REGIONAL DISTRICT OKANAGAN SIMILKAMEEN

INVITATION TO TENDER FOR CONSTRUCTION SERVICES FOR CAMPBELL MOUNTAIN LANDFILL LEACHATE MANAGEMENT

ITT Number: RDOS-21-ENG-10

October 2021

Owner: Regional District Okanagan Similkameen
(NAME OF OWNER)

Contract: Campbell Mountain Landfill Leachate Management
(TITLE OF CONTRACT)

Reference No. RDOS-21-ENG-10
(OWNER'S CONTRACT REFERENCE NO.)

The Owner invites tenders for: Construction of Campbell Mountain Leachate Management Infrastructure. Construction efforts include but are not limited to civil, mechanical, and electrical works for leachate extraction infrastructure including trenching, pump and discharge line, and electrical components and conduit installation.
(BRIEF DESCRIPTION OF THE WORK)

***Contract Documents* may be viewed and obtained:**

Tender Documents, Tender Drawings and Reference Material for this project will be distributed electronically in digital format (PDF format) through the BC Bid tendering website at http://www.bcbid.gov.bc.ca/. For personal hard copies, it is the responsibility of the Contractor to download the PDF and print as needed.

Tenders are scheduled to close:

Tender Closing Time: 16 : 00 , 4 pm local time
Tender Closing Date: November 3rd , 20 21

Submit Electronic copy to:

Address: Sperling Hansen Associates Inc.

Attention: Scott Garthwaite, AScT, Project Manager
(ADDRESS WHERE TENDERS MUST BE SUBMITTED)

NAME OF *OWNER'S* REPRESENTATIVE Scott Garthwaite, AScT sgarthwaite@sperlinghansen.com

(604) 803-7120
(PHONE)

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(FOR USE WHEN UNIT PRICES FORM THE BASIS OF PAYMENT TO BE USED ONLY WITH THE GENERAL CONDITIONS AND OTHER STANDARD DOCUMENTS OF THE UNIT PRICE MASTER MUNICIPAL CONSTRUCTION DOCUMENTS.)

**(TO BE READ WITH "INSTRUCTIONS TO TENDERERS - PART II"
CONTAINED IN THE EDITION OF THE PUBLICATION
"MASTER MUNICIPAL CONSTRUCTION DOCUMENTS" SPECIFIED IN ARTICLE 2.2 BELOW)**

Owner: Regional District Okanagan Similkameen
(NAME OF OWNER)

Contract: Campbell Mountain Landfill Leachate Management
(TITLE OF CONTRACT)

Reference No. RDOS-21-ENG-10
(OWNER'S CONTRACT REFERENCE NO.)

1.0 Introduction

1.1 These Instructions apply to and govern the preparation of tenders for this *Contract*. The *Contract* is generally for the following work but not limited to:

1. Civil and Earthworks: The Contractor is required to excavate and backfill a common utility trench for electric and leachate conveyance to Extraction Well 19-03, from the leachate pond and an electrical utility trench from the leachate pond to the extisting electrical Kiosk 1. Other works include the supply and install of the leachate forcemain including pressure testing, concrete manhole, leachate discharge structure, and other miscellaneous works.
2. Mechanical: The Contractor is required to supply and install the submersible pump and motor, variable frequency drive, level transmitter, pump hour meter, controls, all electrical components including wiring, drop pipe with pitless adaptor, pipe from well the well to the check valve, check valve, and yard hydrant. The Contractor is required to commission, test and provide necessary manuals.
3. Electrical: The Contractor is required to supply and install all electrical components for connection to Kiosk 1, three electrical conduits in the common utility trench and electrical utility trench, electrical cable for one conduit, pull boxes, and the Pump Kiosk which includes all electrical components shown on the electrical drawings excluding the variable frequency drive. The Contractor is required to commission, test and provide necessary manuals and training for systems.

(BRIEF DESCRIPTION OF THE WORK)

1.2 Direct all inquiries regarding the *Contract*, to:

Scott Garthwaite, AScT, Project Manager with Cc to Dustin Zahara, Engineering Technologist

(NAME AND POSITION OF INDIVIDUAL WHO WILL ANSWER INQUIRIS)

Address: Sperling Hansen Associates Inc.
1332 McGill Rd,
Kamloops, BC V2C 6N6

Phone: 604 803 - 7120

Email: sgarthwaite@sperlinghansen.com

Address: Dustin Zahara, Regional District of Okanagan Similkameen
101 Martin Street,
Penticton, BC V2A 5J9

Phone: 250 490 - 4210

Email: dzahara@rdos.bc.ca

The deadline for submitting inquiries is **Friday, October 29, 2021, at 2 pm.**

2.0 Tender Documents

2.1 The tender documents which a tenderer should review to prepare a tender which consists of all of the *Contract Documents* listed in Schedule 1 entitled “Schedule of Contract Documents”. Schedule 1 is attached to the Agreement which is included as part of the tender package. The *Contract Documents* include the drawings listed in Schedule 2 to the Agreement, entitled “List of *Contract Documents*”.

2.2 A portion of the Contract Documents are included by reference. Copies of these documents have not been included with the tender package. These documents are the Instructions to Tenderers - Part II, General Conditions, Specifications and Standard Detail Drawings. They are those contained in the publication entitled “Master Municipal Construction Documents - General Conditions, Specifications and Standard Detail Drawings”. Refer to Schedule 1 to the Agreement or, if not specified in Schedule 1, then the applicable edition shall be the most recent edition as of the date of the Tender Closing Date. All sections of this publication are by reference included in the Contract Documents.

2.3 Any additional information made available to tenderers prior to the Tender Closing Time by the Owner or representative of the Owner, such as geotechnical reports or as-built plans, which is not expressly included in Schedule 1 or Schedule 2 to the Agreement, is not included in the Contract Documents. Such additional information is made available only for the assistance of tenderers who must make their own judgment about its reliability, accuracy, completeness and relevance to the Contract, and neither the Owner nor any representative of the Owner gives any guarantee or representation that the additional information is reliable, accurate, complete or relevant.

3.0 Submission of Tenders

3.1 Tenders, including amendments and Addendums, must be submitted in Electronic form and must be received by the office of:

Sperling Hansen Associates

Attention: Scott Garthwaite, AScT, Project Manager

(TITLE OF POSITION)

on or before:

Tender Closing Time: 16 : 00 , PM local time

Tender Closing Date: November 3rd , 20 21

at

Email: sgarthwaite@sperlinghansen.com

Tenders must be submitted electronically with the subject:

"TENDER – CAMPBELL MOUNTAIN LANDFILL – LEACHATE MANAGEMENT"

When a Tenderer submits their Tender by email then the email containing the Tender will be deemed to have been received at the Closing Location at the date/time stamped/tagged by Sperling Hansen Associates' email system, and the Tenderer assumes the entire risk that the email is received by the addressee and is complete, including the risk that the Sperling Hansen Associates' system will not properly receive the email and any email attachments before the Tender Closing Date and Time. Sperling Hansen Associates' inability to receive an email or email attachment, for any reason, shall not constitute an excepton to the mandatory requirement to submit the Tender by the Closing Date and Time, and Sperling Hansen Associates assumes no risk or responsibility that any email will be received.

3.2 Late tenders will not be accepted or considered, and will be returned unopened.

4.0 Additional Instructions to Tenderers

4.1 Total Performance is expected on or before April 1, 2022.
4.2 Substantial Performance is expected on or before March 18, 2022
4.3 Notice of Award is expected on November 29th, 2021.
4.4 Notice to Proceed is expected on December 6th, 2021.

These Supplemental Instructions to Tenderers modify the MMCD Instructions to Tenderers - Part II in the following sections:

4.5 IT 5.3 is amended by adding the following after IT 5.3.5:

5.3.6 Appendix 6 - List of Available Equipment Owned by the Contractor

4.6 IT 6.2 and 6.3 are deleted.

4.7 The following is added after IT 8.1:

8.1(a) A **mandatory visit** by tenderers to the Place of the Work is scheduled for **1:00 p.m. on, October 26, 2021**. Representatives of the Owner and Contract Administrator will be in attendance. All tenderers must attend the mandatory site visit. It is anticipated that answers to questions that are made at the mandatory site visit will be distributed through an Addendum. The holding of the mandatory visit in no way limits the responsibility of tenderers under paragraph 8.1 of these Instructions to Tenderers – Part II or otherwise to have inspected the Place of the Work.

4.8 Award of the Contract is subject to the approval of the Board of Directors
4.9 Award of the Contract is subject to funds being legally available for the project.
4.10 The Contractor will provide all construction layouts. Digital files will be provided by the Owner or Consultant for layout purposes.
4.11 All materials and density testing, including granular materials and compaction tests, will be arranged by and paid for by the Contractor. The Contractor is responsible for ensuring all materials meet MMCD specifications and any Supplementary Specifications. Where initial tests fail and subsequent testing is considered necessary by the Contract Administrator, the subsequent testing will be arranged by and paid for by the Contractor.

4.12 The Owner reserves the right to reject any or all tenders or to accept any tender should it be considered in the interest of the Owner to do so. The lowest or any tender will not necessarily be accepted and the Owner reserves the right to negotiate with any bidder.

(FOR USE WHEN UNIT PRICES FORM THE BASIS OF PAYMENT TO BE USED ONLY WITH THE GENERAL CONDITIONS AND OTHER STANDARD DOCUMENTS OF THE UNIT PRICE MASTER MUNICIPAL CONSTRUCTION DOCUMENTS.)

BETWEEN *OWNER* AND *CONTRACTOR*

This agreement made in duplicate this

_____ day of _____, 2021____.

Contract: Campbell Mountain Landfill Leachate Management
(TITLE OF CONTRACT)

Reference No. RDOS-21-ENG-10
(OWNER'S CONTRACT REFERENCE NO.)

BETWEEN:

The Regional District Okanagan Similkameen
(NAME OF OWNER)

(the "*Owner*")

AND:

_____

_____

_____
(NAME AND OFFICE ADDRESS OF CONTRACTOR)

(the "*Contractor*")

The *Owner* and the *Contractor* agree as follows:

Article 1 The Work Start / Completion Dates

1.1 The *Contractor* will perform all *Work* and provide all labour, equipment and material and do all things strictly as required by the *Contract Documents*.

1.2 The *Contractor* will commence the *Work* in accordance with the *Notice to Proceed*. The *Contractor* will proceed with the *Work* diligently, will perform the *Work* generally in accordance with the construction schedules as required by the *Contract Documents* and will achieve *Substantial Performance* of the *Work* on or before March 18, 2022 subject to the provisions of the *Contract Documents* for adjustments to the *Contract Time*.

1.3 Time shall be of the essence of the *Contract.*

Article 2 Contract Documents

2.1 The "*Contract Documents*" consist of the documents listed or referred to in Schedule 1, entitled "Schedule of Contract Documents", which is attached and forms a part of this Agreement, and includes any and all additional and amending documents issued in accordance with the provisions of the *Contract Documents*. All of the *Contract Documents* shall constitute the entire *Contract* between the *Owner* and the *Contractor*.

2.2 The *Contract* supersedes all prior negotiations, representations or agreements, whether written or oral, and the *Contract* may be amended only in strict accordance with the provisions of the *Contract Documents.*

Article 3 Contract Price

3.1 The price for the *Work* ("*Contract Price*") shall be the sum in Canadian dollars of the following

1.1.1 the product of the actual quantities of the items of *Work* listed in the *Schedule of Quantities and Prices* which are incorporated into or made necessary by the *Work* and the unit prices listed in the *Schedule of Quantities and Prices*; plus

1.1.2 all lump sums, if any, as listed in the *Schedule of Quantities and Prices*, for items relating to or incorporated into the *Work*; plus

1.1.3 any adjustments, including any payments owing on account of *Changes* and agreed to *Extra Work*, approved in accordance with the provisions of the *Contract Documents.*

3.2 The *Contract Price* shall be the entire compensation owing to the *Contractor* for the *Work* and this compensation shall cover and include all profit and all costs of supervision, labour, material, equipment, overhead, financing, and all other costs and expenses whatsoever incurred in performing the *Work*.

Article 4 Payment

4.1 Subject to applicable legislation and the provisions of the *Contract Documents*, the *Owner* shall make payments to the *Contractor*.

4.2 If the *Owner* fails to make payments to the *Contractor* as they become due in accordance with the terms of the *Contract Documents* then interest calculated at 2% per annum over the prime commercial lending rate of the Royal Bank of Canada on such unpaid amounts shall also become due and payable until payment. Such interest shall be calculated and added to any unpaid amounts monthly.

Article 5 Rights and Remedies

5.1 The duties and obligations imposed by the *Contract Documents* and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

5.2 Except as specifically set out in the *Contract Documents*, no action or failure to act by the *Owner*, *Contract Administrator* or *Contractor* shall constitute a waiver of any of the parties' rights or duties afforded under the *Contract*, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach under the *Contract*.

Article 6 Notices

6.1 Communications among the *Owner*, the *Contract Administrator* and the *Contractor*, including all written notices required by the *Contract Documents*, may be delivered by hand, or by email, or by pre-paid registered mail to the addresses as set out below:

The *Owner*:

Regional District Okanagan Similkameen

101 Martin Street

Penticton, BC V2A 5J9

Email: dzahara@rdos.bc.ca

Attention: Dustin Zahara

The *Contractor*:

Email:

Attention:

The *Contract Administrator*:

Sperling Hansen Associates Inc.

1332 McGill Rd.

Kamloops, BC V2C 6N6

Email: sgarthwaite@sperlinghansen.com

Attention: Scott Garthwaite, AScT

6.2 A communication or notice that is addressed as above shall be considered to have been received

1.1.4 immediately upon delivery, if delivered by hand; or

1.1.5 immediately upon transmission if sent by fax and received in hard copy; or

1.1.6 after 5 *Days* from date of posting if sent by registered mail.

6.3 The *Owner* or the *Contractor* may, at any time, change its address for notice by giving written notice to the other at the address then applicable. Similarly, if the *Contract Administrator* changes its address for notice, then the *Owner* will give or cause to be given written notice to the *Contractor.*

6.4 The sender of a notice by fax assumes all risk that the fax is received in hard copy.

Article 7 General

7.1 This *Contract* shall be construed according to the laws of British Columbia.

7.2 The *Contractor* shall not, without the express written consent of the *Owner*, assign this *Contract*, or any portion of this *Contract*.

7.3 The headings included in the *Contract Documents* are for convenience only and do not form part of this *Contract* and will not be used to interpret, define or limit the scope or intent of this *Contract* or any of the provisions of the *Contract Documents*.

7.4 A word in the *Contract Documents* in the singular includes the plural and, in each case, vice versa.

7.5 This agreement shall ensure to the benefit of and be binding upon the parties and their successors, executors, administrators and assigns.

IN WITNESS WHEREOF the parties hereto have executed this Agreement the day and year first written above.

Contractor:

(FULL LEGAL NAME OF CORPORATION, PARTNERSHIP OR INDIVIDUAL)

(AUTHORIZED SIGNATORY)

(AUTHORIZED SIGNATORY)

Owner:

Regional District Okanagan Similkameen

(FULL LEGAL NAME OF CORPORATION, PARTNERSHIP OR INDIVIDUAL)

(AUTHORIZED SIGNATORY)

(AUTHORIZED SIGNATORY)

(INCLUDE IN LIST ALL DOCUMENTS INCLUDING, IF ANY, SUPPLEMENTARY GENERAL CONDITIONS, SUPPLEMENTARY SPECIFICATIONS, SUPPLEMENTARY STANDARD DETAIL DRAWINGS.)

Schedule 1 Schedule of Contract Documents

The following is an exact and complete list of the *Contract Documents*, as referred to in Article 2.1 of the Agreement.

***NOTE*:** The documents noted with "*" are contained in the "Master Municipal Construction Documents - General Conditions, Specifications and Standard Detail Drawings", edition dated 2009. All sections of this publication are included in the *Contract Documents*.

8.1 Agreement, including all Schedules;
- Schedule A – Supplementary General Conditions
- Schedule B – Supplementary Technical Specifications

8.2 Supplementary General Conditions attached as Schedule A;

8.3 General Conditions*;

8.4 Supplementary Technical Specifications attached as Schedule B (takes precedence over MMCD Specifications);

8.5 Executed Form of Tender, including all Appendices;

8.6 *Contract Documents listed in Schedule 2 to the Agreement –"List of Contract Documents"* (takes precedence over MMCD Standard Detail Drawings);

8.7 Specifications*;

8.8 Standard Detail Drawings*;

8.9 Instructions to Tenderers - Part I;

8.10 Instructions to Tenderers - Part II*;

8.11 MMCD Supplemental Update 2019
MMCD Supplementary Update 2016-11-18
MMCD Supplementary Update 2015-11-02
MMCD Supplementary Update 2014-09-19
MMCD Supplementary Update 2014-07-15
MMCD Supplementary Update 2014-02-28
MMCD Supplementary Update 2013-06-13
MMCD Supplementary Update 2012-08-07
MMCD Supplementary Update 2012-06-08

MMCD Supplementary Update 2012-05-30
MMCD Supplementary Update 2011-08-08
MMCD Supplementary Update 2011-08-04
MMCD Supplementary Update 2010-05-18
MMCD Supplementary Update 2010-03-25
MMCD Supplementary Update 2009-11-19

8.12 The following Addenda:

(ADDENDA, IF ANY)

(COMPLETE LISTING OF ALL DRAWINGS, PLANS AND SKETCHES WHICH ARE TO FORM A PART OF THE CONTRACT, OTHER THAN STANDARD DETAIL DRAWINGS AND SUPPLEMENTARY STANDARD DETAIL DRAWINGS. CONTRACT DOCUMENTS LISTED IN SCHEDULE 2 TAKE PRECEDENCE OVER THE MMCD STANDARD DETAIL DRAWINGS)

Schedule 2 List of Contract Documents

CAMPBELL MOUNTAIN LANDFILL LEACHATE MANAGEMENT			
SHEET No.	**DWG No.**	**REV.**	**TITLE**
0	20039 - 00	A	Site Location Map and List of Drawings
1	20039 - 01	A	Leachate Extraction and Conveyance Work
2	20039 - 02	A	Leachate Conveyance Pipe Profile
3	20039 - 03	A	Leachate Conveyance and Trench Details
4	20039 - 04	A	Extraction Well and Manhole Details
5	20039 - 05	A	Extraction Well 19-03 Pump Configuration
Electrical			
1	CML-21-E100	A	Leachate Line Pump System One Line Diagram
1	CML-21-E200	A	Leachate Line Pump System Electrical General Arrangement
1	CML-21-E210	A	Leachate Line Pump System Pump Kiosk Mini Power Center Panel Schedule
1	CML-21-E800	A	Leachate Line Pump System VFD Schematic

FOR USE WHEN UNIT PRICES FORM THE BASIS OF PAYMENT - TO BE USED ONLY WITH THE GENERAL CONDITIONS AND OTHER STANDARD DOCUMENTS OF THE UNIT PRICE MASTER MUNICIPAL CONSTRUCTION DOCUMENTS.

Owner: Regional District Okanagan Similkameen
(NAME OF OWNER)

Contract: Campbell Mountain Landfill Leachate Management
(TITLE OF CONTRACT)

Reference No. RDOS-21-ENG-10
(OWNER'S CONTRACT REFERENCE NO.)

To *Owner*:

WE, THE UNDERSIGNED:

1.1 have received and carefully reviewed all of the *Contract Documents*, including the Instructions to Tenderers, the specified edition of the "Master Municipal Construction Documents - General Conditions, Specifications and Standard Detail Drawings" and the following Addenda:

_____

_____

_____ ;
(ADDENDA, IF ANY)

1.2 have full knowledge of the *Place of the Work*, and the *Work* required; and

1.3 have complied with the Instructions to Tenderers; and

ACCORDINGLY WE HEREBY OFFER

2.1 to perform and complete all of the *Work* and to provide all the labour, equipment and material all as set out in the *Contract Documents*, in strict compliance with the *Contract Documents*; and

2.2 to achieve Substantial Performance of the Work on or before March 18, 2022; and
(WORK DURATION OR DATE)

2.3 to do the *Work* for the price, which is the sum of the products of the actual quantities incorporated into the *Work* and the appropriate unit prices set out in Appendix 1, the "*Schedule of Quantities and Prices*", plus any lump sums or specific prices and adjustment amounts as provided by the *Contract Documents*. For the purposes of tender comparison, our offer is to complete the *Work* for the "*Tender Price*" as set out on Appendix 1 of this Form of Tender. Our *Tender Price* is based on the estimated quantities listed in the *Schedule of Quantities and Prices*, and excludes *GST*.

WE CONFIRM: 3.1 that we understand and agree that the quantities as listed in the *Schedule of Quantities and Prices* are estimated, and that the actual quantities will vary.

WE CONFIRM: 4.1 that the following appendices are attached to and form a part of this tender:

4.1.1 the appendices as required by paragraph 5.3 of the Instructions to Tenderers – Part II; and

4.1.2 the *Bid Security* as required by paragraph 5.2 of the Instructions to Tenderers – Part II.

WE AGREE: 5.1 that this tender will be irrevocable and open for acceptance by the *Owner* for a period of 90 calendar days from the day following the *Tender Closing Date and Time*, even if the tender of another tenderer is accepted by the *Owner*. If within this period the *Owner* delivers a written notice ("*Notice of Award*") by which the *Owner* accepts our tender we will:

5.1.1 within 15 *Days* of receipt of the written *Notice of Award* deliver to the *Owner*:

.1 a Performance Bond and a Labour and Material Payment Bond, each in the amount of 50% of the Contract Price, covering the performance of the Work including the Contractor's obligations during the Maintenance Period, issued by a surety licensed to carry on the business of suretyship in the province of British Columbia, and in a form acceptable to the Owner;

.2 a Baseline Construction Schedule, as provided by GC 4.6.1;

.3 a "clearance letter" indicating that the tenderer is in Worksafe BC compliance; and

.4 a copy of the insurance policies as specified in GC 24 indicating that all such insurance coverage is in place.

5.1.2 within 2 *Days* of receipt of written "*Notice to Proceed*", or such longer time as may be otherwise specified in the *Notice to Proceed*, commence the *Work*; and

5.1.3 sign the Contract Documents as required by GC 2.1.2.

WE AGREE:

6.1 that, if we receive written *Notice of Award* of this *Contract* and, contrary to paragraph 5 of this Form of Tender, we:

6.1.1 fail or refuse to deliver the documents as specified by paragraph 5.1.1 of this Form of Tender; or

6.1.2 fail or refuse to commence the *Work* as required by the *Notice to Proceed*,

then such failure or refusal will be deemed to be a refusal by us to enter into the *Contract* and the *Owner* may, on written notice to us, award the *Contract* to another party. We further agree that, as full compensation on account of damages suffered by the *Owner* because of such failure or refusal, the *Bid Security* shall be forfeited to the *Owner*, in an amount equal to the lesser of:

6.1.3 the face value of the *Bid Security*; and

6.1.4 the amount by which our *Tender Price* is less than the amount for which the *Owner* contracts with another party to perform the *Work*.

OUR ADDRESS IS AS FOLLOWS:

_____

_____

Phone: _____

Fax: _____

Email: _____

Attention: _____

This Tender is executed this
_____ day of _____, 20 _____.

Contractor:

_____
(FULL LEGAL NAME OF CORPORATION, PARTNERSHIP OR INDIVIDUAL)

_____
(AUTHORIZED SIGNATORY)

_____
(AUTHORIZED SIGNATORY)

Appendix 1- Schedule of Quantities and Prices

Item	Description	Quantity	Units	Unit Price	Amount
1	**General Contract Considerations**				
1.01	Mobilization /Demobilization	1	LS		
1.02	Performance and Labor & Materials Bonds	1	LS		
1.03	Insurance	1	LS		
1.04	Health and Safety	1	LS		
1.05	Survey, Submittals, Record Drawings and Operation & Maintenance Manuals	1	LS		
	Sub-Total For General Contract Considerations				
2	**Civil and Earthworks**				
2.01	Excavate and Backfill Common Utility Trench - in Clean Fill or Native Soil	418	m		
2.02	Excavate and Backfill Common Utility Trench - in Waste	160	m		
2.03	Excavate and Backfill Electrical Trench	110	m		
2.04	Locate Existing Utilities	1	LS		
2.05	Supply and Install Leachate Discharge Structure	24	m		
2.06	Supply and Install Extraction Well Force Main and Discharge Pipe	602	m		
2.07	Supply and Install 1,200 mm Concrete Manhole	1	LS		
2.08	Construct Gravel Pad with Owner Supplied Pitrun	1	LS		
	Sub-Total For Civil and Earthworks				
3	**Mechanical - Leachate Extraction**				
3.01	Supply and Install Submersible Pump & Motor for EW19-03	1	LS		
3.02	Supply and Install Control Panel and SD20 VFD	1	LS		
3.03	Supply and Install Level Transmitter, Pump Hour Meter and Controls	1	LS		
3.04	Supply and Install Drop Pipe and Stainless Steal Pitless Adaptor	1	LS		
3.05	Supply and Install Stainless Steal Check Valve and Pipe to Pitless Adaptor	1	LS		
3.06	Supply and Install Yard Hydrant	1	LS		
3.07	Pump System Commissioning	1	LS		
	Sub-Total For Mechanical - Leachate Extraction				
4	**Electrical Works**				
4.01	Supply and Install Electrical Components at Kiosk 1	1	LS		
4.02	Supply and Install Pump Kiosk	1	LS		
4.03	Supply and Install Electrical Conduits	690	m		
4.04	Supply and Install Tech Cable Run, Single Conduit	690	m		
4.05	Pull Boxes Including All Hardware Components	2	Each		
	Sub-Total For Electrical Works				
	Grand Total Items 1 through 4				

Notes: Totals of this table to be carried forward to the summary below.

TENDER PRICE SUMMARY

Total from Schedule of Unit Prices and Estimated Quantities (Sub-Total for Items 1.01 through 4.05)	**$**_____
Goods and Services Tax **(GST at 5%)**	**$**_____
TOTAL TENDERED AMOUNT (Total for Items 1.01 through 4.05 including GST)	**$**_____

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

See paragraph 5.3.2 of the Instructions to Tenderers – Part II.

Indicate Schedule with bar chart with major item descriptions and time.

MILESTONE DATES
Total Performance is expected on or before April 1, 2022.
Substantial Performance is expected on or before March 18, 2022.
Notice of Award is expected on November 29th, 2021.
Notice to Proceed is expected on December 6th, 2021.

ACTIVITY	CONSTRUCTION SCHEDULE																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Tenderer's Initials _____

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

See paragraph 5.3.3 of the Instructions to Tenderers – Part II.

Name:
Experience:

Dates:
Project Name:
Responsibility:

References:

Dates:
Project Name:
Responsibility:

References:

Dates:
Project Name:
Responsibility:

References:

Dates:
Project Name:
Responsibility:

References:

Tenderer's Initials

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

See paragraph 5.3.4 of the Instructions to Tenderers – Part II.

PROJECT	OWNER / CONTACT NAME PHONE and FAX	WORK DESCRIPTION	VALUE ($)
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		
	Owner / Contract ________ Phone ( ) ____ Fax ( ) ____		

Tenderer's Initials ________________

	Owner / Contract _____ Phone ( ) _____ Fax ( ) _____		

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

See paragraph 5.3.5 of the Instructions to Tenderers – Part II.

TENDER ITEM	TRADE	SUBCONTRACTOR NAME	PHONE NUMBER

Tenderer's Initials _____

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

See paragraph 4.5 of the Instructions to Tenderers – Part I.

EQUIPMENT	MODEL	HOURLY RATE

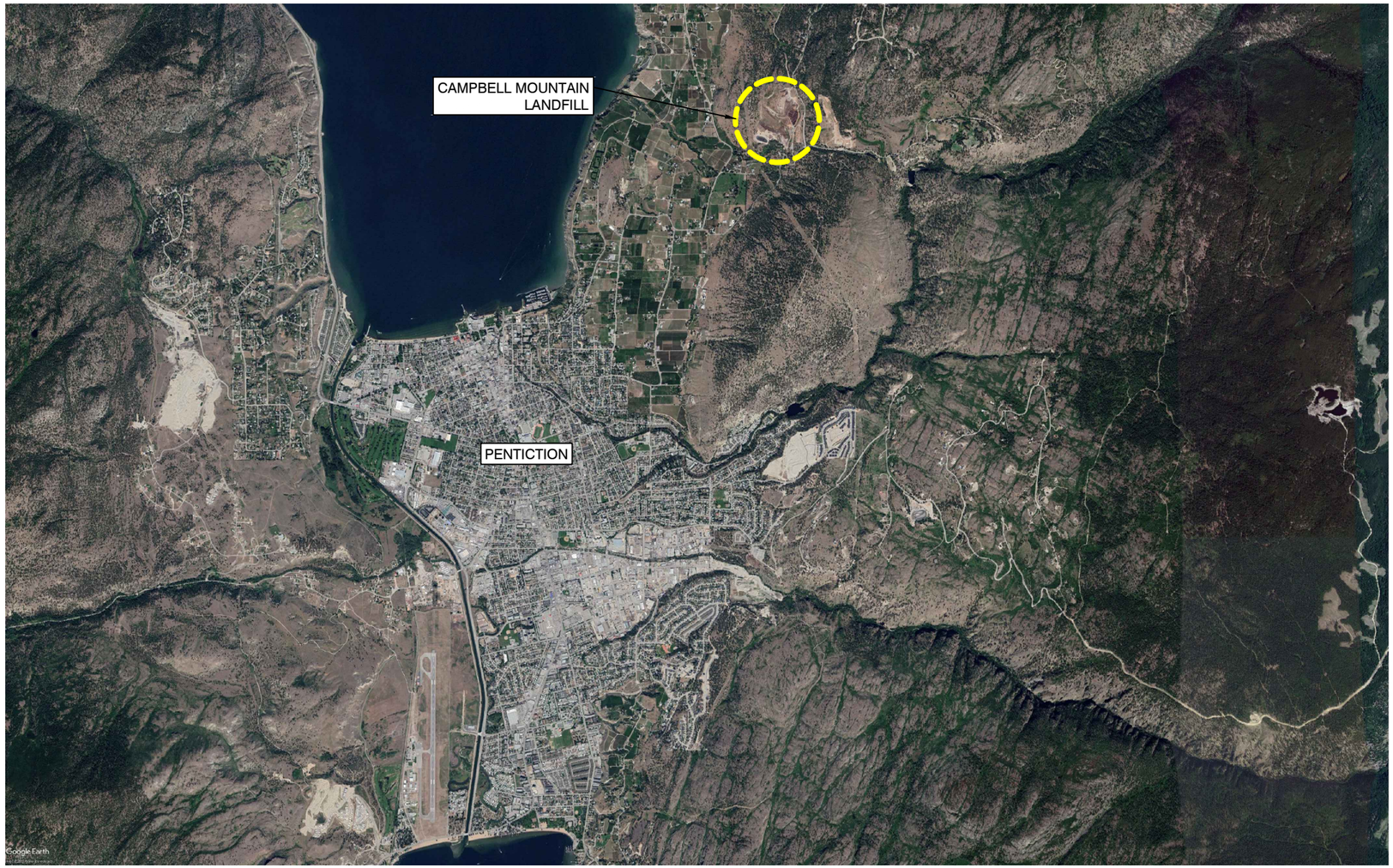
Tenderer's Initials _____

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

This section includes the Contract Documents as listed in Schedule 2 and shall be read with and shall form part of the Tender Form.

