



REGIONAL DISTRICT of Fraser-Fort George

INVITATION TO TENDER ES-24-09

Construction and Repair Services Azu Community Water System

- Date Issued:** May 2, 2024
- Closing Location:** Regional District Office
3rd Floor, 155 George Street,
Prince George, BC V2L 1P8
- Closing Date:** May 27, 2024
2:00 pm (Pacific Standard Time)
No Public Opening
- Inquiries:** Email Bryan Boyes at bboyes@rdffg.bc.ca
- Note:** Late submissions will not be considered

Regional District of Fraser-Fort George
155 George Street, Prince George BC V2L 1P8
Telephone 250-960-4400 / Toll Free 1-800-667-1959 / Fax 250-562-8676

www.rdffg.ca

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INVITATION TO TENDER
PART A – INTRODUCTION

The Regional District of Fraser-Fort George (Regional District) invites tenders for construction and repair services for the Azú Community Water System which is located north of Prince George, BC near Azouetta Lake in the Pine Pass.

The contract term is July 1, 2024 to November 15, 2024.

TENDER DOCUMENTS

The Invitation to Tender documents may be obtained on or after **May 2, 2024**:

- (a) in a PDF (Public Document Format) file format from the Regional District's website at www.rdffg.ca;
- (b) on the BCBid® website at www.bcbid.gov.bc.ca; or

All subsequent information regarding this ITT, including amendments, Addendum(s) and answers to questions will also be available as above.

It is the sole responsibility of the tenderer to ascertain that they have received a full set of Tender Documents. Upon submission of their bid, the tenderer will be deemed conclusively to have been in possession of a full set of Tender Documents (listed in Part B, Section 2.1).

DELIVERY OF TENDERS AND CLOSING DATE:

Tenders will be received by the General Manager of Financial Services at the Regional District of Fraser-Fort George, 3rd floor, 155 George Street, Prince George, BC (the "**Closing Location**") not later than 2:00 p.m. local time on **May 27, 2024** (the "**Closing Date**"). There will not be a public opening for this tender. Tenders must be in English and must be submitted using the submission methods below.

The Regional District will accept tenders submitted either by direct delivery or electronically to the Regional District main office.

For Tenders to be submitted by hard copy direct delivery:

Two (2) complete copies of your Tender must be submitted in a sealed envelope with the following information written on the outside of the envelope containing the tender, as well as on the outside of the courier envelope/box (if sending by courier):

1. Attention: General Manager of Financial Services
Regional District of Fraser-Fort George
3rd Floor, 155 George Street
Prince George, BC V2L 1P8
2. Invitation to Tender, **ES-24-09**
Construction and Repair Services – Azú community Water system
3. Responding Tenderer's name and address

The lowest or any Tender will not necessarily be accepted. The Regional District of Fraser-Fort George reserves the right to accept or reject any or all Tenders. **Facsimile Tenders will NOT be accepted.**

For Tenders to be submitted Electronically, with Bid Security:

The closing date and time for this tender is May 27, 2024 at 2:00 p.m. local Prince George Time (the “**Closing Date**”).

“Prince George Time” will be conclusively deemed to be the time indicated in the electronic timestamp the Tender receives upon delivery to the email address specified herein.

Other than the Security Deposit, Tenderers must submit all portions of their Tender by email in accordance with the following:

Subject of the file to be: ES-24-09 Construction and Repair Services – Azu Community water System – (Insert Responding Tenderer’s Name)

All emailed documents must be in PDF format and should be in one combined file. Tenderers should ensure that the files should not collectively exceed 30MB. Zip the files to reduce the size or email separately, if needed. **Submitting the files via Drop Box, FTP, or similar programs, is not acceptable.**

Tenders must be submitted to purchasing@rdffg.bc.ca. Other than the Security Deposit, do not deliver a physical copy of the tender package to the Regional District of Fraser Fort George.

The Security Deposit must not be sent by email. The Security Deposit must be received by the General Manager of Financial Services, at the Regional District of Fraser-Fort George, 3rd Floor, 155 George Street, Prince George, BC on or before the Closing Date. The Security Deposit must be submitted in a sealed envelope with the following information written on the outside of the envelope containing the security deposit, as well as on the outside of the Courier envelope if being sent by courier.

1. Attention: General Manager of Financial Services
Regional District of Fraser-Fort George
3rd Floor, 155 George Street
Prince George, BC V2L 1P8
2. Invitation to Tender **ES-24-09**
Construction and Repair Services – Azu Community Water System
3. Responding Tenderer’s name and address

To be considered, tenders must be signed by an authorized signatory of the tenderer. By signing the tender, the tenderer is bound to statements made in response to this ITT. Any tender received by the Regional District that is unsigned will be rejected.

Tenders not submitted in strict accordance with these instructions or not complying with the requirements in this ITT may be rejected.

The Regional District does not assume any risk or responsibility or liability, including in contract or tort (including negligence), whatsoever to any Tenderer:

1. for ensuring that any electronic email system being operated by or for the Regional District is in good working order, able to receive transmissions, or not engaged in receiving other transmissions such that a Tenderer's electronic transmission, including the transmission of an electronic copy of its Tender, cannot be received;
2. for errors, problems or technical difficulties with respect to a Tenderer's electronic transmission, including the transmission of an electronic copy of its Tender;
3. that a Tenderer's electronic transmission, including the transmission of an electronic copy of its Tender, is received by the Regional District of Fraser-Fort George in its entirety or within any time limit specified by this Tender.

The lowest or any Tender will not necessarily be accepted. The Regional District of Fraser-Fort George reserves the right to accept or reject any or all Tenders. Email Tenders will be accepted, with all documents to be submitted by email only, other than the Bid Security. All Tender Documents (including the Bid Security) must be received by the Closing Date in order for the Tender to receive consideration.

PART B – INSTRUCTIONS TO TENDERERS

The Regional District of Fraser-Fort George, hereinafter referred to as the Regional District, invites Tenders for:

ES-24-09 - CONSTRUCTION AND REPAIR SERVICES – AZU COMMUNITY WATER SYSTEM
July 1, 2024 – November 15, 2024.

Instructions regarding obtaining the Tender Documents are contained in Part A: Introduction.

Questions relating to the tender or project must be directed to:

Bryan Boyes, Utilities Leader
Regional District of Fraser-Fort George
155 George Street
Prince George, BC V2L 1P8
Phone: 250-960-4400
Email: bboyes@rdffg.bc.ca

Deadline for question submissions is 5:00 p.m. (local time) May 16, 2024.

Those questions that are determined to be of a common interest to all potential Tenderers will be summarized and posted as Addendum(s) on the website.

ACKNOWLEDGEMENT LETTER

Upon receipt of this Invitation to Tender, a potential Tenderer should complete and sign the Acknowledgement Letter at Appendix A, and email the signed Acknowledgement Letter to, Project Manager, bboyes@rdffg.bc.ca. A Tenderer who signs and returns the Acknowledgement Letter is not obligated to submit a Tender.

