Submission Transmittal Cover

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Quarry Operations Plan

Prepared For: ***Public Works and Government Services Canada***
9700 Jasper Avenue, Suite 1000
Edmonton, Alberta T5J 4C3

Project: ***Coral Harbour Borrow Development Project***
Coral Harbour, Nunavut

Approval / Acknowledgements / Acceptance

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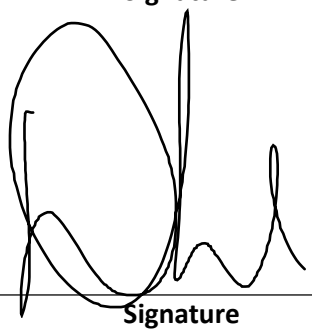
Dino Bruce, Director	July 21, 2023	
Name and Title (please print)	**Date**	**Signature**

Client Acceptance:

Name and Title (please print)	**Date**	**Signature**

All aspects of the work will be conducted in accordance with:

- **Local / Provincial / Federal Legislation and Regulations, as applicable**
- **Site Specific Health and Safety Plan (HASP)**

NOTE: All site personnel must read and acknowledge review of the HASP, prior to start of any work. Refer to Sign-off Sheet – MEHS # 24

Document History:

The Document Author is authorized to make the following types of changes to the document without requiring that the document be re-approved:

- Editorial, formatting, and spelling
- Clarification

To request a change to this document, contact the Document Author or Owner.

Changes to this document are summarized in the following table in reverse chronological order (latest version first).

Revision	Date	Created by	Short Description of Changes

Table of Contents

1 BACKGROUND INFORMATION

1.1 Customer

Public Works and Government Services Canada (PWGSC).

1.2 Project Name

Coral Harbour Site – Borrow Production ("CHRP-BP") Project

1.3 Project Numbers

PWGSC - R.112158.009

SDL/Milestone - 01220240

1.4 Project Location

Coral Harbour Site

Coral Harbour, NU

The project Site is located approximately 10 kilometres (km) northwest of the Hamlet of Coral Harbour, Nunavut, on Southampton Island.

1.5 Overall Project Description

The former military base in Coral Harbour was used by Canadian and American forces during the construction of the Distant Early Warning (DEW) Line in Northern Canada during the Second World War and for various other northern projects. The Site was active from the 1940s until the 1970s and the on-site infrastructure included an airstrip, hospital, and housing for military personnel. When the Site was decommissioned in the 1970s, most buildings were decommissioned, and remaining equipment was abandoned.

Several areas of environmental concern (AECs) including physical hazards related to unconsolidated surface debris and aged structures, and environmental impacts associated with soil contamination, remain on-site. These AECs and physical hazards are proposed for a future site remediation. In preparation for this proposed remediation, local (Site) borrow sources have been identified at the Site. This scope of work is related to the production of all granular (borrow) material from local borrow sources for the following remediation activities:

- Construction of a non-hazardous waste (NhW) facility;
- Backfill material for subsurface excavations related to Site infrastructure;
- Backfill material for contaminated soil excavations; and
- General Site maintenance (e.g., roadway improvements).

1.6 Contractor Scope of Work

The primary components of the Works to be carried out by Sudliq Development Limited (SDL) and Milestone Environmental Contracting Inc. (Milestone), herein referred to as *The Project Team* are highlighted in this section and primarily consist of Borrow Development and Excavation including the following items:

- Baseline topographic survey.
- Site Access Development and Borrow Source Reclamation.
    - Strip and clear surface shrubs and loose materials at the borrow source location. Strip and stockpile topsoil separately. Surficial topsoil, organics, and unutilized overburden will be stockpiled for later use during reclamation of the borrow area.
    - Minimize the flow of water into and out the borrow pits to enhance the efficiency of operations, limit the effects of sedimentation on water quality and prevent permafrost degradation.
- Borrow Extraction, Processing and Stockpiling.
- Reclamation of Borrow Source.

2 PERTINENT SCOPE OF WORK SECTIONS

The Project Team prepared the following document in accordance with the requirements specified within the contract documents (RFP, Statement of Work (SOW), Drawings, etc.). With respect to the implementation of work and the definition of the scope of work, the following Specifications provide the direction and basis for this Borrow Development and Excavation Plan:

- SOW 1.2 – Background
- SOW 2.3 – Site Access Development and Borrow Source Reclamation
- SOW 2.4 – Granular Material Specifications

3 EXECUTION

3.1 Topographic Survey

Prior to site development *The Project Team* will conduct surveying to establish control points and to undertake a baseline topographic survey of the proposed Borrow area, as well as the proposed location of the NhW landfill. This will establish existing grades and be used to define the borrow areas, work areas and provide a baseline for quantity measurements.

