife;

- NWT First Nations and Métis persons residing in Yellowknife, N'Dilo, and Detah;
- Yellowknife, N'Dilo, and Detah residents;
- NWT residents; and
- Canadian residents.

Fortune's commitment is to provide employment and business opportunities to Northerners. Fortune's commitments include support of apprentices at the mine.

3.13.5 On-Site Amenities and Accommodations

During all phases of the NICO Project, a contracted service will provide ongoing Camp management including catering, housekeeping, and laundry services. All areas of the Camp will be 'dry'; alcohol will not be permitted or tolerated on-site.

If the foods supply business can provide 'country foods' such as meat and fish certified by the Canadian Food Inspection Agency at competitive costs, Fortune would include a local food selection prepared when available.

Recreational facilities in the Camp will be available from 5:00 am to 11:00 am, and again from 5:00 pm to 11:00 pm, 7 days a week. Services will include the following:

- gymnasium for basketball, volleyball, and floor hockey;
- hiking trails;
- weight and fitness room;
- common area for television, including a games room;
- outdoor ice rink; and
- access to computers and phones for use in the common area.

Safety personnel with appropriate health and safety training will be stationed at the NICO Project and will be accessible 24 hours a day, 7 days a week. Standard first aid is required for all supervisors, security, and mine rescue team personnel. Medical emergencies will be evacuated by ambulance to Behchokǫ̀, and onto Yellowknife if necessary.

Attracting workers to remote job sites is challenging in a market that faces a growing shortage of highly-skilled labour. Fortune understands that quality of life far from home is an important consideration for people working at the NICO Project. Each room during operations is on the basis of single occupancy; and for workers on 2 week rotations, is shared with an employee on the opposite shift rotation. Rooms will contain a single bed, a desk and chair, closet space, cable television, and wireless internet. Washrooms are shared dormitory-style (wash-car bathrooms).

Arctic corridors-prefabricated metal modules are connected to link the major buildings. These arctic corridors provide heated, well-lit walkways for workers going to and from work at the Plant site.

3.13.6 Employee Training

Fortune has developed training programs cover all phases of the NICO Project for their employees and provides opportunities for career advancement. Section 3.13.2.5 outlines the training requirements required for the NICO Project.

Orientation will be provided for all new hires. Fortune will communicate in the orientation the specifics of the job task, accepted job performance, and Camp amenities. In addition, all employees will receive the following during orientation:

- orientation to job and camp life;
- information on benefits;
- work schedule and transportation; and
- Camp and work site rules.

Fortune is committed to providing opportunities for career advancement for employees hired for the NICO Project, as well as providing opportunities for Aboriginal workers.

3.13.7 Transportation

Fortune will provide scheduled return bus transportation during all phases of the NICO Project, at its expense, to employees travelling from designated pick-up location at the 3 Tłįchǫ communities (Behchokǫ̀, Whatì, and Gamètì). A 22 person bus will travel between the Tłįchǫ communities bringing workers in and out of Camp. A bus will go to Whatì every day to bring people and/or food in and bring people out. Small aircraft will be used to transport employees to and from Wekweètì. Transportation will also be provided for Yellowknife residents. Fortune may re-evaluate the logistics to make adjustments to best suit the workforce during construction and operations of the NICO Project.

During the care and maintenance phase, employees will be based out of Whatì and workers will be required to drive to and from the NICO Project.

3.14 Closure and Reclamation

3.14.1 Introduction

Closure and reclamation (C&R) planning is part of all phases, including design of the NICO Project, and is not left to the end of the NICO Project. Two important concepts are “progressive reclamation” and “design for closure”. Closure and reclamation was considered during the selection of design alternatives for the NICO Project (Section 2).

3.14.2 Closure and Reclamation Objectives

Progressive reclamation during operations, and C&R of the site at the end of mining, will be integrated into NICO Project planning and will be consistent with the objectives outlined by Indian and Northern Affairs Canada in the Mine Site Reclamation Guidelines for the NWT (INAC 2007).

The overall goal of the C&R Plan is to limit the lasting environmental impacts of operations to the extent feasible and to allow disturbed areas to return to productive fish and wildlife habitat as quickly as possible. The key goals of the C&R Plan will be as follows:

- to establish Fortune's management accountability and ownership of closure and remediation activity;
- to comply with relevant or applicable legislative requirements;
- to help to protect indigenous values;
- to protect public health and safety using known safe, responsible reclamation practices;
- to limit or eliminate residual environmental effects post closure;
- to establish conditions that allow the natural environment to recover from mining activities; and
- to establish physical and chemical stability in disturbed areas to reduce requirement for long-term monitoring.