Any Tenderer who does not submit the Acknowledgement Letter will not be sent any Addendum(s), or answers to questions and may be disqualified.

SITE MEETING

There will be no site meeting for this ITT.

TENDER PROCESS

1.0 Definitions

- 1.1 "**Addendum(s)**" means all additional information regarding this ITT including amendments to the ITT.
- 1.2 "**BC Bid**" means the BC Bid website located at www.bcbid.ca.
- 1.3 "**Board**" means the Board of the Regional District.
- 1.4 "**Closing Location**" means the location specified in Part A - Introduction.
- 1.5 "**Closing Time**" means the closing time and date specified in Part A - Introduction.
- 1.6 "**Contract**" means the contract substantially in the form attached to this ITT.
- 1.7 "**Contractor**" means the successful Tenderer to the ITT who enters into a Contract with the Regional District.
- 1.8 "**Form of Tender**" means the form of tender attached to this ITT.
- 1.9 "**ITT**" means the solicitation described in this document, including any attached or referenced appendices, schedules or exhibits and as may be modified in writing from time to time by the Regional District by Addendum(s).
- 1.10 "**Project Manager**" means the Regional District's representative.
- 1.11 "**Tender**" means a submission in response to this ITT.
- 1.12 "**Tender Documents**" means the documents listed in section 2.1.
- 1.13 "**Tenderer**" means the person submitting a Tender.
- 1.14 "**Regional District**" means the Regional District of Fraser-Fort George.

- 1.15 "**Must**" means a requirement that must be met in order for a Tender to receive consideration.
- 1.16 "**Should**", or "**May**" means a requirement having a significant degree of importance to the objective of the ITT, but which the Regional District would strongly prefer to be fulfilled, and which the Regional District may in its sole discretion elect to treat the failure to fulfill as a grounds for rejection of a Tender.
- 1.17 "**Work**" means the total construction and related services required by the Tender documents.

2.0 Tender Documents

2.1 The Tender Documents are:

- (a) Part A – Introduction;
- (b) Part B – Instructions to Tenderers; and
- (c) Appendices

The following Appendices are attached to this Invitation to Tender:

- Appendix A – Acknowledgment Letter;
- Appendix B – Bidder Checklist;
- Appendix C – Tender Form;
- Appendix D – List of Contractor's Personnel;
- Appendix E – List of Subcontractors;
- Appendix F – List of Equipment;
- Appendix G – Tender's Experience in Similar Work;
- Appendix H – Conflict of Interest Disclosure Statement;
- Appendix I – Goods and Services Tax Information;
- Appendix J – Schedule of Quantities (SOQ)
- Appendix K – Technical Specifications
- Appendix L – Drawings
- Appendix M - Contract Agreement and General Conditions
(Refer to MMCD Platinum edition which will form part of the final contract)
- Appendix N – Supplemental General Conditions

2.2 If there is a conflict between or among (i) the Specifications and (ii) the other Tender Documents, the other Tender Documents shall prevail over the Specifications.

3.0 Acceptance of Terms and Conditions

Submitting a Tender indicates acceptance of all the terms and conditions set out in the ITT, including those that follow and that are included in all appendices and any Addendum(s).

4.0 Submission Instructions

- 4.1 Each Tenderer must complete and provide Appendix A and C through I.
- 4.2 All prices and notations should be legibly written in a non-erasable medium. Erasures, interlineations, or other corrections should be initialed by an authorized signatory of the Tenderer.
- 4.3 Subject to any alternatives or options in respect of which the Regional District requests pricing or other information in an Appendix to the ITT, Tenders are to be all inclusive and without qualification or condition.
- 4.4 The Regional District may, at any time and for any reason, extend the Closing Time by means of a written amendment published on the Regional District's website, at www.rdffg.ca and at BC Bid.
- 4.5 Each Tender must be signed by an authorized signatory or authorized signatories of the Tenderer, as is necessary for due execution on behalf of the Tenderer. Each Tender by a company or partnership should specify the full name of the legal entity submitting the Tender.
- 4.6 It is the sole responsibility of the Tenderer to ascertain that they have received a full set of the Tender Documents. Upon submission of their Tender, the Tender will be deemed conclusively to have been in possession of a full set of the Tender Documents.
- 4.7 If the Regional District, in the Regional District's sole discretion, determines that a clarification, addition, deletion, or revision of the ITT is required then the Regional District will issue an addendum and the addendum will be posted on the Regional District website and BC Bid.
- 4.8 It is the sole responsibility of the Tenderer to check for Addendum(s). Addendum(s) issued during the time of Tendering must be signed by the Tenderer and included with the Tender and will become a part of the Tender documents.
- 4.9 The Regional District will not be responsible for any costs incurred by the respondent which may result from the preparation or submission of documents pertaining to this Tender. Accuracy and completeness of a Tender is the Tenderer's responsibility.

5.0 Discrepancies or Omissions

- 5.1 Tenderers finding discrepancies or omissions in the specifications or other documents herein or having doubts on the meaning or intent of any part thereof, should immediately request in written form, either by email or by mail, clarification from the Project Manager. Upon receipt of the written request for clarification, The Project Manager may, in the person's sole discretion, send written instructions or explanations to all parties registered as having returned the

Acknowledgement Letter, and make amendments to this ITT. No responsibility will be accepted for oral instructions. Any requests must be received prior to May 16, 2024.

- 5.2 It is the responsibility of each Tenderer to thoroughly examine the Tender Documents and satisfy itself as to the full requirements of this ITT and their acceptability to the Tenderer.

6.0 Late Submissions

Tenders will be marked with their receipt time upon receipt. Only complete Tenders received before the Closing Time will be considered to have been received on time. Tenders received late will be marked late and not considered or evaluated. In case of a dispute, the Tender receipt time as recorded by the Regional District will prevail whether accurate or not.

7.0 Changes to Tenders

A Tenderer that has already submitted a Tender may amend its Tender prior to the Closing Time:

- (a) For changes to price only, by submitting an amendment via email or mail at the address identified at the beginning of Part B of this Invitation to Tender, identifying a plus or minus variance to the Tenderer's Tender Price; or
- (b) In all cases, by delivering a completely new Tender in accordance with Part A to this Invitation to Tender, clearly indicating it replaces the previously submitted Tender.

Any such revision must clearly identify the ITT number and the Closing Time. A Tender revision submitted as aforesaid shall effectively amend the Tender and the Regional District shall only review and evaluate the Tender as amended.

8.0 Bid Prices

- 8.1 The Tenderer will be deemed to have satisfied themselves as to the sufficiency of the Tender for the work and the price stated in the SOQ. These prices will cover all their obligations under the Contract, and all matters necessary to the proper completion and maintenance of the work, and will include the supply of all labour, equipment material, supervision, services, taxes and assessments, together with the Tenderer's overhead and profit, except where otherwise provided elsewhere in this ITT.

