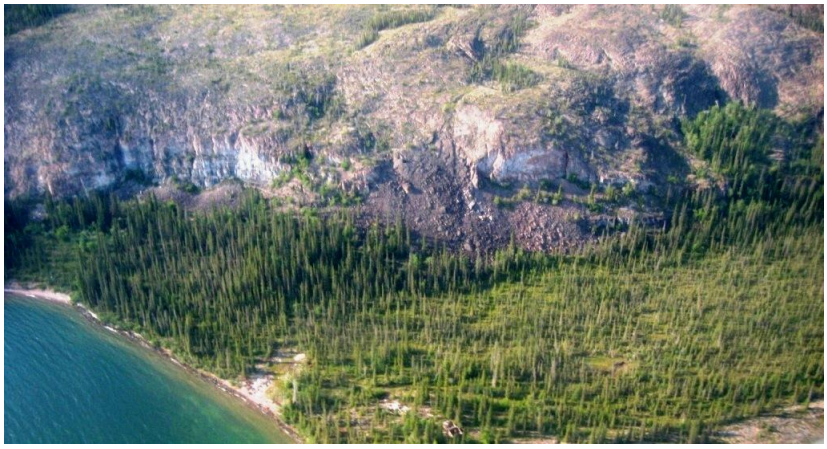
GREAT SLAVE LAKE REMEDIATION PROJECT
QUARRY MANAGEMENT and OPERATIONS PLAN



Aboriginal Affairs and Northern Development Canada
Contaminants and Remediation Directorate

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1.0 Introduction

The Great Slave Lake Project consists of the abandoned Outpost Island, Blanchet Island and Copper Pass mine sites. The Outpost Island Mine site is located approximately 94 km southeast of Yellowknife, NT and occupies two islands; Outpost Island (West Island) and East Island in Great Slave Lake. Mining operations took place on the site from 1941 to 1942 and 1951 to 1952. Gold, copper, and tungsten were mined at the site and gold was extracted using an amalgam mercury extraction process. The majority of the mining operation was located on Outpost Island; in 1955, a fire destroyed all of the buildings at the mine site except for an outhouse and a shed on East Island. The Blanchet Island mine site is located approximately 115 km southeast of Yellowknife, NT on the southern shore of Blanchet Island in Great Slave Lake. Blanchet Island was an area of interest for cobalt nickel mining commencing in 1968, which resulted from the discovery of a high grade showing of nickel, cobalt, and bismuth. The property was explored and mined until 1970, when the end of the mineralized lease was reached. A number of claims were staked between the 1970 and 2005, although no works were reported; all equipment was reportedly removed in 1971. The Copper Pass mine site is located approximately 129 km east of Yellowknife, NT on Sachowia Lake (7.5 km northwest of Sachowia Point on the Hearne Channel of Great Slave Lake). The majority of mining (primarily for nickel) occurred in the late 1960s.

Aboriginal Affairs and Northern Development (AANDC) – Contaminants and Remediation Directorate (CARD) has developed the *Great Slave Lake (GSL) Remediation Project - Quarry Management and Operations Plan (Plan)* in accordance with our "Northern Land Use Guidelines - Pits and Quarries" and although conceptual in nature, the Plan is being submitted in support of our Type "A" Land Use Permit application. A more robust, site specific plan will be submitted by the successful Final Remediation Contractor as part of their contract submittal process and in advance of their mobilization to site. The Plan will be a "minimum standard" with which the Contractor's submittal will be measured against.

Although the proposed quarrying operations will create a ground disturbance at the sites, the activities will provide a net benefit to the sites through the facilitation of excavation of impacted soils and capping and grading of impacted materials. Potential impacts will be mitigated through industry best practices and compliance with conditions set out in the Quarry Permit.

2.0 Granular Resources

2.1 Granular Deposit Evaluation

A historic quarry and borrow source search was conducted with AANDC Lands and South Mackenzie District Office in late 2012-13. The intent of the search was to identify previously disturbed borrow areas within feasible transport distances from the sites, ideally in the McKinley Point vicinity, but also considering the abandoned DeStaffany Mine site. Unfortunately this search proved unproductive and Blanchet was subsequently identified as the project's primary borrow source and logistical base.