CAMPBELL MOUNTAIN LANDFILL
LEACHATE MANAGEMENT



DRAWING LIST

SHEET No.	DWG No.	REV.	TITLE
0	20039-00	A	SITE LOCATION MAP AND LIST OF DRAWINGS
1	20039-01	A	LEACHATE EXTRACTION AND CONVEYANCE WORK
2	20039-02	A	LEACHATE CONVEYANCE PIPE PROFILE
3	20039-03	A	LEACHATE CONVEYANCE AND TRENCH DETAILS
4	20039-04	A	EXTRACTION WELL AND MANHOLE DETAILS
5	20039-05	A	EXTRACTION WELL 19-03 PUMP CONFIGURATION

LEGEND

- 5m EXISTING CONTOUR
- 1m EXISTING CONTOUR
- ROAD
- FENCE
- PROPERTY LINE
- EXISTING DITCH
- EXISTING CULVERT
- SURFACE WATER MANHOLE
- SURFACE WATER PIPE
- PROPOSED LEACHATE CONVEYANCE PIPE
- PROPOSED LEACHATE CONVEYANCE PIPE PROFILE
- EXISTING GROUND PROFILE
- PROPOSED LEACHATE CONVEYANCE PIPE

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A	2021/09/20	ISSUED FOR REVIEW	AT	SG	--

CLIENT: REGIONAL DISTRICT RDOS OKANAGAN-SIMILKAMEEN

DESIGN BY:	--	DATE CREATED:	2021/10/13
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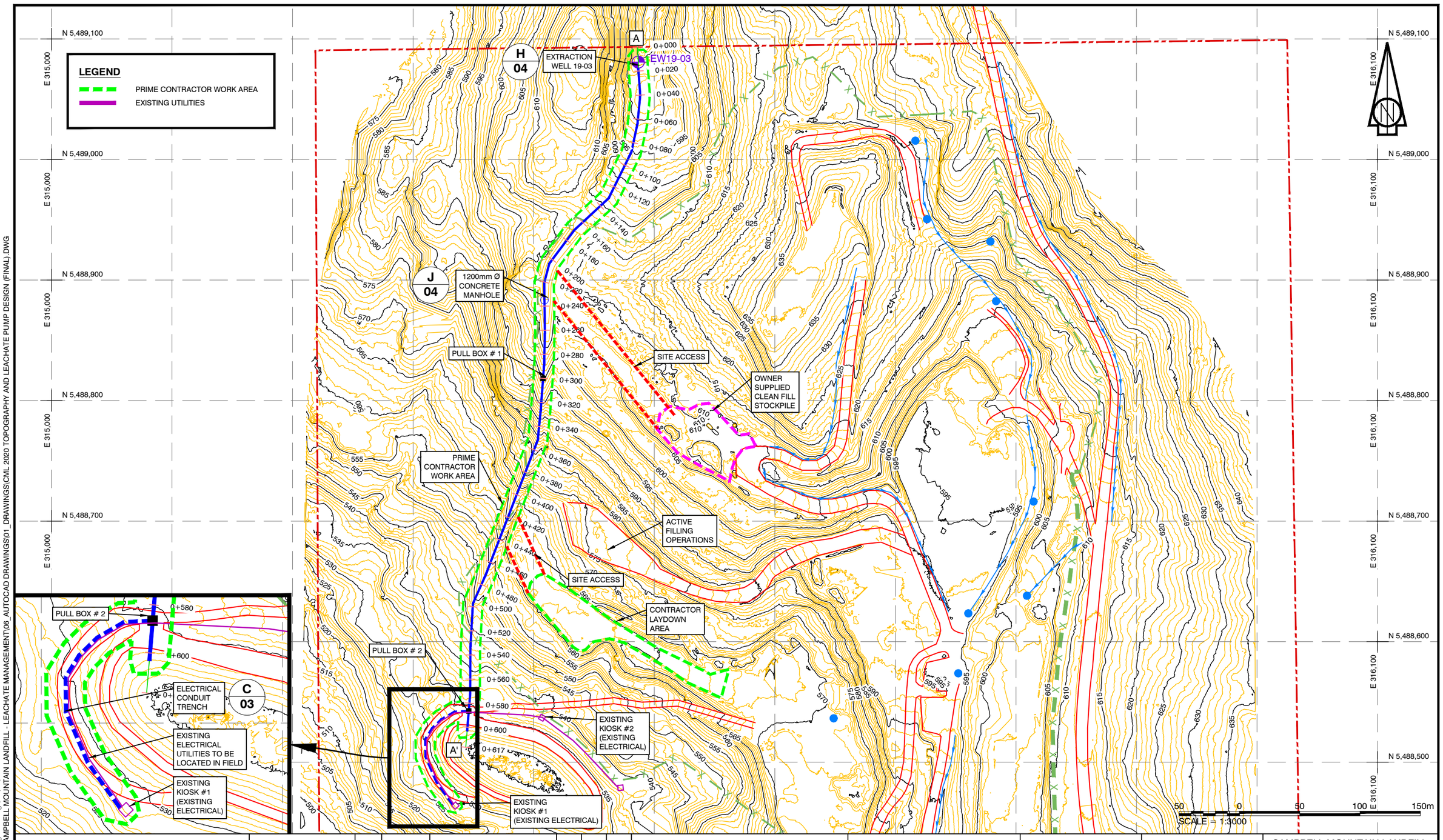
CHECKED BY:	SG	HORIZONTAL SCALE:	N.T.S.
APPROVED BY:	--	VERTICAL SCALE:	N.T.S.
SHA PROJECT #: PRJ20039			

CAMPBELL MOUNTAIN LANDFILL
LEACHATE MANAGEMENT

SITE LOCATION MAP AND LIST OF DRAWINGS

DRAWING NO:	REV	SHEET
20039-00	B	00



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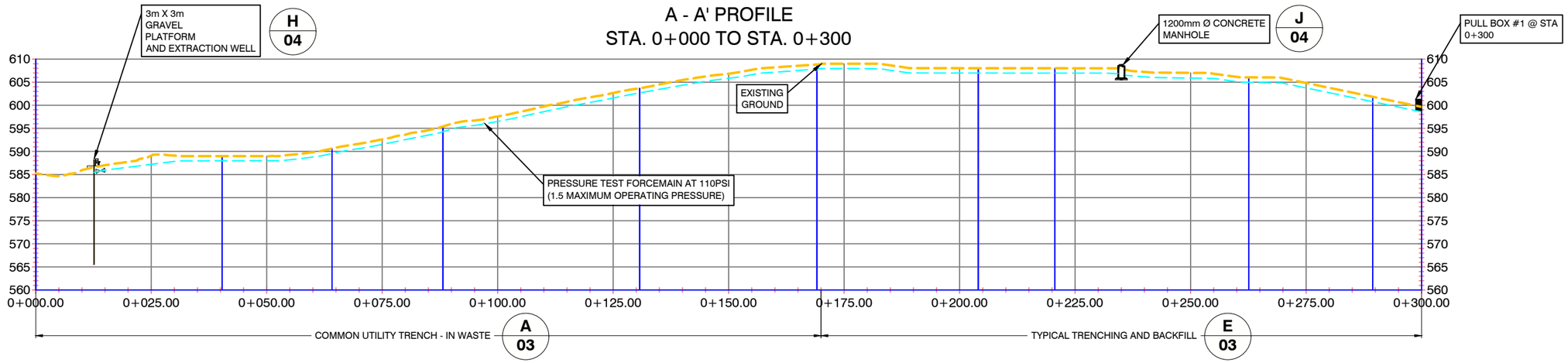
APPROVED BY:	--	VERTICAL SCALE:	1:3000
SHA PROJECT #:	PRJ20039		

CAMPBELL MOUNTAIN LANDFILL LEACHATE MANAGEMENT

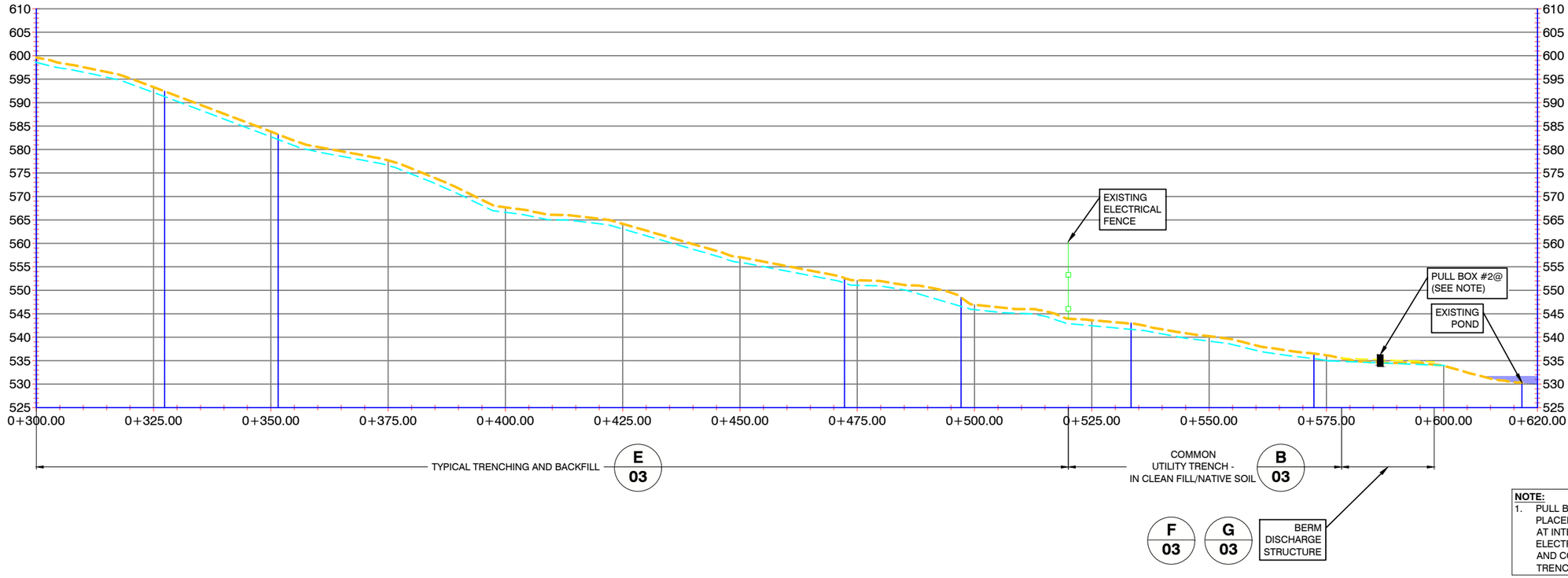
LEACHATE EXTRACTION AND CONVEYANCE WORK

DRAWING NO:	REV	SHEET
20039-01	B	01

A - A' PROFILE
STA. 0+000 TO STA. 0+300



A - A' PROFILE
STA. 0+300 TO STA. 0+620.42



NOTE:
1. PULL BOX TO BE PLACED AT 90° BEND AT INTERSECTION OF ELECTRICAL TRENCH AND COMMON UTILITY TRENCH

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DRAWN BY:	AT	FILE NAME: PRJ20039	
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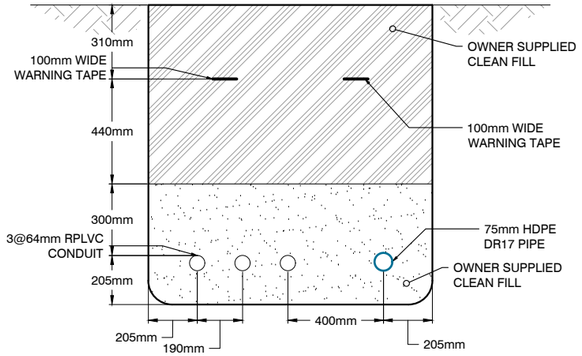
APPROVED BY:	--	VERTICAL SCALE: 1:1000	
SHA PROJECT #: PRJ20039			

CAMPBELL MOUNTAIN LANDFILL
LEACHATE MANAGEMENT

LEACHATE CONVEYANCE PIPE PROFILE

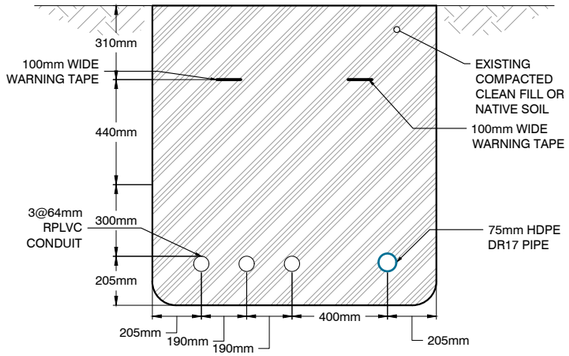
DRAWING NO:	REV	SHEET
20039-02	B	02



COMMON UTILITY PIPE TRENCH IN WASTE DETAIL

A 02

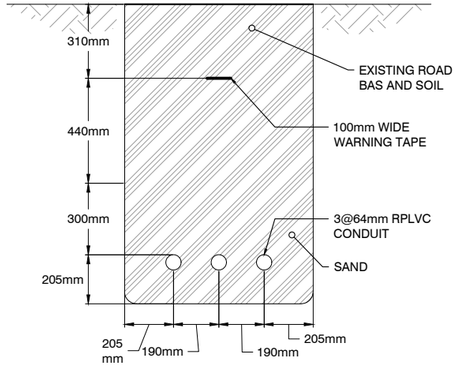
SCALE 1:25



COMMON UTILITY PIPE TRENCH IN CLEAN FILL OR NATIVE SOIL DETAIL

B 02 B 03

SCALE 1:25

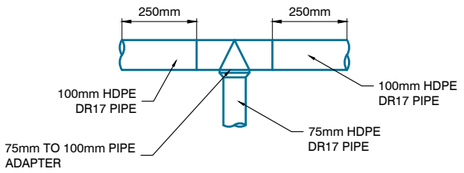


ELECTRICAL CONDUIT TRENCH DETAIL

C 01

SCALE 1:25

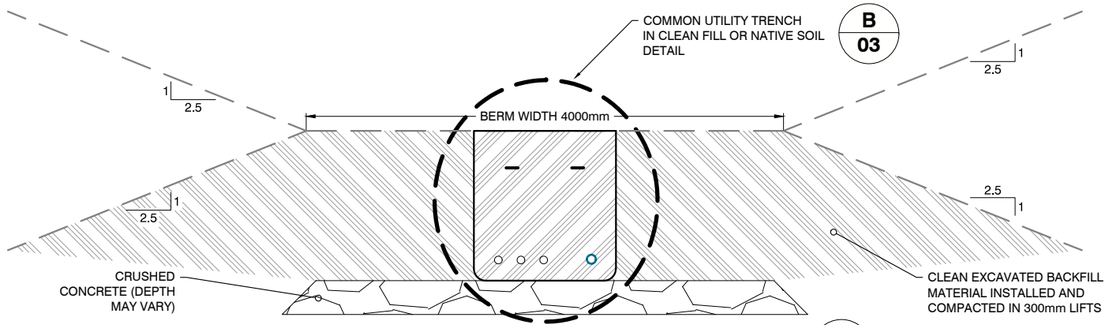
NOTE:
1. ALL FITTING TO BE MOLDED FITTINGS UNLESS SPECIFIED



DISCHARGE PIPE OUTLET DETAIL

D 03

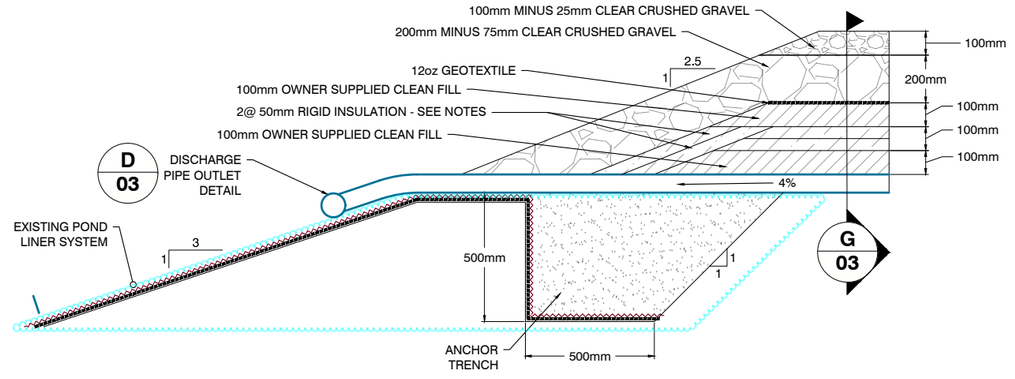
SCALE 1:25



TYPICAL TRENCHING AND BACKFILL DETAIL

E 02

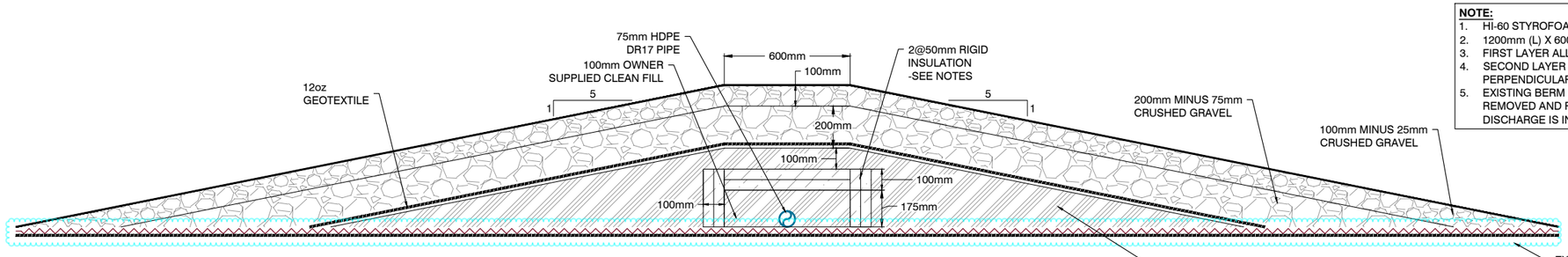
SCALE 1:50



EXTRACTION WELL DISCHARGE PIPE TO POND

F 02

SCALE 1:25



NOTE:
1. HI-60 STYROFOAM SHEET
2. 1200mm (L) X 600mm (W) X 50mm (T)
3. FIRST LAYER ALL SHEETS LAY ACROSS PIPE
4. SECOND LAYER ALL SHEETS PLACED PERPENDICULAR TO FIRST LAYER
5. EXISTING BERM ROAD SURFACE TO BE REMOVED AND REINSTALLED AFTER PIPING DISCHARGE IS IN PLACED

EXTRACTION WELL DISCHARGE PIPE BERM DETAIL

G 02 G 03

SCALE 1:25

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CLIENT:

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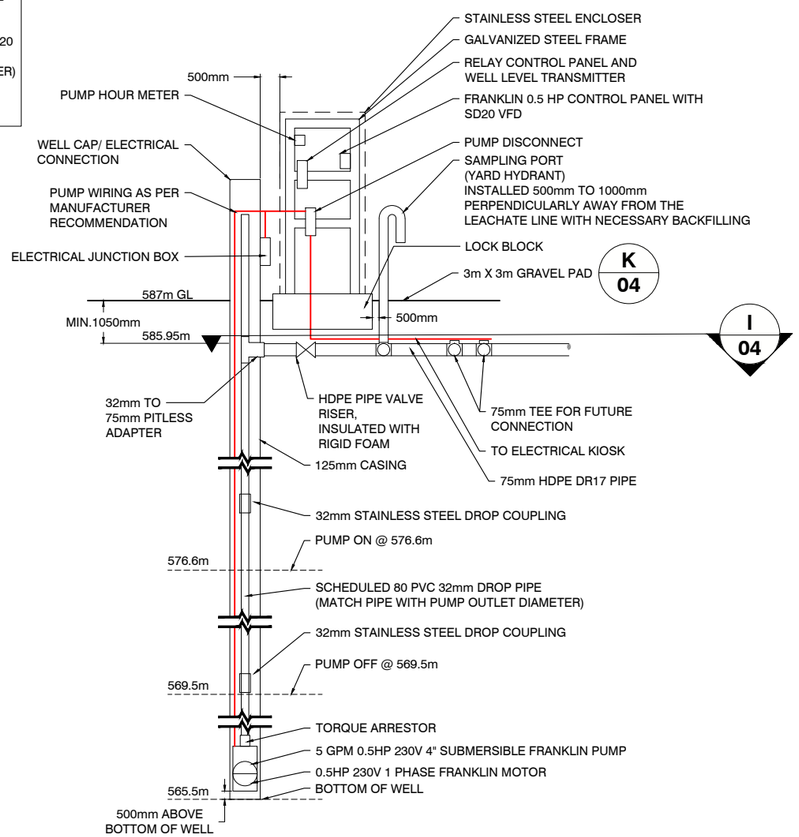
SHA PROJECT #: PRJ20039			

CAMPBELL MOUNTAIN LANDFILL
LEACHATE MANAGEMENT

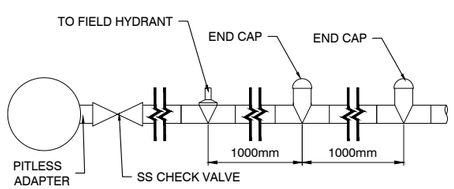
LEACHATE CONVEYANCE & TRENCH DETAILS

DRAWING NO:	REV	SHEET
20039-03	B	03

NOTE:
1. PROVIDE ANCHORAGE FOR PULL PIPE ABOVE THE PITLESS ADAPTER WITH CASING/CAP
2. LOCK BLOCK SHOULD BE INSTALLED TO PROVIDE SUFFICIENT SPACING FOR PIPE TRENCH
3. CONTRACTOR TO CONFIRM PUMP COMPATIBILITY WITH SD20 VDF CONTROLS AND LEVEL SWITCHES (LEVEL TRANSMITTER)
4. ALL HARDWARE SHOULD BE STAINLESS STEEL UNLESS SPECIFIED

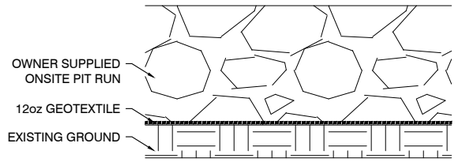


EXTRACTION WELL 19-03 DETAIL (H 01 / H 02)
SCALE 1:25

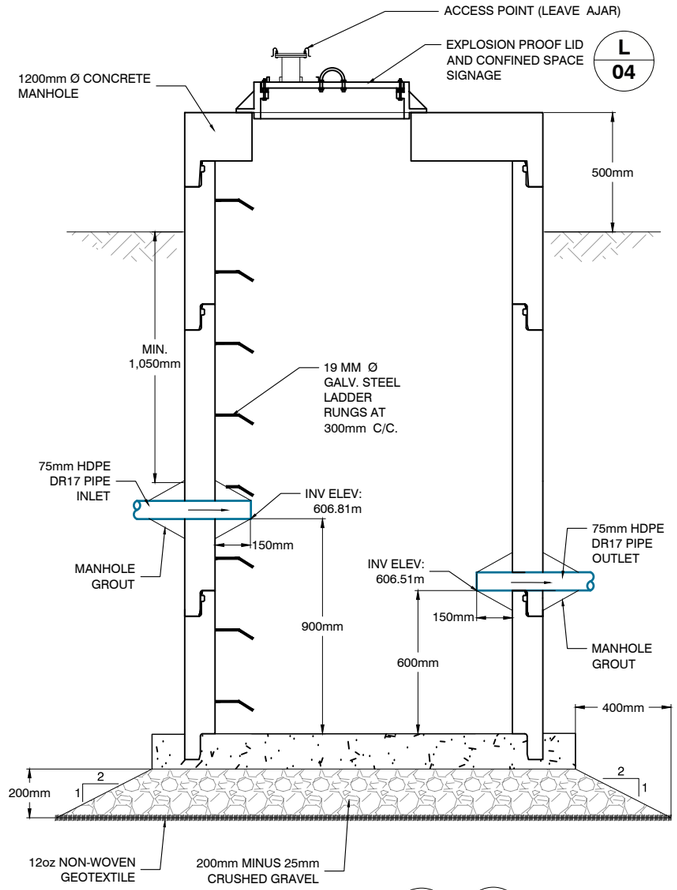


NOTE:
1. ALL FITTINGS ARE DR17 HDPE UNLESS SPECIFIED
2. ALL PIPE BRANCHES MIN. 600mm STUB OF SOLID PIPE NOT INCLUDING FITTING
3. PIPE CONNECTION TO FIELD HYDRANT REDUCED AS NEEDED

75mm FORCEMAIN AT EW19-03 DETAIL (I 04)
SCALE 1:25

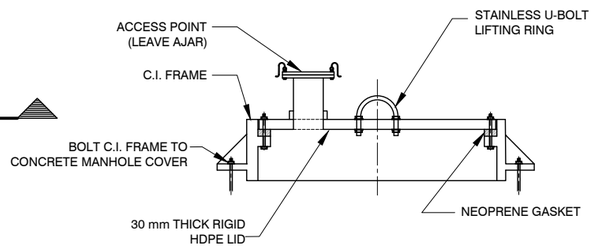


GRAVEL PAD DETAIL (K 04)
SCALE 1:25



MANHOLE DETAIL (J 01 / J 02)
SCALE 1:25

SECTION



SECTION

EXPLOSION PROOF LID DETAIL (L 04)
SCALE 1:25

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CLIENT: REGIONAL DISTRICT RDOS OKANAGAN-SIMILKAMEEN

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SHA PROJECT #: PRJ20039			

CAMPBELL MOUNTAIN LANDFILL
LEACHATE MANAGEMENT

EXTRACTION WELL & MANHOLE DETAILS

DRAWING NO:	REV	SHEET
20039-04	B	04

Extraction Well ID: EW19-03 (N. Ravine) **Client: RDOS**

Project: CML

Location: Penticton, B.C. **Project Number: 18-037-09**

western water ASSOCIATES LTD
Consultants in Hydrogeology and Water Resources Management

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details
ft / m		Ground Surface		6" steel casing in ground to 1.22 m bg (below ground surface). Not yet cemented for piping tie-in installation. Continuous 5" Schedule 40 PVC stick-up 0.60 m (1.97 ft).
0 / 0		**Sand (SP)** Light Brown; Medium sand with some gravel (5-10 mm subrounded); loose; dry		(Plan to) seal with bentonite chips from 0 m to 1.8 m bgs.
12 / 4		**Gravel (GM)** Gravel (5-70 mm subangular) with some fine to medium sand and trace silt; moist at 9.1 m		Natural fill from 1.8 m to 6.4 m bgs.
				1.5" annulus to depth of borehole
24 / 8				Sealed with bentonite chips from 6.4 m to 8.2 m bgs.
32		**Boulder**		5" PVC 10 slot screen from 9.1 m to 21.5 m bgs. Bottom screem plug 21.5 m (70.5 ft) bgs.
		Gravel (Gm) (same as 4.9 m to 9.5 m)		Pump On @ 10.6 m
36				Static Water Level 10.58 m (34.70 ft) August 6, 2019
40 / 12		**Fractured Bedrock** Wet		20-40 filter sand from 8.2 m to 15 m bgs
48		**Bedrock** Wet at 48' (possible fracture); otherwise dry		
52 / 16				
56				Pump Off @ 17.5 m
60			SUBMERSIBLE LEVEL TRANSMITTER	10-20 filter sand from 15 m to 21.5 m bgs
64 / 20				0.5HP, 230 Volt, 5 GPM Pump Bottom @ 19.96 m
68				
72				Total depth 21.5 m (70.5 ft) bgs.

Coordinates: 11U 315490m E 5489077m N
Static Water Level: 10.58 m bgs
Elevation: 592 m
Total Depth: 21.5 m (70.5 ft)

Drilling Contractor: Robbins Drilling and Pump Ltd.
Drilling Method: Air Rotary
Date of Completion: July 26, 2019

Checked By: BM
Drawn By: LM
Logged By: MJ

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SHA PROJECT #: PRJ20039			

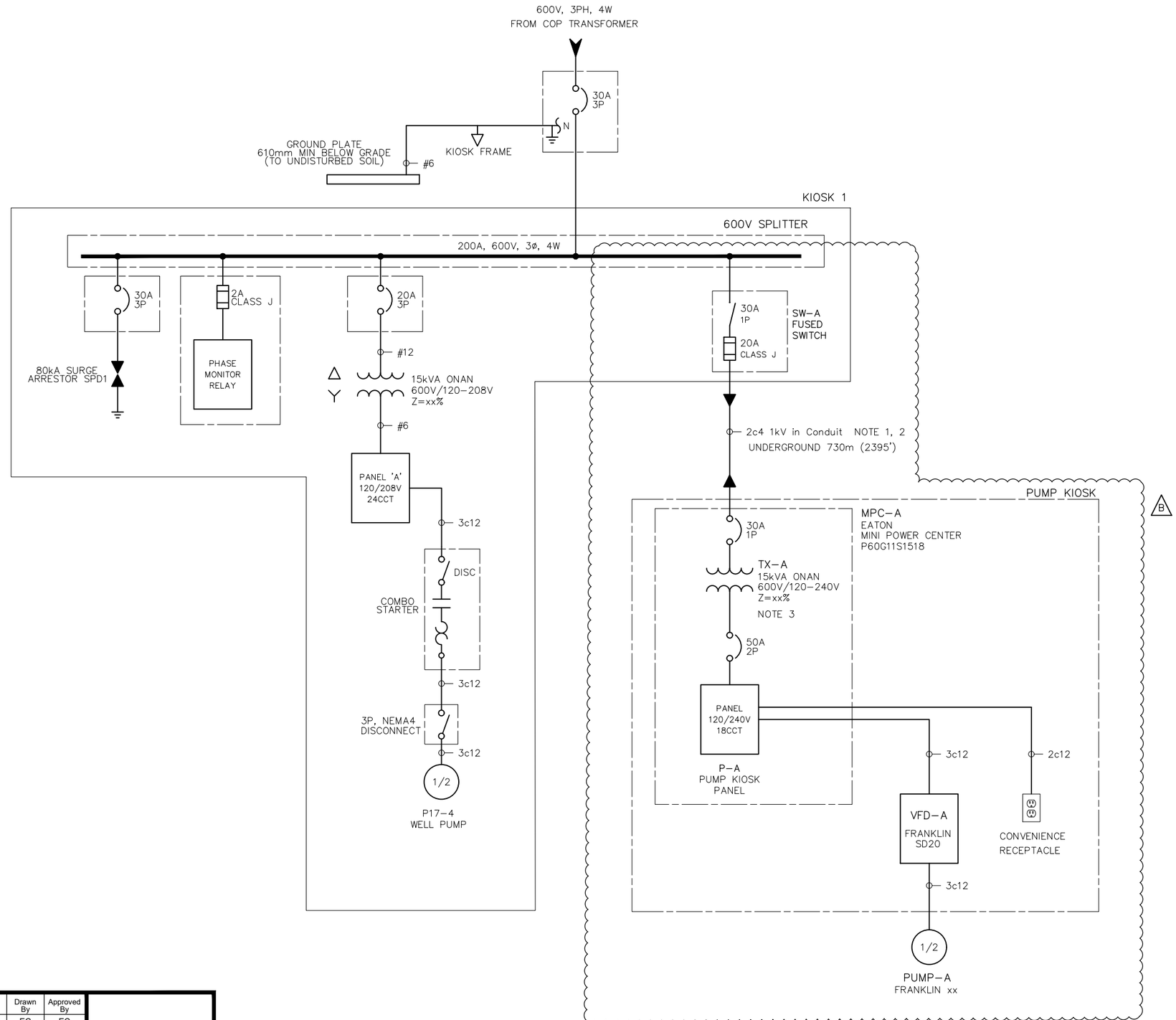
CAMPBELL MOUNTAIN LANDFILL
LEACHATE MANAGEMENT

EXTRACTION WELL 19-03 PUMP CONFIGURATION

DRAWING NO:	REV	SHEET
20039-05	B	05

NOTES:

1. CABLE RUN TO BE IN RIGID PVC CONDUIT FROM KIOSK 1 TO MINI POWER CENTER AT PUMP KIOSK. DB2 CONDUIT IS AN ACCEPTABLE ALTERNATIVE TO RIGID PVC FOR UNDERGROUND PORTIONS OF THE CABLE ROUTE.
2. 600V NEUTRAL (GROUND) CONDUCTOR TO BE IDENTIFIED WITH WHITE MARKING TAPE ON BOTH ENDS OF THE CABLE AS PER CEC 4–024.
3. GROUNDED CIRCUIT CONDUCTORS TO BE IDENTIFIED AS PER CEC 4–032. GROUND CONDUCTOR SIZE TO BE #6 AWG AS PER CEC 10–114.
4. BOND ALL EQUIPMENT AS PER TABLE 16A AND CEC 10–614.