- 8.2 Tender prices must remain open for acceptance for a period of sixty (60) days from the Closing Date unless otherwise stated by the Regional District.

9.0 Subcontractors

All Subcontractors, including affiliates of the Tenderer, should be clearly identified in the Tender as per the form attached as Appendix E.

A Tenderer may not subcontract to a firm or individual whose current or past corporate or other interests, may, in the Regional District's opinion, give rise to an actual, perceived or potential conflict of interest in connection with the services described in the Tender. This includes, but is not limited to, involvement by the firm or individual in the preparation of the Tender or a relationship with any

employee, contractor or representative of the Regional District involved in preparation of the Tender, participating in evaluation or in the administration of the Contract. If a Tenderer is in doubt as to whether a proposed Subcontractor might be in a conflict of interest, the Tenderer should consult with the Project Manager prior to submitting a Tender. By submitting a Tender, the Tenderer represents that it is not aware of any circumstances that would give rise to a conflict of interest that is actual, perceived or potential, in respect of the Tender.

10.0 Rejection of a Tender

10.1 The Regional District may, in its sole discretion, reject any and all Tenders, or accept the Tender deemed most favourable in the interests of the Regional District. The lowest, or any Tender, will not necessarily be awarded.

10.2 Tenders which contain qualifying conditions or otherwise fail to conform to the instructions contained in this ITT may be disqualified or rejected. The Regional District may, however, in its sole discretion, reject or retain for its consideration Tenders which are non-conforming because they do not contain the content or form required by the ITT, or for failure to comply with the process for submission set out in this ITT, whether or not such non-compliance is material.

10.3 The Regional District's intent is to enter into a Contract with the Tenderer who has submitted the best offer. The Regional District reserves the right to accept any or none of the Tenders submitted and will evaluate Tenders based on the best value offered to the Regional District and not necessarily the lowest price. The Regional District reserves the right in its sole unrestricted discretion to:

- (a) accept any Tender which the Regional District deems most advantageous to itself;
- (b) reject any and/or all irregularities in a Tender submitted;
- (c) waive any defect or deficiency in a Tender whether or not that defect or deficiency materially or substantially affects the Tender and accept that Tender;
- (d) reject any and/or all Tender for any reason, without discussion with the Tenderer(s);
- (e) accept a Tender which is not the lowest Tender; and
- (f) cancel or reissue the Tender without any changes.

10.4 Without limiting any other provision of this Tender, the Regional District may, in its sole discretion, reject a Tender submitted by a Tenderer, if the Tenderer or any officer or director of a corporate Tenderer, is, or has been within a period of two years prior to the Closing Time, engaged either directly or indirectly through another corporation or legal entity in a legal proceeding initiated in any court against the Regional District in relation to any contract with, or works or services provided to the Regional District.

11.0 Conflict of Interest

11.1 When submitting a Tender, the Tenderer must complete, sign and include with their Tender a Conflict of Interest Disclosure Statement (Appendix H).

11.2 Without limiting any other provision of this ITT, the Regional District may reject a Tender based on an actual, potential or perceived conflict of interest.

The Regional District may reject any Tender where:

- a. one or more of the directors, officers, principals, partners, senior management employees, shareholders or owners of the Tenderer, is an officer, employee or director of the Regional District or a consultant involved in the procurement process, or is a member of the immediate family of an officer, employee or director of the Regional District or a consultant involved in the procurement process; or
- b. in the case of a Tender submitted by a Tenderer who is an individual person, where that individual is an officer, employee or director of the Regional District or a consultant involved in the procurement process or is a member of the immediate family of an officer, employee or director of the Regional District or a consultant involved in the procurement process.

A Tenderer who has any concerns regarding whether a current or prospective employee, advisor or member of that Tenderer is, or may be, a Restricted Party, is encouraged to request an advance decision by submitting to the Project Manager, not less than ten working days prior to the Closing Time, by email, the following information:

- (a) names and contact information of the Tenderer and the person for which the advance opinion is requested;
- (b) a description of the relationship that raises the possibility or perception of a conflict of interest or unfair advantage; and
- (c) copies of any relevant documentation.

The Regional District may make an advance decision regarding whether the person is a Restricted Party, and whether the Regional District will reject a Tender based on the information provided.

12.0 Tender Evaluation

12.1 The purpose of this ITT is to select a Tenderer with the capability and experience to efficiently and cost effectively complete the work described in this ITT.

12.2 The Regional District shall be the sole judge of a Tender and its decision shall be final. The Regional District staff shall use the following criteria to evaluate tenders received:

- (a) Tenderer's Qualifications, Experience, and References;
- (b) Past Work Experience with the Regional District;
- (c) Tender Price; and

12.3 The Tenderer acknowledges that the Regional District may rely upon criteria that the Regional District deems relevant even though such criteria may not have been disclosed to the

Tenderer. By submitting a Tender, the Tenderer acknowledges the Regional District's right under this clause and absolutely waives any right of action against the Regional District for the Regional District's failure to accept the Tenderer's Tender, whether or not such right of action arises in contract, negligence, bad faith or any other cause of action.

- 12.4 Notwithstanding any other provision in this ITT, the award of a Contract by the Regional District may be subject to the availability of funding and the approval of the Board.

13.0 Proof of Ability

The Tenderer will be competent and capable of performing the Work. The Tenderer is required to provide evidence of previous experience and financial responsibility before the contract is awarded.

14.0 Equipment

A complete list of the equipment, which the Tenderer will make available for the completion of the Contract, will be included with each Tender.

15.0 Security Deposit

A certified cheque, bank draft or money order in the amount of Fifteen Thousand Dollars (\$15,000) must accompany the Tender. This security deposit will be returned to all unsuccessful bidders within ninety (90) days of Tender opening and to the successful bidder when a contract has been executed. Failure of the successful bidder to execute the contract upon award by the Regional Board will result in forfeiture of the Security Deposit.

16.0 Examination of Contract Documents and Site

- 16.1 The Tenderer will satisfy themselves as to the practicality of executing the work in accordance with the Contract, and they will be held to have satisfied themselves in every particular before making up their Tender by inquiry, measurement, calculation and inspection of the site.
- 16.2 The Tenderer will examine the site and its surroundings and, before submitting their Tender will satisfy themselves as to the nature of the site, the quantities and nature of the work and equipment necessary for the completion of the work, and the means to access to the site, the accommodation they may require, and in general, will obtain all relevant information as to risks, contingencies and other circumstances which may influence their Tender.

17.0 Liability for Errors

- 17.1 The Regional District will not be responsible for any costs incurred by Tenderers as a result of the preparation or submission of a Tender pertaining to this ITT. The accuracy and completeness of the Tender is the Proponent's responsibility. If errors are discovered, they will be corrected by the Tenderer at their expense.
- 17.2 Tenderers acknowledge that the Regional District, in the preparation of the ITT supply of oral or written information to Tenderers, review of Tenders or the carrying out the Regional District's responsibilities under this ITT, does not owe a duty of care to Tenderers.