Outpost Island

There are no viable borrow sources on the islands save for the waste rock which is mixed with tailings and as such makes the material unsuitable as borrow material. For the purposes of the remediation work, no quarrying of borrow will take place at this site. In discrete locations where waste rock is free of tailings, this waste rock will be used to cover the adjacent mine openings. Photographs of the available waste rock are presented in Appendix A of the attached Borrow Source Assessment Technical Memo (TM). There are two locations where waste rock is available as shown in plan on Figure 4 of the memo. The coordinates for the respective waste rock areas are presented with the estimated volumes in Table 1of the TM.

Blanchet Island

The Blanchet mine site has three viable borrow areas as shown in plan on Figure 5 of the TM. The inferred coordinates for each, and nature of the aggregate within the borrow areas, are summarized in Table 2 of the TM. In general, the primary and tertiary borrow sources are located within the near shore environment along Great Slave Lake and as such, a portion of these potential borrow areas encroach the 30 + 1m setback requirement mandated by the AHJ for borrow areas near water bodies. Furthermore, these potential borrow areas are located within an area that is vegetated with larger trees and heavy brush (more details are presented below with respect to the nature of the vegetation within the respective borrow areas).

The primary borrow source is located between the base of the escarpment and the shoreline of Great Slave Lake due north of the former camp area. The secondary borrow source is located near the mine site (adit and waste rock area). The tertiary borrow source is located at the Beach Area of the site where fine grained soils have been identified. Within this borrow area the surficial soils are organic rich and the upper 300 mm of organic material will be side-cast for re-use as borrow source cover. The groundwater table is relatively shallow within this area and as such a minimal cut can be achieved. The estimated surface area of this borrow source is 6000 m2 with an average depth of 1 m. Photographs of the borrow area are provided in Appendix A of the TM. The results of grain size analyses for the aggregate within this borrow area are provided in Appendix B of the TM. The areas will need to be selectively cleared (preserving as much of the mature tree stand as possible) using hand tools before quarrying operations begin. All areas will be brought back to the minimum required grades as per the regulations and organic cover reinstated where applicable once the remedial works have been completed. A robust vegetative screen will be maintained between access/view points and all disturbed areas.

Copper Pass Mine Site

On the basis of the subsurface investigation work undertaken at this site it has been determined that the majority of the surficial or near-surface overburden is impacted with arsenic and as such there are currently no viable borrow materials identified at site, excluding some waste rock inventory that does not contain arsenic-bearing materials. Photographs of the waste rock are provided in Appendix A of the TM. The location of the stockpiles is provided on Figure 6 of the TM. The estimated volume of waste rock is approximately 2,000 m3. On the basis of the Phase II ESA it is possible that the fine to medium aggregates (sands and gravels) encountered at depth near Trench # 2 will meet the site specific remediation standards. Should analytical data confirm this, the area would be an alternate borrow source. The estimated lateral extent of the sandy material is approximately 5,000 m2 with an estimated depth of 1 m. Grain size analysis of this material, based on the nearby surface sample collected and analysed, is provided in

Appendix B of the TM. Photographs of the potential borrow area are provided in Appendix A TM. The coordinates and estimated volume of waste rock are presented in Table 3 of the TM.

All areas will be brought back to the minimum required grades as per the regulations and organic cover reinstated where applicable once the remedial works have been completed.

2.2 Permitting Requirements

AANDC-CARD maintains an Environment, Health and Safety Management System (EHS-MS) that provides a framework for AANDC, PWGSC and Contractors to work within and help ensure compliance with all legal requirements, policies and procedures. The federal *Canada Labour Code-Part II* and *NWT Mine Health and Safety Act* will be complied with to ensure health and safety of all individuals accessing and working on the sites.