Although C&R will be progressive and begin as soon as possible, it will extend decades into the future. Fortune will use the latest proven technology that is available at the time of reclamation, in accordance with the legal requirements at that time.

3.14.3 Approach

Fortune uses the concept of C&R planning to highlight the mitigation methods planned to re-establish the site to useable conditions after closure. Throughout the mine planning process, a considerable amount of effort has been expended to look at the various mine development options available given the ore body and land base associated with the development area. Where possible, the designs of mine waste disposal areas, dams, dykes, and mine water management facilities have been chosen or modified to reduce the overall impact of the development. The C&R Plan summarizes the mitigation process for the NICO Project and incorporates Fortune's operational experience as well as applicable regional experience. Also addressed will be the timing and schedule for implementation of reclamation designs and the setting of performance monitoring indicators.

Corporate policies relevant to the ongoing closure process will include the following:

- end land use objectives will be developed with input from regulators and communities;
- there will be an ongoing engagement process with regulators and communities; and
- adaptive management of the C&R Plan will be pursued through the incorporation of results of Fortune's site-specific studies and any available regional research.

Table 3.14-1 summarizes the permits and authorizations that will be needed to be met for final closure. The C&R Plan is intended to meet these requirements.

Table 3.14-1: Potential Permits, Authorizations, and Agreements Required by Jurisdiction for Closure

Type	Legislation	Responsible Authority
Land Lease License of Occupation	*Territorial Lands Act and Regulations* *Real Property Act*	Indian and Northern Affairs Canada
Mineral Lease	*Territorial Lands Act* *Canada Mining Regulations*	Mineral and Petroleum Resources Directorate, Indian and Northern Affairs Canada
Water License (Obtain Class A)	*Mackenzie Valley Resource Management Act* *Northwest Territories Waters Act* *Northwest Territories Water Regulations*	Wek'èezhìi Land and Water Board
Land Use Permit (LUP) (Renew Class A)	*Mackenzie Valley Resource Management Act* *Mackenzie Valley Land Use Regulations*	Wek'èezhìi Land and Water Board

3.14.4 Conceptual Closure Planning

The general components of the reclamation program are summarized briefly as follows (additional details are provided in Section 9):

- salvage and stockpile soil and overburden, to the extent practical, from areas of disturbance;
- stockpile appropriately sized rock for use in the construction of site roads and the dam structures for the CDF; and
- progressively reclaim the CDF, which is actively used between Year 1 and mine closure.

At the end of operations the general components include the following:

- cover exposed tailings at the CDF;
- remove all potentially hazardous materials from site;
- dismantle and remove or demolish all buildings and related structures;
- scarify and grade sites of former Plant and laydown areas;
- regrade Mine Rock piles and place a barrier around the perimeter;
- cap vent raises and plug ramp portal;
- decommission and remove redundant power lines; and
- monitor conditions over time to evaluate the success of the C&R Plan, and using adaptive management and newer proven methods as available, adjust the plan, if necessary. Fortune will comply with the legal requirements for C&R in effect at the end of operations.

3.14.5 Schedule of Key Activities

Progressive reclamation is fundamental to the NICO Project's C&R Plan, whereby any disturbed area that is no longer in use is reclaimed as soon as possible and practical. As a result, closure and reclamation activities will occur throughout the 18 year operational life of the NICO Project. Key milestones in the closure and reclamation schedule are outlined in Table 3.14-2.

Table 3.14-2: Key Activities and Milestones in the Conceptual Closure and Reclamation Schedule

Activity / Milestone	Operation Year	Closure Year
Begin progressive reclamation of Co-Disposal Facility	2	-
Remove underground equipment, seal adit	2	
Wetland Treatment Systems No. 1, 2, and 3 construction and testing	17	-
Decommissioning and salvage of on-site facilities	-	1
Demolish on-site facilities, debris to landfill		1,2
Remove main fuel storage tanks	-	1
Excavation and removal of potentially contaminated sites	-	1
Demolish operational Effluent Treatment Facility system, if not required	-	10
Breaching of Contingency Pond dams	-	10
Reclaim on-site roads		10
Close Camp facilities		2,10
Reclaim NICO Project Access Road	-	5
Reclaim airstrip	-	5
Place cover on CDF and re-vegetate	-	1,2
Barricade Open Pit with boulder wall	-	1
Begin naturally flooding the Open Pit	-	1
Revegetation of borrow and disturbance areas	-	1
Construct winter road to move equipment in size needed to construct Wetland Treatment System No. 4	-	118
Wetland Treatment System No. 4 construction and testing	-	118
Construct new Effluent Treatment Facility, if required	-	118