18.0 Limitation of Liability

Except for claims for costs of preparation of its Tender, each Tenderer, by submitting a Tender, irrevocably waives any claim, action, or proceeding against the Regional District including without limitation any judicial review or injunction application or against any of the Regional District's employees, advisors or representatives for damages, expenses or costs including costs of Tender preparation, loss of profits, loss of opportunity or any consequential loss for any reason including: any actual or alleged unfairness on the part of the Regional District at any stage of the Tender process; if the Regional District does not award or execute a contract; or, if the Regional District is subsequently determined to have accepted a noncompliant Tender or otherwise breached or fundamentally breached the terms of this ITT.

19.0 Ownership of Tenders and Freedom of Information

19.1 Tenders will be received and held in confidence by the Regional District, subject to the provisions of the Freedom of Information and Protection of Privacy Act and this ITT. Each Tender should clearly identify any information that is considered to be confidential or proprietary information.

19.2 As an exception to Tenders being received and held in confidence, Tenderers are advised and acknowledge that any contract entered into as a result of this Tender may be subject to Board approval, which may be discussed and voted on at a meeting of the Board that is open to the public. If Board approval is required, details of Tenders, including but not limited to proposed or negotiated fees, may be provided to the Board in a publicly available staff report, discussed at a Council meeting that is open to the public, and posted on a publicly available electronic agenda on the Regional District's website.

20.0 Confidentiality

In accordance with the *Freedom of Information and Protection of Privacy Act*, Tenderers will treat as confidential and will not, without prior written consent of the Regional District, publish, release, or disclose, or permit to be published, released, or disclosed, any information supplied to, obtained by, or which comes to the knowledge of a Tenderer as a result of this ITT except insofar as such publication, release or disclosure is required by the laws of British Columbia.

CONTRACT CONDITIONS

21.0 Contract

21.1 Form of Contract

The Contract Form and General Conditions which will be utilized will be MMCD c.2009 Unit Price Contract.

21.2 Award of Contract

A contract for ES-24-09 Construction and Repair Services – Azu Community Water System is anticipated to be awarded at Regional Board on May 27, 2024. All tenderers will be advised, in writing, as to the awarding of the Contract after that date.

The Regional District may, in its sole discretion, award Contract ES-24-09 Construction and Repair Services – Azú Community Water System, or it may delay the date of awarding the Contract or cancel this ITT if deemed appropriate by the Regional District for any reason.

22.0 Start and Duration of Contract

The term of the Contract will begin on July 1, 2024 at 12:01 a.m. and the Contract will remain in force until midnight on November 15, 2024. Construction will commence upon award and signing of the contract as laid out in Part 1 of the Tender.

A construction start date will be mutually agreed upon by the Regional District and the Contractor. Once construction works begin on-site, they will continue without interruption until project completion, on or before November 15, 2024 or later date as agreed upon by the Regional District and the Contractor.

In the event of an unanticipated work stoppage due to changes in the status of or delays in material delivery or inclement weather and in the absence of alternative contractual related tasks, no fault should be found with either the Owner or the Contractor and a revised schedule shall be agreed upon.

23.0 Term and Termination

The term of this Contract shall commence as set out in Section 22.0 and shall continue in effect until terminated by either party as provided herein. Either party may terminate this Agreement at any time, with or without cause, by providing not less than thirty (30) business days advance written notice to the other party. The Contractor or the Regional District may terminate this Agreement immediately in writing if either party becomes insolvent, enters bankruptcy, receivership, or other like proceeding (voluntary or involuntary) or makes an assignment for the benefit of creditors.

24.0 Intent of Contract Documents

This Contract is not an agreement of employment. The Contractor is an independent contractor and nothing herein will be construed to create a partnership, joint venture, or agency and neither party will be responsible for the debts or obligations of the other.

25.0 Assignment of Contract

The Contractor will not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portions thereof, or their right, title or interest therein, or their obligations thereunder without written consent of the Regional District, except for an assignment to a bank of the payments to be received hereunder.

26.0 Payment

Payment will be made by the Regional District within thirty (30) days of the Regional District approving the invoice.

Each progress payment claim is subject to a 10% hold back. All claims must be accompanied by supporting documentation as to its completion and proof of passing all required inspections.

The Regional District and/or the Engineer will inspect the work before making recommendation of payment.

The Regional District will withhold 10% of the total payment due under the Contract as a performance assurance holdback. The holdback will be released to the Contractor once the following two conditions have been satisfied:

1. The work has been completed to the satisfaction of the Regional District.
2. The Regional District has received notification from WorkSafeBC that all required WorkSafeBC assessments have been paid for the period covering the Contract term.

No payment will be made for materials supplied by the Regional District.

27.0 Scope of Work

27.1 Reservoir Drainage upgrades

- a) The Contractor will excavate and expose the existing drainage pipe from the reservoir.
- b) The Contractor will be responsible for any clearing of vegetation and creating any access that may be required to expose the drainage pipe.
- c) The Contractor will cut and install prebenched manhole to direct drainage water as per drawing alignment.
- d) The Contractor will confirm alignment with WSP prior to ordering of prebenched manhole to ensure outlet is located at a favorable drainage location to be determined in the field with the Contract Administrator or the RDFFG.
- e) The Contractor will install Corrugated Steel Pipe (200mm) from prebenched manhole to field determined daylight outlet location. (approximate distance 42 meters)

27.2 Water Supply upgrades

- a) The Contractor will expose well supply piping and pumphouse inlet piping to confirm sizing, depth of installation and fittings required to complete designated work as defined in the scope and contract drawings.
- b) The Contractor will install via trenching well supply piping from the defined areas as found in the project drawings and schedule of quantities. (using minimum 2.7 meters cover)
- c) Installation includes: Cap and decommission of existing water lines, tie in to wells (x3) and tie in to pumphouse, testing (pressure, chlorination, flushing, BacT), compaction to 95% spd of installation and coordination with Contract Administrator for documentation and installation review.
- d) Standard field testing procedure to follow MMCD HDPE well supply piping.

Also refer to Schedule of Quantities (SOQ) from WSP in Appendix J.

28.0 Changes to the Contract Work

The Regional District, without invalidating the Contract, may make changes by altering, adding to, or deducting from the work. The Contractor will proceed with the work as changed and the work will be executed under the provisions of the Contract. No changes will be undertaken by the Contractor without written order of the Regional District, except in an emergency endangering life or property, and no claims for additional compensation will be valid unless the change was so ordered. The Regional

District will entertain no payment for extra work or changes in the Contract unless a “Change Order” form is completed and signed by the Regional District, the Consultant and the Contractor.

If, in the opinion of the Regional District, such changes affect the Contract amount, these will be adjusted at the time of ordering the changes. The value of the addition or deduction from the Contract amount will be decided by the Regional District based on a lump sum estimate submitted by the Contractor and accepted by the Regional District.