AANDC-CARD will submit Type "A" Land Use Permit and Quarry Permit applications to the Mackenzie Valley Land and Water Board (in accordance with the *Mackenzie Valley Resource Management Act)* and it is anticipated that the permits will be issued in support of proposed project mobilization, remediation/ and demobilization schedule. AANDC-CARD will also comply with pertinent federal legislation for human health and safety, environmental protection, transportation and shipping, dangerous goods and explosives handling. It has been determined through DFO that a Fisheries Authorization will not be required for the project. AANDC-CARD will also comply with pertinent territorial legislation for public health, waste disposal, wildlife and forestry management. Archaeological preservation will be ensured through compliance with NWT Archaeological Sites Regulations**,** pursuant to the *Northwest Territories Act.*

3.0 Project Planning and Design

3.1 Site Conditions

3.1.1 Field Investigations

Regional Geology

The Outpost Islands are underlain by metamorphosed sedimentary rocks belonging to the Wilson Island phase of the Point Lake-Wilson Island Group (Columbia 2006). As indicated by EBA (2009), the lower Proterozoic Wilson Island Group is exposed in a northeast trending belt in the East Arm of Great Slave Lake. Deposits are made of intercalated basalt flows, felsic flows and related intrusions, volcaniclastics, braided alluvial arkose and conglomerates. Overlying the volcanic assemblage is a debris flow paraconglomerate, which grades vertically into fluvial to marginal marine or lacustrine arkose and dolostone (Johnson 1985). Sheared and silicified zones with disseminated metallic minerals occur along Outpost Island in eight major zones (Silke 1999). The zones cover an area over 2,130 m long and 230 m wide and encompass four islands of the Outpost Island group of islands. The zones dip southerly at angles between 75 and 85 degrees (SENES/Franz 2011).

Summarized from the NORMIN Database Blanchet Island Mine Showing Report (NORMIN 2010), Blanchet Island is part of the large Slave Geological Province. Within a smaller graben of partially deformed and metamorphosed sedimentary and volcanic rocks, lithologic units in the

vicinity of the mine show evidence of thrusting and intrusion by diorites-monzonites. Results of earlier bedrock mapping indicate greywacke and carbonate sediments encircle Blanchet Island, and the center portion of the island is composed of hornblende-biotite diorite. The intrusives are clustered at the contact of the Pethei sedimentary unit and the Stark Formation breccias. Nickel, copper, and cobalt (and to a lesser extent silver and gold) arsenide hosted mineralization has been identified along the margins of the intrusions at multiple locations on Blanchet Island.

The Copper Pass site is located at the southern margin of the Slave Structural Province and basement lithologies consist of mafic flows/fragmentals with metasediments belonging to the Archean Yellowknife Supergroup rocks. Great Slave Supergroup rocks, primarily lava flows and ferruginous sediments, cover the Archean basement approximately 1 km south of the mineral showings (NORMIN 2010). Following the emplacement of a granitic batholith, a series of granitic and finally diabase dykes were intruded into the host lithologies. The dominant dyke is diabase and roughly transects the East Showing, with smaller hydrothermally brecciated granitic intrusions at the Main and West Showings. The intrusive bodies have been extensively mapped and strike north to northeast, dipping steeply to the southeast (Thomas 1969). Regional and localized metamorphism has heavily altered the host rock. The Yellowknife Supergroup rocks have been transformed to biotite and hornblende schists and are now the dominant host rock lithology. The emplacement of the granitic and diabase intrusions, and subsequent quartz-carbonate vein system, further altered the suite.

Local Bedrock Geology

The bedrock throughout Outpost Island consists of micaceous metasedimentary rocks (Franz/EcoMetrix 2010). The bedrock has been glacially polished, with clear northeast southwest striations observed. The majority of ore zones are within silicified, sheared, and or brecciated greywackes and pelitic schists. Mineralized zones are 0.7-1.8 m in width and up to 55 m in length, containing the minerals chalcopyrite, pyrite, gold, scheelite, ferberite, marcasite and bornite (SENES/Franz 2011).

At Blanchet, a large escarpment (with associated talus and colluvial deposits) runs approximately northeast through the Blanchet Island Mine area. At an elevation of 90 m above the lake, the escarpment represents the folded and undulating contact of sedimentary units with intrusive units. This contact is the site of mineralization at the Blanchet Island Mine. Host rock lithologies are banded limestone/dolostone and metalimestone/metadolostone. Metamorphosis of the carbonaceous rocks increases with proximity to the diorite intrusion, with outcrops near to the adit the most severely altered. High temperature metamorphosis in combination with increased fluid flow within carbonaceous units resulted in silicification and chemical replacement. At the brecciated contact of the host and intrusive units, massive calcite and dolomite were observed within veins, also the source of nickel, cobalt, and magnetite mineralization. Where nickel bearing ore minerals rammelsbergite and niccollite are exposed to surface elements (oxygen and water), alteration to the hydrated nickel arsenide annabergite occurs. Similarly, cobalt ore minerals cobaltite and safflorite alter to the hydrated cobalt arsenide erthyrite. These minerals, known as nickel bloom and cobalt bloom, are abundant at the site (SENES/Franz 2011).

