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## Site C Clean Energy Project Main Civil Works

### *Detailed Operations Plan – 85th Ave Industrial Lands*

FINAL - November 22, 2016

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<b>Contract Ref No.</b>	<b>Section 31 12 00 [Sources of Materials] Clause 1.4.1.1</b>	
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The signatures below indicate that this document has been reviewed, accepted and demonstrates that the signatories are aware of all the requirements contained herein and are committed to ensuring their provision.

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## **1 INTRODUCTION**

This Detailed Operations Plan for the 85th Ave Industrial Lands describes how Peace River Hydro Partners (PRHP) will manage materials from the 85th Ave Industrial Lands Borrow during construction of the main civil works for the Site C Clean Energy Project (Site C) in accordance with Appendix 6-2 Section 31 12 00 – Clause 1.4.1.1 and Appendix 6-1 Exhibit 6-1-1.

This plan will ensure PRHP’s compliance with all requirements of the contract and both provincial and federal regulations for the project.

The following sections of this Detailed Operations Plan will describe:

- Borrow pit site development;
- Mining activities and processes;
- The method and equipment PRHP will use to sort and screen the material;
- How PRHP will stockpile materials at the borrow pit location and the project site;
- How PRHP will haul materials from the borrow pit; and,
- The anticipated production rates.

### **1.1 PROJECT SUMMARY**

BC Hydro is constructing the Site C hydroelectric development on the Peace River 7 km southeast of Fort St. John, BC, Canada. The project consists of a 60 m high and 1,050 m long earth fill dam, a spillway and a 1,100 MW powerhouse. Two 10.8 m finished diameter diversion tunnels are planned to be excavated on the Left Bank to divert the flow of the Peace River during construction of the earth fill dam. During Diversion Stage 1 cofferdams will be installed on the left and right banks, protecting working areas from Peace River flows. Excavations for the river diversion inlet and outlet portal and associated tunnel works are planned during this stage. During Diversion Stage 2 cofferdams will be built across the middle section of the Peace River and flows will be diverted into the tunnels.

### **1.2 DETAILED OPERATIONS PLAN – 85TH AVE INDUSTRIAL LANDS**

#### **1.2.1 Specifications and Reference Material**

The following specifications and reference material and shall be followed for development of the 85th Ave Industrial Lands:

- Site C Clean Energy Project, Main Civil Works, Appendix 6-2 Technical Specifications, Section 31 23 00 (Rev. 3); Engineering Document No. 1016.C.02.00068.DBM;
- BC Hydro’s Construction Environmental Management Plan (CEMP);

- Aggregate Operators Best Management Practices Handbook for British Columbia, Ministry of Energy and Mines (2002);
- Health and Safety: A Practical Guide for Aggregate Operations, Ministry of Energy, Mines and Petroleum Resources, Mining and Minerals Division (2007);
- Work Safe BC regulations;
- Health, Safety and Reclamation Code for Mines in British Columbia;
- Transportation of Dangerous Goods Act (Canada);
- Technical Specification Section 31 70 00 Fill Construction;
- Technical Specification Section 31 12 00 Source of Material;
- Exhibit 6-1-1 85<sup>th</sup> Avenue Industrial Lands Site Measures;
- Appendix 2-6 Material Sources Outside Dam Site Area;
- Technical Specification Section 31 11 00 Clearing, Grubbing and Stripping;
- 85<sup>th</sup> Ave Industrial Lands Environmental Protection Plan.

### 1.2.2 Drawings

The drawing referenced in the following table is attached in Appendix A and provides a preliminary overview of the development of 85<sup>th</sup> Avenue Industrial Lands.

**TABLE 1-1: BC HYDRO – REFERENCE DRAWINGS FOR 85TH AVE INDUSTRIAL LANDS**

Plan Sheet Title	Applicable Drawings
Plans	AS-001 – 85 <sup>th</sup> Ave Industrial Lands Excavation Plan (Draft)

## 2 SITE CONDITIONS

### 2.1 SITE DEVELOPMENT

PRHP will be utilizing 85<sup>th</sup> Avenue Industrial Lands as a borrow for the primary purpose of mining Impervious Fill material, better known through the project technical specifications as Zone 1 material. The 85<sup>th</sup> Avenue Industrial Land is composed of 237 acres, its property lines starts at the North end by 85<sup>th</sup> Avenue and extends past Shaman Industrial Way to the South, and is enclosed between Old Fort Road to the East and 100<sup>th</sup> St to West (Figure 2-1). PRHP has identified the 85<sup>th</sup> Avenue Industrial Lands as the preferred source of impervious material due to its close proximity to Site.