29.0 Insurance

The Contractor shall, without limiting its obligations or liabilities, and at its own expense, provide and maintain throughout the Contract term, the following insurance with insurers licenced in the Province of British Columbia, in forms acceptable to the Regional District. All required insurance (except automobile insurance on vehicles owned by the Contractor) shall be endorsed to show the Regional District as additional insured and to require that the Regional District be provided with thirty (30) days’ advance written notice of cancellation or material change. The Contractor will provide the Regional District with evidence of the required insurance, in a form acceptable to the Regional District, upon notification of award and prior to the execution and delivery of the Contract:

- i. Commercial General Liability (CGL) in an amount not less than \$5,000,000 inclusive per occurrence insuring against bodily injury and property damage and including liability assumed under the Contract. Such CGL coverage shall include the following liability extensions: Contingent Employers Liability, Broad Form Products & Completed Operations, Personal Injury, Blanket Contractual, and Cross Liability. The Regional District is to be added as an additional insured.
- ii. Where the Contractor requires the use of Automobiles to undertake the work of the Contract, the Contractor will have the following:
 - a. Automobile Liability on all vehicles owned, operated, or licenced in the name of the Contractor in an amount not less than \$3,000,000 per occurrence.
 - b. Non-owned Automobile Liability insurance in an amount not less \$3,000,000 per occurrence.
- iii. Equipment insurance on all equipment owned or rented by the Contractor to its full insurable value.
- iv. The Contractor will buy and keep in force at their expense until completion of the Contract, firefighting expense insurance in the amount of Five Hundred Thousand Dollars (\$500,000). Such insurance is to include forestry firefighting expenses and will be in the name of the Contractor and the Regional District.

The Contractor shall ensure that all Subcontractors forming from this Contract meet the insurance requirements outlined above.

It is the sole responsibility of the Contractor to determine if additional limits of liability insurance coverage are required to protect them from risk.

30.0 Damage to Existing Property

In the event of damage to the Regional District's property arising from actions of the Contractor the procedure will be as follows:

1. The Contractor will immediately advise the Regional District of any damage to the Regional District's property.
2. Upon investigation, the Regional District will notify the Contractor of damages to be repaired.
3. If the Contractor does not reply within seventy-two (72) hours, the Regional District will repair, to the appropriate specifications or regulations, and deduct the cost of the repair from payment to the Contractor.

31.0 WorkSafeBC

The Contractor will use due care and take all necessary precautions to assure the protection of persons and property while undertaking the Work and will comply with the Workers Compensation Act of the Province of British Columbia.

Prior to undertaking any of the Work in this Service Agreement, the Contractor will provide the Regional District with a Clearance Letter confirming they are in good standing with WorkSafeBC and will pay and keep current all assessments required by WorkSafeBC in relation to the Service Agreement amount.

Out of Province Contractors will be compliant with WorkSafeBC's registration requirements pertaining to out of Province firms. Where WorkSafeBC registration requirements allow for a Contractor to be registered with another Province's Worker's Compensation Board, or like organization, the Contractor will provide the Regional District with their registration number and written documentation confirming that the Contractor is in good standing with the appropriate Worker's Compensation Board, or like organization. The Contractor will pay and keep current all assessments required to maintain good standing in relation to the Service Agreement amount.

The Contractor will maintain an Occupational Health and Safety Plan (OHSP) and ensure that their employees and Sub-Service Providers are well trained and aware of the OHSP.

32.0 Indemnity and Release by Contractor

Notwithstanding the compliance of the Contractor with all the clauses concerning insurance, the Contractor shall indemnify, protect, and save harmless the Regional District, its officials, officers, employees, volunteers, servants, and agents from and against any and all liabilities, damages, losses, claims, costs, expenses of any kind whatsoever (including legal costs), and actions recoverable by any third party from the Regional District, arising from or caused by a negligent act or omission of, or breach of this Agreement on the part of, the Contractor, and shall be paid by the Contractor. If the Regional District pays, or is required to pay, any damages, costs, or fees on account of the actions, claims and demands herein recited, or if the property of the Regional District shall be charged in any way as a result of the aforesaid actions, causes of actions, and claims for demands, then the Regional District shall be entitled to recover from the Contractor all such damages, costs, fees or other charges together with any costs or expenses incurred in so doing. The Contractor covenants and agrees that this clause shall survive the termination of the Contract herein granted.

33.0 Force Majeure

If either the Contractor or the Regional District are prevented from performing their obligations under the Contract, or where the Regional District's work in respect of which the Contractor is providing Services cannot be performed, because of an act of God, an act of a legislative, administrative or judicial entity, fire, flood, labour strike or lock-out, epidemic, unusually severe weather, or other similar cause outside of the control of the Parties (collectively "Force Majeure"), then the obligations of the Contractor and the Regional District under the Contract shall be suspended for so long as the condition constituting Force Majeure continues. The Party affected by Force Majeure shall provide the other Party with notice of the anticipated duration of the Force Majeure event, any actions being taken by the Party providing notice to avoid or minimize the effect of the Force Majeure event and shall make reasonable efforts to remove or mitigate the effects of the condition constituting Force Majeure. Upon the termination of the Force Majeure event, the Regional District shall grant to the Contractor a time extension for performance of any milestone dates required as part of the Services as may be agreed with the Contractor or, if the Regional District and the Contractor are unable to reach agreement, as determined by the dispute resolution process under Section 41.0 of the Contract. Where as a result of Force Majeure there is a material increase in the Contractor's cost of or the time required for the performance of the Services that is not offset by a decrease in cost, then the Regional District shall increase the amount of the service fee payable to the Contractor under Section 26.0 of this Agreement, as may be agreed by the Contractor, or as determined under Section 41.0 of the Contract. If the event of Force Majeure results in a material increase in the cost of the work to be performed in respect of which the Contractor is providing the Services, then the Regional District may choose not to proceed with the completion of the work and may terminate this Agreement. If the Regional District terminates this Agreement following the termination of the Force Majeure event, then it shall compensate the Contractor in accordance with Section 23.0 of this Agreement.

34.0 Rights of Waiver

A waiver, or any breach of any provision of this ITT will not constitute or operate as a waiver, or any other breach, of any other provisions, nor will any failure to enforce any provision herein operate as a waiver of such provisions or of any other provisions.

35.0 Severability

All paragraphs of the Contract are severable one from the other. Should a court of competent jurisdiction find that any one or more paragraphs herein are void or unenforceable, the validity of the remaining paragraphs hereof will not be affected.

36.0 Supervisor and Labour

The Contractor will keep a competent supervisor on the work site at all times and for the duration of the project. The Contractor will identify the person who will act as the supervisor, in writing, to the Regional District and the Engineering Contractor. The supervisor will represent the Contractor in their absence and directions given to them will be considered to have been given to the Contractor. The supervisor will have the ability to report to the Regional District and the Engineering Contractor and have the authority to act on contractual obligations on behalf of the Contractor. The Contractor shall employ at all times, qualified and experienced personnel to carry out the work.