At Copper Pass, shearing and faulting occurs throughout the property with a general trend of 45o (Thomas 1969). Mineralization at the Copper Pass Mine appears to be associated with the red hydrothermally brecciated granitic lithologies. These rocks were further veined and cemented by the quartzcarbonate vein system. Vein breccias and quartz-carbonate veins carry the nickel ore hosted as niccollite (also known as nickeline), skutterudite, gersdorffite and

rammelsbergite. Minor sulphide minerals (pyrite, arsenopyrite, and chalcopyrite) are also documented within the vein system (NORMIN 2010). The ore minerals are notably classified as nickel arsenides and nickel sulphides. Where surficially exposed to air and water, the nickeline is altered to annabergite, a bright green powdery nickel arsenate mineral commonly referred to as nickel bloom (McDonald 1967). While annabergite is observed throughout the showings, the unaltered nickel ore was sparsely distributed, likely due to the 50 year time period that the materials have been exposed to the atmosphere (SENES 2013).

3.1.2 Permafrost

The Great Lake Project sites are situated below the tree line, in a zone of discontinuous permafrost. Hydro-geological conditions at each site are described under Section 3.2 below.

3.1.2 Vegetation

Vegetation at Outpost includes: spruce willow, poplar, dwarf birch, cinquefoil, raspberry, rose, Labrador tea, arctic cotton, mosses, and lichens. Vegetation at Blanchet includes: willow, alder, dwarf birch, tamarack, dogwood, white and black spruce, horsetail, Labrador tea, bog rosemary, sphagnum moss, wild rose, phragmites, wild strawberry, and lichen. Vegetation at Copper Pass includes: spruce, poplar, birch, dwarf birch, willow, alder, cinquefoil, Labrador tea, rose, juniper, horsetail, raspberry, bearberry, blueberry, soapberry, lichen, moss, and various grasses.

3.1.3 Archaeological

Consultation with the Prince of Wales Northern Heritage Centre (PWNHC) regarding the potential for archaeological significance at the sites (NWT Archaeological Sites Database Licence Agreement #DR2013-538) has resulted in recommendations for a full Archaeological Impact Assessment for the Outpost and Blanchet sites, which is scheduled to take place in Spring/Summer 2014. Consultation with NWT Mine Heritage Society regarding the potential for mine heritage items at the sites has resulted in a decision to preserve the hoist and power generators at the Outpost Island site.

3.2 Site Design

3.2.1 Site Access

Access to each mine site will be through a combination of barging and overland (winter road) transportation. Access to site borrow locations will be via existing roads and trails to extent possible; where necessary, access routes will be upgraded to facilitate set up and movement of equipment.

3.2.2 Buffer Strips

The primary quarry area at Blanchet contains some mature white spruce with observed base diameters up to 12” and heights up to 50 ft. All attempts will be made to preserve as much of the mature tree stand as possible and a vegetative screen (willow, alder, black spruce) will be maintained along the crest of the embankment at Blanchet.

3.2.3 Visual Impacts

Preservation of a vegetative screen at Blanchet will reduce any visual impacts, especially from any lake access on the south side of the island. Visual impacts are not as much of a concern at Copper Pass due to limited access to the site; however, measures will be taken to ensure that existing sight lines from Sachowia Lake are preserved.

3.2.4 Noise and Dust

Dust generation is anticipated to be minimal but considerations will be given to wind direction and migration with dust suppression (freshwater and/or cellulose-based product) being applied as needed. Given the remoteness of the sites, noise will not be a concern other than for workers in the camps and as such, quarrying operations will be carried out through the day.