Table 2-1 outlines the production requirements for zone material for the duration of the project.

**TABLE 2-1: PRODUCTION REQUIREMENTS**

Zones	Volumes (m <sup>3</sup> )
Zone 1	2,353,800
Zone 1a	160,000
Zone 1b	133,000
Zone 1c	10,200
Zone 1d	54,150
<b>Total</b>	<b>2,711,150</b>

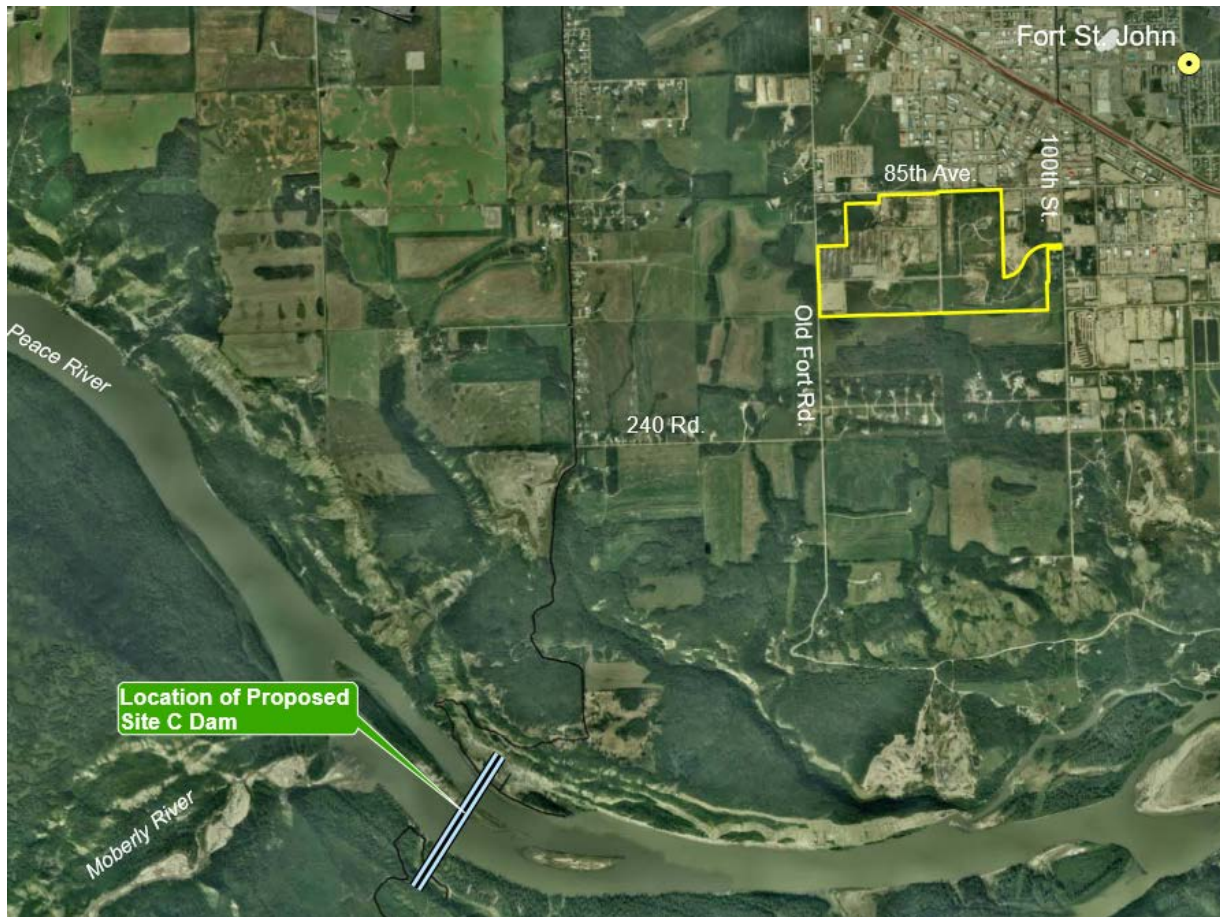


FIGURE 2-1: RELATIVE LOCATION OF THE 85TH AVENUE INDUSTRIAL LANDS

### 3 PROPOSED METHODOLOGY

#### 3.1 STRIPPING OVERBURDEN & SITE PREPARATION

Majority of the 85<sup>th</sup> Avenue Industrial Lands has been previously cleared by Others with the exception of the Northwest corner which is still forested. This area will be left intact as it will not form part of the areas being excavated. In the case that said area is found to be required to source materials, it will be stripped and grubbed according to the **Technical Specification Section 31 11 00 Clearing, Grubbing and Stripping**. Most of the 85<sup>th</sup> Avenue Industrial Lands have been previously used by others; therefore, there is a minor requirement for clearing and grubbing activities.