The Contractor will comply with all federal and provincial legislation regarding wages and labour regulations including payment of any and all dues, levies, or charges made under or in relation to the Contract. The Contractor will make proof of payment available to the Manager when requested.

37.0 Character of Workers

The Contractor and workers must have sufficient knowledge, skill and experience to perform properly the work assigned to them and to be tactful and courteous in dealing with the public and the Regional District's staff. Any supervisor or worker employed by the Contractor or Subcontractor who, in the opinion of the Owner does not perform their work in a competent manner, appears to act in a disorderly or intemperate manner, appears to be under the influence of drugs or alcohol, or is negligent, or willfully misconducts themselves will, at the written request of the Owner, be removed from the site of the work immediately and will not be employed again in any portion of the work without the approval of the General Manager of Environmental Services.

38.0 Regional District's Termination of Contract

In the event of the breach or non-performance by the Contractor of any of the covenants, conditions, and agreements contained in the Contract to be performed, the Regional District reserves the right to terminate this Contract without notice. The Regional District may also deduct from the payments due to the Contractor any payments or expenditures it is required to make to remedy any such non-performance or breach hereof.

39.0 Contractor's Termination of Contract

The Contractor shall have the right to terminate the Contract in the event the Regional District fails to pay for the Work performed except as provided in the Contract Documents, within thirty (30) days from the specified date of payment and fails to remedy such default within ten (10) days of the Contractor's written notice to do so.

40.0 Regional District's Right to Correct Deficiencies

The Regional District shall have and retain full authority to inspect the work of the Contractor to ensure that the requirements of the Contract are being fulfilled. Upon failure of the Contractor to perform the work in accordance with the Contract Documents, and after five (5) days written notice to the Contractor, or without notice if any emergency or danger to the work or public exists, the Regional District may, without prejudice to any other remedy they may have, correct such deficiencies. The cost of work performed by the Regional District in correcting deficiencies shall be paid by the Contractor or may be deducted from monies payable to the Contractor.

41.0 Dispute Resolution

If a claim, dispute, or controversy arises out of or relates to the interpretation, application, enforcement, or performance of services under this agreement, the Contractor and the Regional District agree first to try in good faith to settle the dispute by negotiations between the Contractor and the Regional District. If such negotiations are unsuccessful, the Contractor and the Regional District agree to attempt to settle the dispute by arbitration if both parties agree. If the dispute cannot be settled through arbitration, the Contractor and the Regional District may agree to attempt to settle the dispute through good faith

mediation. If the dispute cannot be resolved through mediation and unless otherwise mutually agreed, the dispute shall be settled by litigation in an appropriate court in the Province of British Columbia.

42.0 Permit and Regulations

The Contractor will, at their own expense, unless pre-approved in writing by the Regional District, procure all other permits, certificates, and licences required by law for the execution of the work and will comply with all federal, provincial, and local laws and regulations affecting the execution of the work, save in so far as the Contract Documents specifically provide otherwise.

To ensure public health protection regarding drinking Water, section 7 of the Drinking Water Protection Act requires that a Construction Permit is obtained from the Issuing Official before commencing construction, alteration or extension of a water supply system or before a new water source is used.

43.0 Local Conditions

The Contractor will, by personal inspection, examination, calculations or tests, or by any other means, satisfy themselves with respect to the local conditions to be encountered and the quantities, quality and practicability of the Work and of their methods of procedure. No verbal agreements or conversation with any officer, agent or employee of the Regional District, either before or after the execution of the Contract, will affect or modify any of the terms or obligations herein contained.

44.0 Manager's Status

The Manager or their delegate will be the Regional District's representative during the period of operation and will observe the Work in progress on behalf of the Regional District for the purpose of ensuring that the Work has been satisfactorily carried out. The Manager will have the authority to stop the Work whenever such stoppage may be necessary, in their opinion, to ensure the proper execution of the Work in accordance with the provisions of the Contract.

If at any time the Manager is of the opinion that there exists a danger to life or to property, they may order the Contractor to stop Work or to take such remedial measures as is considered necessary.

The Contractor will comply with such an order immediately. Neither the giving, nor the carrying out of such orders thereby, entitles the Contractor to any extra payment and the Regional District will not be held liable for any damages or any breach of laws, bylaws or regulations that may result.

45.0 Protection of Work and Property

The Contractor shall take all reasonable precautions necessary to protect the Regional District's property from damage during the performance of the Contract and shall make good on any damage to the Regional District's property caused by the Contractor, its Subcontractor, employees, or agents during the performance of the Contract.

46.0 Occupational Health and Safety

The Contractor will ensure that they follow all occupational health and safety policies and procedures established by the Regional District. Contractors, their employees or agents not complying with the

Regional District's health and safety expectations will be required to stop Work and will not be allowed to resume Work until the safety requirements are met.

The Contractor will use due care and take all necessary precautions to assure the protection of persons and property at the Facility, the Landfill and points in between and will comply with the Workers' Compensation Act of the Province of British Columbia.

The Contractor, upon award of the contract, will submit a job specific health and safety plan including measures applied at the work site to meet requirements that will be approved by the Regional District prior to the commencement of construction.

47.0 Goods and Services Tax (GST)

Federal law states that five percent (5%) tax be paid on all goods and services. If the Contractor does not qualify as a small supplier, then the Contractor is required to identify the tax (GST/PST, as applicable) on all invoices and the Regional District is liable to pay this amount to the Contractor.

48.0 Removal of Liens

The Contractor will forthwith remove at their own expense liens, filed or registered, against Regional District related properties and the Contractor will indemnify and save harmless the Regional District from liability arising out of any such claims of lien.

49.0 Disputed Work

If, in the opinion of the Contractor, they are being required to perform work beyond that which the Contract requires him to do, whether at the discretion of the Regional District or otherwise, they will, within five (5) days, deliver to the Project Manager a written notice of protest in the form prescribed herein prior to proceeding with any of the disputed work. The five (5) day period commences from the time of direction given by the Manager or the time at which the Contractor determines that he is required to perform such work, whichever occurs first.

The Contractor will keep accurate and detailed cost records that should indicate the cost of the work done under protest. The Contractor will not be entitled to payment if they fail to keep and produce such records.

50.0 Site Location and Facility Information

The Azu community Water System is located 194 km north of Prince George, BC along Hwy 97, near Azouetta Lake in the Pine Pass, at the base of the Powder King Ski Hill. The Regional District is responsible for the operation of this facility under the BC Drinking Water Protection Act and Regulation. The system consists of three drilled wells, a pumphouse, reservoir and distribution piping network.

51.0 Notice of Protest

TO: General Manager of Environmental Services
Regional District of Fraser-Fort George
FROM: (Contractor)
DATE:
SUBJECT: THE CONTRACT

Date of Direction:

You have required me to perform the following work that is beyond the scope of the Contract.
(Set out details of work).
(Include dates where applicable)

The additional costs and claim for this work is as follows:
(Set out details of cost)

All supporting documentation and invoices are attached.