3.14.6 Soil and Overburden

During the development of the mine, overburden will be removed to expose the top of the deposits and to allow surface mining of the deposits to proceed. To the extent possible and practical, these materials will be stockpiled and used for construction and reclamation activities. In a similar fashion, soils disturbed during the construction of the Plant site, Airstrip, and other on-land facilities will be, to the extent possible and practical, initially stockpiled. As progressive reclamation occurs, soils will be recovered from the stockpiles and spread over reclaimed areas that would benefit from additional soil.

3.14.7 Co-Disposed Tailings and Mine Rock

During community feedback and considerations of traditional knowledge the decision to go with the CDF considered that it would have the smallest footprint of the 3 potential alternatives, that it would be entirely contained in the Grid Pond area, and that it would not be visible from the Įdaà Trail.

Over the mine life, the NICO Project is projected to produce approximately 96.9 Mt of Mine Rock. Of this total, 6.5 Mt is classified as sub-economic mineralized rock that may become economic if parameters used in the reserve estimate change. Approximately 0.2% of the Mine Rock will be used as aggregate for the cemented rockfill (as the Open Pit advances towards the underground, stopes will be backfilled with broken ore from the pit floor via drop raises or as they are exposed, and as the pit will advances through the ore body). The remainder of the Mine Rock will be stored in the CDF.

Tailings and Mine Rock will be co-disposed in a single facility. The design of the CDF described in Section 3.8 is based on preliminary engineering studies. Fortune will continue to refine waste management protocols and facilities during the permitting process. The final design will be developed from detailed engineering undertaken during the final design phase. The final design will be consistent with the environmental protection policies of the preliminary design.

Geochemical testing will be undertaken on an ongoing basis through the mine life. This will focus on the geochemical characterization of Mine Rock and its variability over the mine life. The testing program will also include on-site testing, such as barrel leaching tests as well as covered test plots equipped with lysimeters.

3.14.7.1 Covering of the Co-Disposal Facility

Golder (2010b) discussed several closure options for the CDF, which included progressive grading and reclamation, cover material selection (e.g., clean fill or overburden) and the composition of the waste material (i.e., Mine Rock, thickened tailings, and paste rock). Closure of the CDF was designed to limit wind and water erosion, effectively shed water, and reduce infiltration. The selected cover design for the top surface of the CDF will comprise 2 layers of soil: 0.25 m of overburden on surface underlain by 0.25 m of sand. The lower layer will act as a “capillary break”, which will prevent the vegetation on the surface from uptaking arsenic and other metals from the underlying tailings. Mine Rock will not be a substantial source of arsenic uptake, so the cover on the sloped Mine Rock Perimeter Dyke will consist of a single 0.5 m thick layer of overburden without a capillary break layer.

3.14.8 Dams and Emergency Spillways

Throughout the mine planning process, a considerable amount of effort has been expended to look at the various mine development options available given the ore body and land base associated with the development area. Where possible, the designs of mine waste disposal areas, dams, dykes, and mine water management facilities have been chosen or modified to reduce the overall impact of the development.

The Water Management Ponds are designed to accommodate extreme precipitation events (i.e., intense, prolonged or above average rainfall – snowmelt events), up to return periods that are acceptably long. Should longer return period events occur, the dams forming the ponds are designed to include spillways to protect against overtopping (in the absence of spillways, overtopping could otherwise lead to dam failure).

3.14.9 Mined Areas

The NICO Project will result in the creation of one Open Pit mine and one underground mine. Underground and open pit mining will be done concurrently for the first 2 years of operation. After 2 years, the underground mining will cease. The C&R activity planned is described below.

3.14.9.1 Underground Mine

Underground mining will cease by the end of Year 2. Once underground mining is completed, the mobile equipment will be removed, decommissioned, and shipped off-site. The underground mine workings will be sealed and the portal will be filled with rock shortly after underground mining is completed.

3.14.9.2 Open Pit

Mining within the Open Pit is scheduled to finish in Year 18 of the operation. The Open Pit has an ultimate depth of 185 m, and a bottom elevation of 95 m. At closure, pumping of water out of the Open Pit will cease and the Open Pit will slowly fill with water.