PRHP will develop the borrow source by stripping overburden material from the excavation areas as required. Based on previous geotechnical investigations carried out within the 85<sup>th</sup> Avenue Industrial lands limits, a 1.2m cut will be performed in order to dispose of all unusable overburden within the designated excavations areas.

The excavated overburden will be used to construct a minimum of 3m tall berms with the purpose of providing a noise and light barrier for nearby residents. These berms will be placed around the perimeter



of the main borrow area, as well as any area that has a direct line of site. If necessary, to further reduce noise, secondary berms will be constructed closer to work front. All existing vegetation, where possible will be left in place to act as a noise dissipation barrier.

PRHP will address any potential of siltation, by constructing a series of ditches and waterways that will divert all surface water runoff to a constructed Siltation Pond, which will be located at the lowest point of the 85<sup>th</sup> Avenue Industrial Land quarry. For clarification and design detail, please reference the following plan:

- Environmental Protection Plan for the 85th Avenue Industrial Land.

### **3.2 RESPONSIBLE PARTIES**

**The PRHP Construction Manager will:**

- Ensure all applicable execution plans, ITP's and relevant drawings are approved for use with this execution plan.
- Coordinates with other construction managers within Site C to project to identify required quantities of materials.
- Coordinate as required with Area Superintendent.
- Monitor and report all daily activities
- Implement the appropriate circuit to be used within the 85th Avenue Industrial Lands to maintain equipment maneuverability and production rates

**The PRHP Area Superintendent will:**

- Coordinate as required with Area Foremen and other contractor
- Ensure that all access road & maintenance gravel roads are properly maintained and that erosion and sediment controls are in place
- Monitor production rates as well as water levels within Siltation Pond and report as applicable
- Ensure that a copy of the Health, Safety and Reclamation Code for Mines in British Columbia is available to all employees in the site office.

### **3.3 PRODUCTION QUANTITIES**

PRHP forecasts that it will utilize approximately 2,711,150 m<sup>3</sup> of impervious fill material for the completion of the Main Civil Works scope.



PRHP will produce the impervious fill material by direct excavation, hauling and sorting of materials. Only a relatively small volume of materials will require processing such as screening or moisture control prior to hauling to site.

### 3.4 MINING

Prior to commence of any mining activities PRHP will ensure that the following activities have been executed:

1. Access will be restricted via fencing of the 85<sup>th</sup> Avenue Industrial lands according the **Technical Specification Exhibit 6-1-1 Scope of work.**
2. All existing utilities have been identified and decommissioned accordingly
3. Areas of interest have been laid out (i.e. Main Excavation Area)
4. Designated areas have been cleared and stripped for mining
5. Berms have been constructed according to **Technical Specification Exhibit 6-1-1 Scope of work**
6. Siltation Pond has been completed
7. Water management plant ditches and water ways have been established.
8. Both visual and noise barrier have been implemented according to **Technical Specification Exhibit 6-1-1 Scope of work.**

PRHP will concentrate the mass majority of its excavation activities in the Main Excavation Area and believes that there will be enough material within this area. If required additional areas will be developed in order to meet the project demands. Please refer to Appendix A for preliminary layout drawing of the 85<sup>th</sup> Avenue Industrial Lands Borrow.

Refer to drawing JK-00001 for preliminary layout of the excavation areas.

PRHP will commence excavation activities at the site's highpoint (Eastside). Bulldozers will be utilized to push material down the excavation face towards the west, ensuring that all material mined is of a consistent composition. As the mining area increases in depth and size PRHP will implement 2H:1V slopes to ensure safe working conditions.

The mined material will be loaded on to articulating rock trucks by excavators and will then be transported the Sorting, Stockpile and Conveyor Area. From here, materials will be process through grizzlies in order to meet the **Technical Specification Section 31 70 00 Fill Construction**; material will then be stockpile or sent directly to the Site C Dam Project.

Geotechnical investigations will be performed in order to optimize the mining process as well as set up all necessary quality measures on site, in order to properly classify and distribute the demanded type of impervious material.

PRHP will mine the 85<sup>th</sup> Avenue Industrial Land by strictly using excavators and haul trucks, and no drilling and blasting will be necessary.