	Date (dd/mm/yy)	Revision	Drawn By	Approved By
A	07/07/21	Issued for Review	EC	EC
B	07/09/21	Motor changed to single phase. Re-Issued for Review	EC	EC
C	15/10/21	Issued for Tender	EC	EC
D				
E				
F				
G				
H				

WESTWOOD ENGINEERING

655 Larkspur Road, Vernon, BC V1B 3J2
westwoodeng.com

	By	Date (dd/mm/yy)
Design	EC	07/07/21
Drawn	EC	07/07/21
Approved	EC	07/07/21

Scale: Not to Scale

Project title: Job No: 40643

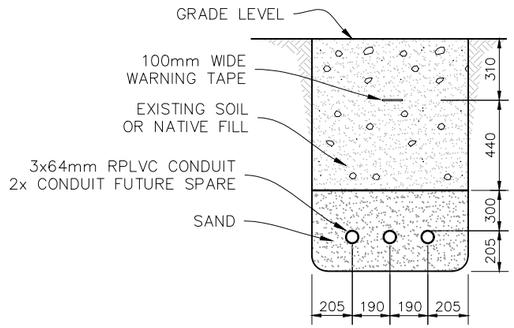
Houle Electric
Kelowna, BC
Campbell Mountain Landfill

Drawing title:
Leachate Line Pump System
One Line Diagram

Sht 1 of 1 Dwg No. CML-21-E100 Rev C

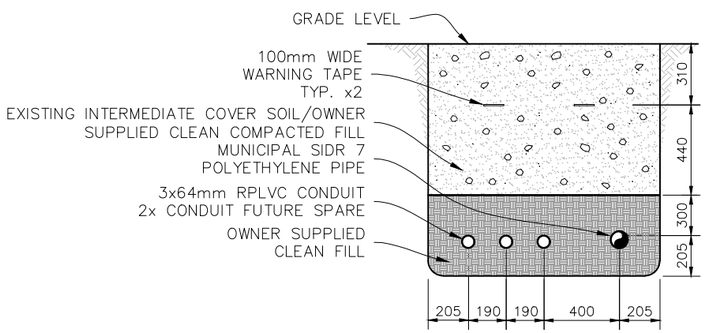
GENERAL NOTES:

1. ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH CANADIAN ELECTRICAL CODE, C22.1–18.
2. TRENCH LOCATIONS TO BE DETERMINED ON–SITE.
3. ALL 600V CONDUIT TRENCHES SHALL BE IN ACCORDANCE WITH DETAILS 'A' AND 'B'.



DETAIL 'A': 600V TRENCH

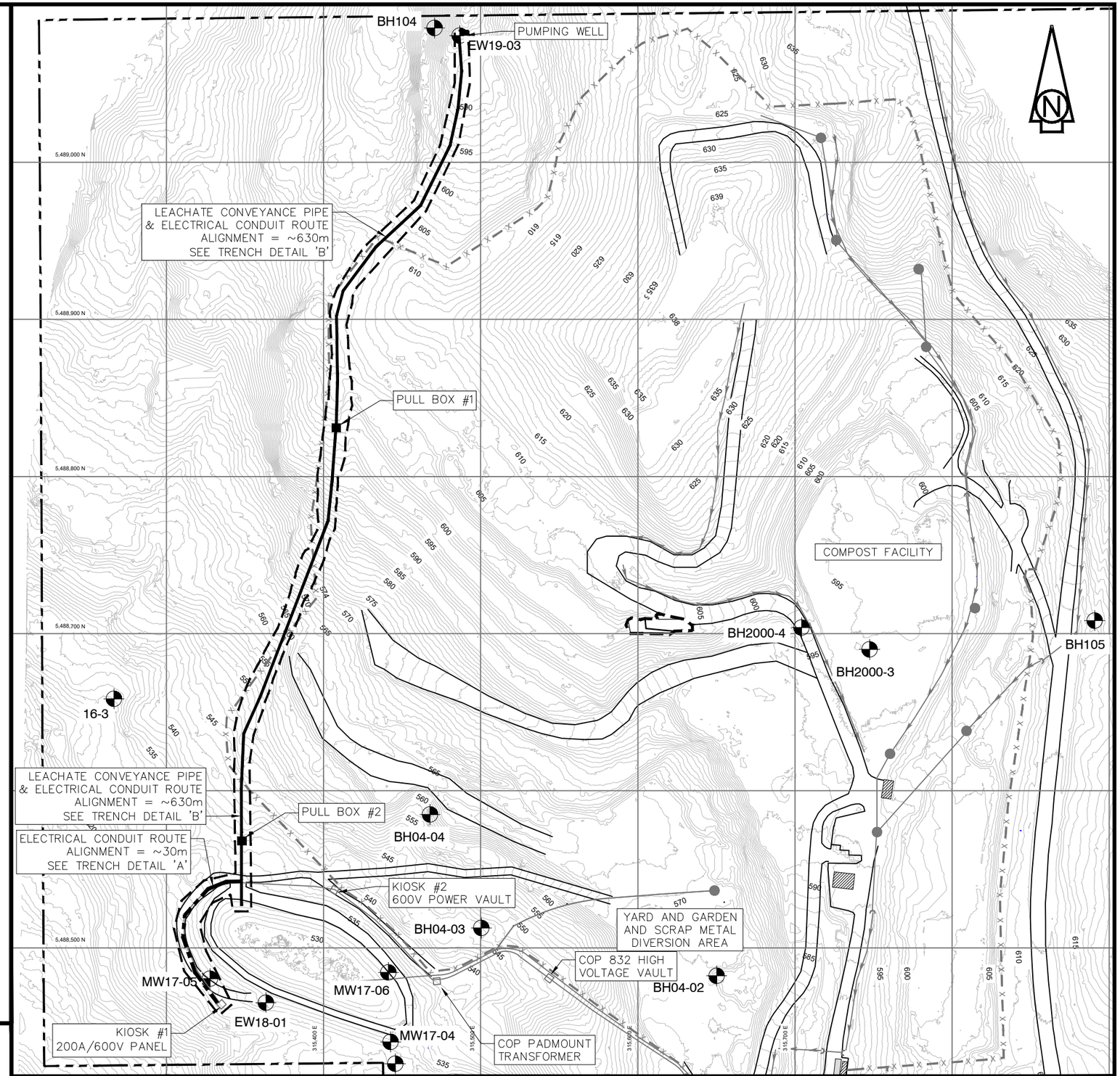
SCALE: N.T.S.



DETAIL 'B': 600V TRENCH w/ MUNICIPAL PIPE

SCALE: N.T.S.

	Date (dd/mm/yy)	Revision	Drawn By	Approved By
A	09/07/21	Issued for Review	AR	EC
B	13/09/21	Trench Routing Updated. Details 'A' & 'B' Revised. Re-Issued for Review	AR	EC
C	15/09/21	Detail 'A' & 'B' Electrical Conduit Revised. Re-Issued for Review	AR	EC
D	15/10/21	Details 'A' & 'B' Revised. Trench Location Updated. Issued for Tender	AR	EC
E				
F				
G				
H				



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	By	Date (dd/mm/yy)
Design	EC	09/07/21
Drawn	AR	09/07/21
Approved	EC	09/07/21
Scale:	Not to Scale	

Project title: Job No: 40643

Houle Electric
Kelowna, BC
Campbell Mountain Landfill

Drawing title:

Leachate Line Pump System
Electrical General Arrangement

Sht 1 of 1 Dwg No. CML-21-E200

Rev. D

NOTES:

1. EATON BR TYPE PUSH-IN BREAKERS TO BE ORDERED SEPARATELY. REQUIRE ONE (1) BR220 AND ONE (1) BR115.

PANEL SCHEDULE

TOTAL CONNECTED LOAD 7.5kW

INTERRUPTING CAPACITY 10kA AT 240V

BUS RATING xx AMPS 120/240 VOLTS

2P-50A

CKT NO.	DESCRIPTION	AMPS A	AMPS B	BREAKER SIZE
1		-		
3			-	
5				
7		-		
9			-	
11				
13		-		
15			-	
17				
				S/N

BREAKER SIZE	AMPS A	AMPS B	DESCRIPTION	CKT NO.
2P-20A	-		PUMP VFD FEEDER	2
		-		4
1P-15A			CONVENIENCE RECEPTACLE	6
	-			8
		-		10
				12
	-			14
		-		16
				18
GROUND				

NEUTRAL

TOTAL AMPERES 25 | 10

EQUIPMENT NO. MINI POWER CENTER

DESCRIPTION: PANEL

LOCATION: PUMP KIOSK

POWER SUPPLIED FROM

KIOSK 1
SW-A

PANEL DESCRIPTION

18 CIRCUIT, 120/240V 1PH-3W, xx AMP AL. BUS, TOP ENTRY, INTEGRAL TO MINI POWER CENTER, NEMA 3R.

	Date (dd/mm/yy)	Revision	Drawn By	Approved By
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B	07/09/21	Pump motor changed to single phase. Re-Issued for Review	EC	EC
C	15/10/21	Issued for Tender	EC	EC
D				
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Approved	EC	07/07/21

Scale: Not to Scale

Project title: Job No: 40643

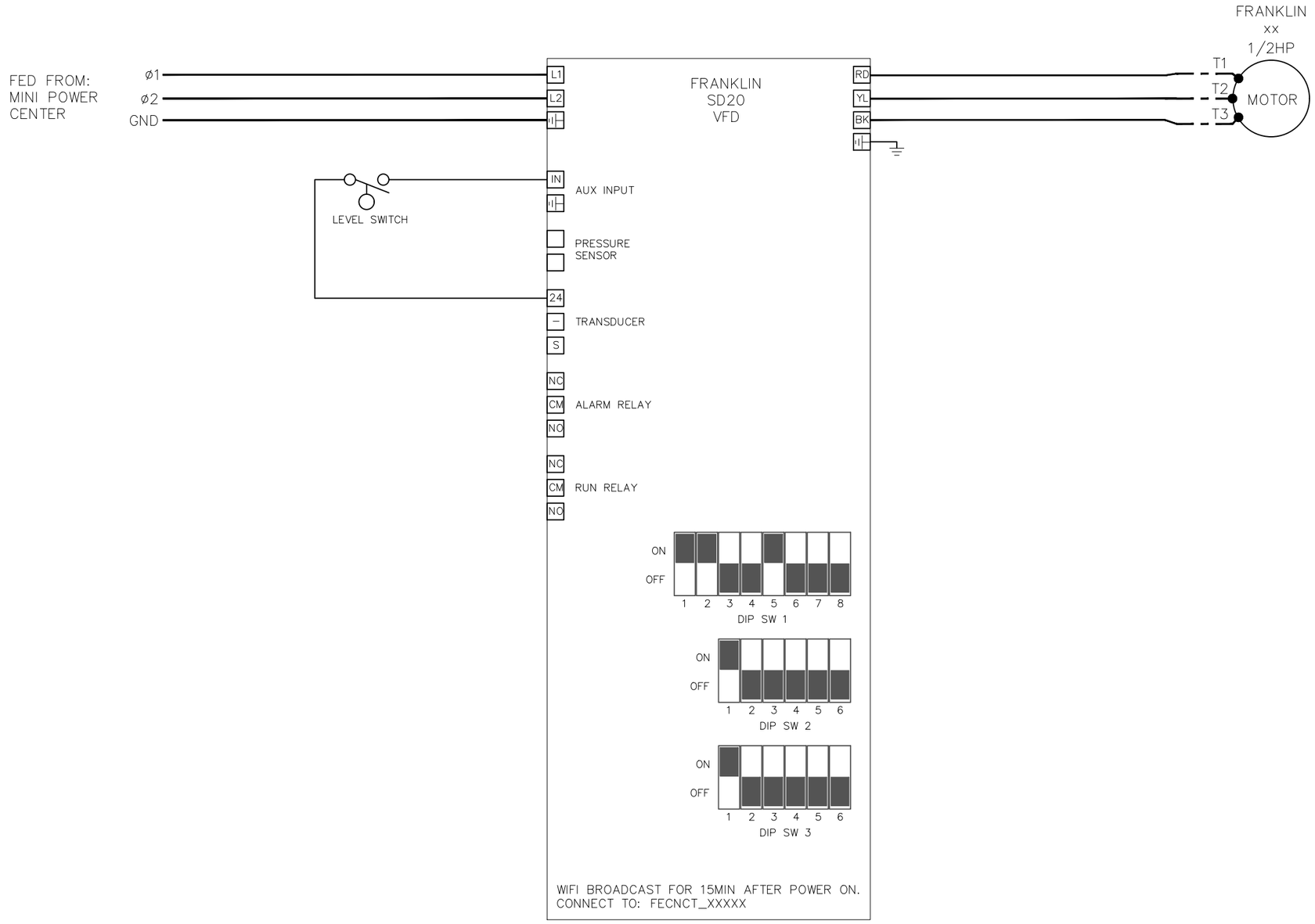
Houle Electric
Kelowna, BC
Campbell Mountain Landfill

Drawing title:

Leachate Line Pump System
Pump Kiosk Mini Power Center
Panel Schedule

Sht 1 of 1 Dwg No. CML-21-E210

Rev C



NOTES:

1. AUX INPUT TO BE SETUP FOR 'FAULT WITH LOW'. VFD WILL RUN WHEN LEVEL SWITCH CLOSES. VFD WILL STOP WHEN LEVEL SWITCH OPENS AND WILL SHOW FAULT 'F26'.

	Date (dd/mm/yy)	Revision	Drawn By	Approved By
A	07/07/21	Issued for Review	EC	EC
B	07/09/21	Pump motor changed to single phase. Re-Issued for Review	EC	EC
C	15/10/21	Issued for Tender	EC	EC
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Design	EC	07/07/21
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Scale:	Not to Scale	

Project title: Job No: 40643

Houle Electric
Kelowna, BC
Campbell Mountain Landfill

Drawing title:
Leachate Line Pump System
VFD Schematic

Sht 1 of 1 Dwg No. CML-21-E800 Rev C

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

This section shall be read with and shall form part of the Tender Form. This section shall take precedence over the MMCD Specifications.

Schedule A

8.2 SUPPLEMENTARY GENERAL CONDITIONS

SGC.1 HOURS OF WORK; WORK AREAS

The Contractor must comply at all times with the Regional District Okanagan Similkameen (RDOS or Regional District) Noise Control By-Law and verify the hours within which construction work may be performed. No work noise shall be created except as permitted by all applicable RDOS by-laws.

The Regional District's forces work at the Campbell Landfill (the Landfill Site) between the hours of 8:30 A.M. and 4:45 P.M. Monday through Saturday and 8:30 A.M. and 4:45 P.M. on Seasonal Sundays (March 1st to end of November) and the landfill is open all statutory holidays (March 1st to the end of November) and the landfill is closed on Sundays (December to end of February), Sundays or "holidays" as defined in the *Employment Standards* of British Columbia). Work will not be performed by RDOS forces or RDOS inspectors outside these hours except by special arrangement agreed to by the Consultant or in case of an emergency. The Consultant will be made available for all critical stages in accordance with notification requirements. Where deemed necessary, work performed in the absence of a required inspection is not permitted. Notwithstanding any other provision hereof, the District shall not pay overtime labour rates to the Contractor (for example, but without limitation, in relation to any Force Account Work), unless the payment of overtime has been specifically approved in writing by the RDOS, and the Contractor hereby acknowledges that such overtime labour and equipment rates shall only be considered by the RDOS if the Contractor is required to work in excess of ten (10) hours per day or in excess of six days per week to complete the Work.

The Contractor will confine its performance of the Work to the limits of the areas noted on the Drawings, except that the Contractor will be entitled to utilize the roads within the Landfill Site for transporting its labour and equipment to and from such Work areas and except also that the Contractor may place its Site office within an area approved by the Consultant and Regional District.

SGC.2 WORK WITH CONSULTANT AND COORDINATION ON SITE

The Work shall be done in accordance with the Contract Documents and to the satisfaction of the Contract Administrator (also referred to in the Contract Documents as "Engineer" and "Owner's Representative"). The Contractor shall coordinate the Work with the Contract Administrator, the Owner and other contractors, as necessary. The Contractor shall have no cause for claim against the Regional District whatsoever with

respect to delays or other interruption of the Work by the Regional District forces or due to the above requirement to coordinate the Work with the Contract Administrator, the Owner and other contractors.

The Contractor will be responsible for completing the Work in a way that does not hinder other work on the Landfill Site being conducted either by the Regional District or third parties. The Contractor will have no cause for claim against the Regional District whatsoever with respect to delays or other interruption of the Work due to the above requirement to complete the Work in a way that does not hinder other work on the Landfill Site.

Notwithstanding any other provision hereof, it is expressly hereby agreed that the Contractor's rights to access the Landfill Site shall at all times be subordinated to the rights of other contractors already performing operations at the Landfill Site as of the date of the Agreement.

SGC.3 DESIGN AND INSPECTION

The Consultant has been hired by the Regional District as the Contract Administrator, consultant to complete the Specifications and Drawings, be the payment certifier and conduct inspections during the performance of the Work. The Contractor must allow inspectors from the Consultant and the Regional District to perform their reviews and inspections during the Work so that all design standards, specification requirements, quantities and prices may be independently verified.

SGC.4 TRAFFIC MANAGEMENT AND COORDINATION

The Contractor will not use the Site for the parking of its employees or other vehicles, except for those actively and reasonably required for the performance of the Work. Vehicle traffic within the Site must be limited to Work purposes, such as grading, staging and delivery. All Work shall be in full compliance with WorkSafeBC requirements and guidelines.

The Traffic Control Plan shall be approved by the Engineer prior to commencing any Work.

SGC.5 TRUCK SAFETY

All truck operators must comply with the Regional District by-laws regulating truck use, including truck route, engine brake noise, and weight and load securement provisions, and must also comply with the speed limit at the Campbell Mountain Landfill, as posted.

SGC.6 CONSTRUCTION DURING INCLEMENT WEATHER

In accordance with the Specifications, placement, compaction and/or installation of materials shall not be conducted while it is raining or snowing, when ground conditions are wet, or in poor sub-grade conditions, unless approved by the Consultant.

The Consultant may order the Contractor to cease certain operations due to inclement weather at any time.

There will be no extensions to the Construction Schedule granted and no extra compensation payable on account of delays caused by inclement weather. Any costs incurred by the Contractor to accelerate the Work in order to achieve the Construction Schedule will be borne solely by the Contractor.

SGC.7 DUST AND ODOUR CONTROL

The Contractor shall at all times control the generation of dust by its operations by water sprinkling or by other methods approved by the Contract Administator. There is no available water supply at the Campbell Mountain Landfill. The Contractor is also responsible for regular maintenance on the Work Site and any attributable road cleanliness on the Landfill Site and adjacent public roads, including but not limited to road sweeping and vehicle washing, in order to reduce any accumulated dust and other debris.

SGC.8 SUBSURFACE CONDITIONS

The Contractor now acknowledges that it is experienced and familiar with assessing and working with the variable and unpredictable nature of compacted landfill waste and unknown material and sub-surface conditions and acknowledges that the Owner has made available to the Contractor all available information concerning the relatively unknown state of decomposition, compaction, and composition of the residential, commercial and industrial waste, demolition material, and other matter comprising the subject matter of the Work. The Contractor now assumes all risks of any kind or nature associated with performing the Work on and in landfill waste, whether or not such risks arise due to the reasonably foreseeable consequences of working in and around landfill waste, and whether or not such risks are the result of sub-surface conditions which were not known to the Contractor at the time of submitting the Contractor's Tender, and the Contractor now agrees not to make any claim for an extension of Contract Time or additional compensation for anything arising during the Contract which would not have occurred but for the existence of landfill waste.

The Contractor shall be solely and fully responsible to take all necessary measures to protect underground utilities from any excavation damage within the worksite. The

Owner has indicated the presence of underground utilities (underground facilities) known to be within the proposed area of excavation on the Construction Drawings issued for Tender. The location of underground utilities as identify in the Drawings shall be considered approximate and for information only. The underground utilities include, but not limited to electrical conduits and cables, water and sewage pipes. Irrespective of the depth of the utility line, the Contractor must not use mechanical excavating equipment to dig within the boundary limits to expose the utility line. Hydrovac excavation or equivalent can be used as an alternative to hand digging.

SGC.9 ENVIRONMENTAL PROTECTION AND SUSTAINABILITY

The Contractor shall give prime consideration to protecting the environment during all stages of construction and shall cooperate fully with Owner, Consultant, Site operating personnel, and appropriate authorities to protect the natural environment.

Inspectors from the Ministry of Environment and Climate Change Strategy (ENV) and other authorities having jurisdiction may make periodic visits to the Site during construction. They have the authority to order the Contractor to stop work if in their opinion work is not being completed in accordance with existing regulations and approvals applicable to Work. The Contractor must provide at all times proper facilities for safe access to the Work by authorized government officials.

The Contractor will provide environmentally sensitive products or services wherever possible. Where the Contract Documents require that the Contractor supply materials, and where such materials may cause adverse effects, the Tenderer is to notify the Consultant of the nature of the hazard. The Contractor is to advise the Consultant of any known alternatives or substitutes for such materials that would mitigate the effects of any adverse conditions on the environment.

SGC.10 FORCE ACCOUNT

Payment for Force Account Work performed by the Contractor shall be calculated as follows:

(a) Labour: at the lower of the hourly rates set out in the Contractor's Tender under Schedule E- Force Account Labour & Equipment Rates including all amounts paid for labour and all related taxes, assessments payable as required by any statutory scheme such as workers' compensation premia, employment insurance premia, holiday pay, insurance and all employee benefits. A mark-up of 3% on the foregoing shall be allowed for all small tools. A mark-up of 10% on the total of the foregoing, including the foregoing mark-up, shall be allowed for overhead. A further mark-up of 10% on the total of the foregoing, including the foregoing mark-ups, shall be allowed for profit. Over time rates will be determined as outlined in SGC.1.

(b) Equipment shall be paid for in the lesser of:

I. Contractor Owned or Bare Rented: at the non-operated hourly rates as set out in Schedule E- Force Account Labour & Equipment Rates, based on actual hours, in minimum increments of 0.5 hours, plus a 10% mark-up to cover all overhead costs and profit. Plus, an allowance for the operator wage as per subsection (a); or

II. Non- Contractor Owned and Operated: at the lower of the rate presented in Schedule E- Force Account Labour & Equipment Rates for operated equipment, or the actual rental costs incurred by the Contractor, as evidenced by invoice, plus, in either case, a 10% mark-up to cover all overhead costs and profit.

III. All Found (AF) rates as presented in the Equipment Rental Rate Guide by BC Road Builders & Heavy Construction Association (Blue Book). If a particular equipment is not listed then a rate determined by the Consultant based on equivalent equipment shall be used.

Separate rental for small tools will not be allowed.

(c) Materials incorporated into the work or consumed in performing the Work: at the Contractor's actual cost, as evidenced by invoice, including all transportation, freight and haulage costs plus a mark-up of 10% on such actual cost to cover all overhead, handling and profit.

Force Account Work performed by a Subcontractor (or a subcontractor of a Subcontractor) shall be paid for in the lesser of: (i) the amount as provided by subparagraphs (a), (b) and (c) above (as if the Subcontractor, or such subcontractor of a Subcontractor, were the Contractor), plus a mark-up of 10%, in total, to cover all overhead and profit of the Contractor, the Subcontractor and any such other subcontractor; or (ii) the actual amount the Contractor pays the Subcontractor, plus a mark-up of 10% on such actual amount to cover all overhead and profit.

SGC.10 COMPLIANCE WITH LAWS

The Contractor will complete the Work in accordance with the requirements of all Applicable Laws.

The Contractor will be required to obtain and pay for any applicable municipal, provincial and federal permits and licenses necessary for the proper completion of the Work. The Regional District will not be liable in any manner for the same and the Contractor agrees to indemnify and save the Regional District from and against all claims and Losses in relation to obtaining and paying for any applicable municipal, provincial and federal

permits and licenses necessary for the proper completion of the Work. Extra compensation will not be allowed for costs incurred by the Contractor as a result of the failure of the Regional District or the Contractor to secure construction permits such that the Contractor can proceed with the Work in accordance with the Construction Schedule.

SGC.11 PRICING

The Tendered Price will represent the entire cost excluding GST to the Owner of the complete Work based on the estimated quantities in the Schedule of Quantities and Prices of the Form of Tender. Notwithstanding the generalities of the above, tenderers shall include in the tendered prices (including unit prices, lump sum prices, or other forms of pricing) sufficient amounts to cover:

(a) The cost of all labour, equipment and material included in or required for the Work, including all items which, while not specifically listed in the Schedule of Quantities and Prices, are included in the Work specifically or by necessary inference
(b) from the Contract Documents*;*
(c) All assessments payable with respect to labour as required by any statutory scheme such as unemployment insurance, holiday pay, insurance, CPP and all employee benefits and the Workers Compensation Act;
(d) All overhead costs, including head office and on-site overhead costs, and all amounts for the Contractor's profit.

The tendered prices and all subcontracts must allow for compliance with all applicable laws regarding trade or other qualifications of employees performing the Work, and payment of appropriate wages for labour included in or required for the Work.

SGC.12 QUANTITY VARIATION

If for any reason, including an addition or deletion of work, the actual quantity of a unit price item listed in the Schedule of Quantities and Prices varies, neither the Contractor nor the Owner shall be entitled to unilaterally revise the unit price of said item. The unit rates set out in the Schedule of Quantities and Prices shall be considered fixed.

SGC.13 VARIANCE THRESHOLD PERCENTAGE

GC 1.76 "Variance Threshold Percentage" is hereby amended by changing the variance from 15% to 25%. The amended GC 1.76 "Variance Threshold Percentage" reads:

"Variance Threshold Percentage" means a variance of 25% between the quantity of a unit price item actually constructed or provided by the time of Total Performance and the quantity shown on the tendered Schedule of Quantities and Prices for that item.

SGC.14 DAMAGES TO OTHER CONTRACTORS

If in the performance of the Work the Contractor causes damages to another Contractor, the Contractor shall use best reasonable efforts to reach a settlement with the Other Contractor. If another Contractor commences litigation or arbitration proceedings against the Owner on account of damage that the Other Contractor alleges was caused by the Contractor, then the Owner shall so notify the Contractor in writing. On written demand from the Owner, the Contractor shall, at the Contractor's own expense, reasonably cooperate with the Owner in the defence of the Other Contractor's claim, or assume the entire defence of the Owner. If a final order or judgement is given in such litigation or proceeding against the Owner the Contractor shall pay or satisfy it and pay all defence costs reasonably incurred by the Owner.

SGC.15 WILDFIRE PREVENTION AND MITIGATION

The Contractor will be responsible at its own cost to comply with the Wildfire Act and perform its activity in such manner to reduce the risk of wildfires and to minimize the impact if a wildfire does occur. As soon as the Fire Danger Rating as defined by the Canadian Forest Fire Danger Rating System is above Moderate, the Contractor will be responsible to supply and maintain at its own cost, for as long as needed, fire suppression equipment consisting of mobile water supply apparatus complete with high flow water pump. The Contractor will be responsible at its own cost to bring water to site for construction purposes, dust and fire suppression.

Campbell Mountain Landfill Leachate Management

(TITLE OF CONTRACT)

This section shall be read with and shall form part of the Tender Form. This section shall take precedence over the MMCD Specifications.

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SECTION 00 73 19

SITE HEALTH AND SAFETY REQUIREMENTS

007319 SITE HEALTH AND SAFETY REQUIREMENTS

007319.1 GENERAL

007319.1.1 Section Includes

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B. Site Specific Health and Safety Plan

C. Site Health and Safety Officer

D. Safety Provisions Related to Operations at Landfill

E. Contractor Safety Equipment and Monitoring Instruments

F. Additional Safety Requirements

007319.1.2 Background

007319.1.3 General Safety Provisions

A. The work area shown on the drawing is adjacent to the west of the the Campbell Mountain Landfill that has been filled with a variety of materials, including asbestos and large waste. Therefore, the Contractor shall exercise caution during all work below the ground surface. In particular, asbestos, landfill gas, and large-sized waste may be encountered in some excavation areas and must be dealt with safely by the Contractor. Large-sized waste must be excavated carefully by the Contractor so that nearby utilities are not disturbed. The Contractor shall be responsible for damage caused to utilities during the excavation process.

B. The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons (including employees) and property during the performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to Provincial Standards, and all other applicable federal, provincial, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent shall be followed. The Contractor's failure to thoroughly familiarize himself/herself with the aforementioned safety provisions shall not relieve him/her from compliance with the obligations and penalties set forth therein.

C. The Contractor shall develop and maintain for the duration of this Contract, a safety program that will effectively incorporate and implement all required safety provisions.

The Contractor shall appoint an employee who is qualified and authorized to supervise and enforce compliance with the safety program.

D. The duty of the Owner does not include review or approval of the adequacy of the Contractor's safety program, safety supervisor, or any safety measures taken in, on, or near the Project site.

E. The Contractor, as part of his safety program, shall maintain at his office or other well-known place at the Project site, safety equipment and instruments applicable to the work as prescribed by the aforementioned authorities, all articles necessary for giving first aid to the injured, and shall establish the procedure for the immediate removal to a hospital or a doctor's care of persons (including employees) who may be injured on the Project site.

F. If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Engineer and the Owner. In addition, the Contractor must promptly report in writing to the Owner all accidents whatsoever arising out of, or in connection with, the performance of the Work whether on, or adjacent to, the Project site, giving full details and statements of witnesses.

G. If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer and the Owner, giving full details of such claim.

H. The Contractor shall make provisions for other Owner contractors to safely transit through the designated work area for this contract on an as needed basis. The contractor for this contract will be designated prime contractor in the work area shown on the drawing.

007319.1.4 Submittals

A. Submit Contractor's Site Specific Health and Safety Plan for project records.

007319.1.5 Site Specific Health and Safety Plan

A. The Contractor shall develop and maintain for the duration of this Contract, a Site Specific Health and Safety Plan that will effectively incorporate and implement all required Municipal, Provincial (Workers' Compensation Board Occupational Health and Safety Regulation), and Federal safety provisions. The Contractor shall provide a written Site Specific Health and Safety Plan for the construction within 7 days of Notice to Proceed and maintain at least one copy at the work site at all times.

B. Preparation of the Site Specific Health and Safety Plan is solely the Contractor's responsibility and no statement made in these provisions shall relieve Contractor of sole

responsibility for information included and implementation of the Site Specific Health and Safety Plan.

C. Submission of the Site Specific Health and Safety Plan is solely for evidence of compliance with the Contract Documents, and for reference and general information. Submission and subsequent review by Engineer or Owner shall not relieve Contractor from sole responsibility as to the adequacy of its Site Specific Health and Safety Plan.

D. The Engineer's or Owner's review of the Contractor's performance is not intended to include a review or approval of the adequacy of the Contractor's safety supervisor, safety program or any safety measures taken in, on, or near the Site.

E. The Contractor's Site Specific Health and Safety Plan should include, but not be limited to, the following:

a. A list of chemical and physical hazards (such as exposure to methane and/or, asbestos contaminated material, electrical shock, etc.), allowable exposure levels, threshold limit values, other regulatory exposure levels, fall hazard, and the emergency response should an exposure or injury occur.

b. An emergency evacuation plan for immediate removal to a hospital or a doctor's care any person who may be injured on the job site including an evacuation plan route to medical treatment, and emergency telephone numbers including hospital, ambulance, fire, sheriff and/or police, poison control, the Owner, and others as deemed necessary.

c. A list of safety equipment and monitoring instruments at the job site and locations where equipment and instruments are stored or expected to be maintained.

d. Monitoring instrument action levels, frequency of testing, and recommended responses.

e. Procedures for entering confined spaces.

F. Contractor shall inform all workers and the public visiting the site of the potential for the presence of methane and other landfill gases emanating from the natural decomposition of refuse buried at or near the job site, and the importance of safety precautions to ensure the safety of all workers and the public. Contractor shall also instruct all workers and maintain strict control of construction activity to protect and maintain the integrity of the landfill. The Contractor, as a part of his/her safety program, shall maintain at the job site, safety equipment applicable to the work as prescribed by the governing safety authorities and all articles necessary for giving first aid to the injured.

G. The Contractor shall inform all workers and the public visiting the area of work of the potential for exposure to asbestos contaminated material from drill cuttings, excavations,

and trenches and the importance of safety precautions to ensure the safety of all workers and the public.

H. The Contractor shall submit three (3) copies of the Site Specific Health and Safety Plan in accordance with Submittal Procedures Section. Failure on the part of the Contractor to follow the plan or to continue any work in an unsafe manner may result in suspension of the work by the Owner. The Contractor shall not be entitled to extra compensation for health and safety related suspensions, nor shall the contract completion date be extended.

a. The Contractor shall perform whatever work is necessary for safety and be solely and completely responsible for conditions of the Site, including safety of all persons (including employees of the Owner, Engineer, any Site visitors, and Contractor) and property during the Contract period. This requirement applies continuously and is not limited to normal working hours.

b. No Work can commence on Site until the Contractor has submitted their Site Specific Health and Safety Plan to the Owner and received written confirmation.