In September 2022, a general site layout and precursory topographic assessment was performed utilizing a Total Station tied to local reference benchmarks.

In July 2023 *The Project Team* will complete a baseline survey utilizing a DGPS Real Time Kinetic (RTK) system with a base station setup and tied to pre-existing project coordinates. When connected to the base station and satellites the DGPS unit can be processed to provide a 3-dimensional accuracy of +/- 0.01 m.

The baseline horizontal and vertical survey elevation data will be submitted to the PWGSC Construction Representative (PCR) upon completion of the on-site efforts (per SOW 2.1). Intermittent surveys will be conducted throughout the project using established controls for verification of material volumes. Data derived from the intermittent topographic surveys will be submitted to the PCR on a weekly basis (per SOW 2.1)
In support of progress payment requests (per SOW 2.4) *The Project Team* will measure the processed volumes of each type as they are stockpiled. The Progress Claim will be accompanied by original ground and progress survey results demonstrating the volumes of processed and stockpiled granular material of each type. It should be noted that during construction these volumes may fluctuate as they are used, *The Project Team* will ensure that the volume of each pile or windrow is surveyed and quantified before it is used for construction.

3.2 Clearing, Grubbing and Stripping

According to the scope of work (per SOW 2.3) the land cover consists of sparse vegetation, thus minimal site efforts are required in clearing, grubbing and stripping in order to access the borrow source materials. After contract award and during the September 2022 pre-mobilization site visit, *The Project Team* inspected the Borrow Areas and identified that the planned efforts included in the contract (BOPC Item 1) sufficiently covers the efforts required to access the borrow materials. The June 2023 pre-mobilization site visit will seek to identify other potential areas (e.g., access roads, laydown areas, etc.) requiring clearing, grubbing and stripping, if any, to support construction and/or remediation. *The Project Team* will seek permission from the PCR to carry out any clearing, grubbing and stripping efforts outside of the borrow areas.

Due to limited distribution and depths of topsoils special care will be taken in areas with notable topsoil. Topsoils will be stripped with care to not mix in underlying soils, segregated and stockpiled for use during Borrow Reclamation efforts.

It is PWGSC's responsibility to identify and acquire all necessary permits and approvals (eg. Land Use Permit and Quarry Permits) for stockpiling and storage of materials removed through the process of clearing and/or stripping. *The Project Team* will work with the PCR to locate suitable stockpile locations for any cleared, grubbed and/stripped materials, whether temporary or permanent. The proposed stockpile locations will be identified to ensure it will not interfere with any of the Works or future remediation activities.

Clearing, grubbing and stripping works will be completed utilizing a Komatsu PC-400-LC-3 Excavator, Caterpillar 977 Bulldozer, D-6 Caterpillar 1450 B Bulldozer and Double Axel Tandems, as required to transport material.

3.3 Borrow Area Access

The Project Team will utilize pre-existing roads from historical Site operations to access the borrow areas. As such, access road development is not anticipated. Based on information provided in the RFP, *The Project Team* did not anticipate the installation of culverts to provide access without blocking the natural or engineered surface water flow. During the September 2022 premobilization site visit *The Project Team* did not identify any locations where culverts may be warranted to be installed to provide access to the main GMD-B borrow area. Should conditions have changed during the recent freshet *The Project Team* will propose to PWGSC any changes to costs and/or schedule should culverts be required to be mobilized and installed prior to commencing borrow source development.

Within the borrow areas, *The Project Team* will carry-out nominal grading efforts to provide safe and efficient routes for access and hauling. Borrow area access works will be completed utilizing the PC-400 Excavator, D6 Dozer, Champion 720 Grader and Tandem Truck(s) as required to grade surfaces and transport material.