### 3.5 MATERIAL SORTING AND SCREENING

Material mined from the 85<sup>th</sup> Avenue Industrial Lands would be processed by means of grizzly or equivalent in order to obtain gradation requirement set forth by the **Technical Specification Section 31 70 00 Fill Construction**:

**Impervious Fill Material Zone 1 and Zone 1a** shall comply with the gradation outlined in Table 3-1.

**TABLE 3-1: GRADATION OF IMPERVIOUS FILLZONE1**

Sieve Size (mm)	Percent Passing by Weight	
	Coarse Limit	Fine Limit
150	100	-
40	80	100
10	61	85
2.5	48	72
0.315	31	58
0.08	20	50

**Impervious Fill Zone 1b** shall be select fine Zone 1 material graded as shown Table3-2.

**TABLE 3-2: GRADATION OF IMPERVIOUS FILL ZONE 1B**

Sieve Size (mm)	Percent Passing by Weight	
	Coarse Limit	Fine Limit
20	100	-
10	84	100
2.5	61	85
1.25	52	78
0.315	38	68
0.08	25	60

**Impervious Fill Zone 1c** shall be select coarse material meeting the grading outlined in Table 3-3.

**TABLE 3-3: GRADATION OF IMPERVIOUS FILL ZONE 1C**

Sieve Size (mm)	Percent Passing by Weight	
	Coarse Limit	Fine Limit
150	100	-
56	83	100
10	58	70
2.5	40	52
0.315	22	30
0.08	15	20

Impervious Fill Zone 1d shall have the same gradation requirements as Zone 1 Table 3-1.

### 3.5.1 Method

PRHP will have screening equipment set up in its southwest corner of the quarry that will be utilized for processing the different types of silts. Material will be loaded via excavator into the screening plants; the output from said plants will then be loaded onto the conveyor system to be transported to site.

### 3.5.2 Stockpiling

#### 3.5.2.1 Stockpiles for 85<sup>th</sup> Avenue Industrial Lands:

PRHP plans to implement three different stockpiles at its 85<sup>th</sup> Avenue Industrial Lands:

- Stockpiles for materials requiring moisture control and or processing.
- Stockpiles for materials ready to be moved the Site C project.
- Stockpiles for the material found to be unsuitable for the project.

All of the stockpiles at 85<sup>th</sup> Avenue Industrial Land will be relatively small except for the stockpile designated for unsuitable material. The volume of this stockpile will largely depend on unsuitable material excavated, and the volume of rejected material coming off the screening plant. In the event that these stockpiles become too large, PRHP will utilize said material for berm construction, or material will be spread and levelled in conformance with future land uses, in areas where excavation activities have concluded.

Stockpiles that require moisture control; PRHP will implement preliminary measures at 85<sup>th</sup> Avenue, getting the material as close as possible to its designated moisture content at which point it will be loaded onto the conveyor system and transport to the Site C were after placement of said material additional measure will be taken if need to adjust the moisture content. These stockpiles will not remain at the 85<sup>th</sup> Avenue site for longer than 48 hours. Stockpiles requiring processing through screening plants will be processed then placed on conveyor and hauled to site.

Material ready to be moved to site will only be stockpile at the 85<sup>th</sup> Avenue site for a period not extending over 12 hours. Materials shall only be stored here to adhere to the 12 hour working restrictions.

All Stockpiles will be properly sloped in order ensure proper water run-off and protect material accordingly.

### **3.5.2.2 Stockpiles for Site C Locations:**

PRHP will stockpile material coming from 85th Avenue Industrial Lands in Area 25 of the site. Area 25 will be stripped and graded in preparation for this material. PRHP will also be implementing ditch lines and sedimentation ponds in order mitigate any potential for siltation. The material in Area 25 will be piled with a telescoping radial staking conveyor system. This will minimize any potential segregation and optimize the Stockpile area.