Water balance modelling indicates that water will slowly accumulate in the Flooded Open Pit until it will eventually overflow from the pit through the former haul road at about Elev. 260 m. The main sources of water that will contribute to the formation of the Flooded Open Pit will include precipitation, runoff from the pit walls, groundwater inflow, upgradient runoff, and runoff from the CDF. It is projected that overflow will occur about 120 years after closure.

The results of the hydrodynamic model for the Open Pit suggest that a limited monolimnion (approximately 3% of the filled volume of 28 000 000 m^3) will form. The remaining volume of Flooded Open Pit will be fully mixed. Estimates of post-closure water quality in the Flooded Open Pit suggest that some water quality parameters could occur at concentrations in excess of the SSWQOs (Section 7, Appendix 7.VII). The base case assumption, inferred from the hydrodynamic modelling, is that the water in the Flooded Open Pit will require and should be amenable to passive treatment in Wetland Treatment System No. 4, which will be constructed on the west shore of Peanut Lake.

The Open Pit will require a safety barrier and warning signs around the perimeter. To achieve this, environmental design features and mitigation will be implemented at the NICO Project and will include a boulder barrier around the Open Pit. The wall will be constructed outside of a ‘safe-line’ of approximately 50 m from the edge of the Open Pit beyond any area of potential pit instability. According to Ontario Mine Development and Closure Regulation (Ontario Regulation 240/00), boulders used for fencing should be a minimum of 1.25 m in height, and be no further than 0.6 m apart.

3.14.10 Buildings, Machinery, and Other Infrastructure

3.14.10.1 General Demolition and Disposal Procedures

After mining has ceased, C&R of the plant site will begin. Mobile mining equipment will be shipped off-site. Some of the construction equipment will remain on-site for up to 10 years to assist in closure, but after that, it too will be shipped off-site. To support on-site personnel during the initial C&R phase of the NICO Project, site services, including potable water treatment, sewage treatment, and communications will be maintained. Once they are no longer needed, they will be decommissioned, dismantled, and removed from site or disposed of in the CDF. They will be replaced, as appropriate, with smaller, temporary facilities in support of post-closure monitoring activities.

Where it is economical, processing equipment, generators, Camp trailers, pumps, and valves will be decommissioned and shipped off-site for salvage. Materials with scrap value (e.g., stainless steel, copper, and possibly also structural steel) will be removed from site and sold as scrap. Buildings will be demolished and the debris will be hauled to an industrial non-hazardous waste landfill in the CDF. Equipment that cannot be salvaged or sold as scrap will also be placed in the landfill. The landfill will be covered after it is no longer required. Building foundations and slabs on grade will be left in place, punctured to allow drainage and covered with till or gravel to provide a medium for subsequent surface revegetation.

The ETF, including the pumps and pipelines and the Peanut Lake diffuser, will be decommissioned and mothballed. It will remain in place as a contingency in case it becomes necessary to treat any site water prior to release into Peanut Lake. If the ETF system is not required after 10 years, it will be demolished. Should active treatment of water from the Flooded Open Pit become necessary after overflow occurs, then a new ETF system would be constructed.

3.14.10.2 Mineral Processing Plant

At the end of the operational life of the mine, all remaining ore stockpiles will be processed through the Plant. The base of the stockpile will be scraped by bulldozers, and the scrapings run through the Plant. Once all the ore has been processed, the various circuits within the Plant will be cleaned with high-pressure water, starting at the front of the process train (i.e., the primary crusher) and working through the various circuits to verify the recovery of residual ore materials and to remove all process residues. The material cleaned from each circuit will be processed through the remaining circuits. The final washings will be discharged into the CDF.

When the milling circuit has been cleaned out, the interior of the building will be washed. All potentially hazardous materials, such as hydrocarbons, chemicals, and reagents, will be removed and prepared for off-site disposal. Reagent tanks will be drained, cleaned, and eventually demolished. The process equipment will be drained of any potentially hazardous materials, such as lubricating oil and glycol. In addition, all utilities and services, including air, glycol, power, and water, will be shutoff, de-energized, and drained as necessary to permit demolition.

All buildings and equipment with no salvageable value will be dismantled and buried in the CDF.

- Concrete foundations and floor slabs will be broken down to original ground level and demolition rubble buried in the CDF.
- All buried piping, with the exception of the fuel and glycol lines, will be removed to just below grade and the pipe ends will be capped. Buried fuel and glycol lines, if present, will be flushed with water, removed and buried in the CDF. Surface piping will be flushed, if necessary, removed, and salvaged if economical. Otherwise, it will be removed and buried in the CDF.
- Buried electrical cables will be cut approximately 1 m below grade at surface terminations and left intact. The remaining above-ground cable will be removed and salvaged if economical. Otherwise, it will be disposed of in the CDF.
- All other inert materials not suitable for re-use or salvage, such as metal cladding, wallboard, and insulation, will be buried in the CDF.