3.4 Preparation

Initially two borrow source areas, NhW facility footprint and GMD-B, have been identified as the Borrow Sources that *The Project Team* will develop to produce the various aggregates required within the contract. Upon contract award and during the September 2022 pre-mobilization site visit, *The Project Team* visually inspected the Borrow Areas and identified favourable locations for excavation. *The Project Team* collected 8 bulk samples that are held under SDL custody in Coral Harbour for potential sieve analysis when the Camp Geotechnical Laboratory has been established. These samples will only be tested should there be difficulty achieving the screening requirements and additional locations be required. During borrow development all

records (field notes, photographs, etc.) will be provided to the PCR upon their completion as part of a weekly update. If any of the Borrow Areas are fully or partially inadequate to provide the necessary aggregates, *The Project Team* will propose to the PCR the intent to develop a different source, as indicated on Figure 1 (GMD-A,C,D,E,F and G) and will declare the location, quantity and rational on why it is being recommended as an alternative and supported with any changes in schedule and/or costs. No source outside of the approved Borrow Areas will be developed without prior written approval from PWGSC.

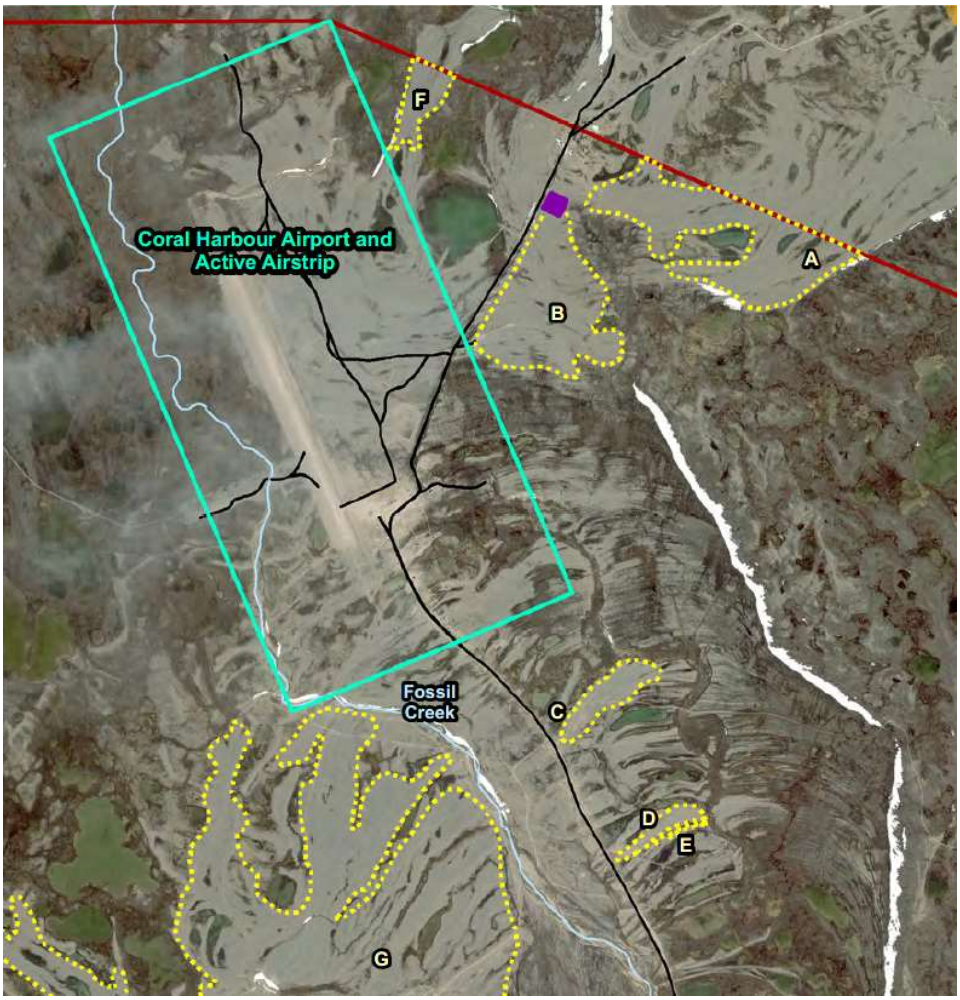


Figure 1: Non-Hazardous Waste Facility (Purple) and Borrow Source Locations

Regardless of the location of excavations, *The Project Team* will ensure that the borrow pits will be safely sloped and graded to be free draining. Furthermore, any surrounding terrestrial and aquatic environments will be protected using windrows as required and as designated following the June 2023 premobilization site visit.

3.5 Excavation

Excavation will be initially carried out within the NhW Facility footprint (see Figure 1 below) following the boundaries, lines, grades, and elevations indicated in the contract Drawings. It is anticipated that the Excavation efforts for this footprint will be within the non-frozen unconsolidated surface soils above the permafrost, as

visible in Figure 2 below. These initial efforts will be completed regardless of the quality of materials. This excavation will involve segregation of like materials and stockpiling for processing and screening, as required, to create the defined Borrow types of material. Should the removed materials be unsuitable for use or screening, *The Project Team* will stockpile the soils as discussed with section 3.2 of the Quarry Operations Plan (QOP).