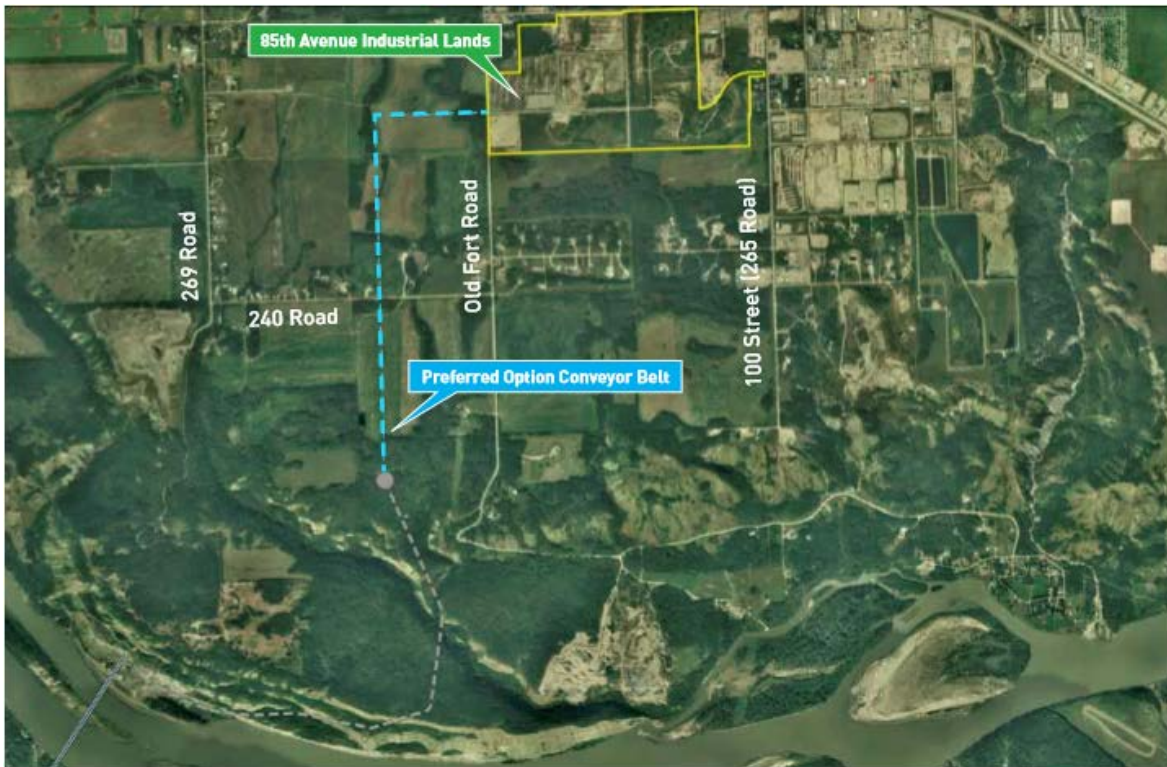
A contingency stockpile will be kept on site C in the event that the conveyor systems malfunctions or breakdowns volumes for this stockpiles will be dependent on volume demands by Site C and productions rates at the 85<sup>th</sup> Avenue Industrial Land Borrow.

All Stockpiles will be properly sloped in order ensure proper water run-off and protect material accordingly.

### **3.5.3 Conveyor System**

Material from the 85<sup>th</sup> Avenue Industrial Lands to Laydown Area 25 stockpiles will be hauled via 4.85 km long conveyor system that will be manufactured and constructed per specification. PRHP will construct the conveyor along a proposed 15 m wide corridor and will contain a gravel maintenance road, lights and the conveyor system itself.

Design of the conveyor system and alignment will be provided in a separate submittal.



**FIGURE 3-1 : CONVEYOR PRELIEMINARY ROUTE FROM 85TH AVENUE TO SITE C DAM SITE**

PRHP will commence the installation of conveyor system by:

1. Surveying the location of the conveyor corridor and marking it accordingly.
2. Stripping all vegetation and overburden.
3. Constructing a 4.5 m wide gravel maintenance road.
4. Installing the chain link fence in order to restrict access to authorized personnel only.
5. Utilizing the newly constructed right of way to transport material and equipment into place for the physical installation of the conveyor system from the 85<sup>th</sup> Avenue Industrial Lands to Site C Dam Site.

PRHP plans on constructing overpass structures at each junction where the conveyor system requires to over pass an existing road or requires and access over a specific section, these section may include the following:

- Old Fort Road
- 240 Road
- Drainage Channel at RSEM Area L3

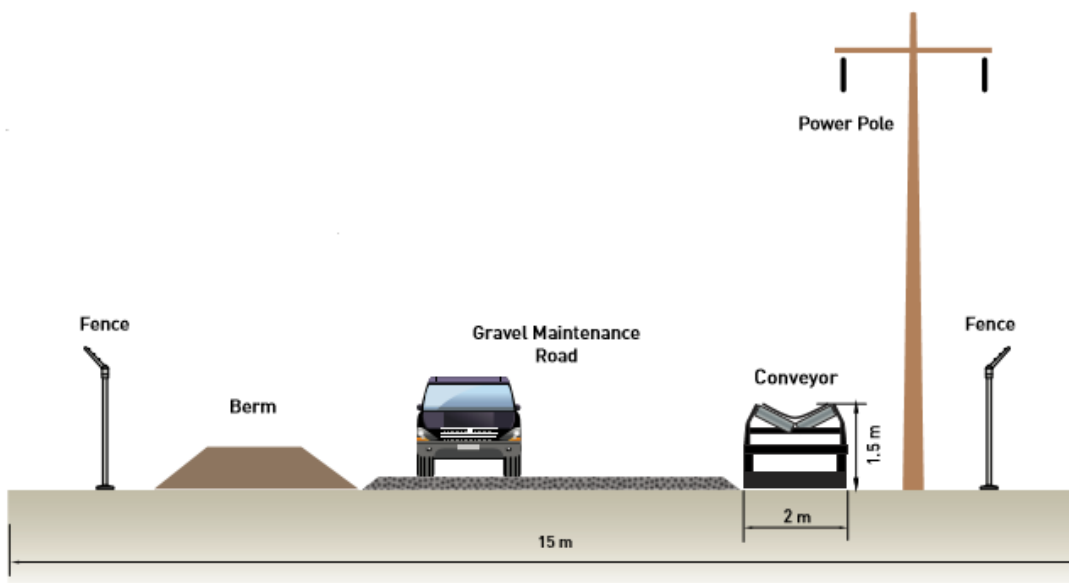
- North Bank Road

The design of the overpasses will be finalized once the conveyor contractor is procured, but PRHP will ensure that all overpasses will have clearance height of at least 6 metres in height where applicable and that all sections of the conveyor system are accessible for maintenance.

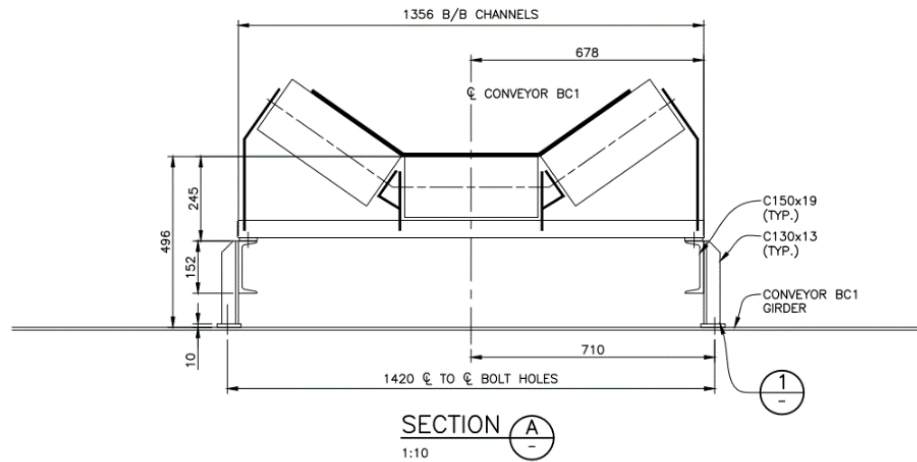
By implementing the overpass feature PRHP will ensure that local traffic conditions are not affected by the everyday operations of the 85<sup>th</sup> Avenue Industrial Lands.

The conveyor corridor will be composed of a perimeter berm to mitigate noise pollution, a 4.5-meter wide gravel maintenance road for maintenance of conveyor system, utilities poles as a means of power supply and chain link fence to limit access to authorize personnel (Figure 3-3). Additionally, the conveyor corridor will be equipped with a surveillance system and a sprinkler system install at the inlet and other location of the conveyor to address dust mitigation. Typical conveyor cross section as shown in Figure 3-4.

Refer to 85<sup>th</sup> Ave Industrial Lands Borrow EPP for further clarification on Noise and Dust control measures.



**FIGURE 3-2 : PRELIMINARY CROSS SECTION OF CONVEYOR CORRIDOR**



**FIGURE 3-3: PRELIMINARY CONVEYOR CROSS SECTION**

### 3.6 RECLAMATION

PRHP will progressively reclaim the 85th Avenue Industrial Lands as operation allows, following the guidelines set by **Technical Specification Exhibit 6-1-1 Scope of Work**. Final excavations within the 85<sup>th</sup> Avenue Industrial lands should reach a maximum elevation of 664m when excavated. Previously excavated overburden as well as rejected material from the excavation will be utilized in the reclamation measures, material will be levelled in conformance with future land uses. PRHP will also be stabilizing slopes implementing and restabilising drainage systems in order address natural water run-off in this area. Seeding and other vegetation will also be used as means to control sedimentation and erosion on the new embankment slopes.

The sedimentation pond will be one of the last components removed from this site. PRHP will allow vegetation measures to be in place and working prior to its removal. An option to keep the sedimentation pond as an aesthetic body of water may be considered at the time of decommissioning this parcel of land.

All berms and perimeter fencing will be removed as part of the reclamation process. Trees will be placed on 10m centres within the North property line that parallels 85<sup>th</sup> Ave between 107<sup>th</sup> and the East property line. This activity will be performed during initial developmental stag of site. Trees will be maintained in “good condition” to assist in the reclamation process.