3.2.5 Progressive Reclamation

To the extent possible, each quarry area will be restored (backfilled, graded and re-vegetated using bio-engineering approaches such as live staking and bank stablization) as work proceeds. Final quarry remediation will occur with the remediation and restoration of each site.

3.3 Water Management

3.3.1 Regional Hydrology

With a surface area of 25,568 km2 and an estimated volume of 2,088 km3, Great Slave Lake represents the principal hydrologic system in the region. The average depth of Great Slave Lake is 73 m, with a maximum depth of 614 m making it the deepest lake in North America. The Slave River is the largest freshwater source to Great Slave Lake contributing approximately 77% of total inflow. The Mackenzie River represents the principal outflow (MRBB 2003).
The Great Slave Lake Sub-Basin (part of the larger Mackenzie River Basin) has a catchment area of 379,000 km2, stretching from Alberta and British Columbia and covering the majority of the central Northwest Territories. The sub-basin straddles the Precambrian Shield to the east and the Interior Plains to the west (MRBB 2003). The Blanchet Island Mine lies within the erosion resistant Precambrian Shield. Great Slave Lake was formed through glacial scouring resulting in several distinct arms and islands. The East Arm has deep waters (up to 614 m) and lower dissolved minerals than observed elsewhere in the lake. The large Western Basin is shallower and contains high volumes of dissolved minerals and solids (i.e., silt) deposited in the lake via the Slave River. The oligotrophic lake is low in both planktonic crops and benthic invertebrate diversity (Biodiversity Institute of Ontario 2008).

3.3.2 Site Hydrology

The Outpost Island Mine lies near to the centre of Great Slave Lake and is surrounded by several other small islands. The island chain would be partially inundated with waves during some storm conditions and is assumed to be subject to ice scour. Lake effects would be most prominent on the northern shores of Outpost and East Islands which face the open lake (i.e., the southern shores are protected by other islands in the chain). No active streams or water courses have been identified on Outpost Island or East Island. Water on the site flows either directly into Great Slave Lake or into rock depressions found throughout the islands. Some mining features, such as rock trenches and raises, are partially filled with ponded water resulting from precipitation, melt water, and/or wave action from Great Slave Lake. Two small scale drainage paths exist near the former mill area, one flowing northeast and the second flowing southeast towards Great Slave Lake. The drainage terminates at small ponds in bedrock depressions before flowing into the lake. The ponds in the southern reaches of Outpost Island (one in APEC 4 near the former dump area and a larger pond in APEC 6 near Shaft #2), are of greater size and have vegetation on shallow soils within and surrounding the ponds. While benthic invertebrates and aquatic vegetation may survive in the ponds, they do not serve as fish habitat and would not be drinking water sources for humans visiting the site. There are no other aquatic environments within or surrounding the footprint of the mine.

Blanchet Island is typified by steep escarpments with talus slopes, rounded rock outcrops, and numerous lakes filling topographic depressions. Surface drainage on Blanchet Island is generally radial into Great Slave Lake, flowing along the topographic depressions. Elevated lakes, wetlands, and small creeks are present in the vicinity of the Blanchet Island Mine. A small lake lies north and topographically above the Mine Area from which a small creek discharges toward the mine site (Figure 2). Immediately below the Mine Area, a wetland covers the low lying areas before discharging to a shallow creek that flows southwest to Great Slave Lake. This stream is characterized by multiple channels which merge and diverge along its course towards Great Slave Lake. Approximately 1,200 m east of the Beach Area, the creek cascades down a bedrock ridge before discharging into the lake. All reaches of the stream investigated in the Phase IIIa ESA were less than 1 m wide and a maximum of 0.3 m deep (SENES/Franz 2011). A second and smaller creek was observed north of the Camp Area. The creek flows south and appeared to go underground before re-emerging between the Beach and Camp Areas and discharging into Great Slave Lake. The northern portion of the creek was observed to be approximately 1.5 m wide and a maximum depth of 0.5 m, reducing in size closer to the Beach Area (SENES/Franz 2011).