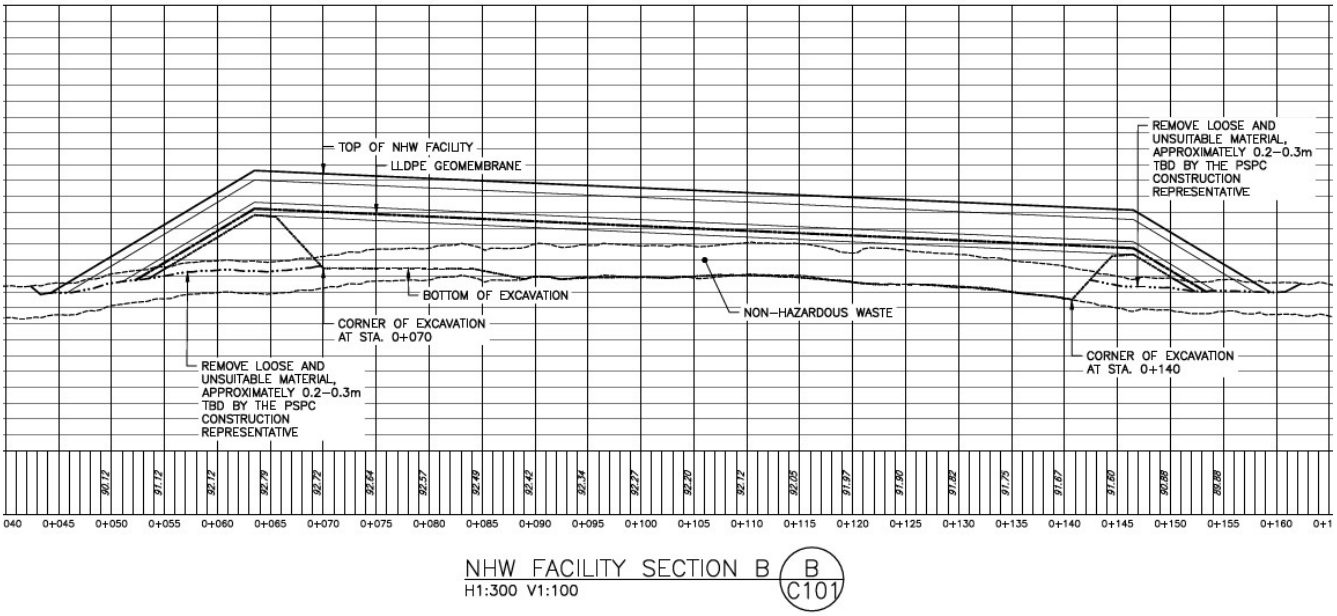


Figure 2: Non-Hazardous Waste Facility Cross Section

As required to achieve the required volumes of this SOW, *The Project Team* will continue borrow excavation activities within GMD – B at a minimum distance of 20 m from the proposed location of the NhW facility, or as approved by the Project Authority. This material will be segregated and stockpiled for processing and screening, as required. In general, the excavation depth will remain within the upper 1-m to 1.5-m of non-frozen unconsolidated surface soils above the permafrost. To the extent possible and to avoid problems associated with operating in water, we will not excavate the pit or quarry below the permafrost, unless approved by the Project Authority.

The excavation efforts are scheduled within the BPS throughout the month of July 2023. Due to the short work season the excavation efforts may require spatial sequencing to efficiently access non-frozen soils. Soils will be excavated to a maximum of the frozen limits and allowed to thaw before additional excavation efforts are spent. Based on local and northern experience the long daylight hours of July naturally aids this process. As areas thaw, *The Project Team* will return to achieve the NhW design limits and/or to access good soil deposits. Where spatial efficiencies can be found in removing only the upper surficial soils, The Project Team may choose to widen the borrow area and reduce the depths of excavations. During initial excavation efforts the borrow surface may be uneven and generating thaw waters that may collect in topographic lows. *The Project Team* will be responsible for constructing and maintaining swales and/or earth berms throughout the duration of the project to ensure adequate water management of the Borrow Areas, however, these efforts may be initially inhibited by frozen surficial soils.