3.14.10.3 Diesel Generators

One or more of the generators will remain operational as long as necessary during the post-closure phase to provide power for mine water pumping, water treatment, lighting, and heating. Once they are no longer needed, the generators will be decommissioned. A small amount of power may still be required for accommodations, site services, and other activities. If such is the case, a small, skid-mounted diesel generator set will remain on-site, and will be demobilized when it is not longer required.

3.14.10.4 Water Treatment Facility

The Water Treatment Facility will remain on-site and continue to operate until it is no longer required. Once the facility is no longer required, it will be cleaned and demolished using the same procedures described for the Plant.

3.14.10.5 Waste Petroleum Products, Chemicals, and Explosives

Any unused explosives, reagents, or other chemicals that remain after production ceases will be shipped off-site. Fuel tanks will be pumped out and hauled off-site. Studies (i.e., Phase 1 and Phase 2 Environmental Site Assessments) will be undertaken to determine the existence and extent of any hydrocarbon or other by-product contamination. The landfarm (i.e., a bioremediation cell) already established on-site will treat hydrocarbon contaminated soils. Remediated soils will be placed in the CDF.

Prior to demolition, buildings and equipment will be inspected so that potentially hazardous materials are correctly identified and flagged for appropriate removal and disposal. All equipment will be drained of fluids and cleaned so that potentially hazardous materials are not placed within the CDF.

3.14.10.6 Transportation Corridors and Airstrip

After the closure phase (approximately 5 years after mine operations have stopped), the NPAR and Airstrip will no longer be required for the NICO Project. Fortune will offer the NPAR and Airstrip to the Tłįchǫ Government. If they do not want the NPAR or Airstrip transferred to them, they will be closed and reclaimed by Fortune.

Site roads not required for post-closure maintenance and monitoring will be decommissioned and reclaimed at the end of the closure phase. Reclamation for both the roads and Airstrip will involve scarifying and loosening the surface to encourage natural revegetation. Lighting, navigation equipment, and the Airstrip will be de-registered with Transport Canada. Culverts or stream-crossing structures will be removed and the corresponding surface area contoured to eliminate potential hazards to wildlife and to re-establish natural drainage.

3.14.10.7 Borrows

The reclamation of borrows will involve removing all mobile and stationary equipment, and then stabilizing and contouring the surface of the quarries to blend with the surrounding landscape. Borrows will be decommissioned at different times during the operation of the NICO Project. Those used primarily during construction of the site and NPAR will be reclaimed early in the operation of the NICO Project. The remaining borrows will be reclaimed at the end of operations.

3.14.11 Erosion Control and Revegetation

The entire area will be stabilized and contoured to blend with the surrounding landscape. Ditches will be contoured or backfilled as required to eliminate any hazards to wildlife and to re-establish pre-mining drainage patterns. Any remaining overburden will be used for final reclamation.

3.14.11.1 Erosion Control

Erosion will be controlled principally by keeping slope angles of constructed facilities at less than the angle of repose or by rock armouring, as appropriate. Where feasible, long-term sediment control will be achieved by revegetation. Rock armouring will be done where revegetation is not possible and erosion control is required. The rock will be obtained by screening suitably sized inert material from the Mine Rock stockpile.

Some specific erosion control practices available for the NICO Project include the following:

- limit soil exposure and control surface runoff, especially during wet weather and in areas close to watercourses;
- construct temporary cross ditches to redirect surface runoff;
- construct temporary berms of imported logs, construction timbers, sandbags, or other material as appropriate and available;
- construct roads so natural drainage patterns are not impeded and in a manner that runoff to road ditches enters natural drainage systems or contoured containment areas;
- use temporary erosion control practices and procedures, such as mulches, mats, and netting to control erosion prior to establishment of a protective vegetative cover; and
- promptly seed exposed areas and topsoil stockpiles with a self-sustaining, erosion controlling seed mix appropriate to the region.