As part of the development of the 85<sup>th</sup> Avenue Industrial Lands PRHP will set up an office and laydown area for personnel and equipment working on the 85<sup>th</sup> Avenue site. The implementation of these areas will be outlined below.

### 3.7 ACCESS

The 85<sup>th</sup> Avenue Industrial Lands site will be completely fenced as per BC Hydro specifications. There will be a number of gates to access the area with the main gate located on Shaman Industrial Way.



Access will be closed to the general public and controlled for the duration of the mining operations. Gates and signs will be erected to notify the public of safety concerns.

PRHP will leave all three roads located within the site, as access roads for equipment and personnel. Access and egress ramps will be available at each designated excavation as per Work Safe BC Guidelines.

### **3.8 FACILITIES**

PRHP plans to implement an office trailer, washroom facilities and corresponding utilities in order to run the everyday operations of the 85<sup>th</sup> Avenue Industrial Lands.

Facilities will be connected to potable water and septic tanks that will be serviced regularly via septic pump truck and portable water tanks, power will come from the power lines that run parallel to Old Fort Road and telecommunication connections will be done via local infrastructure.

### **3.9 PARKING**

Parking will only be available for site personnel and authorized visitors it will be located adjacent to the site office and laydown area. All parking and walkways will have a gravel base in order to provide a proper bearing surface.

### **3.10 SPECIALIZED EQUIPMENT**

The 85<sup>th</sup> Avenue Industrial land will not require any special equipment in its everyday operations with the exception of the conveyor system which as discussed in Section 3.4.3. For additional information concerning equipment, please refer to Section 8 of this plan.

### **3.11 PROCESS WATER CONTAINMENT**

The requirement for process water and equipment wash-down will lie with the PRHP subcontractor and supplied by PRHP means and methods. The run-off water from daily operations will be diverted through a sequence of trenches and ditches that will ultimately be discharged to a designated sediment pond. Please refer to the Environmental Protection plan for the 85<sup>th</sup> Avenue Industrial land for further clarification.

## **4 HAUL ROAD DESIGN**

PRHP will not be utilizing any local roads for the transportation of the mined material from the 85<sup>th</sup> Avenue Industrial Land. PRHP will be implementing a gravel maintenance road in the construction of the conveyor corridor. The gravel maintenance road will have an approximate width of 4.5 meters and maintained as required by PRHP. PRHP will install perimeter fencing and gates at each potential exit and entrance in order to restrict access to only authorized personnel.

## **5 EXPLOSIVES**

The mining process utilized by PRHP in the 85<sup>th</sup> Avenue Industrial Land will not require any drilling or blasting and therefore this would eliminate the need for any explosives.

## 6 HEALTH AND SAFETY AND ENVIRONMENTAL REQUIREMENTS

In order to maintain worker safety within the 85<sup>th</sup> Avenue Industrial Land PRHP will generate a safety and environmental plan that will address safety and environmental concerns as well deal with visual, noise and operational needs.

Refer to **The Environmental Protection Plan for the 85th Avenue Industrial Lands** and **The 85th Avenue Industrial Lands Safety Plan** for further clarification.