I understand that I am required to keep accurate and detailed cost records which will indicate the cost of the work done under protest and failure to keep such records will be a bar to any recovery by me.

Signature of Contractor

APPENDIX A - ACKNOWLEDGEMENT LETTER

The undersigned has received the full set of Tender Documents.

Signature

Company

Name (please print)

Address

Title

City

Phone Number

Fax Number

Date

Email Address

We presently intend to _____ provide/ _____ not provide a Tender as requested.

Please send any amendments to this Invitation to Tender via: _____ email _____ fax.

Return immediately to:

Bryan Boyes, Utilities Leader
bboyes@rdffg.bc.ca
Regional District of Fraser-Fort George
155 George Street
Prince George BC V2L 1P8
Phone: 250-960-4400

APPENDIX B – BIDDER CHECKLIST

Before submitting your tender bid, check the following points:

- | | | |
|--------------------------|--|-------|
| <input type="checkbox"/> | Has the Tender Form been signed and witnessed? | _____ |
| <input type="checkbox"/> | Has the Tender Form Summary been completed? | _____ |
| <input type="checkbox"/> | Has the Security Deposit requirement been met? | _____ |
| <input type="checkbox"/> | Are the following pages included? | |
| | • List of Contractor's Personnel? | _____ |
| | • List of Subcontractors? | _____ |
| | • List of Equipment? | _____ |
| | • Tenderer's Experience in Similar Work? | _____ |
| | • Goods and Services Tax Information? | _____ |
| | • Conflict of Interest Disclosure Statement | _____ |
| | • SOQ | _____ |
| | • Addendum(s) | _____ |
| <input type="checkbox"/> | Are the documents complete? | _____ |

Note: Your Tender may be disqualified if ANY of the applicable foregoing points have not been complied with.

If submitting by hard copy:

Tenderers should ensure that the Tender is returned in a sealed envelope clearly marked on the outside with:

- Attention: General Manager of Financial Services
Regional District of Fraser-Fort George
155 George Street
Prince George, BC
V2L 1P8

- Invitation To Tender ES-24-09
Construction and Repair Servies – Azu Community Water System

- Responding Organization's name and address.

If submitting by email:

Tenderers should ensure that the files should not collectively exceed 30MB. Tenders must be submitted to purchasing@rdffg.bc.ca. DO NOT deliver a physical copy of the tender package to the Regional District of Fraser Fort George.

Subject of the file to be:

ES-24-09 Construction and Repair Servies – Azu Community Water System– (Insert Responding Tenderer's Name).

APPENDIX C – TENDER FORM

Date: _____

Regional District of Fraser-Fort George
3rd Floor, 155 George Street
Prince George, BC V2L 1P8

ATTENTION: General Manager of Financial Services

Dear Sir/Madam:

Having carefully examined the Instructions to Tenderers, Form of Tender, Contract Agreement, General Conditions of Contract and Operational Specifications and subsequent written Addendum(s) (if any), and having visited the site(s) for purposes of examining site conditions and having satisfied myself/ourselves as to the sufficiency of the ITT, the undersigned agrees to furnish all labour, transportation, equipment, materials, supervision, accommodation, assessments, taxes and services and to do all work necessary for and reasonably incidental, as specified in accordance with the ITT, to do the work.

I/We agree that in consideration of having my/our tender submission considered for the Total Contract Price as shown on the SOQ, this price is open for acceptance for ninety (90) days from the date of the tender opening and will not be withdrawn during that period of time.

It is understood that payment will be made for the work on the basis of the awarded Contract only and that any approved extras or refunds will be made by mutual agreement between the Regional District and me/us.

I/We agree that the Subcontractor(s) employed will be as listed on the List of Subcontractors and further agree that no changes or additions will be made to the list without written approval of the Regional District.

If I am/we are notified in writing of the acceptance of our tender, I/we agree that within fourteen (14) days of the date of the acceptance notice I/we will enter into a contract and execute an agreement for the stated sum in the form of the specimen submitted to guarantee completion of the contract in accordance with the contract documents and within the time stated in the Tender documents.

I/We agree that the Regional District reserves the right to waive informalities in tenders, reject any or all tenders, or accept the tender deemed most favourable in the interests of the Regional District.

I/We agree that tenders which contain qualifying conditions or otherwise fail to conform to the instructions contained in this ITT may be disqualified or rejected. I/We agree that the Regional District may, however, in its sole discretion, reject or retain for its consideration tenders which are non-conforming because they do not contain the content or form required by the ITT, or for failure to comply with the process for submission set out in the ITT, whether or not such non-compliance is material.

Accompanying this Tender please find our certified cheque, bank draft or money order as the security deposit in the amount of Fifteen Thousand Dollars (\$15,000).

I/We agree that except for a claim for the reasonable cost of preparation of this tender, by submitting a tender, I/We irrevocably waive any claim, action, or proceeding against the Regional District including, without limitation, any judicial review or injunction application, and any claim against the Regional District and its elected officials, officers and employees for damages, expenses or costs, loss of profits, loss of opportunity or any consequential loss for any reason, including any such claim, action or proceeding arising from:

- 1) any actual or alleged unfairness on the part of the Regional District at any stage of the tender process, including without limitation any alleged unfairness in the evaluation of a tender or award of a contract;
- 2) a decision by the Regional District not to award a contract to that tenderer; or
- 3) the Regional District's award of a contract to a tenderer whose tender does not conform to the requirements of this ITT.

Addendum No. _____ dated: _____ Addendum No. _____ dated: _____

Addendum No. _____ dated: _____ Addendum No. _____ dated: _____

Addendum No. _____ dated: _____ Addendum No. _____ dated: _____

Signed and Delivered by:

Signature of Authorized Signatory

Name of Tenderer

Name of Authorized Signatory (Please print)

Address

Title

City, Province, Postal Code

Signed in the presence of:

Signature

Address

Name of Witness (Please print)

City, Province, Postal Code

APPENDIX D - LIST OF CONTRACTOR'S PERSONNEL

The Contractor agrees that the personnel employed by them will be as listed below and further agrees that any changes or additions made to this list will be made in writing to the Regional District.

Name of Employee	Employee's Experience / Qualifications

Name of Onsite Supervisor	Supervisor's Experience / Qualifications

APPENDIX E - LIST OF SUBCONTRACTORS

The Contractor agrees that the Subcontractors engaged by it will be as listed below and further agrees that any changes or additions made to this list will be made in writing to the Regional District.

Name of Subcontractor	Address of Subcontractor	Work to Be Performed by Subcontractor

APPENDIX F - LIST OF EQUIPMENT

The Tenderer will list size, model, year and operating weight of equipment they propose to use to complete the work herein. No changes or additions will be made to this list without the written approval of the Regional District.

State standby equipment to be used in the event of breakdown of above, and where it will be drawn from.