Surficial hydrology at the Copper Pass Mine is dominantly controlled by steep bedrock topography. Anthropogenic features, such as blast areas and waste rock deposits have only a minor effect on the flow regime (SENES 2013). The hydrology of the site has been summarized from the Phase III ESA (SENES 2013). All surface waters flowing from the Camp Area and mine showings would drain into Sachowia Lake. The lake is approximately 4 km long in an east-west direction and an average of 300 m wide. As part of a larger drainage system, Sachowia Lake drains southeast into Joan Lake which flows into Great Slave Lake. An unnamed pond (subsequently assigned the title “Upland Pond”), lies between the Main and East Showings and flows northeast within a bedrock controlled valley to Sachowia Lake. This drainage path represents the primary surficial drainage within the near vicinity of the mine. However, due to the location of the showings and orientation of topographic ridges, this drainage path is not expected to receive mine waters from the three showings. At the Main Showing, drainage diverges to both the northeast (from the northern portion of the showing at Trench #1), and to the southwest from the southern portion of the showing (Trenches #2, #3 and #4). Trenches #1

and #2 at the Main Showing were filled with standing water, although no outflow was observed. While not clearly observed or delineated, surficial water flow at the West Showing is likely to the southwest toward Sachowia Lake. A narrow valley immediately east of the East Showing would capture any water flowing down gradient from the trench and waste rock deposits at that location.

3.3.3 Site Hydrogeology

Outpost Island and East Island are composed almost exclusively of competent bedrock. As such, significant groundwater flow is unlikely. The limited groundwater movement in the subsurface may occur in surficial overburden, and/or in large and small scale fractures in bedrock. Shallow overburden groundwater flow at the Outpost Island Mine site is likely dominated by direct infiltration of precipitation into soils located between bedrock outcroppings, with vertical fluid migration. The flow of groundwater in bedrock units would be largely controlled by regional shearing, creating large scale fractures as well as small scale fissures. Based on the topography, groundwater flow is expected to flow radially outwards from the topographic highs to Great Slave Lake, which acts as a discharge zone for the entire groundwater flow system of the site (Franz/EcoMetrix 2010).

Groundwater investigations at the Blanchet Island Mine were limited to installation of seven shallow groundwater wells focusing on the collection of chemical data. Limited monitoring data has been obtained from the groundwater wells. Regionally, groundwater is anticipated to flow along bedrock surfaces radially from higher elevations towards Great Slave Lake. Due to the absence of shallow permafrost, groundwater rather than ground ice may be the dominant medium in the saturated zone, able to transmit groundwater from the upland areas down to Great Slave Lake during the spring and summer months. Where soils are absent, some groundwater movement may occur along the joints and fractures of the low porosity bedrock. (SENES/Franz 2011). At the Beach Area, the water table rises with topography at a shallow gradient upwards from Great Slave Lake. The overall groundwater flow direction is to the south-southwest and depth to the water table ranges from 0.7 metres below ground surface (mbgs) to 0.1 mbgs. Groundwater surface water interactions are active during the summer months, as observed during the site investigations. It appears that the drainage course close to the lake shore exists predominantly as shallow groundwater as opposed to surface flow (Columbia/Franz 2010). It is hypothesized that the majority of groundwater from the Mine Area drains to the adjacent wetland. The wetland serves as a groundwater sink from which water may then discharge to the creek system (SENES/Franz 2011).

The precise nature of the hydrogeological regime at the Copper Pass Mine is uncertain due to the lack of data from piezometers or monitoring wells at the mine site. While quantitative hydrogeological characteristics are not available, qualitative assumptions may be made from topography, soil and geological features. It is suspected that precipitation and subsequent water migration into the unsaturated zone is vertical through the soil column. The velocity of vertical migration is a function of the permeability of the sands and silts, precipitation rates, as well as infiltration amounts. It is predicted that groundwater flow in the saturated zone of shallow soils would flow towards Sachowia Lake and would be directly controlled by the bedrock topography, including bedrock valleys and troughs and the presence of permafrost. This shallow groundwater flow may be seasonally active, not at steady-state and significantly influenced by recharge events (i.e.,precipitation). To the extent that it occurs, groundwater flow within the bedrock is assumed to be dominated by any large scale shearing and faulting that may be present. Shears and faults trending 45o are hypothesized to host the majority of groundwater flow in wide aperture, well connected fractures. A lesser fraction of total flow is suspected within

the fissile schistose units, in which hydrogeological flow would be constrained to planes of weakness. If it occurs, flow within the bedrock units would most probably drain north from the showings into Sachowia Lake, or in the case of deeper flow, directly into Great Slave Lake (SENES 2013).