3.14.11.2 Revegetation

Revegetation in northern areas is challenging due to limitations associated with cool short summers, low precipitation levels, cold winters, permafrost, and other biotic and abiotic influences that are not always readily identifiable or controllable. Other challenging factors include the limited availability of soil, a less-than-comprehensive understanding of indigenous plant phenology and associated succession processes, and the general absence of endemic plant seeds or other propagules in sufficient quantities for use in large-scale planting or seeding. As a result, growth and establishment of vegetation in northern areas is often slow and uncertain.

There are few examples of successful and well-documented revegetation programs in northern latitudes, especially for large-scale disturbances, that can provide direction. A Revegetation Management Plan that can fulfill the reclamation objectives will need to be flexible and developed through the operational life of the mine to take advantage of key findings obtained at other mine sites. At the Ekati and Diavik diamond mines, active reclamation research has been ongoing for several years with the goal of developing optimum revegetation strategies for disturbed northern areas (Harvey Martens & Associates Inc. 2005; Naeth et al. 2005). These research projects have involved the use of various combinations of amendments, soil materials, fertilizers, and vegetative species to maximize regrowth and develop a self-sustaining vegetative cover.

The following results will be considered for revegetation at the NICO Project.

- The Ekati Diamond Mine has found that for selective mine units, including a diversion channel, a former exploration growth media stockpile and a lake sediment stockpile, seedlings and willow cuttings have had some success.

- Similarly, a combination of dwarf birch, fireweed, and bluejoint were successfully established in esker areas at the Ekati Diamond Mine, whereas direct seeding of the tundra has not been successful.
- Care needs to be taken in stockpiling soil materials for reclamation, with free dumping proving to be more effective at maintaining soil physical properties than levelling the piles.
- Site recontouring and landscaping have improved moisture conditions, which in turn have improved vegetation success.
- Creating microhabitat, such as small boulder piles and mild depressions to trap moisture, has shown to be effective in enhancing plant growth opportunities, although boulder piles have only worked where vegetation is already established.
- The Ekati Diamond Mine has found that native plant cultivars applied at a low seeding rate have been the most successful in encouraging native plant recolonization.
- Sewage sludge has had mixed success at the Ekati Diamond Mine, but it has been a key part of plant establishment at Diavik Diamond Mine
- Based on experience at the Ekati Diamond Mine, careful control of the application of sludge is required to prevent depressions from over-concentrating sludge and preventing plant establishment.
- Summer planting has not proven successful with seeds failing to germinate or seedlings dying from moisture stress; fall or spring planting shows the most promise.
- Grazing of newly established vegetation has been problematic at the Ekati Diamond Mine, and some method of discouraging grazers, such as Arctic hares, may be required.
- Salvaged glacial materials mixed with lakebed sediments containing a preponderance of till yield a soil with improved texture that has proved successful in promoting plant growth; however, the inclusion of too much lake sediment has led to soil compaction and the inhibition of plant growth.

Fortune will study the feasibility and applicability of using various plant species and planting or site preparation techniques as part of their revegetation program; however, the current revegetation management objective will be to create a stable and favourable landscape that will encourage natural colonization, and encroachment and regeneration of endemic plant species. This will be complemented by planting or seeding where required.

3.14.12 Post-Closure Maintenance and Monitoring

3.14.12.1 Maintenance

Most of the active closure activities will be completed within 2 years after operations cease, although a few activities need to be deferred. This period will be followed by post-closure monitoring and maintenance, which will extend 10 years after mine closure and may include maintaining the ETF for that time period, if required.

3.14.12.2 Monitoring

Pursuant to the assessment approach outlined in the DAR, 3 types of monitoring are planned:

- compliance inspection;
- environmental monitoring; and

- follow-up monitoring.

Compliance inspection will consist of programs designed to confirm the implementation of approved design standards and the environmental design features described in the DAR.

Environmental monitoring is used to track conditions or issues during the lifespan of the NICO Project and apply adaptive management if required. Examples of environmental monitoring include:

- monitoring the effectiveness of erosion control structures during construction and operation;
- verifying the effectiveness of water diversion and control structures during the life of the NICO Project; and
- determining the effectiveness of the Wetland Treatment Systems.

Follow-up monitoring programs are designed to test impact predictions, reduce uncertainty, determine the effectiveness of environmental design features and mitigation, and provide appropriate feedback to operations for modifying or adopting new mitigation designs, policies, and practices. Follow-up or effects monitoring will involve programs focused on the receiving environment, with the objectives of verifying the conclusions of the DAR, evaluating the short-term and long-term effects on the terrestrial environment and on the physical, chemical, and biological components of the aquatic ecosystem of local lakes, estimating the spatial extent of effects, and providing the necessary input to adaptive management.

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