The Project Team will survey the borrow source area prior to and post excavation for tracking the quantity of extracted borrow volumes. *The Project Team* recognizes that these volumes are necessary as supporting

documentation for permits and will not have a direct correlation to the final processed volumes since some materials may be rejected at source or as an unused screening waste stream.

In general, the excavations works will be completed utilizing the PC400 Excavator, D6 Dozer or equivalent, and Dual Tandem Trucks as required to transport material.

3.6 Aggregate Production

The Project Team will deliver stockpiles of the required amounts of granular material as defined in the scope of work. The following table indicates that necessary volumes of granular materials to be developed during the Borrow Production project:

Work Item	Granular Material Type	Estimated Volume Required (m^3)
Non-Hazardous Waste Facility	Type 1	8,100
	Type 2	4,600
	Type 3	3,950
Backfill material – infrastructure excavation	Type 4	250
Backfill material – contaminated soil excavation		1000
General Site maintenance		10,000

Following the creation of Type 1, 2, 3 and 4 materials, with delivery required for construction requirements in 2023 and 2024. It should be noted that the aggregate volumes required for the completion of the Remediation contract were increased for both Type 3 and 4. Remediation contract quantities included an increase of 250-m^3 for Type 3 and 1,850-m^3 for Type 4.

Since *The Project Team* has been awarded the main Remediation Contract, efficiencies were proposed during tendering that allows for Borrow Development to be achieved to meet the actual construction temporal requirements. Furthermore, The Project Team will work diligently not to over produce aggregates beyond the revised contracted quantities and will notify the PCR when 75% of the quantities have been produced and placed. As previously mentioned, intermittent surveys will be conducted throughout the project using established controls for verification of material volumes.

3.6.1 Pit-Run Aggregates (Type 1 and Type 4)

It is anticipated that the Type 1 and Type 4 granular material will not require processing and will be able to be sourced directly from one of the proposed borrow areas. The major difference between these pit-run materials being the maximum cast size of 50-mm and 200-mm for Type 1 and Type 4 respectively.

Type 1 Granular Fill is selected material obtained from excavation or borrow areas approved by the PCR or a designated representative, generally consisting of pit-run, screened stone, gravel, and sand in an unfrozen state and free from rocks larger than 50 mm, waste, or other deleterious materials.

Type 1 Granular Fill Material Gradation

Sieve Designation	% Passing
50 mm	100
4.75 mm	30-65
0.425 mm	10-35
0.075 mm	2-15

Type 4 granular fill consists of granular pit-run material from identified borrow sources with a maximum particle size of 200 mm. It is generally used for regrading low areas, backfilling excavations and general site grading requirements.

Materials unsuitable to use as Type 4 aggregate will include:

1. Soils with moisture content exceeding optimum moisture by 5% or more.
2. Soils with organic material, snow, ice, or other deleterious material.

3.6.2 Processed Aggregates (Type 2 and Type 3)

It is anticipated that Type 2 and Type 3 granular materials will require screening to achieve the following gradation standards.

Type 2 Granular Fill is selected material obtained from excavation or borrow areas, generally consisting of screened medium to fine granular materials in an unfrozen state and free of other deleterious materials.

Type 2 Granular Fill Material Gradation

Sieve Designation	% Passing
9.5 mm	100
4.75 mm	20-85
0.075 mm	0-20

Type 3 Granular Fill is selected material obtained from excavation or borrow areas approved by Project Authority or a designated representative, generally consisting of screened coarse granular in an unfrozen state and free of other deleterious materials.

Type 3 Granular Fill Material Gradation

Sieve Designation	% Passing
150 mm	100
25 mm	40-75
19 mm	30-50
9.5 mm	0-5

Screening, as required, for development of the Type 2 and Type 3 granular materials will involve mobilizing and screening two Screen King Ultra screening plants with different size screens for producing the required granular materials. Screen King Ultra is a very durable and robust screening plant, suitable for a remote operations such as this project, which has virtually nothing to wear out. All plate and structural steel is 3/8” and rated at 44,000 PSI Minimum Yield Strength. They have very few moving parts - the 2 main ones being (1) a simple drive belt and (2) the 4 oscillating mounts. The mounts, which are the 4 "springs" at the corners of the screen deck where

it attaches to the base and allow the deck to vibrate, are made by a company in Switzerland called Rosta and are the best available in the world. These machines are very easy to operate and easy to maintain so the chances of wearing them out are almost non-existent. Beyond that, there are 2 bearings, one on either end of the precision ground main shaft. The manufacturer of them specifies they be given one shot of grease and *only* one shot, and no more often than once every 200 hours. Other maintenance includes keeping the air filter clean and the oil changed and that's it for maintenance. During production efforts dust suppression controls, such as watering, using a dust skirt and minimizing the drop height when releasing material from a conveyor will be incorporated into our work planning and used as required. These efforts will be applied, as required, to prevent fugitive dusts.