007319.1.6 Site Health and Safety Officer

A. The Contractor shall assign an individual serving as a Site Health and Safety Officer at the job site at all times during work. The Site Health and Safety Officer shall be responsible and authorized to supervise and enforce compliance with the Site Specific Health and Safety Plan.

B. The Site Safety and Health Officer will act as the Qualified Coordinator as defined by Workers' Compensation Board.

C. The Site Health and Safety Officer shall be thoroughly trained in rescue procedures, and the use of safety equipment and monitoring instruments. The Site Health and Safety Officer should be identified to the Owner and Engineer. This person shall be present at all times during working hours and shall implement the safety plan and shall conduct monitoring.

D. The Site Health and Safety Officer shall have the delegated authority to order any person or worker on the landfill site to follow the safety plan. Failure to observe the safety plan shall be sufficient cause for removal of the person or worker(s) from this Project.

E. The Site Health and Safety Officer shall be responsible for determining the extent to which any safety equipment and instruments must be utilized, depending upon conditions encountered at the site.

007319.1.7 Safety Provisions Related to Operations at Landfill

A. Contractor shall be responsible for informing his employees and subcontractors and their employees of the potential danger in working on and near landfills.

B. Contractor shall be familiar with the following document: "A Compilation of Landfill Gas Field Practices and Procedures, Health and Safety Section" prepared by the SWANA Landfill Gas Division Health and Safety Task Force August 1991 (revised August 2010). Copies may be obtained from SWANA at 1100 Wayne Avenue – Suite 700, Silver Springs, Maryland 20910, telephone number (301) 589-7068.

C. Contractor is advised that the construction of this project is being performed in and adjacent to buried wastes and refuse. During construction activity, the potential exists to puncture containers that could become explosive, release pockets of landfill gas under pressure, release fluids that could be contaminated, create surface subsidence by shifting refuse, and other types of hazards. Exposure to decaying wastes is possible during this work. Exposure may also include possible contact with leachate, asbestos, inhalation of landfill gas, explosion, pathogenic bacteria, and others.

D. As these buried materials decompose, they will generate gas, which typically consists of carbon dioxide, methane, and trace amounts of other gases, including but not limited to, hydrogen sulfide, dependent upon the composition of the buried materials. These gases normally vent to the atmosphere through the cover soils, but can migrate laterally to adjacent areas depending on site and weather conditions.

E. Landfill gases have the potential to create hazardous conditions if not controlled or recognized, some of the hazards include:

   a. Fires which may start spontaneously from exposed and/or decomposing refuse.

   b. Fires and explosions which may occur from the presence of methane gas.

   c. Landfill gases which may cause an oxygen deficiency in underground trenches, manholes/catch basins, and other structures.

   d. Hydrogen sulfide, a highly toxic and flammable gas, which may be present.

F. Other Safety Considerations:

   a. Possible caving of trenches and excavations when working over or in refuse fills.

   b. Possible exposure to asbestos contaminated material brought to the surface of the landfill as a result of drilling processes or excavation.

007319.1.8 Contractor Safety Equipment and Monitoring Instruments

A. The Contractor shall provide and maintain safety equipment and monitoring instruments at the site. Safety equipment shall be applicable to the work as prescribed by the governing safety authorities and all articles necessary for giving first-aid to the injured. Monitoring instruments shall include, but not be limited to, the following:

a. Oxygen meter

b. Combustible gas meter

c. Hydrogen sulfide meter.

B. Monitoring instruments may also include, but do not require, either a HNu or similar photo-ionizing detector or an Organic Vapor Analyzer for monitoring volatile organic constituents in the air.

C. All personnel shall be trained in the use of appropriate safety equipment and monitoring instruments that would be utilized during the course of the work. It is the responsibility of the Site Health and Safety Officer, or person(s) in authority, to ascertain that all safety equipment is being used when appropriate.

007319.1.9 Additional Safety Requirements

A. In addition to conforming to the safety rules and regulations of Governmental authorities having jurisdiction, Contractor shall conform to the following precautionary measures:

a. Smoking is not permitted at the site. The Contractor is responsible to ensure that the Contractor's workers and subcontractor's workers do not smoke at the site.

b. Any refuse exposed during the construction shall be covered as soon as possible after exposure with at least a 300 mm layer of earth. In no event shall refuse remain exposed overnight.

c. No arc or gas welding shall be permitted in trenches, enclosed areas, or over refuse unless performed in specially ventilated and secured areas of the site tested and approved by the Site Health and Safety Officer.

d. Construction equipment used in excavating activities and/or refuse removal operations shall be equipped with vertical exhaust and spark arrestors.

e. Electric motors utilized in excavation areas and below ground shall be explosion proof.

f. Worksafe BC Regulations shall be strictly followed including guidance of meeting and fall protection.

007319.2 PRODUCTS

N/A

007319.3 EXECUTION

N/A

** END OF SECTION **

SECTION 01 11 00

SUMMARY OF WORK

011100 SUMMARY OF WORK

011100.1 GENERAL

011100.1.1 Section Includes

A. Scope of Work

B. Description of Work

C. Contractor Use of Site and Premises

D. Work Sequence and Schedule

E. Fees and Permits

011100.1.2 Scope of Work

A. The work included in this contract is defined on the drawings and within these specifications, which form part of the Contract Documents.

B. For additional details refer to Contract Drawings and Specifications.

011100.1.3 Description of work

A. The project includes construction of the following works at the Cambell Mountain Landfill, located approximately 4.5 km northeast of Penticton on the western slope of Campbell Mountain:

a. General Contract Considerations

b. Civil and Earthworks

c. Mechanical – Leachate Extraction

d. Electrical Works

011100.1.4 Contractor Use of Site and Premises

A. The Contractor shall inspect the site to determine the adequacy of access for the work.

B. Construction Operations: The Contractor shall limit construction activities to the construction area boundaries indicated on the Drawings. Coordinate use of the premises with the Owner and other contractors if applicable.

C. The Contractor shall assume full responsibility for the protection and safekeeping of products stored on the site under this contract, and shall move any stored products under Contractor's control which interfere with the operation of others.

D. The Contractor should make a careful examination of the work site and investigate and satisfy themselves at their own risk and expense as to all matters relating to the nature and extent of work to be undertaken, the means of access to the work site, the extent of required coordination with public use of adjacent areas, and any and all matters which are referred to in the Specifications and Drawings and other Contract Documents, or which are necessary for the full and proper completion of the work or are required by the conditions under which it must be performed. No allowance will be made subsequently for any error, negligence, interpretation, or misinterpretation on the Contractor's part.

E. The Contractor is required to make sufficient enquiries with the Owner so as to properly evaluate the requirements and risks related to performing the work referred to in these Contract Documents as a Contractor with access rights and non-interference obligations which are subordinate to those of the contractors already performing operations at the Campbell Mountain Landfill, as well as being subordinate to the regular commercial, governmental and residential users of the landfill.

F. The Contractor shall, as far as is practicable, confine operations to the Consultant's specified area within the work site. Rights to access any land or property outside the work site boundaries which the Contractor requires during construction shall be acquired by the Contractor at the Contractor's own expense, and the Contractor shall make its own arrangements for the use of such land or property and for the compensation of its owners.

G. Starting of the work constitutes acceptance of existing conditions as suitable for completion of the work.

011100.1.5 Work Sequence and Schedule

A. Construction work in sequence and phases/stages to accommodate Owner's quality assurance and contract administration requirements during the construction period, coordinate construction schedule and operations with the Owner.

B. Allow 10 working days after submitting site survey information prior to any site work.

011100.1.6 Fees and Permits

A. The Contactor is required to obtain all necessary permits for construction.

B. Contractor shall secure and pay for all required permits, government fees and licenses. Pay for and obtain inspections by Municipal, Regional, Provincial, and Federal authority's agencies and bodies as required.

011100.2 PRODUCTS

N/A

011100.3 EXECUTION

N/A

** END OF SECTION **

SECTION 01 14 00

WORK RESTRICTIONS

011400 WORK RESTRICTIONS

011400.1 GENERAL

011400.1.1 Related Sections

A. Section 01 32 16 - Construction Progress Schedules Bar (Gantt) Chart.

011400.1.2 Access and Egress

A. Design, construct, and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with the relevant municipal, provincial, and other regulations.

011400.1.3 Time Restriction

A. Time Restrictions for Performing Contract Work: REFER TO GENERAL CONDITIONS AND SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT.

B. The Contractor’s work hours and schedule will be coordinated with the Owner.

011400.1.4 Use of Site and Facilities

A. Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with the Owner to facilitate work as stated.

B. Maintain existing access and services to site and provide for personnel and vehicle access.

C. Where security is reduced by work provide temporary means to maintain security.

011400.1.5 Existing Services

A. The Contractor is responsible for locating all existing utilities before commencing work.

Notify the Owner of intended interruption of services and obtain required permission. The contract requires connection of buried electrical power line to the existing Kiosk 1, located SW of the leachate pond. The Contractor must obtain the necessary permits and approvals from the owner prior to starting the work.

B. Where work involves breaking into or connecting to existing services, provide the Owner 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum. Carry out interruptions during agreed time periods with the owner.

C. Provide for personnel and vehicular traffic.

D. Construct barriers in accordance with Section 01 50 00 - Temporary Facilities and Controls.

E. Provide adequate bridging over trenches which cross roads to permit normal traffic.

F. Where unknown services are encountered, immediately advise the Owner and confirm findings in writing.

G. Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by the Authorities having jurisdiction.

H. Record locations of maintained, re-routed and abandoned service lines.

011400.1.6 Special Requirements

A. Submit schedule in accordance with Section 01 32 16 - Construction Progress Schedules Bar (Gantt) Chart

B. Ensure that the Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic, and security regulations.

C. Keep within limits of work and avenues of ingress and egress.

011400.1.7 Smoking Environment

A. Comply with smoking restrictions for the site.

011400.2 PRODUCTS

N/A

011400.3 EXECUTION

N/A

** END OF SECTION **

SECTION 01 20 00

MEASUREMENT AND PAYMENT

012000 MEASUREMENT AND PAYMENT

012000.1 GENERAL

This section summarizes the work included in each bid item listed on the Schedule of Quantities and Prices and defines the methods of measurement and payment for each.

012000.2 MEASUREMENT FOR PAYMENT QUANTITIES

A. Measurement for payment will be performed by the Contractor according to the standard measures and based on actual units of work performed or installed. The method of measurement is described under each bid item.

B. The Contractor shall make all interim measurements, and determine all interim quantities and amounts of complete work done under the Contract. At the time measurements are made for quantity determinations, the Owner or its representative will be present to verify such measurements.

C. Description of Methods for Measurement of Quantities

1. For items specified to be measured by a length unit (e.g. lineal or vertical meter), pay length will be measured along the line and grade of the item involved as actually placed and accepted.

2. When items are specified to be measured by an area unit (e.g., square meter, hectare, etc.), the Owner will use one of the following methods for measurement:

    a. For those items to be measured by the in-place area, measurement shall be employed by the most practical means as determined by the Owner.

    b. For those items measured by the in-place length with a neat line measurement for width, the area will be determined by the in-place horizontal measure for length multiplied by the fixed plan dimension for width as shown on the Drawings.

3. For items specified to be measured by a volume unit (e.g. cubic meters), the Owner will use one of the following methods for measurement:

    a. For those items to be measured by the in-place volume, measurement shall be determined by detailed topographic survey methods. The quantity for payment shall be the calculated as a difference between the original ground surface (prior to construction) and the final ground surface (after construction is completed). The volume shall be calculated by a cut and fill analysis using Civil 3D software. For volumes of excavation or

embankment which are small or otherwise impractical to measure quantities by a cut and fill analysis, an average-end-area method shall be used as specified by the Owner.

b. For those items measured by the in-place area with a neat line measurement for depth, the volume will be determined by the in-place horizontal measure for area multiplied by the fixed plan dimension for depth as shown on the Drawings.

c. For those items measured by the hauling vehicle, the volume will be determined by the dimensions of each hauling vehicle. Each hauling vehicle will be measured by the Owner to establish the number of cubic metres carried by that vehicle when full. All haul vehicles shall be numbered or otherwise uniquely marked for identification purposes.

For each load delivered to the site, the Contractor shall provide to the Owner at the time of delivery, a ticket indicating the vehicle number or other identification, material type, date, time of delivery, reference to borrow source location, and intended use of material (i.e., subgrade, embankment, backfill, cover soil, drainage aggregate, drain rock, embedment, etc.)

In addition to vehicle tickets, the Contractor shall provide to the Owner on a daily basis, a summary of vehicle loads delivered that day listing the number of loads; type of material carried by each vehicle, and intended use of each type of material.

Subsequent loads will be checked at the option of the Owner, and adjustments will be made for partial loads. Where a discrepancy in the initial vehicle capacity determined is encountered, the Owner may elect to adjust all previous loads received by the vehicle or if applicable since the last check date.

4. For items specified to be measured by weight, the Owner will use the following methods for measurement:

   a. Weight will be determined using truck scales approved by the Owner.

5. Where lump sum is the specified pay unit, complete payment for the work described to be done, completed and accepted, without further measurement will be used.

D. No measurement or payments will be made for:

6. Work performed or materials placed outside of lines indicated in the Drawings or established by the Owner.

7. Materials wasted, used, or disposed of in a manner not called for under the Contract.

8. Rejected materials (including material rejected after it has been placed, if the rejection is due to the Contractor's failure to comply with the provisions of the Contract).
9. Hauling and placement of materials from or to interim stockpiles.
10. Hauling and disposing of rejected materials.
11. Material on hand after completion of work.
12. Any other work or material when payment is contrary to any provision of the Contract.
13. Work that has been buried and/or concealed without inspection and approval (immediately prior to, and during burying and/or concealment) from Engineer where required in the specifications.
14. Work that has not received the required documentation and approval required through the submittal process.
15. Work that has not been surveyed and documented for as-built records.

012000.3 INSTRUCTIONS REGARDING FORM OF TENDER

A. Work completed under this Contract will be made for at the lump sum prices and unit prices set out in the Schedule of Quantities and Prices.

B. Incorporate all costs associated with finding, procuring, and supplying all materials and performing all work specified herein in the prices set out in the Schedule; allow for Contractor's overhead and profit except for Provisional items which shall be priced as per Contract requirements.

C. Any claim by Contractor for extra payment on grounds that work performed or materials supplied in accordance with the drawings and/or specifications could not be properly charged to items listed in the Schedule will not be considered by the Owner.

D. If the Schedule of Quantities and Prices does not include a pay item that is shown in the drawings and/or specifications (by either direct mention and/or implication), the Contractor shall include costs and allocate to the pay item which pertains most closely.

E. Prorate costs of a general nature that do not pertain to any one item among all items except for Provisional Items.

F. Payment will only be made for actual quantities supplied and installed during the Contract.

012000.4 PROGRESS PAYMENTS

A. The Contractor shall submit an Application for Payment monthly in accordance with the General Conditions of Contract and in a format acceptable to Owner.

B. The Owner will pay the Contractor on or before the last day of the next month following the period covered by the Certificate.

C. The Owner will hold back ten (10) percent of the amount of each Certificate in accordance with the Builder's Lien Act.

D. The Owner will in addition, and where reasonably justified, make special payment hold backs as provided for in the General Conditions of Contract.

E. With every Monthly Application for Payment, the Contractor shall submit all relevant survey records for the current Progress Claim and a survey record summary for all completed work, in a form acceptable to the Owner. Failing to provide such records, could invalidate the Progress Claim and payment may not be considered.

F. The Contractor shall provide a Statutory Declaration and a WCB Clearance Letter in accordance with the General Conditions of Contract for all progress payment certificates except the first one.

012000.5 FORCE ACCOUNT WORK

A. Work may be required which is not covered by the Contract.

B. All Force Account work shall be carried out in accordance with the General Conditions of Contract.

C. All Force Account work carried out must have prior written approval from the Owner. All hours of work carried out under this item must be approved on the day the work is carried out. It is the Contractor's responsibility to obtain approval each and every day that work is carried out under this item. If these approvals are not received prior to commencement of the work and at the end of each day as the work is carried out, payment may not be considered.

012000.6 DESCRIPTION OF PAYMENT ITEMS

The section summarizes the work included for each of the Items listed in the Schedule of Quantities and Prices.

A. General Contract Considerations

1. Payment Item 1.01 – Mobilization and Demobilization

a. Measurement: Will be made on a lump sum basis. Fifty percent (50%) of the value will be paid on completion of mobilization to the site, as determined by the Engineer and the fifty percent (50%) balance will be paid when all outstanding deficiencies have been addressed and all structures, materials and equipment have been demobilized from the site.

b. Payment: Lump Sum.

c. Includes: All activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; purchasing permits; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site. The lump-sum bid under this item shall not exceed 5% of the total Tender.

2. Payment Item 1.02 – Performance, and Labour and Materials Bonds

a. Measurement: Will be made on a lump sum basis after the Contract is signed and the Bonds are submitted to the Owner.

b. Payment: Lump Sum.

c. Includes: Cost to obtain all required bonding and insurance for work associated with this contract. The Bonding shall cover the entire duration of the Contract.

3. Payment Item 1.03 - Insurance

a. Measurement: Will be made on a lump sum basis after the Contract is signed and proof of insurance meeting the insurance requirements of the Contract is submitted to the Owner.

b. Payment: Lump Sum.

c. Includes: Cost to obtain all required bonding and insurance for Work associated with this Contract. The Insurance shall cover the entire duration of the Contract.

4. Payment Item 1.04 - Health and Safety

a. Measurement: Will be made on the lump sum basis. Fifty percent (50%) of the value will be paid after the Site-Specific Safety and Health Plan is received and reviewed by the Engineer, and implemented by the Contractor. The fifty percent (50%) balance will be prorated for the duration of the Contract as per Engineer's estimate.

b. Payment: Lump sum

c. Includes: This item includes all costs for labour, equipment and materials to prepare and implement the health and safety requirements including the onsite safety officer and safety equipment for the duration of the work for all areas that it applies to. The pay item also includes the costs associated with the Prime Contractor responsibilities for the Work site, which involves coordination of safety issues with all applicable parties conducting on-Site Works per WorksafeBC requirements.

5. Payment Item 1.05 - Survey, Submittals, Record Drawings and Operation & Maintenance Manuals

a. Measurement: Will be made on a lump sum basis. Thirty percent (30%) of the value will be paid at the completion of the Contract after all records and as built information have been received and accepted by the Engineer. The Seventy percent (70%) balance will be prorated for the duration of the Contract as per Engineer's estimate.

b. Payment: Lump Sum

c. Includes: The work consists of performing all surveys, measurements, and computations required by the Contract. Verification and establishment of survey control points prior to starting work. Provide field engineering services and construction surveys. Establish locations, elevations, lines, grades and levels necessary for construction of structures and systems. Locate, layout, and mark (stake) in the field all existing utilities. Periodically verify layouts. The unprocessed construction survey records shall be provided immediately and be available at all times during the progress of the work for examination and use by Engineer. Complete, unprocessed survey records and supporting data for progress payments must be submitted to Engineer with each payment certificate.

Includes all costs associated with the provision of all documents pertaining to the equipment which form part of this tender to include, but not limited to, maintenance manuals, operation manuals, commissioning certificates, a comprehensive list of recommended spare parts and warranty details as applicable.

B. Civil and Earthworks

1. Payment Item 2.01 – Excavate and Backfill Common Utility Trench - in Clean Fill or Native Soil

a. Measurement: Will be made on a linear meter basis on surveyed pipe alignment centerline. Survey is to be conducted by Contractor and verified by Engineer before and after work is completed.

b. Payment: Linear Meter (m)

c. Includes: Excavation in existing soils, crushed concrete and/or imported soils of all gradations and composition including cobbles and boulders less than the trench width. Also includes excavation for the range of trench widths and depths as shown on the Drawings. Also includes benching, sloping, and shoring, and all safety measures necessary for working in and around the trench. Also includes de-watering, and disposal of excess material. Payment also includes placing and compacting embedment material, final backfill material, embankment, and road surface structure with existing materials.

2. Payment Item 2.02 – Excavate and Backfill Common Utility Trench - in Waste

a. Measurement: Will be made on a linear meter basis on surveyed pipe alignment centerline. Survey is to be conducted by Contractor and verified by Engineer before and after work is completed.

b. Payment: Linear Meter (m)

c. Includes: Excavation in existing cover soil and/or waste of all gradations and composition including cobbles and boulders less than the trench width. Also includes excavation for the range of trench widths and depths as shown on the Drawings. Also includes benching, sloping, and shoring, and all safety measures necessary for working in and around the trench. Also includes shoring, de-watering, and disposal of waste material to be placed in owner supplied equipment. Payment also includes placing and compacting embedment material with owner

supplied clean fill, final backfill material with salvaged cover soil where no waste is encountered or owner supplied clean fill where waste is encountered, and embankment and road surfaces to be re-instated. Also includes all costs required to excavate, relocate waste, shape and cover any exposed waste by day's end with minimum 300 mm of Owner supplied intermediate cover.

3. Payment Item 2.03 – Excavate and Backfill Electrical Trench

a. Measurement: Will be made on a linear meter basis on surveyed pipe alignment centerline. Survey is to be conducted by Contractor and verified by Engineer before and after work is completed.

b. Payment: Linear Meter (m)

c. Includes: Excavation in existing soils, and/or imported soils of all gradations and composition including cobbles and boulders less than the trench width. Also includes excavation for the range of trench widths and depths as shown on the Drawings. Also includes benching, sloping, and shoring, and all safety measures necessary for working in and around the trench. Also includes de-watering, and disposal of excess material. Payment also includes placing and compacting embedment material, final backfill material, embankment, and road surface structure with existing materials.

4. Payment Item 2.04 – Locate Existing Utilities

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: Furnishing equipment, materials, and labour to perform electrical line locates at the leachate pond to locate buried utilities onsite. Also includes all materials, labour and equipment for line painting, and alignment and elevation stakes. Also includes hydro-vac excavation through existing soils at the crossing of the 75 mm leachate line and the existing electrical line. Includes managing liquids and solids from the hydro-vac process and disposal onsite at a location designated by the Owner. The pay item applies to electrical and all other type of existing infrastructure.

5. Payment Item 2.05 – Supply and Install Leachate Discharge Structure

a. Measurement: Will be made on a linear meter basis on surveyed pipe alignment centerline. Survey is to be conducted by Contractor and verified by Engineer before and after work is completed.

b. Payment: Linear Meter (m)

c. Includes: All labour, equipment, materials and all other incidental work required to supply and install the leachate discharge structure in the road area, as shown in Detail F & G: Extraction Well Discharge Pipe Berm Detail and all other relevant details, as shown in the contract Drawings. Also include, excavation in existing soils, and/or imported soils of all gradations and composition including cobbles and boulders less than the trench width. Also includes excavation for the range of trench widths and depths as shown on the Drawings. Also includes placing and compacting embedment and backfill material to be owner supplied clean fill, and road structure with contractor supplied material, as shown on the drawings.

d. Excludes: All HDPE pipe and Fittings will be part of Payment Item 2.06.

6. Payment Item 2.06 – Supply and Install Extraction Well Force Main and Discharge Pipe

a. Measurement: Will be made on a linear meter basis on surveyed pipe alignment centerline. Survey is to be conducted by Contractor and verified by Engineer before and after work is completed.

b. Payment: Linear Meter (m)

c. Includes: All labour, materials, equipment and incidental work necessary to supply and install the extraction well force main and discharge pipe from the check valve at Extraction well 19-03 to the end of the leachate discharge pipe, including the leachate pond energy dissipator. This work includes but not limited to the supply and installation of 75 mm DR17 HDPE Solid pipe and fittings, leachate pond energy dissipator, future well connections, hydrant connection, and watertight connection fittings to the manhole. Also included is pressure testing of the force main and discharge pipe.

7. Payment Item 2.07 – Supply and Install 1,200 mm Concrete Manhole

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

a. Payment: Lump Sum

b. Includes: All labour, equipment and materials required to supply and install prefabricated reinforced, watertight concrete manhole. The work includes all costs required to excavate and relocate soil and concrete rubble, and place and compact excavated material as backfill or owner supplied clean fill if cut material is not acceptable. Also includes all costs associated with supply and installation of granular material, prefabricated concrete base, barrels and cover, grout, explosion proof lid with flanged access point and confined space warning signs. Includes all costs associated with leakage testing.

8. Payment Item 2.08 – Construct Gravel Pad with Owner Supplied Pitrun

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment and materials required to place and compact owner supplied gravel to construct a 3 meter by 3 meter pad adjacent to Extraction Well 19-03. Pad location is required to provide unencumbered access to Extraction Well 19-03, the pump kiosk, and field hydrant. Also includes the supply and install of 12 oz. non-woven geotextile for the base of the gravel pad, and placement of owner supplied lock block for the Pump Kiosk.

C. Mechanical – Leachate Extraction

1. Payment Item 3.01 – Supply and Install Submersible Pump & Motor for EW19-03

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment, materials, shipping, handling, procurement and all other incidental works required to supply and install 5 GPM, 0.5 Horse Power, 230V, 4” Submersible Franklin Pump, and 0.5 Horse Power, 230 V, 1 Phase Franklin Motor, and Torque arrestor for Extraction well 19-03, as per the Contract Documents. The work also includes but not limited to permits, all mechanical components to be Stainless Steel unless otherwise specified, and all electrical components and wire and pump disconnect to be installed in accordance with applicable standards and codes.

2. Payment Item 3.02 – Supply and Install Control Panel and SD20 VFD

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment, materials, shipping, handling, procurement and all other incidental works required to supply and install SD20 Variable Frequency Drive and 0.5 Horse Power Franklin Control Panel, as per the Contract Documents. The work also includes but not limited to permits, all mechanical components to be Stainless Steel unless otherwise specified, and all electrical components and wire to be installed in accordance with applicable standards and codes.

3. Payment Item 3.03 – Supply and Install Level Transmitter, Pump Hour Meter and Controls

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment, materials, shipping, handling, procurement and all other incidental works required to supply and install the Level Transducer and Controls, and Pump Hour Meter, as per the Contract Documents. The work also includes but not limited to permits, all mechanical components to be Stainless Steel unless otherwise specified, and all electrical components and wire to be installed in accordance with applicable standards and codes.

4. Payment Item 3.04 – Supply and Install Drop Pipe and Stainless Steal Pitless Adaptor

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment, materials, shipping, handling, procurement and all other incidental works required to supply and install the 1.25” Schedule 80 PVC drop pipe and Stainless Steel Pitless Adaptor, as per the contract documents. The work also includes but not limited to permits, all mechanical components to be Schedule 80 PVC or Stainless Steel, as required.

5. Payment Item 3.05 – Supply and Install Stainless Steal Check Valve and Pipe to Pitless Adaptor

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment, materials, shipping, handling, procurement and all other incidental works required to supply and install the stainless steal check valve (minimum pressure rating 100 PSI), and piping from the check valve to the pitless adaptor at Extraction Well 19-03, as per the contract documents. The work also includes all pipe components to be Schedule 80 PVC or DR17 HDPE, unless otherwise specified.

6. Payment Item 3.06 – Supply and Install Yard Hydrant

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment, materials, shipping, handling, procurement and all other incidental works required to supply and install the yard hydrant, as per the contract documents. All pipe components will be stainless steel, unless otherwise specified.

7. Payment Item 3.07 – Pump System Commissioning

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, equipment, and materials required to commission all mechanical and electrical systems for the Extraction Well 19-03 Pump system, as per the Contract Documents. Payment to include all labour, materials, shipping, handling, procurement, equipment, and all other incidental work.

D. Electrical Works

1. Payment Item 4.01 – Supply and Install Electrical Components at Kiosk 1

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, materials, and equipment required to supply and install all electrical components at Kiosk 1, as per the Contract Documents. The work also includes but not limited to 600 V splitter, disconnects, switches, permits, and all electrical components and wire and to be installed in accordance with applicable standards and codes. Payment to include all labour, materials, shipping, handling, procurement, equipment, and all other incidental work.

2. Payment Item 4.02 – Supply and Install Pump Kiosk

a. Measurement: Payment will be made as a lump sum after work is completed and verified and accepted by the Engineer.

b. Payment: Lump Sum

c. Includes: All labour, materials, and equipment required to supply and install the Pump Kiosk, as per the Contract Documents. The work includes but not limited to the Mini Power Center, pump kiosk housing to be installed on lock block foundation, convenience receptacle, and all electrical components and wire and to be installed in accordance with applicable standards and codes. Payment to include all labour, materials, shipping, handling, procurement, equipment, and all other incidental work.

d. Excludes: Electrical components in Section C: Mechanical – Leachate Extraction.

3. Payment Item 4.03 – Supply and Install Electrical Conduits

a. Measurement: Will be made on a linear meter basis on surveyed pipe alignment centerline. Survey is to be conducted by Contractor and verified by Engineer before and after work is completed.

b. Payment: Linear Meter (m)

c. Includes: All labour, materials, and equipment required to supply and install the Electrical Conduits from existing Kiosk 1 to the Pump Kiosk, as per the Contract Documents. The work includes but not limited to three conduit lines in a common trench, and all components to be installed in accordance with applicable standards and codes. Payment to include all labour, materials, shipping, handling, procurement, equipment, and all other incidental work.

4. Payment Item 4.04 – Supply and Install Tech Cable Run, Single Conduit

a. Measurement: Will be made on a linear meter basis on surveyed pipe alignment centerline. Survey is to be conducted by Contractor and verified by Engineer before and after work is completed.

b. Payment: Linear Meter (m)

c. Includes: All labour, materials, and equipment required to supply and install electrical lines in one conduit from existing Kiosk 1 into the Pump Kiosk, as per the Contract Documents. All components to be installed in accordance with applicable standards and codes. Payment to include all labour, materials, shipping, handling, procurement, equipment, and all other incidental work.

5. Payment Item 4.05 – Pull Boxes Including All Hardware Components

a. Measurement: Per count of installation.

b. Payment: Per Each

c. Includes: All labour, materials, and equipment required to supply and install pull boxes, as per the Contract Documents. All components to be installed in accordance with applicable standards and codes. Payment to include all labour, materials, shipping, handling, procurement, equipment, and all other incidental work.

** END OF SECTION **

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

013000. ADMINISTRATIVE REQUIREMENTS

013000. GENERAL

013000.1 SECTION INCLUDES

A. Coordination

B. Preconstruction Conference

C. Progress Meetings

013000.2 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Coordinate access into the Site at the Site entrance with the Owner's Representative.

C. Coordinate all Work on access roads within the landfill with the Owner's Representative.

D. Coordinate space requirements and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner partial occupancy.

F. After Owner occupancy of the Site, coordinate access to Site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

013000.3 PRECONSTRUCTION CONFERENCE

A. Owner will schedule a conference after date of contract execution.

B. Attendance Required: Owner, Contractor, Engineer, major Subcontractors, and Existing Site Contractors and/or other Stakeholders.

C. Agenda:

1. Distribution of Contract Documents
2. Submission of list of Subcontractors, list of products, Schedule of Values, and progress schedule.
3. Designation of personnel representing the parties in Contract and the Owner.

4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.
5. Scheduling.
6. Use of premises by Owner and Contractor.
7. Owner's requirements.
8. Construction facilities and controls provided by Owner.
9. Security and housekeeping procedures.
10. Procedure for maintaining record documents.
11. Contractor’s Health and Safety Program.

013000.4 PROGRESS MEETINGS

A. Owner’s Representative will schedule and administer meetings throughout progress of the Work every week or as determined by Owner.

B. Owner’s Representative to arrangement meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within two days to Owner, participants, and those affected by decisions made.

C. Attendance Required: Job superintendent, major Subcontractors and Suppliers, Owner or Owner’s Representative, and other representative(s) as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings
2. Safety items and report of any safety related incidents
3. Review of work progress
4. Field observations, problems, and decisions.
5. Identification of problems which impede planned progress
6. Review of submittals schedule and status of submittals
7. Review of off-Site fabrication and delivery schedules
8. Review of design for prior to initial construction of individual components
9. Review of surveying for construction, progress payments, and as-built documentation
10. Maintenance of progress schedule
11. Corrective measures to regain projected schedules

12. Planned progress during succeeding Work period
13. Coordination of projected progress
14. Maintenance of quality and Work standards
15. Effect of proposed changes on progress schedule and coordination
16. Other business relating to work

013000. PRODUCTS

Not Used

013000. EXECUTION

Not Used

* * END OF SECTION * *

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULES

013216 CONSTRUCTION PROGRESS SCHEDULES

013216.01 Related Sections

A. Section 01 33 00 - Submittal Procedures.

013216.02 Definitions

B. **Activity**: element of work performed during course of project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

C. **Bar Chart (GANTT Chart)**: graphic display of schedule-related information. In typical bar chart, activities or other project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, a bar chart should be derived from commercially available computerized project management system.