Excavations will be approximately 1-2 m in depth and no closer than 300 mm to the groundwater table. In the event of any groundwater intrusion, the excavation will cease and the area backfilled.

3.4 Development Timing

The quarries will be developed during the summer months of 2014 and 2015. Depending on project schedule and Copper Pass quarry resources, the Blanchet quarry(ies) may remain operational in 2015 to service the Copper Pass remediation.

3.5 Pit/Quarry Management

Overall quarry management will be achieved through the Departmental Representative, who will oversee the Remediation Contractor's quarrying activities. The Departmental Representative will ensure that the Contractor is operating in compliance with all legal requirements and conforming to all contract and procedural requirements.

4.0 Site Development

4.1 Clearing

In general, the primary and tertiary borrow sources at Blanchet are located within the near shore environment along Great Slave Lake and as such, a portion of these potential borrow areas encroach the 30 + 1 m setback from ordinary high water mark requirement. Furthermore, these potential borrow areas are located within an area that is vegetated with larger trees and heavy brush. In order to optimize the available borrow within these two areas, the final limits of the borrow sources will need to be reviewed and confirmed by the Land Use Inspector and Departmental Representative prior to excavation earthworks at the mine sites. Options for timber salvage will be explored with the community of Lutsel K'e and if required, a Timber Permit will be obtained from the AHJ. Brush disposal will be in accordance with Land Use permit conditions.

4.2 Soil and Overburden

Surficial soil is minimal on Outpost and East Island, and generally only observed in bedrock depressions. Where present, soil occurs as a thin veneer of organic material overlying shallow mineral soils. The surficial topsoil in these depressions consists of sand, gravel, and organic-rich peat material that is generally moist to wet. Recorded thickness of native soils varied from approximately 0.05 m to 0.4 m, ranging in colour from light brown to light and dark grey (Franz/EcoMetrix 2010). No quarrying will be carried out at Outpost with no overburden or vegetation is present within the limits of the waste rock piles that will be re-graded.

The soil profile at the Blanchet Island Mine is largely defined by the glacial events that took

place in the area. Overburden is primarily sand and gravel, with minor quantities of silt, cobble, and boulders. A greater portion of fine materials (i.e., clay and silt) is observed surrounding water bodies, including the presence of a clay layer in test pits from the Beach Area. Mineral soils are overlain by a layer of organic materials (i.e., topsoil, peat, and vegetation), which increases in thickness in areas with high soil moisture such as the wetland in the Mine Area. The depth of overburden was not confirmed during the course of the assessment work. However, based on the topography of the area there is the potential for more than 5 m of granular overburden to be present at the Beach and Mine Areas (SENES/Franz 2011).

The Blanchet borrow area is to be stripped prior to borrow recovery and this material would need to be stockpiled into the Organic Overburden Storage Area located outside the mandated setback from a water body. For this program the stockpile of organic material would be placed on the eastern portion of the borrow areas. The Remediation Contractor as part of their contractual submissions are required to prepare an Erosion, Sediment and Drainage Control Plan which must address how the borrow sources are to be managed to mitigate concerns with erosion and the migration of fine grained particles from the borrow area during precipitation events or snow melt. The Contractor's site specific Quarry Plan will address how the borrow areas are to rehabilitated post-remediation (i.e. issue of positive drainage will be addressed).

The preparation of this borrow source will entail initial clearing and grubbing, the removal and stockpiling of organic material and cutting of approximately 1 to 2 m of aggregate down to within 300 mm of the groundwater table. The estimated surface area of this borrow source is 8000 m2 with an estimated average depth of 1.5 m. Photographs of the borrow area are provided in Appendix A of the TM . The results of grain size analyses for the aggregate within this borrow area are provided in Appendix B of the TM. The preparation of this area will entail clearing and grubbing, removal of ore stained surficial soils to a depth of 0.5 m, the recovery and stockpiling of minimal organic material and cutting of approximately 1 to 1.5 m of fine grained aggregate down to within 300 mm of the groundwater table. The estimated surface area of this borrow source is 3500 m2 with an estimated average depth of 1.25 m. Photographs of the borrow area are provided in Appendix A of the TM. The results of grain size analyses for the aggregate within this borrow area are provided in Appendix B of the TM. The organic overburden storage area is presented on Figure 5 of the TM for each potential borrow source location; final location may vary as per the remediation contractor. It is estimated that a spruce forest covers 80% of the primary borrow area, 20% of secondary borrow area and 70% of the tertiary borrow area.