The screening plants will be located in Borrow Source GMD-B. This will allow for excavated materials to be stockpiled in close proximity to the screening plants while providing adequate space to manage and stockpile the process streams. The following Figure 3 illustrates the anticipated setup of the processing area in relationship to the NhW and GMD-B

Figure 3: Non-Hazardous Waste Facility (Purple) and Production Area (Green)

All construction materials will be stockpiled at the production area, as illustrated above, and within the borrow area. Should additional areas be required to stockpile granular materials or processed materials, *The Project Team* will indicate the locations and seek prior areas approval from the PCR on site. *The Project Team* will screen, sort and size excavated materials, as required, to produce the required volume of borrow and the necessary material types as indicated in the SOW. To achieve the gradation quality standards process streams may require blending with other process streams or being screened by both screening plants equipped with different sized deck screens. Oversized materials rejected, such as boulders >200-mm that do not meet the material specifications, will be segregated, stored and used for borrow pit reclamation.

Granular materials stockpiled as feed piles will have stable slopes with a horizontal to vertical slope ratio of no greater than 2H:1V. Process stream piles will generally form a stable stockpile based on the output material gradation. As necessary, *The Project Team* will transfer process streams to stockpiles for either further processing or storage.

Stockpiles for each material type will be placed a minimum of 5 m distance from each other to facilitate working space between the stockpiled materials. Disturbed areas of borrow areas will be graded to eliminate uneven and low spots. Slopes will be graded with a horizontal to vertical slope ratio no steeper than 3H:1V.

4 QUALITY CONTROL

During material production, Quality Control (QC) testing will be performed on-site by *The Project Team* and in accordance with the following items be completed:

a. Submit and follow a Quarry Operations Plan as defined in the SOWs.
b. Confirm that all permits and approvals are in place prior to commencing any Works.
c. Identify, for review and approval by the PCR, the Works area using proper survey control.
d. Collect and provide a high-resolution survey of the pre-excavation surface.
e. Collect and provide interim surveys.
f. During the quarrying operations, approximate quarried volumes will be tracked and reported daily. The volumes will be agreed upon by Project Authority or a designated representative onsite and the contractor site supervisor.
g. Complete a single sieve test to verify each gradation of Type 1, Type 2 and Type 3 materials.
h. Provide written documentation verifying that the Type 4 materials meet applicable quality standards.
i. Document the extent, depth, and ice content of permafrost in each borrow pit.
j. Document the depth of groundwater/active zone water levels in each borrow pit.
k. Advise the PCR when the NhW facility base excavation has been completed and is ready for inspection.

Specific to the sieve tests, *The Project Team* will have a set of soil sieves and a shaker established at the Camp Facility to ensure that the aforementioned gradations are within the limits specified when tested to ASTM C136 and ASTM C117; sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2. *The Project Team* will collect a minimum of 4 samples for each of Type 1, Type 2 and Type 3 and transfer them to the Camp Geotechnical Laboratory for sieve analysis. Materials will be sampled directly from the process stream or stockpiled materials, as applicable. *The Project Team* will review the sieve analyses before indicating that they are ready for use as construction materials. *The Project Team* will transmit all sieve analyses to the PCR, including both samples that meet quality standards and those that fail. *The Project Team* will utilize any abject sieve analyses to tweak the production process. *The Project Team* reserves the right to resample a stockpile with greater frequency to assess if the whole stockpile is unfit for use, requires additional processing or if it can be mixed or blended to achieve the gradation criteria

5 BORROW AREA RECLAMATION

Borrow reclamation will include contouring the borrow areas following resource extraction. Excess material that does not meet design specification will be used in the reshaping of the borrow pit. Upon completion of final grading, we will leave all slopes in a stable condition, no steeper than 3H:1V. Once site contouring is completed and the ground surface is stabilized, stored topsoil will be placed evenly on areas from which the soil was stripped. Topsoil will be spread over as much of the surface of the disturbed area and as close to the original thickness as possible.

Following borrow area reclamation we will demobilize all equipment and any waste materials from the project site.