D. **Baseline**: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

E. **Construction Work Week**: Work days of the week as defined by the Contractor and incorporated into the schedule as part of bar (GANTT) chart submission.

F. **Duration**: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually is expressed as workdays or workweeks.

G. **Master Plan**: summary-level schedule that identifies major activities and key milestones.

H. **Milestone**: significant event in project, usually completion of major deliverable.

I. **Project Schedule**: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities must be accomplished to satisfy project objectives. Monitoring and control process involves using said Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

J. **Project Planning, Monitoring and Control System**: overall system operated by Consultant to enable monitoring of project work in relation to established milestones.

013216.03 Requirements

A. Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

B. Plan to complete work in accordance with prescribed milestones and time frame.

C. Allow for progress reporting time within the schedule.

D. Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

013216.04 Submittals

A. Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

B. Submit a Master Plan to the Engineer within five (5) working days of Notice of Award. The Master Plan shall be in the form of a bar (GANTT) chart for planning, monitoring, and reporting of project progress. The Master Plan shall be submitted to the Engineer in hard copy and in Microsoft Project electronic format.

C. Submit a Project Schedule to the Engineer within five (5) working days of receipt of acceptance of the Master Plan. The Project Schedule shall be submitted in hard copy and Microsoft Project electronic format.

013216.05 Master Plan

A. Structure schedule to allow orderly planning, organizing, and execution of Work as Bar Chart (GANTT).

B. The Engineer will review and return revised schedules within five (5) working days.

C. Resubmit revised schedule within five (5) working days.

D. Accepted revised schedule will become Master Plan and be used as baseline for updates.

E. Update Project Schedule and submit to the Engineer with each application for Payment with every progress claim, or as per The Contract requirements

013216.06 Project Schedule

A. Develop detailed Project Schedule derived from Master Plan.

B. Detailed Project Schedule must include all line items from schedule of quantities and payment and all the following items:

1. Notice of award
2. Submittals, including Health and Safety Plan
3. Mobilization
4. Survey staking and utility locating
5. Completion of each item identified in the schedule of quantities and prices
6. Submittal of as-built survey and project record documents
7. Startup, field testing, commissioning, and training
8. Substantial Performance
9. Clean-up and demobilization

10. Total performance

013216.07 Project Schedule Reporting

A. Update Project Schedule on a weekly basis or as otherwise requested by the Engineer, reflecting activity changes and completions, as well as activities in progress.

B. Include as part of Project Schedule, narrative report identifying work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays, and impact with possible mitigation.

013216.08 Project Meetings

A. Discuss Project Schedule at weekly Site meetings, identify Activities that are behind schedule and provide measures to regain slippage, and include planned Activities for the next three weeks Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on Baseline schedule.

013216.09 Products

N/A

013216.10 Execution

N/A

* * END OF SECTION * *

SECTION 01 33 00

SUBMITTAL PROCEDURES

013300 SUBMITTAL PRODCEDURES

013300.1 GENERAL

013300.1.1 Section Includes

A. Submittal Procedures

B. Construction Progress Schedules

C. Shop Drawings

D. Product Data

E. Samples

F. Manufacturers' Instructions

G. Manufacturers' Certificates

013300.1.2 Submittal Procedures

A. Submittals must be presented in the format acceptable to and approved of in advance by the Engineer.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and tracking. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate.

C. On at least the first page of each submittal, and elsewhere as required for identification, show the submittal number to which the item belongs.

D. Number the transmittal forms and corresponding submittals sequentially. Number each resubmittal using the original submittal number and an alphabetic suffix. For example, the first resubmittal of submittal 3 would be number 3A. Resubmittals shall be transmitted with a new letter of transmittal, and shall cite the original submittal number for reference.

E. Submit the number of copies of Shop Drawings and data required to be returned, plus four (4) copies to be retained by the Owner. Prior to each submittal, carefully review and coordinate all shop drawings and data furnished by suppliers and Subcontractors for accuracy and for conformance with requirements of the specifications.

F. Identify variations from Specifications and products that would benefit the Owner and the completed work and highlight the advantages of such products. Any request to substitute

an alternate product must be submitted to the Engineer in writing as part of the tender documents and shall include complete product specifications addressing all Specifications outlined within this section and the benefits to the Owner resulting from the substitution.

G. Submittals shall clearly show drawings, sketches, catalog cuts or letters from supplier which demonstrate compliance with the specific requirements of the Specifications. If compliance is not clearly demonstrated, the submittal will be rejected.

H. Data and information included in each specification shall indicate the guaranteed performance, predicted performance, interface requirements, and construction features of all Contractor-furnished materials and equipment. The accuracy of such information and the compatibility of such information with overall performance requirements specified by the Engineer shall be the sole responsibility of the Contractor.

I. Provide space for Contractor and Owner review stamps.

J. Revise and resubmit submittals as required, clearly identifying all changes made since previous submittal. The Contractor is solely responsible for producing and submitting accurate and relevant submittals. The Engineer will review and respond to a maximum of two revisions for each submittal before a decision is reached.

K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

L. Make submittals of Shop Drawings, Samples, substitution requests, and other items in accordance with the provisions of this Section.

M. Apply Contractor's stamp, signed or initialed certifying that review, verifications or products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the Work and Specifications.

N. Make submittals in groups containing all associated items. Partial submittals will be rejected as not complying with provisions of the Specifications.

O. Submittals shall be scheduled to expedite the Project. Deliver submittals to the Owner's business address. Coordinate submission of related items. Make submittals far enough in advance of scheduled installation dates to provide adequate time for reviews, for shipping time between parties, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and taking delivery of materials.

P. If not otherwise noted in the Contract, allow at least ten (10) working days for review by the Engineer following receipt of the submittal by the Engineer. Each rejected or returned for revision version of submittals shall be subject to an additional ten (10) working days

review period by the Engineer. The Contractor shall schedule the submittal delivery to allow for Engineer's review period including any potential revisions.

013300.1.3 Progress Schedule

A. Submit initial progress schedule in duplicate for Owner's review within 15 days after date established in the Notice to Proceed.

B. Revise and resubmit each month with request for payment.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Indicate estimated percentage of completion for each item of Work at each submission.

013300.1.4 Shop Drawings

A. General

a Coordinate and check all shop drawings furnished by Suppliers and Subcontractors for accuracy and for conformance with requirements of the Specifications.

B. Drawings and Transmittals

a General

1. Supply all drawings, data sheets, performance curves, test reports, and instruction manuals as specified herein.

2. The drawings and data submitted shall include sufficient detail and clarity to enable the Owner to determine that the proposal or design is in compliance with the Specifications. If standard drawings and/or standard published descriptive data are submitted, any modifications required and intended by the Contractor to meet the requirements of each Specification shall be clearly indicated.

3. Data and information included in each specification shall indicate the guaranteed performance, predicted performance, interface requirements, and construction features of all Contractor-furnished materials and equipment. The accuracy of such information and the compatibility of such information with overall performance requirements specified by Owner shall be the sole responsibility of the Contractor.

b Design Submittals

1. Submit drawings, data and other required information within the provided time limits.

2. The following drawing requirements shall be met:

   - All measurements shall be in S.I. Metric units. U.S units may be provided within parenthesis. All writing shall be in English.
   - Drawing size shall not exceed ANSI D size (22" x 34").
   - Preliminary drawings shall be reproducible for sizes greater than ANSI B size (11" x 17").
   - Final (certified) drawings shall be full size reproducible original.
   - Final (certified) drawings shall display the work "CERTIFIED" with an accompanying signature and date.
   - When a drawing is revised, a revision number shall be clearly displayed in or near the title block. Current revisions shall be so indicated by circling the affected portions of the drawing.

3. Furnish certified general arrangement drawings and outline drawings showing all major equipment, component parts and accessories, assembly, all interface connections to related equipment, disassembly clearances and magnitude of permissible reaction forces and moments at major piping connections of equipment, and equipment center of gravity.

4. Furnish certified detailed drawings to enable Engineer to verify design of foundation, supports, and equipment interfacing. Connection-points and foundation drawings shall be fully dimensioned. Connection details shall be fully identified. Drawing information shall include as a minimum:

   i Component and auxiliary system equipment, flow diagrams including instrumentation, pipe, and valve arrangement drawings

   ii Foundation loading, pipes and valves loading, and clearance dimensions including magnitude and direction of loads for all load cases

   iii Anchor bolt and embedded parts size, location, and details

   iv Pipe and conduit sleeve sizes and locations

   v Certified wiring diagrams, interconnection wiring diagrams

   vi Instrument board, cabinet and panel layout, and terminal identification drawings and diagrams

vii Wire and cable designation drawings

viii Control logic diagrams

ix Materials designations shall be indicated on assembly drawing

5. Complete process flow and instrumentation drawings

6. Provide adequate certified information covering installation, operation and maintenance requirements. As a minimum the following information shall be furnished.

   i Installation and erection drawings and details; including, and not limited to welding and/or bolting specifications and extent of field Work required

   ii Operating, maintenance, and repair (Instruction) Manuals

   iii Insulation and lagging requirements

   iv Record of all clearances, tolerances, and other pertinent data required for installation

   v Foundation, load and anchorage detail requirements

   vi List of loose instruments, instrument panels, pipe, tubing, and accessories

   vii Erection procedures

   viii Estimated total weight of components shipped fully assembled

   ix Shipping Splits: Approximate weight and size of major pieces

   x Field assembly requirements of components (i.e., bolted or welded, lineal metre (feet) of field weld, if applicable, etc.)

7. Provide adequate certified information covering installation, operation and maintenance requirements.

C. Technical Data

a Provide certified data, including graphs, curves, and other pertinent information for the materials, equipment, and machinery. Technical data shall include the following:

1. A signed Certificate of Compliance stating the following:

   "All work provided under this Specification complies with all requirements of this Specification and accepted deviations."

2. Data Sheets (pumps, motors, valves, fans, louvers, etc.).

3. Documents identifying deviations and their acceptance.

4. Manufacturer's Data Report for CSME Code (or ASME Code) stamped items.

5. Materials Test Reports where required by governing Codes or Standards.

6. Non-destructive examination procedures and results.

7. Shop Test results.

8. Field Test results.

9. Electrical Test results.

10. Welding procedures.

11. Records of all major weld repairs and related processing and examination.

12. A complete list of all special tools and gauges of custom manufacture necessary to overhaul, operate, adjust, or maintain equipment.

013300.1.5 Product Data

A. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

B. After review, distribute in accordance with paragraph 31 33 00.1.2 of this Section. Where contents of submitted manufacturer’s literature include data not pertinent to the submittal, clearly indicate which portions of the contents are being submitted for review.

013300.1.6 Samples

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Owner's selection.

C. Identify each sample and include full Project information with each sample.

D. One sample will be retained by Owner.

013300.1.7 Manufacturer's Instructions

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

C. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in strict accordance with manufacturer's printed directions, unless otherwise specified. Furnish bound copies of manufacturer's printed specifications for installation, use or maintenance to Owner.

013300.1.8 Manufacturer's Certificates

A. When specified in individual Specification Sections, submit manufacturer's certificate to Owner for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Owner.

013300.1.9 Health and Safety and Environmental Management Plan

A. The Contractor is required to submit the standard Environmental Management Plan of their company.

B. The Contractor is required to supplement, refine and finalize, as required, and submit the Health and Safety and Environmental Management Plan for use during their construction activities before notice to proceed.

013300.2 PRODUCTS

Not used.

013300.3 EXECUTION

Not used.

** END OF SECTION **

SECTION 01 42 19

REFERENCE STANDARDS

014219. REFERENCE STANDARDS

014219.1 GENERAL

014219.1.1 Section Includes

A. Quality Assurance

B. Schedule of References

014219.1.2 Quality Assurance

A. For products or workmanship specified by an association, trade, or Federal Standard, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. All codes/standards shall be the latest issue of specified codes/standards as amended and revised to the tender closing date, except when a year date is mentioned.

C. Should specified reference standards conflict with Specifications, request clarification from the Engineer before proceeding.

D. The Contractor shall supply to the Engineer satisfactory evidence that all equipment and material complies with Standard Specification or test requirements.

E. When references to the following capitalized abbreviations are made, they refer to specifications, standards or methods of the respective association. Abbreviations listed herein, but not mentioned in the Specifications, shall be disregarded.

F. All references to specifications, standards or methods of technical associations refer to the latest adopted revision, including all amendments.

014219.1.3 Schedule of References

AAC Aluminum Association of Canada
1010 Sherbrooke West
Suite 1600, Montreal (Quebec)
Canada H2A 2R7

AASHTO American Association of State Highway & Transportation Officials
444 N Capitol St. NW
Suite 249
Washington, DC 20001

ACI	American Concrete Institute British Columbia Chapter 5406 Lanark St. Vancouver, British Columbia, Canada V5P 2Y1
AGC	Associated General Contractors of America 2300 Wilson Blvd., Suite 400 Arlington, VA 22201
AI	Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480
ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 800-843-2763 (U.S/Canada)
ANSI	American National Standards Institute 1819 L Street, NW (between 18th and 19th Streets), 6th floor Washington, DC 20036
ASTM	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA 19428-2959
AWS	American Welding Society 550 NW LeJeune Road Miami, FL 33126
BCC	British Columbia Codes Contact Queen's Printer 800-663-6105 bccodes@gov.bc.ca
CAC	Cement Association of Canada 502-350 Sparks Street Ottawa, ON K1R 7S8
CCA	Canadian Construction Association 1900 - 275 Slater Street Ottawa, ON K1P 5H9
CGA	Canadian Gas Association 350 Sparks Street, Suite 809 Ottawa, Ontario, Canada K1R 7S8

CGSB	Canadian General Standards Board Place du Portage III, 6B1 11 Laurier Street Gatineau, Quebec, Canada K1A1G6
CISC	Canadian Institute of Steel Construction CISC – Western Region 3760 14th Avenue, Suite 200 Markham, Ontario, Canada L3R 3T7
CPCI	Canadian Precast/Prestressed Concrete Institute 100 – 196 Bronson Avenue Ottawa, Ontario K1R 6H4
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60195
CSA	Canadian Standards Association 13799 Commerce Parkway Richmond, British Columbia, Canada V6V 2N9
CSC	Construction Specifications Canada 120 Carlton Street, Suite 312 Toronto, Ontario, Canada M5A 4K2
CSME	Canadian Society of Mechanical Engineers 1295 Hwy 2 East Kingston, Ontario K71 4V1
CTAA	Canadian Technical Asphalt Association Suite 300, 895 Fort Street Victoria, British Columbia, Canada V8W 1H7
CWB	Canadian Welding Bureau 8260 Parkhill Drive Milton, ON, Canada L9T 5V7
CWS	Canadian Welding Society 7250 West Credit Avenue Mississauga, ON L5N 1N5
CWWA	Canadian Water and Wastewater Association Unit 11, 1010 Polytek Street Ottawa, Ontario K1J 9H9
EEMAC	Electrical Equipment Manufacturers Association of Canada Electro-Federation 180 Attwell Drive, Suite 300

Toronto, Canada M9W 6A9

FM Factory Mutual System
1301 Atwood Avenue
P.O. Box 7500
Johnston, RI 02919

ICC International Code Council
500 New Jersey Avenue, N.W., Sixth Floor
Washington, D.C. 20001

IEEE Institute of Electrical and Electronics Engineers
3 Park Avenue, 17th Floor
New York, NY 10016

ISO International Organization for Standardization
1, ch. de la Voie-Creuse
Case postale 56
CH-1211 Geneva 20, Switzerland

MMCDA Master Municipal Construction Documents Association
102-211 Columbia Street
Vancouver, British Columbia V6A 2R5

MTI Ministry of Transportation and Infrastructure
PO Box 9055 STN PROV GOVT
Victoria, British Columbia V8W 9E2

NFPA National Fire Protection Association
1 Battery March Park
Quincy, MA 02169

NSWMA National Solid Wastes Management Association
4301 Connecticut Avenue, NW, Suite 300
Washington, DC 20008

PCA Portland Cement Association
5420 Old Orchard Road
Skokie, IL 60077

PCI Prestressed Concrete Institute
200 W. Adams St. #2100
Chicago, IL 60606

PPI Plastic Pipe Institute
105 Decker Court #825
Irving, TX 75062

SSPC The Society for Protective Coatings

40 24th St 6th Floor

Pittsburg, PA 15222

TAC Transportation Association of Canada
2323 St. Laurent Blvd.
Ottawa ON K1G 4J8

WCB Worker's Compensation Board of British Columbia
707-808 Nelson Street
Vancouver British Columbia V6Z-2H2

WSBC WorkSafeBC
6951 Westminster Highway
Richmond, British Columbia, Canada

UL Underwriters Laboratories, Inc.
2600 N.W. Lake Road
Camas, WA 98607-8542

ULC Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario, Canada M1R 3A9

014219.2 PRODUCTS

N/A

014219.3 EXECUTION

N/A

** END OF SECTION **

SECTION 01 45 00

QUALITY CONTROL

014500 QUALITY CONTROL

014500.1 GENERAL

014500.1.1 Section Includes

A. Quality Assurance and Control of Installation

B. Field Samples

C. Inspection and Testing Laboratory Services

D. Manufacturers' Field Services and Reports

E. Submittals

014500.1.2 Quality Assurance and Control of Installation

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply fully with manufacturer's instructions, including each step in sequence.

C. Should manufacturer's instructions conflict with the Specifications, request clarification from the Owner before proceeding.

D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

014500.1.3 Field Samples

A. Take field samples at the Site as required by individual Specification sections for review.

B. Acceptable samples represent a quality level for the work.

C. All elements of the project must be inspected and approved by the Engineer with no exceptions unless specifically stated and recorded by the Engineer. It is the sole responsibility of the Contractor to ensure this happens to avoid delays in the Work and

subsequent Progress Payments. As an agent of the Owner, the Engineer has the responsibility to ensure the Work is completed according to the Specifications. The Owner requires the Engineer's formal endorsement of the Work before any payments are made. The Engineer cannot endorse unseen work as required by the tenets and bylaws of their profession.

014500.1.4 Inspection and Testing Laboratory Services

A. Contractor will employ services of an independent firm to perform inspection and testing as specified in the Contract Documents. An "Independent Firm" will perform sampling and testing of concrete, asphalt concrete pavement, and compaction.

B. The independent firm will also perform inspections, sampling, tests, and other services as required by the Engineer.

C. Reports will be submitted by the independent firm to the Engineer, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Specification.

D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.

   a Notify Engineer and independent firm 48 hours prior to expected time for services. The Engineer will endeavor to assist the Contractor in promptly receiving Work endorsements; however, conflicting duties whilst on-site may require additional engineering services to carry out the inspections. As such, prompt notification will reduce construction delays.

   b Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

E. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer at no additional cost to the Owner.

F. All field inspections to be carried out by the Engineer will require the Contractor to provide access to the Work in question, before any underground Works being backfilled.

G. To accommodate both the Engineers' and the Contractor's needs to inspect, approve and pay for the Works, the Contractor must organize a meeting with the Engineer to develop an inspection protocol to the satisfaction of both parties. The meeting would include a presentation of the Engineer's requirements on behalf of the Owner and a review of the Owner's requirement in payment of the Work. The Contractor is encouraged to

collaborate with the Engineer to develop a Memorandum of Understanding confirming the inspection protocol to be followed during the construction process.

014500.1.5 Manufacturers' Field Services and Reports

A. The Contractor will submit qualifications of observer to the Owner 15 days in advance of required observations. Observer subject to approval of the Owner.

B. When specified in individual Specification sections, it is required that material or product suppliers or manufacturers provide qualified personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, balance, or replacement of equipment as applicable, and to initiate instructions when necessary.

C. The Contractor shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit reports in duplicate within 10 days of observation to the Engineer for review.

014500.1.6 Submittals

A. Submit in accordance with section 01 33 00 - Submittal procedures.

B. Submit name, address, and telephone number of independent firms to perform inspection and testing.

C. On request, submit documentation verifying accuracy of test results.

014500.2 PRODUCTS

N/A

014500.3 EXECUTION

N/A

** END OF SECTION **

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

015000.1 TEMPORARY FACILITIES AND CONTROLS

015000.1.1 Section Includes

A. The provisions required for temporary facilities, services, and their control.

015000.1.2 Temporary Electricity

A. Provide and pay for power service required from the utility.

B. Provide temporary electric feeder from existing electrical service. Do not disrupt the Owner's need for continuous power service.

C. Provide separate metering and reimburse the Owner for cost of energy used.

D. Provide main service disconnect and overcurrent protection at convenient location.

015000.1.3 Temporary Lighting

A. Provide and maintain lighting for construction operations.

015000.1.4 Temporary Telephone Service

A. Provide, maintain, and pay for telephone service to field office as needed.

015000.1.5 Temporary Heat

A. Provide and pay for heat devices and heat as required to maintain specified conditions for construction operation.

015000.1.6 Temporary Ventilation

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

015000.1.7 Temporary Water Service

A. Provide, maintain, and pay for suitable quality water service required.

B. Provide separate metering and backflow prevention and reimburse the Utility for cost of water used.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing, as required.

015000.1.8 Temporary Sanitary Facilities

A. Provide and maintain required facilities and enclosures.

015000.1.9 Barriers

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.

C. Provide protection for plant life designated to remain. Replace damaged plant life.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

015000.1.10 Water Control

A. Grade site to drain. Provide, install, operate, and maintain necessary machinery, appliances, and equipment to keep excavations free of water during construction.

B. Dewater and dispose of water in a manner that will not cause injury to public, private property and the environment.

C. Do not cause a nuisance to the public.

D. Keep sufficient pumping equipment and machinery on hand at all times for emergencies, including electric power failures.

E. Keep experienced personnel available at all times to operate pumping equipment, machinery, and appliances.

F. Do not shutdown dewatering systems between shifts, on holidays and weekends, nor during work stoppages.

G. Control groundwater to prevent softening of bottoms of excavations, or formation of "quick" conditions or "boils."

H. Design and operate dewatering system that will not remove natural soil.

I. Keep excavation free of water during excavation, construction of structures, installation of pipelines, place of structures, backfilling, and placing and curing of concrete.

J. Control surface water runoff to prevent entry and collection in excavations.

K. Draw down static water level a minimum of 300 mm (1 foot) below bottom of excavations to maintain the undisturbed state of foundation soils and allow placement and compaction of fill and backfill materials to required density.

L. Install and operate dewatering system so that groundwater level outside excavations is not lowered to an extent that will damage or endanger adjacent structures or property.

M. Do not use open or cased pumps as primary dewatering means for excavations more than 1 metre (3 feet) below the static water level. Locate open or cased sumps outside of excavation limits.

N. Release static water level in a manner to maintain the undisturbed state of natural soils; prevent disturbance of compacted backfill; and prevent flotation or movement of structures and pipelines.

O. Do not obstruct ditches; provide means for free flow of surface water.

P. Provide methods to remove and dispose of surplus water, mud, silt, slickings, or other runoff pumped from excavations or from sluicing or other operations.

015000.1.11 Dust Control

A. Provide dust control during construction to the satisfaction of the Owner and local air pollution control authority/jurisdiction.

015000.1.12 Protection of Installed Work

A. Protect installed Work and provide special protection where specified in individual Specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

015000.1.13 Security

A. Provide security and facilities to protect work, equipment and supplies, and existing systems and facilities, from unauthorized entry, vandalism, or theft.

015000.1.14 Access Roads

A. Construct and maintain temporary roads accessing public thoroughfares to service construction area.

B. Provide and maintain access to fire hydrants free of obstructions.

015000.1.15 Progress Cleaning

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

D. Remove waste materials, debris, and rubbish from site periodically and dispose off-site. Depending on type of materials, they can be disposed at the landfill with Owner's approval and at the Contractor's cost.

E. Set up and maintain a "Decontamination Area" for cleaning and decontaminating material and equipment which comes in contact with refuse during work activities. Decontaminate equipment and material prior to removal from site.

015000.1.16 Project Identification

A. Provide a project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter, to Owner's design, colors, size, and approval.

B. List title of project, names of Owner, Engineer, and Contractor.

C. Erect on site at location established by Owner.

D. No other signs are allowed without Owner permission except those required by law.

015000.1.17 Field Offices and Sheds

A. Provide and Maintain Office: Weather-tight, with lighting, electrical outlets, heating and ventilating equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for project meetings, with table and chairs to accommodate 8 persons.

C. Locate offices and sheds a minimum distance of 9 metres (30 feet) from new structures.

D. Provide space, meeting table, chairs, shelves, tables, phone, and facsimile machine.

Provide Tidy office for Engineer with desk, chair, book case, table and chair.

015000.1.18 Traffic Control

A. Provide temporary traffic control to maintain existing operations of the landfill and its activities.

B. Provide personnel, flaggers, traffic lights, traffic markers and traffic signs as necessary to direct traffic in an orderly fashion and maintain traffic movement which is part of the day to day activities of landfill operations.

015000.1.19 Removal of Utilities, Facilities, And Controls

A. Remove temporary above grade or buried utilities, equipment, facilities, foundations, and materials prior to Final Application for Payment.

B. Remove underground installations to a minimum depth of 1 metre (3 feet). Cap conduits; abandon utilities, etc., pursuant to local code requirements. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

015000.1.20 Erosion and Sediment Control

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize amount of bare soil exposed at one time.

C. Provide temporary measures such as berms, dikes, and drains to control water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Comply with requirements of local and provincial stormwater permits for Construction Activities.

015000.1.21 Fire Protection

A. Coordinate with local fire and safety authority for required fire protection and provide as necessary.

015000.2 PRODUCTS

N/A

015000.3 EXECUTION

N/A

Temporary Facilities and Controls

* * END OF SECTION * *

SECTION 01 60 00

PRODUCT REQUIREMENTS

016000 PRODUCT REQUIREMENTS

016000.01 Section Includes

A. Purchasing

B. Products

C. Delivery, Storage, and Handling

D. Product Options

E. Substitutions (approved alternates)

016000.02 Purchasing

A. The Contractor is responsible for the acquisition, and safe storage of all materials required to complete the Work (s).

016000.03 Products

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. It does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components required for reuse.

B. Products may include existing materials or components supplied and approved by the Engineer, at the Engineer's discretion.

C. Provide interchangeable components of the same manufacturer, for similar components.

016000.04 Delivery, Storage, And Handling

A. General

1. All equipment shall be adequately prepared for shipment and for outdoor storage.

2. Prior to shipment, equipment shall be completely drained and thoroughly dried. When such drainage requires the removal of plugs, drain valves, etc., Contractor shall be responsible that these parts are reinstalled or reassembled prior to shipment.

3. All openings and machined surfaces shall be provided with protection to prevent damage, corrosion, and entrance of foreign matter during shipment and storage.

4. Flanged connections shall be protected by a 13 mm (1/2-inch) or thicker plywood disc, or suitable alternate, bolted to the face of the flange.

5. Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast iron plugs are not acceptable for protection unless part of the permanent assembly.

6. Butt weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.

7. Covers, straps, or fasteners shall not be welded to equipment.

8. Equipment shall be adequately supported for shipment. All loose parts shall be crated or boxed for shipment and appropriately identified. Where shipment is braced internally, it shall be marked conspicuously "Remove internal braces before testing and operating."

9. To facilitate rapid installation, all equipment shall be shop assembled to the maximum extent practical before shipment to site.

10. All large and heavy shipping units shall have suitable skids for moving. Crating shall also be adequate for lifting with slings. If location of slings is critical, these locations shall be marked accordingly. Lifting lugs, if required, shall be provided and installed by Contractor.

B. Site Handling and Storage of Materials and Equipment

1. Where required to protect against condensation and humidity, sufficient desiccant for the prescribed storage interval shall be provided by the Contractor and its presence with the need of periodic removal, dry-out, or replacement shall be so marked. When electric space heaters are provided for that purpose, these shall be wired by the Contractor such that energization immediately upon receipt is possible without disassembly of crates, etc. This also requires that no combustible material be left inside the equipment or crate.

2. Contractor shall provide one copy of storage and handling instructions to Owner, including descriptions for periodic inspection and/or storage maintenance. The Contractor will ascertain that no deterioration will occur during storage. One set of these instructions shall also be fastened securely to the outside of each shipping unit to aide personnel in storage and handling.

3. All material and equipment shall be protected against loss, damage by corrosion, weather, overstressed components, or contamination by foreign materials, Contractor shall repair or replace any material or equipment damage during delivery or installation at no cost to the Owner.

016000.05 Product Options

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

016000.06 Substitutions (Approved Alternates)

A. Substitutions may be considered at the option of the Owner.

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. A request constitutes a representation that the Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the Substitution as for the specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.

D. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
3. The Owner will notify Contractor, in writing, of decision to accept or reject request.

016000.07 Non-Payment for Rejected Products:

A. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Works.
5. Products remaining on hand after completion of the Works.
6. Loading, hauling and disposing of rejected products.

Product Requirements

016000.1 PRODUCTS

N/A

016000.2 EXECUTION

N/A

* * END OF SECTION * *

SECTION 01 71 23

FIELD ENGINEERING

017123. FIELD ENGINEERING

017123.1 GENERAL

017123.1.1 Section Includes

A. The work described in this section includes field engineering and survey requirements.

B. The Contractor shall provide the following surveying work.

C. Survey existing site features, structures and pipe that impact the work.

D. Survey to provide lines and grades for construction of the works.

E. Survey of as-built work to determine quantities for measurement and payment on a monthly basis.

F. Survey of final as-built work upon completion of the project.

G. Monthly as-built drawings and survey information for quantities with application for progress payment.

H. Final as-built drawings and survey information for use with project record documents.

017123.1.2 Quality Control

A. The Contractor shall retain the services of a Land Surveyor registered with the Association of BC Land Surveyors (ABCLS) for all measurement and payment related survey records.

B. All drawings and records shall be directly provided to the Engineer by the Land Surveyor.

C. Subject to Engineer's approval and periodic auditing, the Contractor might utilize an in-house Surveyor. The Contractor shall provide details regarding the proposed Surveyor qualifications and experience for the Engineer's review.

D. If in the opinion of the Engineer, any of the measurement and payment related survey records are inadequate or perceived inaccurate, the Engineer can, at any time, without consulting with the Contractor, and without any cost or schedule implications, subject to 10-day notice, revoke any previous approval for utilizing an in-house Surveyor.

E. Utilize recognized engineering survey practices.

017123.1.3 Submittals

A. Submittals shall be made in accordance with the provisions of Schedule 17 Summary of Submittals and Section 01 33 00 - Submittal Procedures.

B. Submit name, address, telephone number and member ID of ABCLS Surveyor before starting survey Work.

C. If the Contractor intends to use an in-house surveyor, in addition to the ABCLS Surveyor submittal, the Contractor shall submit for review any documentation supporting his request for surveyor change.

D. On request, submit documentation verifying the accuracy of survey Work.

017123.1.4 Project Record Documents

A. Maintain a complete and accurate log of control and survey Work as it progresses for verification during the Engineers auditing process.

B. Submit Record Documents under provisions of Section 01 77 00 Closeout Procedures.

017123.2 PRODUCTS

017123.2.1 General

A. Provide hard copy and electronic drawing files in AutoCAD (.dwg format) and Adobe Acrobat (.pdf format) in a version acceptable to the Engineer (i.e. Civil 3D 2020 version) of all as-builts.

B. Drawings must include 3D poly-lines (or feature lines) for each structure, pipe and components completed by Contractor or existing infrastructure in the general area of Work. In the AutoCAD file, provide lines and survey points on separate layers for each individual pay item as per the Schedule of Quantities and Prices (or as otherwise agreed with Engineer).

C. Identify construction elements type and size on as-built drawings in an acceptable format approved by the Engineer.

D. Utilize naming conventions and descriptions on the as-built drawings consistent with Master Municipal Construction Documents (MMCD) drawings and legend as otherwise approved by the Engineer.