Topsoil at the Copper Pass Mine is present in discontinuous areas of peat and organic material which overlies the bedrock or is present in the marshy low lying areas. The organic material is typically less than 100 mm on the bedrock ridges and found in bedrock depressions. Deeper deposits were noted in the low lying areas, such as the marshes below the West and East Showings. In most locations near the mine showings, the overburden was either non-existent or a thin veneer of silty material likely related to the weathering of the underlying bedrock. The exception was in the Main Showing valley between Trench #1 and below Trench #2. There is some fine grained soil (sands) mixed with cobble and gravel at this location which appears to be a glacial or alluvial deposit; however, the depth of the overburden is undetermined due to difficulties in penetrating the cobble at depth. There is a potential for a metre or more of mineral soil to be present within this valley which slopes to the north and south from the crown near Trench #1.

No overburden storage area is required for the Copper Pass Mine Site as the overburden on site is contaminated and will be disposed of as such. It is estimated that a spruce forest covers

5% of the borrow area. The area will need to be cleared using hand tools before quarrying operations begin.

5.0 Operations

The quarries will be operated during the summer months of 2014 and 2015. Depending on project schedule and Copper Pass quarry resources, the Blanchet quarry may remain operational in 2015 to service the Copper Pass remediation.

5.1 Resource Extraction

Extraction equipment may include: excavator, dozer and haul truck.

5.2 Resource Processing

Processing equipment may include a grizzly/screener and crusher.

5.3 Monitoring and Maintenance

The Departmental Representative will monitor day to day operations and maintenance of the quarry sites, with regular site visits from AANDC and PWGSC.

5.4 Site Security

AANDC is custodian of the mine sites and is responsible for all site access. The Remediation Contractor will be responsible for ensuring that only authorized individuals are allowed on site.

6.0 Spills

6.1 Spill Contingency Plan

In accordance with AANDC's EHS-MS, a Spill Contingency Plan (conceptual) will be submitted to the MVLWB as part of its Land Use Permit application and the Contractor will be required to submit a detailed, site specific plan under the Final Remediation Contract.

6.2 Spill Prevention

In accordance with AANDC's EHS-MS, appropriate spill prevention training, equipment and supplies will be provided for all site personnel.

6.3 Spill Response

In accordance with AANDC's EHS-MS, appropriate spill prevention training, equipment and supplies will be provided for all site personnel.

7.0 Closure and Reclamation

7.1 Site Cleanup

The quarry sites will be cleaned up as part of final site cleanup and remediation activities under the Land Use Permit.

7.2 Landscape Reconstruction

The quarry sites will be backfilled and re-graded as per Land Use Permit conditions and industry best practices that ensure positive site drainage. The quarry sites will also be guarded with barriers and signs as required by the Authorities Having Jurisdiction.

7.3 Drainage and Erosion Control

The Remediation Contractor will be required to prepare an Erosion, Sediment and Drainage Control Plan which must address how the borrow sources are to be managed to mitigate concerns with erosion and the migration of fine grained particles from the borrow area during precipitation events or snow melt. The Contractor will also be required to provide all necessary sediment and erosion control and containment equipment and materials.

7.4 Re-vegetation

The borrow areas will be rehabilitated as per the Land Use Permit conditions and industry best practices for bio-engineering (live staking, bank stabilization).

7.5 End- Pit Lake

The quarries will be shallow excavations and will be back filled, graded and drained such that no end-pit lakes are created.

7.6 Reclamation Monitoring

The quarry sites will be monitored for ponding, subsidence and erosion as part of overall, long term site monitoring procedures

APPENDIX A:

BORROW SOURCE MEMO (SENES 2013)