## 7 EQUIPMENT

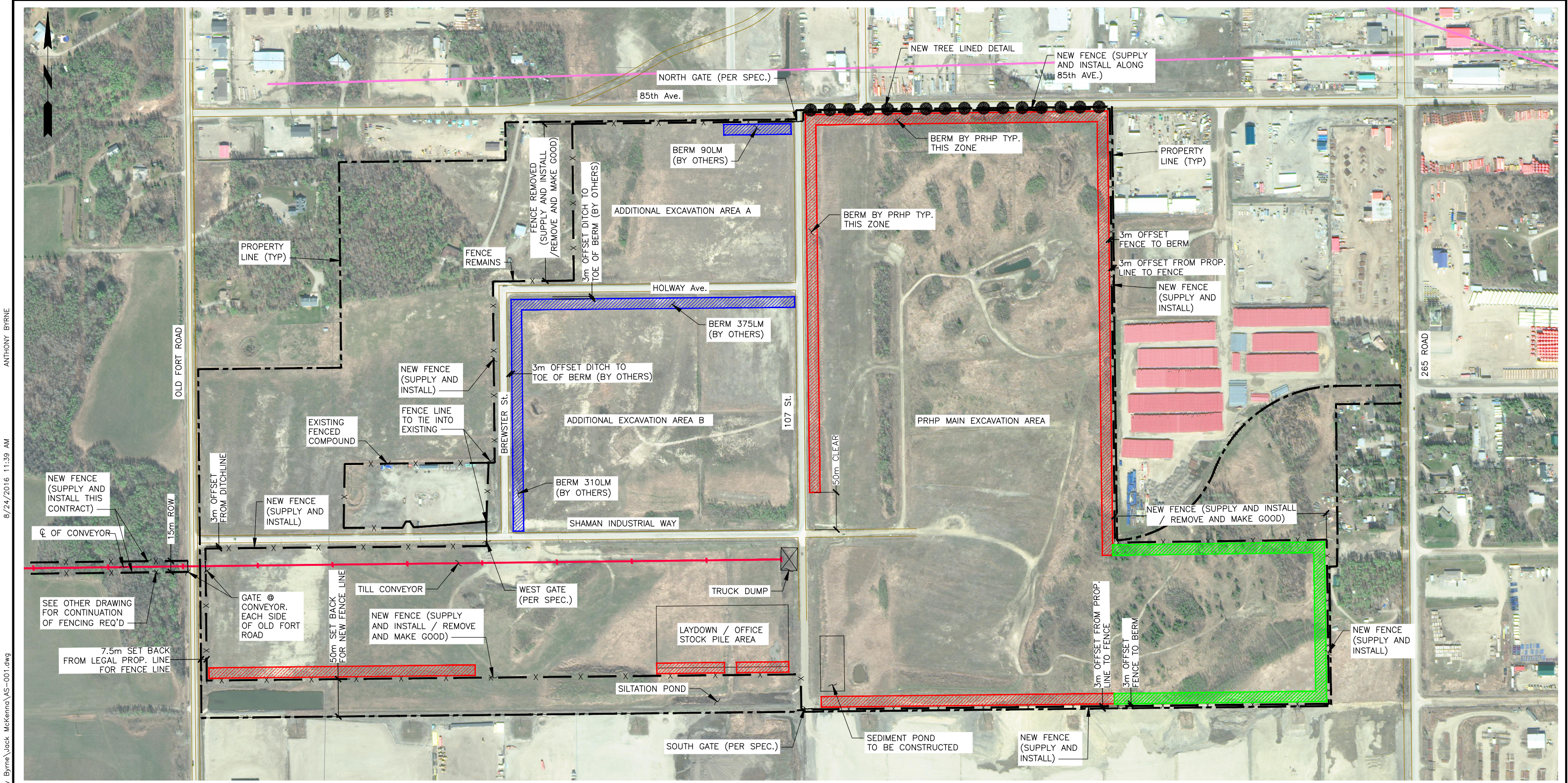
Table 8-1 presents the proposed equipment that PRHP will use at 85th Ave Industrial Lands Quarry.

**TABLE 7-1: 85TH AVE INDUSTRIAL LANDS QUARRY EQUIPMENT LIST**

Equipment	Qty.	Use/Notes
Rubber tired loader	1	Loading feeders and haul trucks
Articulating rock truck	12	Hauling processed and surplus material
Hydraulic excavator	2	Stripping and sorting
Bulldozer	2	Stripping operations, stockpile management
Grader	1	Road Maintenance
Roller Packer	1	Road Maintenance
Conveyor	1	Various sizes to match production
Stacking conveyor	1	Radial telescoping stacker
Water Truck	1	Dust Control & Water Content Measures
Mechanic's truck	1	Service truck with crane
70 Tonne Apron Feeder	2	Material Handling
Wobbler Feeder	2	Material Handling

## Appendix A      **DRAWINGS**





T:\08 Technical\8.4 Drafting\8.4.8 Users\B.4.8.1 Anthony Byrne\Jack McKenna\AS-001.dwg  
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 ANTHONY BYRNE

- LEGEND :**
- GAS PIPE LINE
  - X SECURITY FENCE
  - BERM BY PRHP
  - BERM FOR MOTI
  - BERM (IF MINING REQUIRED)
  - TILL CONVEYOR
  - SITE BOUNDARY
  - TREES

**PLAN**  
 1:5000  
 0  250m  
 1:5000

NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG CHK	INSP CIV	INSP STR	INSP MECH	INSP GEO	INSP ELEC	REV	ACPT
REVISIONS												

**PEACE RIVER HYDRO PARTNERS**

**BC Hydro**

DSGN	
INDEP CHK	
DFTG	AB
DFTG CHK	
INSP	
	CIV STR MECH GEO ELEC
REV	
ACPT	

**SITE C CLEAN ENERGY PROJECT**

**85th AVENUE INDUSTRIAL LANDS  
EXCAVATION PLAN**

DATE: 24AUG2016

DIST:

AS-001

SIZE 11 x 17

R 0



**END OF PLAN**