E. Provide electronic point list files in .csv or .xlsx format, including horizontal (x, y) and vertical (z) positions with relevant point numbering and descriptions. Points shall be described in a manner acceptable to the Engineer (including list of abbreviations).

a. Points to be formatted such that the number of each point begins with the survey date (i.e. 1804160001 – As the first point from April 16, 2018, followed by the point number 0001).
b. At minimum, the points description shall include:
    i. Specify whether it is a pipe, flange, valve, fitting, conduit, wire, JB, MH, CB, headwall, culvert, casing, liner, geotextile, road, shoulder, etc.
    ii. Weather the center, top, invert, sump, inlet, outlet, etc.
    iii. Diameter.
    iv. Material (i.e. Concrete, HDPE, CSP, DI, PVC, 8oz, etc.)

F. Upon request, provide hard copies of drawings both for the purpose of determining progress quantities to the Engineer and for final as-builts drawings of record.

017123.2.2 As-Built Drawings for Monthly Progress Quantities

A. Provide electronic records in AutoCAD (.dwg format) showing the 3D poly-lines for each structure, pipe and components completed for the month. Drawings shall show the entire Works completed to date and distinguish between previously completed Works separately from current month's work.

B. Provide a list of quantities for Work completed for the current month electronically in MS Excel format consistent with the format of the Schedule of Quantities and Prices.

C. Each month's Work shall correspond to the Work identified in the monthly progress payment request.

D. Ensure no overlaps for adjacent pay items (i.e. no double payment for complementary items).

017123.2.3 As-Built Drawings for Record Documents

A. Provide a marked-up set of printed Issued for Construction Drawings showing as-built conditions. Mark all coordinates and elevations noted on printed drawings with as-built coordinates and elevations. Mark or confirm the diameter, length, slope or any other element shown in the drawings. Include all changes and revisions implemented as part of the project. Provide AutoCAD file to Engineer with as-built surveyed points (x,y,z) and 3D poly-lines for each structure, pipe and components for all as-built project items.

B. Provide a complete list of quantities for each project electronically in MS Excel format consistent with the format of the Schedule of Quantities and Prices.

C. Provide documentation verifying accuracy of survey Work.

017123.3 EXECUTION

017123.3.1 Examination

A. Install and verify locations of survey control points prior to starting Work.

B. Before starting any earthwork, The Contractor shall review and confirm the adequacy and accuracy of any control survey points and data established by the Engineer. The Contractor shall make such measurements and surveys as it deems necessary to confirm the Engineer's control surveys. Any variances or discrepancies shall be promptly brought to the attention of the Engineer prior to starting the Work.

C. Should any discrepancies appear, or should any difference of opinion or misunderstanding arise as to the adequacy and accuracy of any control survey points, survey methods, survey coordinates, the resolution shall be determined by the Engineer and the Engineer's decisions shall be final and binding without any claims, schedule or budgetary implications to the project.

D. When control surveys and data have been established to the satisfaction of all concerned, the Contractor shall indicate his acceptance by submitting his acceptance in writing to the Engineer. Initiation of Work without the Contractor’s submission of acceptance shall constitute acceptance of control survey Work by the Contractor.

017123.3.2 Survey Reference Points

A. The Contractor will locate, install and protect survey control and reference points.

B. Maintain accuracy through a third-order survey with a horizontal accuracy to 5 cm and a vertical accuracy to 3 cm.

C. The Contractor must protect Owner’s survey control points at all times and preserve permanent reference points during construction.

D. The Contractor will promptly report to the Engineer the loss or destruction, of any reference points or their relocation due to changes in grades or otherwise.

E. The Contractor will replace dislocated survey control points based on the original control survey. No changes can be initiated without prior written notice by the Engineer and/or Engineer.

017123.3.3 General

A. Establish locations, elevations, lines, grades and levels necessary for construction of structures and systems. Locate, layout, and mark (stake) in the field by instrumentation and similar appropriate means:

a. Stakes for grading, fill placement; utility locations, slopes, and invert elevations

b. Piping systems (stormwater) alignments, grades, connection to existing and proposed. Alignment staking to include elbows, tees, reducers, and end points.

c. Grid or axis for structures

d. Building foundation, column locations, and floor elevations

e. Decommissioned components.

f. Locations where the Hydrovac system is to be used.

B. Periodically verify layouts by same means.

017123.3.4 Existing Site Features

A. Prior to any and all construction, the Contractor shall locate all existing utilities in the areas to be impacted by the work. The Contractor shall field stake and survey locations and alignment of existing utilities that are in the area to be impacted by the work. The Contractor shall dig test pits by hand or by hydrovac, expose and survey the locations and elevations of any existing utilities in the area to be impacted by the work.

017123.3.5 Field Quality Control

Alignment and Grade

A. The Contractor shall provide grade and alignment control during pipe installation process. The Contractor shall provide stakes or similar devices that display relevant information to control work. Grade control devices shall be spaced no greater than 6 meters (20 feet) apart over the entire length of pipe and at critical grade breaks or changes in alignment and no greater than 10 x 10 m grid (30 ft) for surfaces and layers.

B. Provide grade control device showing top of bedding layer design elevation, invert elevation and top of pipe elevation and existing grade elevation. The Contractor shall monitor placement of pipe to verify grade and alignment tolerance are met.

C. The Contractor shall immediately set new grade markers that have been disturbed.

D. The Contractor shall demonstrate to the Engineer that installed pipe meets slope (grade), elevations and alignment. At a minimum, the demonstration shall check elevations, slope, and alignment every 3 meters (10 feet) on center and surfaces on a regular 5 x 5 m grid.

017123.3.6 Survey for Monthly Quantities

A. The Contractor shall measure and record the as-built pipeline information for the work associated with the application for progress payment. The survey information MUST be submitted to the Engineer as part of each progress draw. The progress draw will not be processed until the necessary survey information is provided and reviewed for completeness and accuracy by the Engineer.

B. As-built survey information shall include horizontal and vertical locations of installed pipelines at locations and elevations shown on the Drawings and a minimum of every 3 meters (10 feet) on center, at grade breaks, junctions, pipe fittings, valves, or changes in alignment.

C. As-built survey information shall include horizontal and vertical locations of constructed surfaces and layers on a regular 5 x 5 m grid with additional points taken at major grade breaks, material or layer thickness changes.

017123.3.7 Project Record Documents

The Contractor shall measure and record the final as-built pipeline information.

A. For piping systems, as-built survey information shall include horizontal and vertical locations of pipeline at locations and elevations shown on the Drawings and every 3 meters (10 feet) on center and at grade breaks, junctions, or changes in alignment. The survey shall also include ground surface along buried pipe alignments.

** END OF SECTION **

SECTION 01 77 00

CLOSEOUT PROCEDURES

017700 CLOSEOUT PROCEDURES

017700.1 GENERAL

017700.1.1 Section Includes

This section includes details on:

A. Closeout Procedures

B. Final Cleaning

C. Adjusting

D. Project Record Documents

E. Operation and Maintenance Data

F. Warranties

G. Spare Parts and Maintenance Materials

017700.1.2 Submittals

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Owner's inspection.

B. Provide submittals to Owner that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

017700.1.3 Final Cleaning

A. Execute final cleaning prior to final inspection

B. Clean equipment and structures to a functional and aesthetically pleasing condition.

C. Clean equipment and fixtures to a sanitary condition.

D. Clean or replace filters of operating equipment.

E. Clean site; sweep paved areas, rake clean landscaped surfaces.

F. Remove waste and surplus materials, and construction facilities from the site.

017700.1.4 Adjusting

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

017700.1.5 Project Records Documents

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

   a. Contract Drawings

   b. Specifications

   c. Addenda

   d. Change Orders and other Modifications to the Contract

   e. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

   a. Manufacturer's name and product model and number

   b. Product substitutions or alternates utilized

   c. Changes made by Addenda and Modifications.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

   a. Measured depths of foundations in relation to finish main floor datum

   b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

   c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

   d. Field changes of dimension and detail.

e. Details not on original Contract Drawings.

F. Provide monthly records, for the entire duration of the project, regarding the total amount of fuel used by on-site equipment.

a. Provide separate records for different types of fuels (gasoline, diesel, propane and bio-diesel).

b. Identify the fuel amounts under 2 separate categories:

i. stationary equipment (pumps, generators, etc.)

ii. mobile equipment (excavators, dozers, trucks, etc.).

G. National Pollutant Release Inventory (NPRI) Reporting

a. The Contractor is to track and report on requested metrics identified by the Engineer pertaining to vehicle use, kilometres travelled, and fuel consumption. Reporting to the NPRI is mandatory under the Canadian Environmental Protection Act (CEPA). As part of this reporting, the Engineer must include any Contractor vehicles brought on site as a result of the Work in determining the vehicle-kilometres travelled threshold for reporting on road dust. The road dust created by these vehicles is a result of the facility operations and therefore must be included.

b. Contractors must fill out the Engineer provided NPRI-GHG reporting spreadsheet on a monthly basis.

c. Data is to be recorded on an Engineer provided spreadsheet and submitted to the Engineer within the first week of each successive month.

H. Submit documents to Owner with claim for final Application for Payment.

017700.1.6 Operation and Maintenance Data

A. Prepare four sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D-side ring binders with durable plastic covers.

B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of project, and subject matter of binder when multiple binders are required.

C. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.

D. Part 2: Project documents and certificates, including the following:

a. Shop drawings and product data

b. Instruction manuals for all equipment

1. The descriptions shall not be general or applicable to multiple types of sizes of Seller's equipment, but shall be project specific with references to equipment and drawings submitted by Seller.
2. Schematics, parts lists, and component location diagrams shall be included for all electronic circuitry and for all circuit boards. Parts list shall provide, where applicable, generic part numbers for components.
3. Each manual shall contain the following components as applicable:
    1) Cover
    2) Title Page
    3) Table of Contents
    4) List of Illustrations
    5) List of Drawings and Tables
    6) Equipment Description
    7) Storage
    8) Installation
    9) Alignment and Calibration
    10) Operation
    11) Equipment Maintenance and Repair
    12) Inactivation Procedures
    13) Troubleshooting
    14) Parts Lists
    15) Special Tools and Instruments Lists

c. Air and water balance reports

d. Certificates

e. Photocopies of warranties and bonds.

E. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Owner's comments. Revise and submit documents as required prior to final Application for Payment.

F. Submit final volumes revised, within ten days after final inspection.

017700.1.7 Warranties

A. Provide reproducible notarized copies.

B. Submit prior to final Application for Payment.

C. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

017700.1.8 Spare Parts and Maintenance Manual

A. General

a. Include all spare parts considered necessary for first year of operation. These spare parts shall be in addition to those specifically identified herein. In addition, supply all special tools necessary for installation, operation, and maintenance of the equipment furnished.

b. The list of recommended spare parts shall be accompanied by descriptions sufficiently detailed to identify the spare parts and the specific item or items to which it applies. Indicate the minimum recommended inventory for routine maintenance and installation, startup and continuous operation. Indicate whether the recommended spare is a stock item or special item, location of nearest supply point, approximate lead time required for shipment, and the part price.

c. Spare parts shall be identical in design and manufacture and shall be interchangeable with the corresponding parts in the equipment supplied. Spare parts shall be carefully boxed and/or packed in waterproof packing for storage. Each box shall be properly marked or tagged and contain a list and identification numbers of the parts contained therein.

d. The list of special tools shall be accompanied by descriptions sufficiently detailed to identify the function of the tool and the specific item or items for which it applies. Indicate whether the tool is required for installation, adjustment, or routine maintenance. If the tool is required, it shall be included in the Contractor's scope of supply.

B. Deliver to location directed by Owner; obtain receipt prior to final payment.

017700.2 PRODUCTS

N/A

017700.3 EXECUTION

N/A

** END OF SECTION **

SECTION 03 48 00

PRECAST CONCRETE

034800. PRECAST CONCRETE

034800.1 GENERAL

034800.1.1 Scope of Work

A. All provisions required to install precast concrete in place in relation to the Work.

034800.1.2 Standards

ASTM A48-83	Specification for Gray Iron Castings.
ASTM C139-05	Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C478M-88a,	Specification for Precast Reinforced Concrete Manhole Sections.
CAN3-A23.1-M90,	Concrete Materials and Methods for Concrete Construction.
CAN/CSA-A23, 2-M90	Methods of Test for Concrete
CSA CAN3-A23.4-M78	Precast Concrete - Materials and Construction
CSA A251-M1982	Qualification Code for Manufacturers of Architectural and Structural Precast Concrete
ASTM C478	Precast Reinforced Manhole Sections
ASTM C789	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers

034800.1.3 Submittals

A. Submittals shall be made in accordance with the provisions of Schedule 17 Summary of Submittals and Section 01 33 00 - Submittal Procedures.

B. Submit information showing that the product(s) meet all requirements outlined in the design Drawings and Specifications.

C. Submit product name, supplier information, and shop drawings including reinforcement details

D. Conform to ACI 306 when concreting during cold weather.

034800.2 PRODUCTS

034800.2.1 Castings

A. The structures must be manufactured in accordance with CAN/CSA-A23.4 and CSA A251.

B. Cement: Type 50 Sulphate-Resistant Portland Cement meeting requirements of CAN/CSA-A5.

C. The manufacturing tolerances of the structures must be in accordance with CSA A23.4.

D. The finish edges and formed surfaces of structures with smooth faced finish grade A to CSA-A23.4.

E. Tolerance of precast elements to CSA A251.

F. Cure precast units in accordance with CSA-A23.4. As a minimum, the concrete shall be allowed to cure for a period of 28 days from the time the concrete was deposited and has reached 100 percent of the specified 28-day compressive strength prior to installation.

034800.2.2 Lock Block Walls and Pads

A. Lock Blocks shall conform to industry standards for dimensions

B. Lock Blocks shall be standard grade with one full and one side face free of large imperfections.

C. Lock Blocks shall have a standard 7 strand galvanized cable loop at the top center of the block for the purpose of lifting the block.

034800.2.3 Manholes And Catch Basins

A. Supply precast concrete structures to these Specifications and those shown on the Drawings.

B. Precast perforated manholes shall be 35 Mpa drywell barrels with 100 rectangular openings per barrel circumference on each 900 mm high section. Openings shall be spaced 150mm apart vertically and 200mm apart horizontally.

C. All materials, unless otherwise specified, to CAN3-A23.4

D. Precast manhole sections to ASTM C478M, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

E. Install MH barrels using watertight butyl rubber, pre-lubricated rolling gaskets (Tylox SuperSeal or equivalent), rated for min 10 psi water pressure.

F. Mortar:

i. Aggregate to CSA A82.56.

ii. Cement to CAN/CSA–A8.

G. Grout and plug lifting holes, joints and frame with non-shrink mortar. Remove excess mortar from inside and outside surface of manhole.

H. Ladder rungs to CSA G30.12, NO. 25M billet steel deformed bars, hot dipped galvanized to CSA G164. Rungs to be safety pattern (drop step type). Plastic or composite rungs may be considered by the Engineer upon Contractor's request.

I. All watertight manholes, in addition to the above specifications, to include the following items:

i. Use polyurethane-based, non-sagging elastomeric sealant as per ASTM C-920, Type S, grade NS to seal all inside joints. Comply with all application methods and recommendations as per manufacturer data sheet.

ii. All pipe penetrations to have Link-Seal type gaskets or cast-in-place, watertight connection compatible with the type of penetrating pipe.

034800.2.4 Frames and covers

A. Frames and covers to the Specifications shown on the Drawings.

B. Frames and covers to dimensions as indicated and following requirements:

i. Gray iron castings: to ASTM A48, strength class 30B.

ii. Frames to plan dimensions, heavy duty municipal type for road service; complete with four 12.5 mm stainless pins for securing lid to ring.

iii. Spark resistant fiberglass or rigid polyethylene cover with embedded lifting loop or U-Bolt eye and four holes for anchoring lid on frame.

iv. Spark resistant covers to bear evenly on frames. A frame with cover to constitute one unit. Assemble and mark unit components before shipment.

034800.2.5 Warning Signs

A. Warning signs to the Specifications shown on the Drawings.

B. Unless otherwise specified in the Drawings, warning signs to be constructed of aluminum plate stock with dimensions 300 mm by 300 mm and written with easily visible color and font.

C. Warning signs shall not cover lifting ring on manhole lids. Signs should be adapted, if necessary, to have holes that align with lifting holes.

034800.3 EXECUTION

034800.3.1 Handling

A. Each manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the manufacturer. Materials shall be handled, installed, and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

B. Materials shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skid-walks in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the material into the necessary location. Materials shall not be dropped or dumped.

034800.3.2 Installation

A. Excavate and prepare foundation and bedding in accordance with 31 23 02 Earthworks.

B. Construct precast units in accordance with Drawings, Specifications, and manufacturer's instructions, plumb and true to alignment and grade.

C. Install precast units in the presence of the Engineer.

D. Clean units of debris and foreign materials. Remove fins and sharp projections.

E. Backfill around the blocks and structures in accordance with 31 23 02 Earthworks, and as shown on the Drawings.

** END OF SECTION **

SECTION 05 50 00

MISCELLANEOUS METAL FABRICATIONS

055000 MISCELLANEOUS METAL FABRICATIONS

055000.1 GENERAL

055000.1.1 Section Includes

A. Miscellaneous metalwork, including structural steel, gates, plates, and bars; steel ladders, grating, seat angles, handrails, pipes and miscellaneous supports and guides.

055000.1.2 Referenced Specifications

A. Handbook of Steel Construction, as issued by the CISC.

B. Detailing for Steel Construction, Second Edition, as issued by the AISC.

C. Structural Welding Code as issued by the CWS.

D. Metal Framing Manufacturers Association Standard Publication MFMA-1.

055000.1.3 Submittals

A. Submittals shall be made in accordance with the provisions of Schedule 17 Summary of Submittals and Section 01 33 00 - Submittal Procedures.

B. Provide shop drawings showing dimensions, details, and necessary accessory items. Detailing Work shall conform to CISC Detailing for Steel Construction.

055000.1.4 Product Delivery and Handling

A. Fabricated metal shall be delivered on long-bed trucks or trailers adequately supported to prevent bending and other damage. Adequate preparations shall be made for unloading and handling prior to delivery of materials. Materials shall be unloaded by hand, by appropriate slings, or other means that will prevent damage. Materials shall be stored above ground in such a manner as to prevent rusting and bending, and shall be protected with waterproof covers and allow for inspection.

055000.2 PRODUCTS

055000.2.1 General

A. Materials for miscellaneous metalwork shall be as follows:

Material	Specification
Steel shapes, plates, bars, clips and similar items	ASTM A 36
Steel pipe	ASTM A 53, Type S, Grade B
Steel tubing	ASTM A 500, Grade B
Stainless steel	ASTM A 320, Type 304

Material	Specification
Aluminum	ASTM B 241, Alloy 6061-T6

055000.2.2 Seat Angles, Miscellaneous Supports and Guides

A. Seat angles and supports for grating, supports for floorplates, clips, plates and angles for precast wall panels, lintels and guides for slide gates shall be steel, of sizes shown, and shall be hot-dip galvanized after fabrication.

055000.2.3 Metal Framing System For Pipe Supports, Anchors And Guides

A. General: The bolted metal framing system shall be made of channel, fittings, and hardware as defined in the Metal Framing Manufacturers Association Standard Publication MFMA-1.

B. Material and Finishes:

a. Hot-Dip Galvanized After Fabrication: Channels Hot-Dipped Galvanized After Fabrication shall be made from steel meeting the minimum requirements of ASTM A570, Grade 33. Eighteen gauge (1.2-mm) and lighter channel shall be ASTM A611, Grade C steel. Channels shall be Hot-Dip Galvanized After Fabrication in accordance with ASTM A123. All ¼ (6.3) fittings shall be formed from ASTM A635 steel and Hot-Dip Galvanized After Fabrication in accordance with ASTM A123.

b. Stainless Steel: Stainless Steel Channel and accessories shall be of AISI Type 304 or Type 316 Stainless Steel.

C. Dimensions: Metal Framing Channel shall be cold formed 12 Ga. (2.06mm), 14 Ga. (1.63mm), or 16 Ga. (1.29mm) steel. All channels shall have a nominal overall width of 1 5/8-inch (41.3mm) and have a 7/8-inch (22.2mm) slot face opening. All testing and tolerances shall be in accordance with the latest MFMA-1 Standard.

D. Metal Framing System Components:

a. Components shall be from a single manufacturer such as B-Line System, Inc., or Unistrut Corporation and include the following components:

i. Strut Channel – Model B22 or P1000

ii. Combination Strut Channel – Model B52A or P4101

iii. Pipe Clamp – Model B2400 or P2558

iv. Adjustable Brace – Model B634 or P2815

v. Concrete Insert – Model B22I or P3253

vi. End Cap – Model B205 and B287 or P1180 and P2280A

vii. Spring Nut – Model N226 or P1009

viii. Bolt – Model HHCS 3/8 x Size or HHCS037 x Size

055000.2.4 Galvanizing

A. Hot-Dip Galvanizing: Large structural steel items such as columns and beams shall be galvanized only if specifically shown on the Drawings. Galvanizing by the hot-dip process shall conform to the applicable requirements of ASTM A 123, A 153, A 384, A 385, and A 386.

B. Field Repair of Galvanizing: Field repair of galvanizing shall be done using Z.R.C. Cold Galvanizing Compound.

055000.2.5 Bolts, Nuts and Washers

A. Bolts shall physically conform to ASTM A 193, Grade B8M. Bolt and nut dimensions shall conform to ANSI B18.2. Washer dimension shall conform to ANSI B27.2.

a. Above ground nuts and bolts shall conform to ASTM A 307 unless noted as stainless steel. Carbon steel bolts, nuts and washers shall be hot-dip galvanized after fabrication.

b. All below ground bolts shall be stainless steel. Stainless steel bolts and accessories shall be Type 304 material. Bolts shall be Stainless steel, Grade B, heavy hex, in accordance with the requirements of Class C of ASTM A153. Nuts shall conform to the requirements of ASTM A563. Nuts shall be Grade A, heavy hex, hot dip zinc-coated in accordance with Class C of ASTM A153. Washers shall be Grade A, hot dip zinc-coated in accordance with Class C of ASTM A153.

c. All thread is not allowed unless authorized by the Engineer.

A. **Expansion Bolts**

A. Expansion bolts shall be wedge-type bolts, and shall be Molly Parabolt Concrete Anchors. Expansion bolts shall be stainless steel. Components of stainless steel expansion bolts, including nuts, washers and wedges, shall be stainless steel. Minimum embedment lengths and edge distances shall be as recommended by the manufacturer, unless otherwise shown on the Drawings.

055000.3 EXECUTION

055000.3.1 General Requirements

A. Measurements shall be verified at the Project site. Holes shall be punched 1.6mm (1/16-inch) larger than the nominal size of the bolt, unless otherwise specified.

No drifting of bolts or enlargement of holes will be allowed to correct misalignment.

B. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.

C. Metalwork to be embedded in concrete shall be placed accurately and held in position while the concrete is placed.

D. Structural steel that is completely encased in concrete shall not be galvanized or painted and shall have a clean surface for bonding to concrete.

055000.3.2 Fabrication

A. Fabrication and workmanship shall be performed in accordance with the CISC. Fabrication, including cutting, drilling, punching, threading, and tapping required for miscellaneous metal or adjacent work shall be performed prior to hot-dip galvanizing.

055000.3.3 Connections

A. Welded: Welding shall be done by operators who have been qualified by tests as prescribed by the Canadian Welding Bureau (CWB) in Standard Procedure to perform the type of work required. The quality of welding shall conform to CWB Structural Welding Code.

B. Bolting: Bolts for structural and miscellaneous steel connections shall extend no further than twice the bolt diameter past the nut. Washers shall be installed at the nut on bolt assemblies. Stacking of nuts or washers on bolts will not be permitted. Bolted connection shall conform to CISC and shall be as shown on the Drawings.

055000.3.4 Seat Angles, Supports and Guides

A. Seat angles for grating and supports for floor plates shall be set so that the gratings and floor plates are supported evenly and maintain the grating and floor plates flush with the floor.

055000.3.5 Grating

A. Openings in concrete surfaces for gratings, floor and miscellaneous cover plates shall be field measured for proper cut-outs and proper size. Holes through gratings and cover plates shall be banded. Dimensions shall be field verified to ensure proper fit prior to ordering. Grating shall be attached to supports with a minimum of four hold-down clips per panel.

055000.3.6 Cleaning

A. After installation, damaged surfaces of shop primed metals shall be cleaned and touched-up with the same material used for the shop coat.

055000.3.7 Repair and Galvanizing

A. Damaged areas of galvanizing shall be cleaned with mineral spirits followed by wire brushing. After wire brushing, areas shall be cleaned with Z.R.C. metal conditioner and coated with Z.R.C. Cold Galvanizing Compound in accordance with the manufacturer's printed instructions and recommendations.

* * END OF SECTION * *

SECTION 31 05 18

MINUS 25 MM CRUSHED GRAVEL

310518. MINUS 25mm CRUSHED GRAVEL

310518.1. GENERAL

310518.1.1 Scope of Work

A. This section includes details on the Minus 25mm Aggregate which will be used in the following applications in the Contract item:

i. As road surface on all roads and driving surfaces as indicated in the Contract Drawings.

310518.1.2 Standards

ASTM C131	Test Method for Resistance to Degradation of Small Size Course Aggregates by Abrasion and Impacts in the Los Angeles Machine
ASTM D422	Method of Particle Size Analysis of Soils
ASTM D2434-68	Standard Test Method for Permeability of Granular Soils (Constant Head)
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) (600 kN-m/m).
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

310518.1.3 Submittals

A. The Contractor shall submit the following to the Engineer a maximum of 10 days following award of the Contract. The information provided shall show that the product meets the required specifications of this section.
   a. A grain size curve with the appropriate sieve sizes as shown.
   b. A 20 L sample of the material
   c. Details on the proposed source of the material, including contact details.

B. The Contractor shall submit the following to the Engineer throughout the Contract for every 2,000 m^3 of material delivered onsite and at the request of the Engineer and in the case of a change in material source. The information provided shall show that the product meets the required specifications of this section.
   a. A grain size curve with the appropriate sieve sizes as shown.
   b. A 20 L sample of the material.

310518.2. PRODUCTS

310518.2.1 Minus 25mm Crushed Gravel

A. The Minus 25mm Aggregate shall be composed of inert, clean, tough and durable

particles of crushed gravel. The material will be free of wood, steel, roots, bark or other extraneous material.

B. The aggregate shall have a percentage of wear, by the Los Angeles test (ASTM C 535, 1000 revolutions), of not more than 35% maximum.

C. The aggregate particles shall be uniform in quality and free from excess of flat and elongated particles. The particles shall have a gradation falling within the limits specified below.

Minus 25 mm Aggregate

Sieve Size Opening (mm)	Percent Passing (by weight)
25	100
19	80-100
9.5	50-85
4.75	35-70
2.36	25-50
1.18	15-35
0.3	5-20
0.075	0-5

310518.3. EXECUTION

310518.3.1 Approvals

A. Inform Engineer of proposed source and provide samples or access for sampling at least 2 weeks prior to commencing use.

B. If, in the opinion of the Engineer, materials from the proposed source do not meet, or cannot reasonably processed to meet specified requirements, locate alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

C. Should a change of material source be proposed during work, advise Engineer 2 weeks in advance of proposed change to allow sampling and testing.

D. Acceptance of material does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

310518.3.2 Handling

A. Handle and transport material to avoid segregation, contamination and degradation.

310518.3.3 Stockpiling

A. The Contractor supplied material will be stockpiled on site in locations identified by the Engineer.

B. Material will be stockpiled in sufficient quantities to meet project schedules.

C. Stockpiling sites to be maintained level, well drained by Contractor during project.

D. Stockpile material on ground but do not incorporate bottom 300 mm of pile into Work.

E. Separate different materials by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

F. Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Engineer within 48 hours of rejection.

310518.3.4 Road Base Placement

A. Place Road Base after Sub-base is inspected and approved by Engineer.

B. Construct Road Base to depth and grade in areas indicated.

C. Ensure no frozen material is placed.

D. Place material only on clean unfrozen surface, free from snow and ice.

E. Place material using methods that do not lead to segregation or degradation of aggregate.

F. Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Engineer may authorize thicker lifts if specified compaction can be achieved.

G. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

H. Remove and replace that portion of layer in which material becomes segregated during spreading.

310518.3.5 Compaction Equipment

A. Compaction equipment to be capable of obtaining required material densities.

310518.3.6 Road Base Compaction

A. Compact Road Base to density not less than 100% Modified Proctor corrected maximum dry density in accordance with ASTM D1557.

B. Shape and roll alternately to obtain smooth, even and uniformly compacted base.

C. Apply water as necessary during compacting to obtain specified density (road subbase and trench only).

D. In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.

E. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

310518.3.7 Cleaning

A. Leave material stockpile site in tidy, well drained condition, free of standing surface water.

B. Leave any unused material in neat compact stockpiles as directed by Engineer.

** END OF SECTION **

SECTION 31 05 19

MINUS 75 MM CRUSH

310519. MINUS 75 mm CRUSH

310519.1 GENERAL

310519.1.1 Scope of Work

This section includes details on Minus 75 mm Crush. Within this contract, Minus 75 mm Crush will be used for road sub-base as per the Drawings.

310519.1.2 Standards

ASTM D422	Method of Particle Size Analysis of Soils
ASTM D698	Standard Proctor Compaction Test
ASTM D1557	Modified Proctor Compaction Test

310519.1.3 Submittals

A. The Contractor shall submit the following to the Engineer a maximum of 10 days following award of the Contract. The information provided shall show that the product meets the required specifications of this section.
   a. A grain size curve with the appropriate sieve sizes as shown.
   b. A 20 L sample of the material
   c. Details on the proposed source of the material, including contact details.

B. The Contractor shall submit the following to the Engineer throughout the Contract for every 2,000 m^3 of material delivered onsite and at the request of the Engineer and in the case of a change in material source. The information provided shall show that the product meets the required specifications of this section.
   a. A grain size curve with the appropriate sieve sizes as shown.
   b. A 20 L sample of the material.

310519.2 PRODUCTS

310519.2.1 Minus 75 mm Crush

A. The minus 75 mm crush aggregate will be composed of inert, clean, tough and durable particles of crushed rock capable of withstanding the deleterious effects of exposure to water, freeze-thaw, handling and spreading. The material to capable of compacting to specified density.

B. The aggregate particles shall be uniform in quality and free from excess of flat and elongated particles. The particles shall have a gradation falling within the limits specified below and illustrated in the Drawings.

Minus 75 mm Crush Rock

Sieve Size Opening (mm)	Percent Passing (by weight)
75	100
25	50-85
0.15	0-15
0.075	0-8

310519.3 EXECUTION

310519.3.1 Approvals

A. Inform Engineer of proposed source and provide samples or access for sampling at least 2 weeks prior to commencing use.

B. If, in the opinion of the Engineer, materials from the proposed source do not meet, or cannot reasonably processed to meet specified requirements, locate alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

C. Should a change of material source be proposed during work, advise Engineer 2 weeks in advance of proposed change to allow sampling and testing.

D. Acceptance of material does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

310519.3.2 Handling

A. Handle and transport material to avoid segregation, contamination and degradation.

310519.3.3 Stockpiling

A. Stockpile material on site in locations identified by the Engineer. Do not stockpile on completed pavement surfaces.

B. Stockpile material in sufficient quantities to meet project schedules.

C. Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

D. Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of material. Stockpile material on ground but do not incorporate bottom 300 mm of pile into work.

E. Separate different materials by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

F. Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Engineer within 48 hours of rejection.

310519.3.4 Road Sub-Base Placement

A. Place Sub-base after surface on which material is to be placed is inspected and approved by Engineer.

B. Construct Berm Sub-base to depth and grade in areas indicated.

C. Ensure no frozen material is placed.

D. Place material only on clean unfrozen surface, free from snow and ice.

E. Place material using methods that do not lead to segregation or degradation of aggregate.

F. Place material to full width in uniform layers not exceeding 200 mm compacted thickness. Engineer may authorize thicker lifts if specified compaction can be achieved.

G. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

H. Remove and replace that portion of layer in which material becomes segregated during spreading.

310519.3.5 Compaction Equipment

A. Compaction equipment to be capable of obtaining required material densities.

310519.3.6 Road Sub-Base Compaction

A. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

B. Remove and replace that portion of layer in which material becomes segregated during spreading.

C. Compact Road Sub-Base to density not less than 95% corrected maximum dry density in

accordance with ASTM D 698.

D. Shape and roll alternately to obtain smooth, even and uniformly compacted base.

E. Apply water as necessary during compacting to obtain specified density.

F. In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.

G. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

310519.3.7 Cleaning

A. Leave material stockpile site in tidy, well drained condition, free of standing surface water.

B. Leave any unused material in neat compact stockpiles as directed by Engineer.

** END OF SECTION **

SECTION 31 23 01

EXCAVATING, TRENCHING AND BACKFILLING

312301 EXCAVATING, TRENCHING AND BACKFILLING

312301.1 GENERAL

312301.1.1 Section Includes

A. This section specifies requirements for excavating, trenching and backfilling for the common utility trench and electrical trench, including:

1. Excavation for leachate discharge pipe
2. Excavation for the Manhole
3. Excavation for electrical conduit
4. Excavation of Existing Compacted Clean Fill
5. Excavation of Native Material
6. Excavation of Road Structure
7. Excavation of Cover Soil
8. Excavation of Waste
9. Backfilling with Existing Materials
10. Backfilling with Owner Supplied Clean Fill

312301.1.2 Standards

ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) (600 kN-m/m).
ASTM C117	Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils.
ASTM D698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3).
ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2,700 kN-m/m3).
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
CAN/CGSB-8.1	Sieves, Testing, Woven Wire, Inch Series.
CA/CGSB-8.2	Sieves, Testing, Woven Wire, Metric
CAN/CSA-A3000,	Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

CSA-A3001	Cementitious Materials for Use in Concrete.
CSA-A23.1/A23.2	Concrete Materials and Methods of Concrete Construction/ Methods of Test and Standard Practices for Concrete.

312301.1.3 Submittals

A. Submit design and supporting data for shoring, bracing and underpinning required for work at least seven days prior to commencing work.

312301.2 PRODUCTS

A. Refer to applicable sections

312301.3 EXECUTION

312301.3.1 Protection of Existing Features

A. Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

B. Conduct, with Engineer, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.

C. Prior to commencing excavation work, notify applicable owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Request and review any available drawings from the Owner. Note that Owner will not be responsible for accuracy of Drawings and it remains the Contractor's responsibility to properly locate all services. Confirm locations of buried utilities by careful test excavations.

D. Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

E. In case any unexpected infrastructure is identified, obtain direction of Engineer before re-routing. Costs for such unexpected work to be paid by Owner per pre-approved change order using force account rates.

F. Record location of maintained, re-routed and abandoned underground lines.

G. Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Engineer.

H. Protect extraction wells, manholes and any other structures and pipelines from any uplift and displacement or disturbance during excavation operations.

I. Where required for excavation, cut roots or branches as approved by Engineer.

J. Prior to commencing excavation work, notify applicable owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Request and review any available drawings from the Owner. Note that Owner will not be responsible for accuracy of Drawings and it remains the Contractor's responsibility to properly locate all services. Confirm locations of buried utilities by careful test excavations.

K. Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

L. Utilities may exist in area of excavation. Protect these utilities and work around them as part of the work. Include any costs in rerouting these utilities as shown on the Drawings, or otherwise working around these utilities in the unit rates for the related works. In case any unexpected infrastructure is identified, obtain direction of Engineer before re-routing.

312301.3.2 Site Preparation

A. Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

A. Where traffic is impacted, provide traffic control as specified in other relevant sections.

312301.3.3 Excavation and Trenching

A. All excavations shall be in open cut unless otherwise permitted by the Engineer. Strictly follow WCB work procedures for safe trenching work and follow Health and Safety procedures per other relevant sections.

B. Contractor shall be aware that it is anticipated that some excavation may be in refuse and waste materials. Safety precautions must be taken during these construction activities in conformance to the requirements specified in Section 00 73 19 - Health and Safety Requirements.

C. Contours of existing ground elevations are approximate elevations of the finished grades. The contours and elevations of the present ground are believed to be reasonably correct. Undertake required cuts to depths shown relative to actual ground elevations, as determined during pre-excavation survey. The Contractor shall satisfy himself as to the existing contours and elevations.

D. Excavate material to lines, grades, elevations and dimensions as indicated on the drawings. Conform to maximum size of excavation and cover placement requirements in other sections.

E. Temporarily stockpile clean excavated cover material that is approved for backfilling adjacent to Works. Dispose of unsuitable excavated material as per relevant sections or as instructed by Engineer.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Notify an Engineer immediately if any water seeps into the excavation since this may be an excavation stability concern.

G. Open trenches and excavations shall be Contractor's sole responsibility. Contractor is warned that some excavations may encounter groundwater or ponded stormwater. Dewater excavations into locations as instructed by Engineer.

H. For trench excavation, unless otherwise authorized by Engineer in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

I. Accurately excavate and grade bottom of trenches to provide uniform bearing and support for each section of the pipe on full thickness of approved bedding material at every point along entire length.

J. Wherever possible, earth bottoms of trenches and excavations to be undisturbed soil, level, free from loose, soft or organic matter.

K. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

L. Remove unsuitable material from trench or excavation bottom to extent and depth as directed by Engineer.

M. Correct unauthorized over-excavation using materials as instructed by Engineer

N. Hand trim, make firm and remove loose material and debris from excavations and trenches. Where material at bottom of trench or excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

O. Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw. Seal cuts with approved tree wound dressing.

P. Notify Engineer when bottom of excavation is reached and obtain Engineer approval of completed excavation.

Q. Restrict vehicle operations directly adjacent to open trenches.

312301.3.4 Dewatering

012301.3.4.1 Dewatering Design and Performance Requirements

A. Engage a Professional Engineer, registered in the Province of British Columbia, with demonstrated competence to design, and to supervise construction, operation and maintenance of a dewatering system.

B. Design, construct operate and maintain a dewatering system to control groundwater. Consider also the lateral tracking of groundwater underneath existing structures.

C. Co-ordinate with design and construction of excavation shoring systems, excavation and backfilling operations.

D. Prevent surface run-off from entering the excavations. Construct ditches, berms and similar items as required to lead water away from excavation. Do not allow silt laden run-off water to enter water courses. Direct run-off flows to siltation ponds or catchment areas.

E. Maintain groundwater level a minimum of 300 mm below subgrade level, or lower as may be required, to permit placement of geotextiles, granular filter blankets, underdrains, granular construction working surface, concrete and similar items, on firm dry undisturbed subgrade.

F. Maintain groundwater at required level until:

   i. Backfilling to final grade is complete.

G. Prevent destabilization, heaving, or shear failure of the sides and bottom of excavation.

H. Prevent damage to or displacement of structures from groundwater pressures.

I. Obtain Engineer's written consent prior to allowing a rise in groundwater level or prior to shutting down the dewatering operation.

J. Repair or replace any structure or Works damaged due to dewatering at no expense to the Owner.

012301.3.4.2 Dewatering Discharge Requirements

A. Provide appropriate filter screens so that no soil or foundation material is removed, and solids concentration of less than 5 ppm in the discharge water is achieved. Do not exceed solids concentration of 10 ppm at any time.

B. The Contractor will carry out physical analysis of drainage water to establish conformance with provincial regulations, if required by the Engineer or the District.

312301.3.5 Over Excavating

A. Where, in Engineer's opinion, the Contractor has undertaken overexcavation beyond lines and grades shown on the Drawings refill the excavated space with approved material to the proper elevation in accordance with the procedures specified for backfill. No extra payment will be made for this work.

B. If undisturbed condition of the soils / waste is inadequate for the support of installations, over excavate to adequate supporting soils as directed by Engineer. Where so required by Engineer and except as otherwise specified, the excavation and removal of inadequate material as specified, supply and installation of such material in excess of the quantities shown on Drawings shall be conducted at Force Account rates, with all volumes first estimated and approved by the Engineer. Any overexcavation of unsuitable ground completed without written authorization by Engineer shall be considered excessive overexcavation and shall not be paid for.

312301.3.6 Stockpiling

A. Stockpile excess excavated materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation.

B. Protect stockpiled materials from contamination.

312301.3.7 Shoring, Bracing and Underpinning

A. Protect existing features using temporary barriers as directed by the Engineer and in accordance with applicable local regulations.

B. Engage services of a qualified professional engineer who is registered or licensed in province of British Columbia, Canada in which work is to be carried out to design and inspect proposed shoring, bracing and underpinning required for work.

C. Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in province of British Columbia, Canada.

D. Professional Engineer responsible for design of temporary structures to submit proof of insurance coverage for professional liability except where Engineer is employee of Contractor, in which case Contractor shall submit proof that work by Professional Engineer is included in contractor's insurance coverage.

E. Construct temporary works to depths, heights and locations as directed by aforementioned qualified Professional Engineer.

F. During backfill operation:

1. Unless otherwise as indicated or as directed by Engineer, remove sheeting and shoring

from excavations.

2. Do not remove bracing until backfilling has reached respective levels of such bracing.

3. Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.

G. When sheeting is required to remain in place, cut off tops at elevations as indicated.

H. Upon completion of substructure construction:

1. Remove shoring and bracing.
2. Remove excess materials from site as directed by Engineer.

312301.3.8 Backfill and Compaction

A. Do not proceed with backfilling operations until Engineer has inspected and approved installations.

B. Employ a placement method that does not disturb or damage other works.

C. Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

D. Where excavated material is required for controlled density fill or for backfill requirements as indicated on the drawings, place backfill material in uniform layers not exceeding 300 mm. Use specified backfill materials compacted to the required 95% of Modified Proctor maximum dry density (Modify Proctor). Maintain optimum moisture content of backfill materials required to attain specified compaction density.

E. Compact backfill material using suitable mechanical compacting equipment. Roots, debris or stones greater than 75 mm shall be completely removed from the backfill material.

F. Do not operate heavy compaction equipment closer than 1 metre to foundations, underground utilities, extraction wells and within 500 mm of geomembrane or GCL liners.

G. Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

H. Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

i. Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Engineer, or:
ii. If approved by Engineer, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Engineer.

312301.3.9 Field Quality Control and Quality Assurance

A. The Contractor shall be responsible for all aspects of controlling the construction quality of the Works.

B. The Engineer will provide an on-site representative to monitor and inspect the quality of the Contractor's work and general conformance with Drawings and Specifications. However, the quality of the Work is solely the responsibility of the Contractor.

C. The Contractor shall fully cooperate with the Engineer in conducting the quality control inspection as outlined throughout these specifications.

312301.3.10 Restoration

A. Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Engineer.

B. Grade so that water will drain away from excavations to disposal areas approved by Engineer. Grade to be gradual between finished spot elevations shown on Drawings.

C. Clean and reinstate areas affected by work as directed by Engineer.

** END OF SECTION **

SECTION 31 23 02

EARTHWORK

312302. EARTHWORK

312302.1 GENERAL

312302.1.1 Section Includes

A. Excavation for underground piping and conduit (both trenching and open cut).

B. Excavation for site structures and foundations.

C. Furnishing and installing embedment material for piping and conduit systems.

D. Backfilling and compacting for underground piping, conduit, and structures.

E. Furnishing and installing imported embankment material for road crossings.

F. Disposal of soils, rock, or other material not suitable for use or needed in the project.

G. Dewatering excavations.

312302.1.2 References

A. ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

B. ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbs/ft^3 (600 kN-m/m^3)).

C. ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

D. ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft^3 (2,700 kN-m/m^3)).

E. ASTM D1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

F. ASTM D1587, Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes.

G. ASTM D2166, Test for Unconfined Compressive Strength of Cohesive Soils.

H. ASTM D2167, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

I. ASTM D2216, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

J. ASTM D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

K. ASTM D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

L. ASTM D2573, Standard Test Method for Field Vane Test in Cohesive Soils.

M. ASTM D2937, Standard Test Method for Density of Soil in Place by the Drive Cylinder Method.

N. ASTM D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

O. ASTM D4643, Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating.

P. ASTM D4944, Standard Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Gas Pressure Tester.

Q. ASTM D4959, Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating.

R. ASTM D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

S. MMCD, Master Municipal Construction Documents Association.

312302.1.3 Definitions

A. Backfill: Soils placed from the excavated surface to the existing grade.

B. Embedment Material: material placed in contact with the pipe and/or conduit (and immediately adjacent to) for the purpose of providing structural support to the pipe and/or conduit. If applicable, the material placed in contact with the pipe for the purpose of providing the porous region for transfer of gas/fluids into the piping system. Embedment material is classified into 3 zones of placement per ASTM D 2321 as follows:

   a Bedding: That material placed from the bottom of the embedment zone to the bottom of the pipe.

   b Haunching: That material placed from the bottom of the pipe to the springline of the pipe.

   c Initial Backfill: That material placed from the springline of the pipe to the top of the embedment zone.

C. Final Backfill Material: For piping systems, that material placed above the embedment zone to the existing or proposed subgrade. For structures, that material placed above the base of the structure to the existing or proposed subgrade.

D. Embankment Material: material placed on or above existing ground surface (also referred to as fill).

E. Foundation Material:

a For piping systems, material used to stabilize the trench bottom below the embedment zone when unstable conditions are encountered.

b For structures, slabs, manholes, catch basins and vaults that material placed from the bottom of the excavated surface to the base of the structure.

c For cover systems, a layer of fine grain (high clay content) soil placed, compacted, and fine graded to allow direct placement of overlying geosynthetic materials.

F. Geotextile: porous synthetic fabric used to provide filtration, separation, or reinforcement of soils in civil engineering works (also referred to as textile or filter fabric).

G. Refuse: Manmade or naturally occurring waste products disposed of as part of landfill operations, as determined by the Owner or Engineer.

H. Rock: Sound and solid masses, or ledges of mineral matter in place and of such hardness and texture that, when it is encountered, cannot be excavated by 3 passes of a ripper tooth mounted on a hydraulic excavator with a bucket curling force of at least 25,700 pounds and a stick crowd force of at least 26,100 pounds, or 2 passes of a single shank ripper mounted on a Caterpillar D-8 crawler tractor (or equivalent).

I. Subgrade: The surface prepared to accept other materials.

J. Unstable trench bottom: The trench bottom shall provide adequate support and stable containment of the embedment material so that the density of the embedment material does not diminish.

a Unstable conditions include a soft trench bottom that does not provide an adequate working platform or walls that readily slough. Unstable conditions also include materials with high organic content, fine grained soils saturated with water in excess of their liquid limit, low density fine sands or silts, and expansive soils such as "fat" clays and certain shales that exhibit a large change in volume with change in moisture content.

b In situ soil is considered stable (for cohesive or granular cohesive soils), if the shear strength as measured in accordance with ASTM D2166 or ASTM D2573 is not less than 500 lbs/ft^2.

c In situ soil is considered stable (for sands), if the penetration resistance as determined in accordance with ASTM D1586 is not less than 8 blows per foot.

d If unstable conditions are encountered, the Contractor shall excavate below grade to such depth and width as directed by the Engineer. The excavated area below grade shall be filled with foundation material in 150-mm (6-inch) compacted layers and brought up to within 150 mm (6 inches) of the bottom of the pipe.

312302.1.4 Submittals

A. Submit under provisions of SC.23 Summary of Submittals.

B. Submit surveyed topographic map within area proposed pipeline routes as indicated on the drawings as specified hereinafter. Submit topographic map prior to 10 working days before initiating earthwork.

C. Submit samples of proposed materials to be used in construction, whether excavated and processed from materials on site or imported, for testing and review of testing and inspection service. Submit samples of sufficient size, quantity, and frequency, as determined by the Engineer.

D. Submit laboratory test results and field test results of soils/aggregates used in foundation, embedment, and backfill construction, as specified hereinafter.

E. Submit quality control documentation.

F. Submit a plan showing trench construction sequence and schedule.

G. If dewatering is necessary, submit a plan for controlling site water as specified herein.

H. Submit trench subgrade survey as specified hereinafter.

312302.1.5 Quality Assurance

A. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction and referenced codes and standards.

B. Testing and Inspection: Owner will engage a testing and inspection services for quality assurance during earthwork operations.

C. Contractor shall be responsible for daily quality control including: analysis of soil processing operations to insure that the materials produced and installed comply with the gradations and material specifications described hereinafter. Contractor shall employ a qualified testing and inspection agency to provide the necessary quality control testing. The Contractor shall employ a qualified surveying firm to provide specified alignment, grades, and elevations. Contractor shall maintain and submit accurate reports of all quality control testing and surveying. The Owner's testing and inspection service may make periodic random checks of the Contractor's processing and installation operations.

D. All materials intended for use shall be approved by the Engineer prior to placement.

312302.1.6 Protection

A. Protect persons, both on and off the site, from injury. Barricade temporary open excavations occurring as part of the Work with suitable fences and barriers. Equip barriers with warning lights.

B. Protect trees, shrubs, lawns, existing structures, fences, roads, sidewalks, utilities, and other features that are to remain as part of the completed project site.

C. Protect off-site property from damage caused by Contractor's construction operations. Exercise particular care in preventing any disturbed soils, debris, refuse, or other potential pollutants from entering any water course or adjoining property.

D. Do not bring or use explosives on the site unless specified herein.

E. Immediately repair at Contractor's cost all damage caused by construction work.

312302.2 PRODUCTS

312302.2.1 Materials

A. Foundation Material:

a Foundation material shall be 25 mm crushed gravel in accordance with Contract Section 31 05 18.

B. Embedment Material:

a Embedment material for pipe or conduit shall be existing clean fill, native soil or Owner Supplied Clean.

C. Final Backfill Material: Select material obtained from excavations.

a Final backfill material shall be existing compacted clean fill, native soil, cover soil or owner supplied clean fill obtained from the excavations or from the owner supplied clean fill stockpile.

312302.3 EXECUTION

312302.3.1 Examination

A. Verify that survey benchmark and intended elevations for the work are as indicated.

B. Before starting any earthwork, Contractor shall review and satisfy itself as to the adequacy and accuracy of the control surveys and data established by the Owner for the purpose of computing payment quantities. Contractor may make such measurements and surveys as it deems necessary to confirm the Owner's control surveys. Any variances or discrepancies will be resolved by the Engineer. When control surveys and data have been established to both parties satisfaction, the Contractor shall indicate his acceptance by signing a copy of the Owner's field survey notes which shall be maintained at the job site throughout the work.

C. Verify that materials excavated and processed on site meet the specified requirements.

312302.3.2 Prepare Existing Plan and Profile Survey Map

A. Prior to conducting any site work the Contractor shall prepare a topographic map which identifies and locates (horizontally and vertically) existing site features and utilities along the pipe routes. The map shall be prepared by a qualified surveying firm to national map accuracy standards. The Contractor shall provide existing elevations and locations along

the alignment of the common utility trench and electrical conduit trench gas main, and at every change in alignment, grade, and existing utility(ies)/structure(s). The elevations and locations shall be based on project datum and be accurate to +/- 0.01 meter (~0.05 foot).

Horizontal and vertical locations shall be referenced to project datum. The ground surface shall be indicated with spot elevations. Other features to be identified include existing roads, paved areas, fences, test pits, pipes, manholes, and other visible site features. All features shall be located horizontally and vertically and identified consistent with the plan and legend. The map shall be prepared in digital format and reproducible hard copy formats at the same scale as the plan drawings. Digital format shall be compatible with the current AutoCAD Version. Digital format shall provide mapping features on separate layers.

312302.3.3 Preparation

A. Allow 10 working days after receipt of maps (receipt by Owner) before proceeding with field layout and staking. Notify Owners 3 days in advance prior to conducting work.

B. Locate and layout the required lines, levels, contours, and datum.

C. Identify, flag, and protect known utilities.

312302.3.4 Excavation

A. General

a Excavation consists of removal of all types of material encountered when establishing required grade elevation, trench dimensions and adequate support for elevations, grades and alignment as shown on the Drawings.

b The variety of refuse disposed of within the landfill is unknown. The estimated limits of refuse are shown on the drawing; however, refuse may be encountered outside the limits shown. When it is necessary to excavate into refuse, or near refuse, in order to perform any of the work, the Contractor's Health and Safety Plan shall be strictly followed during excavating, handling, and disposing of the refuse, and whenever working in proximity to exposed refuse. **The Contractor is cautioned of the possibility of encountering potentially harmful gases, liquids, asbestos, or wastes. Work near refuse may encounter harmful gases, liquids, and soil <u>even if refuse is not found</u>.**

c Unauthorized excavation consists of removal of materials beyond indicated subgrade/grade or finished elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

d Remedial Work for Unauthorized Excavation

1. Under footings, foundation bases, or other structures fill unauthorized excavation by extending bottom elevation of footings, base, or structure to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the Engineer.
2. Elsewhere, backfill and compact unauthorized excavations with specified Foundation Material, as determined by Engineer. Compact to a density not less than that specified for the subsequent materials layers.

e Stability of Excavations: Slope sides of temporary excavations to comply with local codes, ordinances, and authorities having jurisdiction. Provide steel strutted trench boxes, or properly designed sheeting, shoring, and bracing systems where sloping is not possible due to space restrictions or where depth of excavation exceeds 1.2 meters (4 feet), or stability of material being excavated. Maintain sides and slopes of excavation in a safe condition until completion of backfilling.

f Excavation shall not interfere with normal 45 degree bearing splay of adjacent structure foundations. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

g Material which is part vegetation soil, surfacing, pavement or cover system (such as gravel, pavement, topsoil, and/or barrier soil), shall be separated from other excavated material wherever possible. Such material shall be removed in a manner to separate it clearly from underlying material and shall be stored or disposed of, on the site where directed by the Engineer. Before excavation through any paved surfaces, pavement shall be sawed by means of a power saw, to the width of the trench and so as to minimize damage to pavement outside of the trench limits.

h Grade top edge of excavation to prevent surface water from draining into excavation.

i Stockpile excess excavated unprocessed material at locations as directed by Engineer.

j The Contractor shall take all necessary precautions to protect underground piping during the course of the construction. Some information may be available from the Owner pertaining to the location and existence of underground piping and utilities. The Contractor is responsible for locating and protecting all underground utilities.

k Schedule all road crossings with Owner and Engineer to minimize disruption to waste disposal operations and traffic. The Contractor shall provide a minimum of 2 week notice of intended road crossing work.

B. Trench Excavation

a For gas and condensate pipe and other utility piping, trench excavation shall conform to ASTM D2321, Section 6.

b Walls of trenches below the elevation of the crown shall be maintained as vertical as possible. Where the trench excavation exceeds depths of 1.2 meters (4 feet), the trench walls shall be sloped or structurally retained with trench boxes or sheeting, shoring, and bracing systems in accordance with applicable safety regulations.

c Hand trim excavation. Remove loose matter, water softened subgrade, lumped subsoil, boulders, and rocks.

C. Structure Excavation:

a Excavate subsoil required to accommodate structural foundations, slabs-on-grade and site structures.

b Extend excavations laterally from structure walls and footings a minimum of 600 mm (2 feet) to allow for clearance for observation and placement and removal of forms.

c Hand trim excavation. Remove loose matter, water softened subgrade, lumped subsoil, boulders, and rocks.

D. Excavation near Geosynthetics:

a Request presence of Engineer when excavating near geosynthetics. Do not expose geosynthetics without giving Engineer opportunity for inspection.

b Provide a “spotter” when using heavy equipment to expose geosynthetics. If using heavy equipment (other than manual labor) to expose geosynthetics, a person must be present during use of heavy equipment to assist the equipment operator in positioning equipment/attachments/tools so as not to damage geosynthetics.

c Expose existing geosynthetics by carefully removing overlying material without damaging existing geosynthetics.

d Protect exposed geosynthetics from soil, rock, etc sloughing off the face of the excavation until the geosynthetics connections are complete and accepted by the Engineer. If a temporary shoring system is used for this purpose, it shall have a flat surface and be heavily padded where in contact with the existing geotextile and geomembrane, so as not to damage or weaken them.

312302.3.5 Backfill Construction

A. General

a Prior to initiating placement of foundation, embedment and final backfill material, submit to the Engineer: laboratory test results for classification of material;

laboratory test results for moisture/density relationships; mechanical equipment to be used for compaction; techniques for appropriate moisture conditioning; verification of trench bottom grade and alignment.

B. Request inspection by Engineer. Do not backfill pipe without giving the Engineer an opportunity for inspection.

C. Do not use frozen materials for backfill construction.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Placement of foundation, embedment and final backfill for pipe systems

a Installation shall conform to ASTM D2321, Section 7, except as specified below.

b Foundation material, if required by the Engineer, shall be moisture conditioned (as required), placed in loose layers no greater than 200 mm (8 inches), and compacted to the specified density.

c Embedment material shall be moisture conditioned (as required). Bedding shall be placed to the depth as shown on the Drawings. Hunching shall be placed in loose layers no greater than 200 mm (8 inches) or 3/4 of the pipe diameter (whichever is smaller).

Hand work material under barrel of pipe without displacing pipe. Material shall be placed by hand tamping to ensure the material is well consolidated on both sides of the pipe. Material shall be poured into the trench gradually so that tamping operations can be carried out simultaneously with placement. Initial backfill shall be placed in loose layers no greater than 200 mm (8 inches). Hunching and initial backfill shall be placed in a manner which does not damage or displace the pipe.

d Install pipe warning tape and electrical locate wire per manufacturer's instructions.

e Final backfill shall be moisture conditioned (as required), placed in loose layers no greater than 300 mm (12 inches), and compacted to the specified density. Place in a manner which does not damage or displace detector tape.

f Excess backfill material shall be stockpiled or disposed of onsite as directed by the Engineer.

312302.3.6 Embankment Construction

A. General

a Prior to initiating placement of embankment material, submit the following to the Engineer a minimum of 10 working days prior to intended use: laboratory test

results for classification of material; laboratory test results for moisture/density relationships; mechanical equipment to be used for compaction; techniques for appropriate moisture conditioning; verification of trench bottom grade and alignment.

B. Do not use frozen materials for embankment construction.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Embankment material shall be moisture conditioned (as required), placed in loose layers no greater than 200 mm (8 inches), and compacted to the specified density.

E. Excess embankment material shall be stockpiled or disposed of onsite as directed by the Engineer.

312302.3.7 Subgrade and Finished Surfaces

A. All areas covered by the work, including excavated and filled sections, shall be uniformly backbladed to the subgrade, or finished ground elevations. The finish surface shall be reasonably smooth and free of irregularities.

B. Area where excavation disrupted a surface system such as vegetation soil, surfacing, pavement or cover system (such as topsoil, gravel, asphalt, and/or barrier soil), shall be restored to the original surfacing.

312302.3.8 Compaction

A. General: Compact soils to not less than the following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D 1557 and, where appropriate, not less than the following percentages of relative density for soils which do not exhibit a well-defined moisture density relationship determined in accordance with ASTM D 4254.

B. Subgrades: Unless otherwise noted, compact top 150 mm (6 inches) of subgrades to density not less than required for the subsequent layer of fill/backfill material.

C. Foundation material: Compact to 95 percent maximum dry density.

D. Embedment material: Compact to 90 percent maximum dry density.

E. Final backfill material: Compact to 90 percent maximum dry density.

F. Embankment material: Compact to 90 percent maximum dry density.

G. Roads & Parking Areas:

a Embankment Material: Compact to 95 percent maximum dry density.

b Surfacing: Compact to 95 percent maximum dry density.

312302.3.9 Tolerances

A. Top Surface of Subgrade: Plus or minus 30 mm (one tenth (1/10) foot).

312302.3.10 Field Quality Control

A. The following field inspection and testing shall.

a Alignment and Grade Control

The Contractor shall provide grade and alignment control during excavation of trenches and during preparation of pipe bedding. The Contractor shall provide stakes or similar devices that display relevant information to control work. Grade control devices shall be spaced no greater than 5 meters (~15 feet) apart over the entire surface and at grade breaks or changes in alignment. Laser level techniques are acceptable in lieu of grade staking.

2. Provide grade control device showing trench top and bottom of bedding layer design elevation, depth and existing elevation. The Contractor shall monitor fine grading to verify grade and alignment tolerance are met.

3. The Contractor shall immediately set new grade markers to replace any which have been disturbed.

B. Compaction Control

a Monitoring compaction effort shall be conducted using the tests and frequencies specified in Table 3. Sample locations shall be in a grid pattern. The grid pattern shall be staggered between successive lifts.

b If tests indicate work does not meet specified requirements, additional tests shall be performed in the immediate vicinity of the failed test. This area shall be tested, the failed area localized and reconstructed in accordance with these specifications and retested at no cost to Owner.

Table 3
Required Tests and Observations on Compacted Soil

Parameter	Test Method	Minimum Testing Frequency
Water Content (Rapid) (Note 1)	ASTM D6938 ASTM D4643 ASTM D4944 ASTM D4959	5/1000 m/lift (1.5/1000 ft/lift) (Note 2)
Water Content (Note 3)	ASTM D2216	One in every 10 rapid water content tests (Note 3)

Table 3

Required Tests and Observations on Compacted Soil

Parameter	Test Method	Minimum Testing Frequency
Total Density (Rapid) (Note 4)	ASTM D6938 ASTM D2937	5/1000 m/lift (1.5/1000 ft/lift) (Notes 2, 4)
Total Density (Note 5)	ASTM D1556 ASTM D1587 ASTM D2167	One in every 20 rapid density tests (Notes 5, 6)
Number of Passes	Observation	1/1000 m/lift (0.3/1000 ft/lift) (Note 2)
Construction Oversight	Observation	Continuous

Notes:

ASTM D4643 is microwave oven drying, ASTM D4944 is a calcium carbide gas pressure tester method, and ASTM D4959 is a direct heating method, ASTM D6938 is a nuclear method. Direct water content determination (ASTM D2216 is the standard against which nuclear, microwave, or other methods of measurements are calibrated for on-site soils.

In addition, at least one test should be performed each day soil is compacted and additional tests shall be performed in areas for which CQA personnel have reason to suspect inadequate compaction.

Every tenth sample tested with ASTM D4643, D4944, D4959, or D6938, shall be also tested by direct oven drying (ASTM D2216) to aid in identifying any significant, systematic calibration errors.

ASTM D2937 is the drive cylinder method and ASTM D6938 is a nuclear method. These methods, if used, shall be calibrated against the sand cone (ASTM D1556) or rubber balloon (ASTM D2167) for on-site soils. Alternatively, the sand cone or rubber balloon method can be used directly.

Every twentieth sample tested with D6938 shall also be tested (as close as possible to the same test location) with the sand cone (ASTM D1556) or rubber balloon (ASTM D2167) to aid in identifying any systematic calibration errors with D6938.

ASTM D1587 is the method for obtaining an undisturbed sample. The section of undisturbed sample can be cut or trimmed from the sampling tube to determine bulk density. This method shall not be used for soils containing any particles greater than one sixth (> 1/6) the diameter of the sample.

312302.3.11 Watering

A. The Contractor shall water for dust control as directed by the Engineer. Water is not available on-site. The nearest source is a municipal hydrant down the road. The Contractor shall not waste water. Separate payment will not be made for watering for dust control. All costs are incidental to the contract and are responsibility of the Contractor. All costs shall be included in the contract with prices for other bid items.

312302.3.12 Acceptance

A. The work shall be accepted by the Engineer when:

a Conformance test results meet the requirements of the Contract Documents.

b Required documentation from the field and laboratory testing laboratories has been received and accepted.

c All repairs have been completed to the Engineer's satisfaction.

d Written certification documents, including as-built drawings, have been received by the Engineer.

END OF SECTION

SECTION 31 23 30

CLEAN FILL

312330. CLEAN FILL

312330.1 GENERAL

312330.1.1 Scope of Work

A. This section includes details on Clean Fill. Within this contract clean fill will be used for:

i. Trench Backfill
ii. 300 mm Thick Cover Over all Exposed Refuse.
iii. Extraction Well Discharge Pipe Berm

312330.1.2 Standards

ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

312330.1.3 Submittals

A. Clean fill is an Owner Supplied Product. The Contractor shall utilize fill from the trench excavation, or owner supplied clean fill from the on-site stockpiles.

312330.1.4 Sequencing and Scheduling

A. The Contractor shall obtain owner supplied clean fill from on-site Stockpiles, as shown in the contract documents. Coordinate loading operations with Operations Contractor. If additional owner supplied material is brought to the Site, the fill can either be stockpiled in the designated stock pile area or placed directly. Contractor shall coordinate deliveries with Engineer. Stockpile adequate clean fill to meet the project's requirements in accordance with a pre-agreed upon schedule and change order based on force account rates. The Contractor shall give the Owner a minimum of 2 weeks notice should the schedule change.

312330.2 PRODUCTS

312330.2.1 Clean Fill

A. The Clean Fill shall be a structurally competent material that is capable of being effectively compacted.

B. Moisture content of the fill must be drier than 2% wet of Standard Proctor optimum.

C. The clean fill must have sufficient shear strength to maintain a factor of safety against failure of 1.5 when compacted in place at a slope of 2.5H:1V.

D. The clean fill shall be free from any large rocks and organic debris and shall be capable of compacting to a specified density.

E. The material shall meet Urban Park Land Standards as defined in the Contaminated Sites Regulation issued by B.C.'s Ministry of Environment.

312330.3 EXECUTION

312330.3.1 Stockpile Locations

A. The owner supplied clean fill stockpile is shown in the Contract Documents.

312330.3.2 General Clean Fill Placement Specifications

A. Where Clean Fill is being placed and compacted, the material shall be placed in 300 mm lifts and compacted to 95% of the Maximum Standard Proctor Density as determined by ASTM D698.

B. Cobbles, boulders or clods larger than 50 mm in diameter to be broken up or removed and stockpiled in an area designated by the Engineer.

C. The Contractor shall remove any debris from the surface prior to proof rolling.

312330.3.3 Final Inspection

A. The Contractor shall request an inspection from the Engineer after the grade fill layer has been completed. The final surface after compacting the grade fill shall be inspected and approved by the Engineer before covering with sub-grade granular.

** END OF SECTION **

SECTION 33 31 16

PVC PIPING AND FITTINGS

333116. PVC PIPING AND FITTINGS

333116.1 GENERAL

333116.1.1 Section Includes

A. Supply, installation and testing procedures for Poly Vinyl Chloride (PVC) Plastic pipe and fittings for use as:

i. Schedule 80 Drop pipe for Extraction Well 19-03.

333116.1.2 Standards

ANSI/ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
ANSI B18.2.1	Square and Hex Bolts and Screws - Inch Series.
ANSI/ASME B18.2.2	Square and Hex Nuts (Inch Series).
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
ASTM D 1784	Standard Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
ASTM D 1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
ASTM D 2464	Standard Specifications for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
ASTM D 2466	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
ASTM D 2467	Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
ASTM D 2564	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
ASTM D 2774	Practices for Underground Installation of Thermoplastic Pressure Pipe
ASTM D 2855	Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
CAN/CGSB-41.22	Fiberglass-Reinforced Plastic Corrosion Resistant Equipment.
CAN/CSA-B137.3	Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.

333116.1.3 Submittals

A. Submit manufacturer's product data including pipe, pipe accessories, and appurtenances.

B. The Contractor shall submit the following Shop Drawings:

1. Construction details of fabricated fittings
2. Quality control test results for fabricated fittings

C. Submit Pipe Manufacturer's qualifications

D. Submit Pipe Fabricator's qualifications and Certificates with applicable standards

E. Submit Pipe Installer's qualifications.

F. The Contractor shall submit samples to the Contract Administrator of each type of moulded, fabricated and flanged fitting, and each valve, to be used on this project.

G. Provide maintenance data for incorporation into manual.

333116.1.4 Payment

A. Payment will be made in accordance with the related sections.

333116.2 PRODUCTS

333116.2.1 PVC Piping and Fittings

A. Pipe and fittings shall be manufactured from a PVC compound which meets the requirements of Cell Classification 1245-B polyvinyl chloride as outlined in ASTM D 1784, ASTM D 1785 and CAN/CSA-B137.3.

B. Pressure rating for all fittings to be same as for pipes, and shall be supplied in accordance with the following:

1. Up to NPS 2: socket type.
2. NPS 2 1/2 and over: flanged type.

C. PVC moulded fittings to ASTM D 2464, ASTM D 2466 and ASTM D 2467, socketed type, from PVC, compatible to piping.

D. Factory fabricated fittings and flanged fittings to CAN/CGSB-41.22, using segments of PVC pipe and moulded fittings, hot welded, reinforced with FRP, tested to CAN/CSA-B137.3.

E. Field fabricated fittings not permitted.

F. All PVC cement shall meet the requirements of ASTM D 2564 for solvent welding.

G. All piping and fittings to be smooth and free from imperfections.

H. Clean rework or recycle material generated by the manufacturer’s own production may be used so long as the pipe and fittings produced meet all the requirements of the specifications.

I. Fittings shall be industrial, heavy duty, hub style.

J. Socket fittings shall be pressure rated the same as the corresponding size pipe prescribed in ASTM D 1785. Threaded fittings shall be pressure rated at 50% of the rating for socket fittings.

333116.2.2 Flanges

A. Flanges shall be one piece solid design or two part van stone type which use the tapered, serrated face and full gasket technique for joining and are compatible with ANSI/ASME B16.1 Class 150 metal flanges.

B. Flanges shall be pressure rated to 1032 kPa, non shock and have a minimum burst requirements of 3.3 times the rated pressure.

C. Gaskets shall be full face Neoprene, 3 mm thick or as indicated in other specification sections or the drawings.

D. Bolts and nuts to ASTM A 307, Grade B, ANSI B18.2.1, ANSI/ASME B18.2.2: stud bolts, carbon steel, semi-finished with heavy hex nuts, complete with washers.

333116.3 EXECUTION

333116.3.1 Handling

A. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

B. Pipe and pipe fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skidwalks in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the pipe into the extraction well borings. Pipe and pipe fittings shall not be dropped or dumped.

333116.3.2 Waste Management and Disposal

A. Place materials defined as hazardous or toxic waste in designated containers.

B. Ensure emptied containers are sealed and stored safely for disposal away from children.

333116.3.3 Preparation for Horizontal Piping and Fittings

A. Verify that the excavated trench surfaces are ready to receive work, and dimensions, alignment, grade and elevations are as shown on the Drawings.

B. Hand trim excavations to required excavations.

C. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

D. Embedment material shall be processed and placed as specified in the drawings for each piping system.

E. Verify bedding is to lines and grades shown on Drawings.

333116.3.4 Joining

A. Solvent cement joints shall be prepared in accordance with ASTM D 2855.

B. Installation shall be as specified by the manufacturer's printed instructions.

C. All pipe and fittings shall be inspected for cuts, scratches, or other damage prior to installation. Materials with imperfections shall not be used.

D. All burrs, chips, etc. shall be removed from pipe interior and exterior.

E. All loose dirt and moisture shall be wiped from the interior and exterior of the pipe end and the interior of the fitting.

F. All pipe cuts shall be square perpendicular to the center of line of pipe.

G. Pipe ends shall be beveled prior to applying primer and solvent cement so that the cement does not get wiped off during insertion into the fitting socket.

H. A coating of CPS primer as recommended by pipe supplier shall be applied to the entire interior surface of the fitting socket, and to an equivalent area on the exterior of the pipe prior to applying solvent cement.

I. The solvent cement shall comply with the requirements of ASTM D 2564 and shall be applied in strict accordance with manufacturer's specifications.

J. Pipe shall not be primed or solvent welded when it is raining or when atmospheric temperatures are below 5 ^{O}C or above 32 ^{O}C when under direct exposure to the sun.

K. After solvent welding, the pipe shall remain undisturbed until cement has thoroughly set. As a guideline for joint setting time, use 1 hour for ambient temperatures between 15 and 40 ^{O}C, or 2 hours when ambient temperature is between 5 and 15 ^{O}C.

L. Pipe and pipe fittings shall be selected so that there will be as small a deviation as possible at the joints, and so that inverts present a smooth surface. Pipe and fittings which do not fit together to form a tight fitting will be rejected.

333116.3.5 Installation of Horizontal Piping and Fittings

A. Prevent debris from entering inside pipe.

B. Install only that amount of pipe which can be backfilled in same day.

C. Remove standing water in trench before installation.

D. Perform joining in an area near the installation location to avoid excessive transportation and possible damage to the pipe.

E. Install pipe, fittings and accessories in accordance with ASTM D2774, the drawings, and manufacturers instructions. Place pipe on prepared bedding layer.

F. Pipes shall be free from burrs, nicks, gouges, surface cracks or defects. Pipe shall be open, clean, and free draining.

G. Lay pipes to grades shown on the Drawings, with maximum variation from true grade of 5 mm in 3 metres. Maintain positive drainage for condensate on all pipe sections.

H. Leave all joints in piping systems uncovered until system is inspected and approved by Contract Administrator.

I. Wherever possible, leave all joints in piping systems uncovered until all tests are completed.

333116.3.6 Quality Control

A. The Contractor shall provide grade and alignment control during pipe laying. The Contractor shall provide stakes or similar devices that display relevant information to control work. Grade control devices shall be spaced no greater than 20 meters (50 feet) apart over the entire length of pipe and at critical grade breaks or changes in alignment.

B. Provide grade control device showing top of bedding layer design elevation, invert elevation and top of pipe elevation and existing grade elevation. The Contractor shall monitor placement of pipe to verify grade and alignment tolerance are met.

C. The Contractor shall immediately set new grade markers which have been disturbed.

D. The Contractor shall measure and record the final as-built pipeline information. As-built survey information shall include horizontal and vertical locations of pipeline every 20 meters (50 feet) on center and at grade breaks, junctions, or changes in alignment. Horizontal and vertical locations shall be referenced to project datum. Vertical locations for pipe shall include top of pipe and invert elevations. Measurements shall be accurate to 1/100 of a meter.

333116.3.7 Cleaning

A. Piping systems shall be cleaned and tested in accordance with the manufacturer's recommendation and as specified herein.

B. Prior to testing, lines shall be cleaned to remove shavings, welding slag, dirt, construction debris, and other foreign material and flushed with clean water at a minimum of 1m/sec (3 fps) velocity.

333116.3.8 Testing

A. Before any section of piping is put into service, it shall be carefully tested to assure it is gas tight.

B. Notify Contract Administrator at least 24 hours in advance of all proposed tests. Perform tests in the presence of the Contract Administrator.

C. All testing of piping systems shall be done with due regard for the safety of employees and the public during testing. Bulkheads, anchorage and bracing suitably designed to resist test pressures shall be installed if necessary.

D. Individual pressure tests should be done for the primary header, each lateral line, and each forcemain (including the associated fittings). The pressure tests shall be conducted as follows:

1. Isolate the line to be tested by closing the appropriate valves and ensuring that all endcaps/flanges are in place and secure.
2. Apply pressure to the pipeline at the rated design pressure for the pipe. For forcemains only, apply 1.25 times the maximum rated pressure for the piping.
3. Maintain the pressure for an adequate period to allow for expansion of the piping.
4. The system must maintain the pressure after accounting for temperature variation for a period of not less than one hour. Vacuum shall be measured with a mercury manometer slope gauge device so calibrated as to be read at increments of not greater than 0.1 psi.
5. Joints and fittings shall be inspected using soap and water, or an equivalent nonflammable solution.

E. If the Contract Administrator does not accept the system test results, then the Contractor is responsible for diagnosing the system faults and making appropriate repairs at the Contractor's expense. Repairs would include:

1. Removing any joints showing leakage form the pipeline, and rejoining.
2. Locate and repair defects in pipelines if additional leakage occurs.

Once the repairs are completed, the testing shall be repeated.

F. The Contractor is responsible for the cost and supply of all equipment and manpower to successfully carry out the test to the satisfaction of the Contract Administrator.

** END OF SECTION **

SECTION 33 41 00

HDPE PIPING AND FITTINGS

334100 HDPE PIPING AND FITTINGS

334100.1 GENERAL

334100.1.1 Section Includes

A. Supply, installation and testing procedures for High Density Polyethylene pipe and fittings for use in the following areas:

i. 3-inch Φ HDPE DR 17 Solid Leachate Conveyance Pipe

334100.1.2 Standards

ASTM F-714	Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F-2619	Standard Specification for High-Density Polyethylene (PE) Line Pipe
ASTM D-3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic
ASTM D-1248	Specification for Polyethylene Plastics Molding and Extrusion Materials
ASTM D-638	Test Method for Tensile Properties of Plastics
ASTM D-695	Test Method for Compressive Properties of Plastics
ASTM F-477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM D-3350	Standard Specifications for Polyethylene Plastics Pipe and Fittings Materials
ASTM D-2412	Standard Test Method for External Loading Properties of Plastic Pipe by Parallel Plate Loading.
ASTM D-2513	Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
ASTM D-2837	Method of Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Material
ASTM D-402	Standard Practice for Safe Handling of Solvent Cements Primers, and Cleaners used for Joining Thermoplastic Pipe and Fittings
ASTM F-405	Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings
ANSI/AWWA C110	Ductile-Iron and Gray-Iron Fittings, 2 inch through 48 inch, for Water and Other Liquids
ANSI/AWWA C111	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI B18.2.1	Square and Hex Bolts and Screws - Inch Series.
ANSI/ASME B18.2.2	Square and Hex Nuts (Inch Series).
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

334100.1.3 Submittals

A. Submit product data in accordance with the submittal requirements from this section and General Conditions section.

B. Submit manufacturer's product data including pipe, pipe accessories, valves, and appurtenances.

C. Submit Pipe Manufacturer's qualifications

D. Submit Pipe Fabricator's qualifications and Certificates with applicable standards

E. Submit Pipe Installer's qualifications.

F. The contractor shall submit samples to the engineer of each type of molded, fabricated and flanged fitting to be used on this project.

G. Provide maintenance data for incorporation into manual.

H. As part of the Tender, the Contractor shall provide proof of at least 5,000 m of HDPE pipe welding experience.

I. Submit Shop Drawings for special fabricated fittings, equipment and sumps

334100.1.4 Payment

A. Payment will be made in accordance with the related sections.

334100.2 PRODUCTS

334100.2.1 General HDPE Piping and Fittings

A. HDPE Pipe shall be made from polyethylene resin compound qualified as PE 4710 as defined in ASTM D3350. The HDPE pipe and fittings shall conform to Cell Classification 445474C or 445574C (ASTM D 3350).

B. Materials used for the manufacture of polyethylene pipe and fittings shall meet the following physical property requirements:

PE 4710 HDPE Pipe Specifications

Property	Unit	Test Procedure	Value
Density	g/cm^3	ASTM D-1505	> 0.959
Melt Index	g/10 min	ASTM D-1238	< 0.15
Flexural Modulus	psi	ASTM D-790	> 120,000
Tensile Strength	psi	ASTM D-638	> 3,600
SCG (PENT)	hours	ASTM F-1473	> 100
HDB @ 23C	psi	ASTM D-2837	1,600
UV Stabilizer [C]	% Carbon Black	ASTM D-746	> 2%

C. Pipe shall be of the nominal diameter and DR shown on the Drawings. Pipe diameters shall conform to ASTM F714. In general pipes will be DR 17 unless otherwise noted on the Drawings.

D. For perforated pipes, perforations shall be as shown on the Drawings.

E. Ring Stiffness Constant (RSC) values for the pipe can be directly related to the pipe's class designation. (Nominal RSC of Class 40 pipe = 40, etc.). The minimum RSC is 90% of the nominal.

F. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specifications from the same raw material supplier.

G. The polyethylene pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or their injurious defects. Any pipe with nicks, scrapes, or gouges deeper than 5 percent of the normal wall thickness shall be rejected. The pipe shall be uniform in color, opacity, density, and other physical properties.

H. The following information shall be continuously marked on the pipe and spaced at intervals not exceeding 1500 mm (5 feet):

i. Name and/or trademark of the pipe manufacturer.
ii. Nominal pipe size.
iii. Standard Dimensional Ratio (SDR).
iv. PE 4710.
v. Manufacturing Standard Reference.
vi. A production code form which the date and place of manufacture can be determined.

I. Fittings shall be manufactured in accordance with ASTM D3261, except as modified herein.

J. Perforated and/or slotted Pipes to be free of any shavings.

334100.2.2 Test Methods

A. Flattening: Three specimens of each of the three pipe products (a minimum of 30 cm long) shall be flattened between parallel plates in a suitable press until the distance between the plates is 40 percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within 2 to 5 minutes. Remove the load, and examine the specimens for splitting, cracking or breaking. Results shall be reported to Engineer.

B. Pipe Ring Stiffness Constant: The pipe ring stiffness constant shall be determined utilizing procedures similar to those outlined in ASTM D-2412. The stiffness of HDPE pipe is defined in terms of the load, applied between parallel plates, which causes 1% reduction of pipe diameter. Test specimens shall be a minimum of two pipe diameter or 1 m in length, whichever is less. Results shall be compared to specifications and reported to Engineer.

334100.3 EXECUTION

334100.3.1 Quality Assurance

A. The pipe and fittings manufacturer shall have an established quality assurance program responsible for inspecting incoming and outgoing materials. At a minimum, incoming polyethylene materials shall be inspected for density per ASTM D 1505, melt flow rate per ASTM D 1238, and contamination. All incoming polyethylene materials shall be certified by the supplier. Certification shall be verified by Quality Assurance. Incoming materials shall be approved by Quality Assurance before processing into finished goods.

B. The pipe and fittings manufacturer shall have an established quality assurance program responsible for assuring the long-term performance of materials and products. Representative samples of polyethylene materials shall be tested against the physical property requirements of this specification. Each extrusion line and molding machine shall be qualified to produce pressure rated products by taking representative production samples and performing sustained pressure tests in accordance with ASTM D-1598.

C. Quality assurance test for representative pipe and fitting samples shall include:

Test	Standard	Pipe	Fittings
Ring ESCR	ASTM F-1248	Yes	Not Applicable
Sustained pressure at 176 F/725 psi hoop stress	ASTM D-1598	Yes (fo> 1 00 h)	Yes (fo>l 00 h)
Sustained pressure at 73OF/1600 psi hoop stress	ASTM D-1598	Yes (fo> 1 000h)	Yes (fo> 1 000h)

D. All outgoing materials shall be inspected for diameter, wall thickness, length, straightness, out-of-roundness, concentricity, toe-in, inside and outside surface finish, markings, and end cut. Quality Control shall perform tests of density, melt flow rate, carbon content, and carbon dispersion. In addition, samples of the pipe provided shall be tested for hoop tensile strength

and ductility by either quick burst per ASTM D-1599 or ring tensile per ASTM D-2290. Molded fittings shall be subject to x-ray inspection for voids, and tests for knit line strength. All fabricated fittings shall be inspected for fusion quality and alignment.

E. The pipe and fitting manufacturer shall maintain permanent QC and QA records.

334100.3.2 Handling

A. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

B. Pipe and pipe fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skidwalks in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the pipe into the extraction well borings. Pipe and pipe fittings shall not be dropped or dumped.

334100.3.3 Preparation

A. Trenching and backfilling shall be done in accordance with relevant sections.

B. Verify that the excavated trench surfaces are ready to receive work, and dimensions, alignment, grade and elevations are as shown on the Drawings.

C. Hand trim excavations to required excavations.

D. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

E. Embedment material shall be processed and placed as specified in the drawings for each piping system.

F. Verify bedding is to lines and grades shown on Drawings.

334100.3.4 Joining

Heat Fusion of Pipe

A. Weld in accordance with manufacturer's recommendation for butt fusion methods. Provide fusion operators certified by the pipe manufacturer.

B. Butt fusion equipment for joining procedures shall be capable of meeting conditions recommended by pipe manufacturer including, but not limited to, temperature requirements, alignment, and fusion pressures.

C. For cleaning pipe ends, solutions such as detergents and solvents, when required, shall be used in accordance with manufacturer's recommendations.

D. Do not bend pipe to greater degree than minimum radius recommended by manufacturer for type and grade.

E. Do not subject pipe to strains that will overstress or buckle piping or impose excessive stress on joints.

F. Branch saddle fusions shall be joined in accordance with manufacturer's recommendations and procedures. Branch saddle fusion equipment shall be of size to facilitate saddle fusion within trench.

G. Before butt fusing pipe, inspect each length for presence of dirt, sand, mud, shavings, and other debris or animals. Remove debris from pipe.

H. Cover at end of each working day open ends of fused pipe. Cap to prevent entry by animals or debris.

I. Use compatible fusion techniques when polyethylenes of different melt indexes are fused together. Refer to manufacturer's specifications for compatible fusion.

Flange Jointing

A. Use on flanged pipe connection sections.

B. Connect slip-on carbon steel backup flanges with bolts and nuts to ASTM A 307, Grade B, ANSI B18.2.1, ANSI/ASME B18.2.2: stud bolts, carbon steel, semi-finished with heavy hex nuts, complete with washers.

C. Butt fuse fabricated flange adapters to pipe.

D. Observe following precautions in connection of flange joints.

1. Align flanges or flange/valve connections to provide tight seal. Require nitrile-butadiene gaskets if needed to achieve seal. Gaskets are required for flange/valve connections.
2. Place U.S. Standard round washers as may be required on some flanges in accordance with manufacturers recommendations. Bolts shall be lubricated in accordance with manufacturer's recommendations.
3. Tighten flange bolts in sequence and accordance with manufacturer's recommendations. CAUTION: Do not over-torque bolts.

E. Pull bolt down by degrees to uniform torque in accordance with manufacturer's recommendation.

F. Protect below grade bolts and flanges by covering with a 5mil polyethylene wrap. Duct tape wrap to HDPE pipe.

Electro-fusion Couplers

A. Do not use electro-fusion couplers, unless approved by Engineer, installed per manufacturers specifications

B. Install electro-fusion fittings in a manner that allows for salvage and reuse of adjacent fitting if the electro-fusion weld fails. Do not install immediately adjacent to or in contact with other fittings.

334100.3.5 Installation

A. Prevent debris from entering inside pipe.

B. Install only that amount of pipe which can be backfilled in same day.

C. Remove standing water in trench before installation.

D. Do not bend in a radius smaller than recommended by manufacturer when staged on Site or installed in the trench.

E. Perform thermal fusion in an area near the installation location to avoid excessive transportation and possible damage to the pipe.

F. Prior to initiating thermal fusion in the field on any pipe on any given day, provide a test weld and operating data to Engineer including welding temperature, machine number, date of last service, and clearance certificate.

G. Install pipe, fittings and accessories in accordance with ASTM D2321, the drawings, and manufacturer's instructions. Place pipe on prepared bedding layer.

H. Pipes shall be free from burrs, nicks, gouges, surface cracks or defects. Pipe shall be open, clean, and free draining.

I. Lay pipes to grades shown on the Drawings, with maximum variation from true grade of 5 mm in 3 metres. Maintain positive drainage for condensate on all pipe sections.

J. Leave all joints in piping systems uncovered until system is inspected and approved by Engineer.

K. Wherever possible, leave all joints in piping systems uncovered until all tests are completed.

334100.3.6 Quality Control

A. Quality control shall be performed in accordance with Supplemental General Conditions.

B. The Contractor shall provide grade and alignment control during pipe laying. The Contractor shall provide stakes or similar devices that display relevant information to control work. Grade control devices shall be spaced no greater than 10 meters apart over the entire length of pipe and at critical grade breaks or changes in alignment.

C. Provide grade control device showing top of bedding layer design elevation, invert elevation and top of pipe elevation and existing grade elevation. The Contractor shall monitor placement of pipe to verify grade and alignment tolerance are met.

D. The Contractor shall immediately set new grade markers which have been disturbed.

E. The Contractor shall measure and record the final as-built pipeline information. As-built survey information shall include horizontal and vertical locations of pipeline every 10 meters on center and at grade breaks, junctions, or changes in alignment. Horizontal and vertical locations shall be referenced to project datum. Vertical locations for pipe shall include top of pipe and invert elevations. Measurements shall be accurate to 1/100 of a meter.

334100.3.7 Cleaning

A. Piping systems shall be cleaned and tested in accordance with the manufacturer's recommendation and as specified herein.

B. Prior to testing, lines shall be cleaned to remove shavings, welding slag, dirt, construction debris, and other foreign material and flushed with clean water at a minimum of 1m/sec (3 fps) velocity.

334100.3.8 Testing

A. Before any section of non-perforated piping is put into service, it shall be carefully tested to assure it is gas/water tight. Perforated piping will not have to be tested.

B. Notify Engineer at least 24 hours in advance of all proposed tests. Perform tests only in the presence of the Engineer.

C. All testing of piping systems shall be done with due regard for the safety of employees and the public during testing. Bulkheads, anchorage and bracing suitably designed to resist test pressures shall be installed if necessary.

D. Individual pressure tests should be done upon selection by Engineer. The pressure tests shall be conducted as follows:

1. Isolate the line to be tested by closing the appropriate valves and ensuring that all end caps/flanges are in place and secure. Contractor to install caps and pressure gauges as needed.

2. Apply pressure to the pipeline at the rated design pressure for the pipe. For forcemains only, apply 1.25 times the maximum rated pressure for the piping.
3. Maintain the pressure for an adequate period to allow for expansion of the piping.
4. The system must maintain the pressure after accounting for temperature variation for a period of not less than one hour per 100 meters of pipe. Vacuum shall be measured with a mercury manometer slope gauge so calibrated as to be read at increments of not greater than 0.1 psi.
5. Joints and fittings shall be inspected using soap and water, or an equivalent nonflammable solution.

E. If the Engineer does not accept the system test results, then the Contractor is responsible for diagnosing the system faults and making appropriate repairs at the Contractor's expense. Repairs would include:

1. Removing any joints showing leakage from the pipeline, and rejoining.
2. Locate and repair defects in pipelines if additional leakage occurs.

Once the repairs are completed, the testing shall be repeated.

F. The contractor is responsible for the cost and supply of all materials, equipment and manpower to successfully carry out the test to the satisfaction of the engineer.

** END OF SECTION **

SECTION 33 44 01

MANHOLES AND CLEANOUTS

334401. MANHOLES AND CLEANOUTS

334401.1 GENERAL

334401.1.1 Scope of Work

A. This section includes details on the Manhole to be installed along the leachate conveyance pipe alignment.

334401.1.2 Standards

ASTM A48-83	Specification for Gray Iron Castings.
ASTM C139-05	Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C478M-88a,	Specification for Precast Reinforced Concrete Manhole Sections.
CAN3-A23.1-M90,	Concrete Materials and Methods for Concrete Construction.
CAN/CSA-A23, 2-M90	Methods of Test for Concrete
CSA CAN3-A23.4-M78	Precast Concrete - Materials and Construction
CSA A251-M1982	Qualification Code for Manufacturers of Architectural and Structural Precast Concrete
ASTM C478	Precast Reinforced Manhole Sections
ASTM C789	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers

334401.1.3 Submittals

A. The contractor shall submit the following to the engineer a maximum of 10 days following award of the contract. The information provided shall show that the product meets the required specifications of this section.

   a. Product data: submit manufacturer's technical literature for all products specified.

   b. Manufacturer: details on the proposed supplier, including contact details.

   c. Shop drawings: submit shop drawings of all shop fabricated components.

   d. Quality assurance:

      i. Submit certificates of compliance and test results on materials and equipment furnished.

      ii. Submit manufacturer's instructions pertaining to storage, handling, installation, and inspection of materials and equipment furnished.

334401.2 PRODUCTS

334401.2.1 Precast Concrete

A. Supply precast concrete structures to the dimensions as shown on the Drawings.

B. All materials, unless otherwise specified, to CAN3-A23.4

C. Precast manhole sections to ASTM C478M, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

D. Pre-cast concrete adjusting rings in accordance with CAN/CSA A257.4 and ASTM C478

E. Joints to be made watertight using grout to plug lifting holes, joints and frame with non-shrink mortar. Remove excess mortar from inside surface of manhole

F. Mortar:

i. Aggregate to CSA A82.56.

ii. Cement to CAN/CSA-A8.

G. Ladder rungs to CSA G30.12, No. 25M billet steel deformed bars, hot dipped galvanized to CSA G164. Rungs to be safety pattern (drop step type).

H. Concrete Brick to CAN3-A165 Series.

I. Frames and covers to dimensions as indicated and following requirements:

i. Gray iron castings: to ASTM A48, strength class 30B.

ii. Castings to be coated with two applications of asphalt varnish.

iii. Frames to plan dimensions, heavy duty municipal type for road service; complete with four 12.5 mm stainless pins for securing lid to ring.

iv. Spark resistant fiberglass or rigid polyethylene cover with embedded lifting loop or U-Bolt eye and four holes for anchoring lid on frame.

v. Spark resistant covers to bear evenly on frames. A frame with cover to constitute one unit. Assemble and mark unit components before shipment.

J. Precast perforated manholes shall be 35 MPA drywell barrels with 100 rectangular openings per barrel circumference on each 900 mm high section. Openings shall be spaced 150mm apart vertically and 200mm apart horizontally.

334401.2.2 Watertight manholes

A. Unless otherwise specified or for perforated manholes, all other manholes shall be watertight manholes

B. All watertight manholes to include the following items:

a. Install Manhole barrels using watertight butyl rubber, pre-lubricated rolling gaskets (superseal or equivalent), rated for min 10 psi water pressure

b. Use polyurethane-based, non-sagging elastomeric sealant as per astm c-920, type s, grade ns to seal all inside joints. Comply with all application methods and recommendations as per manufacturer data sheet.

c. All pipe penetrations to have cast-in-place, watertight connection compatible with the type of penetrating pipe

334401.2.3 Frames and covers

A. Unless otherwise specified, complete all frames, covers and hatches to dimensions as indicated in the drawings and the following specifications:

a. Flush installation in new concrete

b. Prefabricated lid with recessed padlock

c. For non-traffic areas use pedestrian rated, double leaves cover, 6 mm reinforced diamond plates rated for 1460 kg/sq.m (300 psf) complete with fall through protection

d. Stainless steel, heavy duty, tampered proof hinges, slam lock with flush drop handle, automatic hold open arm and hardware

B. All explosion proof covers to be completed using the following specifications:

a. Gray iron castings: to astm a48, strength class 30b.

b. Frames to plan dimensions, heavy duty municipal type for road service; complete with four 12.5 mm stainless pins for securing lid to ring.

c. Spark resistant fiberglass or rigid polyethylene cover with embedded lifting loop or u-bolt eye and four holes for anchoring lid on frame.

d. Spark resistant covers to bear evenly on frames. A frame with cover to constitute one unit. Assemble and mark unit components before shipment.

334401.2.4 Warning Signs

A. Warning signs to be mounted on cover of all chambers, and to include the following:

WARNING
CONFINED SPACE
HAZARDOUS GASES MAY BE PRESENT
AUTHORIZED ACCESS ONLY

B. Warning signs to be constructed of aluminum plate stock with dimensions 300 mm by 300 mm and written with easily visible color and Font.

C. Additional signs to be mounted on sides of all manholes, stating:

DANGER!
CONFINED SPACE
POSSIBLE EXPLOSIVE HAZARD
NO SMOKING

D. Warning signs shall not cover lifting ring on manhole lids. Signs should be adapted, if necessary, to have holes that align with lifting holes.

334401.3 EXECUTION

334401.3.1 Handling

A. Each manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the manufacturer. Materials shall be handled, installed, and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

B. Materials shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skidwalks in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the material into the necessary location. Materials shall not be dropped or dumped.

334401.3.2 Excavation and Backfill

A. Excavate and backfill in accordance with the Drawings.

B. Obtain approval of Engineer before installing manholes, sumps, inlet structures or cleanouts.

C. Compact base material and prepare concrete base for manholes in accordance with the Drawings, or with a minimum 100 mm layer of Minus 25 mm Gravel Bedding compacted to 95% maximum Standard Proctor Density.

334401.3.3 Installation

A. Construct units in accordance with details indicated, plumb and true to alignment and grade.

B. Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.

C. Dewater excavation and remove soft and foreign material before placing concrete base.

D. Precast units:

i. Set bottom section of precast unit in bed of cement mortar and bond to concrete slab base. Make each successive joint watertight with Engineer approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof.

ii. Clean surplus mortar and joint compounds from interior surface of unit as Work progresses.

iii. Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

iv. Install pipes using water tight connections to manholes.

E. Bench to provide a smooth T-shaped channel. Side height of channel to be full diameter of pipe. Adjacent floor to be sloped at 15%. Channels to be curved smoothly. Shape invert to established sewer grade. For details refer to Detail D35 on North Perimeter Leachate Collection System Details.

F. Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.

G. Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

334401.3.4 Leakage Test for Watertight Manholes

A. Install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole. Test duration shall be minimum 1.0 hour for each meter cube volume or portion thereof. Contractor to pre-soak the manhole prior to testing.

B. If permissible leakage is exceeded, correct defects. Repeat until approved by engineer.

** END OF SECTION **