Primary Equipment	Size	Model	Make	Type of Engine	Year	Weight

Secondary Standby Equipment	Size	Model	Make	Type of Engine	Year	Weight

APPENDIX G - TENDERER'S EXPERIENCE IN SIMILAR WORK

The Contractor is to demonstrate that they have a minimum of five (5) years of current customer service experience as well as staff supervision experience. List professional and recent experience.

Year	Work Performed	Reference Contact (name and phone number)	Value

APPENDIX H - CONFLICT OF INTEREST STATEMENT

ES-24-09
Construction and Repair Services
Azu Community Water System

Tenderer's Name: _____

The Tenderer, including its officers, employees, and any person or other entity working on behalf of or in conjunction with, the Bidder on this Procurement Process:

- is free of any conflict of interest that could be perceived to improperly influence the outcome of this procurement process.
- has not, and will not, participate in any improper procurement practices that can provide the Tenderer with an unfair competitive advantage including obtaining and using insider type information to prepare a solicitation offer or participating in bid rigging.
- has an actual, perceived or potential conflict of interest regarding this procurement process as a result of:

State reason(s) for Conflict of Interest:

By signing below I certify that all statements made on this form are true and correct to the best of my knowledge.

Print Name of Person Signing Disclosure

Authorized Representative of

Signature of Person Making Disclosure

Date Signed

APPENDIX I - GOODS AND SERVICES TAX INFORMATION

Supplier: _____
Name _____
Address _____
City _____ Province _____
Postal Code _____ Phone Number _____

Are you a GST Registrant? Yes _____ No _____

If YES, please indicate your registration number: _____

If NO, please fill in the following (check appropriate box):

- Supplier qualifies as a small supplier under s. 148 of the legislation
- Other: Specify _____

Signature of Authorized Person Print Name

Title Date

APPENDIX J – SCHEDULE OF QUANTITIES (SOQ)

Azu Powder King: Drainage and Water Supply Upgrades						
ITEM	MMCD	DESCRIPTION	UNIT	QNTY	UNIT PRICE	ESTIMATED AMOUNT
Onsite Works						
0		General				
0.1	01 33 01	Mobilization (50%) / Demobilization (50%)	LS	1		
0.2		General Conditions, Administration, and Insurance	LS	1		
0.3	01 33 01	Survey Layout and Record Markups	LS	1		
0.4		Materials Testing (compaction, sieve and proctor analysis)	LS	1		
					Subtotal	\$ -
A		Water				
1	33 11 01	Expose and confirm pipe sizing and depth of installation with HydroVac: Well 1, Well 2, and Well 3 outlet Piping and Pumphouse inlet Piping.				
		i. Well 1	ea	1	\$	-
		ii. Well 2	ea	1	\$	-
		iii. Well 3	ea	1	\$	-
		iv. Pumphouse inlet Piping	ea	1	\$	-
2	33 11 01	Replacement of Well Supply Piping from Well 1 to A . Including: 1 x continuous HDPE from well 1 and well 2 to t-wye, fittings, appurtenances, insulation, bedding sand, excavation, compaction, and surface restoration to original or better conditions. 50 mm HDPE DR9 minimum (250 PSI)	m	13	\$	-
		Replacement of Well Supply Piping from Well 2 to A . Including: 1 x continuous HDPE from well 1 and well 2 to t-wye, fittings, appurtenances, insulation, bedding sand, excavation, compaction, and surface restoration to original or better conditions. 50 mm HDPE DR9 minimum (250 PSI)	m	20	\$	-
3	33 11 01	Replacement of Well Supply Piping from B to C (pumphouse) . Including: 1x continuous HDPE piping, fittings, appurtenances, insulation, bedding sand, excavation, compaction, and surface restoration to original or better conditions. 50 mm HDPE DR9 minimum (250 PSI)	m	100	\$	-
4	33 11 01	Replacement / Installation of Well Supply Piping from Well 3 to B . Including: 1x continuous piece of HDPE from Well 3 to T-Wye in Area 1, fittings, appurtenances, and insulation to combine all three well supply pipes to one well supply pipeline. Including fittings, appurtenances, insulation, bedding sand, excavation, compaction, and surface restoration to original or better conditions. 50 mm HDPE DR9 minimum (250 PSI)	m	48	\$	-
5	33 11 01	Replacement / Installation of Well Supply piping from A to B . Including fittings, appurtenances, insulation, bedding sand, excavation, compaction, and surface restoration to original or better conditions. 50 mm HDPE DR9 minimum (250 PSI)	m	63	\$	-
6	33 11 01	Cap and Decommission existing pipelines at each well and existing pumphouse.	ea	4	\$	-
7	33 11 01	Tie in @ Wells and Pumphouse	ea	4	\$	-
8	33 11 01	Testing and Commission (Pressure, Chlorination, Flushing, BacT)	LS	1	\$	-
					Subtotal	\$ -
B		Storm				
1	33 40 01	Expose Outlet piping from Reservoir	ea	1	\$	-
2	33 44 01	1050 mm Storm Manhole (prebenched 110 degree)	ea	1	\$	-
3	33 40 01	CSP (Corrugated Steel Piping) 200 mm OPTION A	m	45	\$	-
4	33 40 01	PVC 200 mm OPTION B	m	45	\$	-
5	33 40 01	Headwall outlet (including CSP Cap)	LS	1	\$	-
6	33 40 01	Cap and Decommission existing drainage from Reservoir	LS	1	\$	-
					Subtotal	\$ -
C		Electrical				
1		OPTIONAL: Replace control / power supply wiring from				
		i. Well 1	ls	1		
		ii. Well 2	ls	1		
		ii. Well 3	ls	1		
2		OPTIONAL: Replace broken/damaged electrical conduit	m	1		
					Subtotal	\$ -
Total Works Subtotal					\$	-
					GST	\$ -
Total Cost of Construction					\$	-
NOTES:						
1		Does not include landscaping				
2		Earthwork volumes are unadjusted				
3		Assumes material onsite will be suitable for fill				
4						
5		Refer to RDFFG Design Bylaws and MMCD Platinum Edition for specifications. RDFFG Design Bylaws take precedence over the MMCD.				

APPENDIX K – TECHNICAL SPECIFICATIONS



**REGIONAL DISTRICT
of Fraser-Fort George**

ITT- ES-24-09

**Construction and Repair Services
Azu Community Water System**

Appendix K

Technical Specifications

Section 0: General

01 33 01: Project Record Documents

01 42 00: Reference Specifications

Section A: Water

33 11 01: Waterworks

Section B: Storm

33 40 01: Storm Sewers

33 44 01: Manholes and Catchbasins

Section C: Earthworks

- 31 23 01: Excavating, Trenching and Backfilling.**
- 31 05 17: Aggregates and Granular Materials**
- 32 11 16.1: Granular Subbase**
- 32 11 23: Granular Base**

PROJECT RECORD DOCUMENTS

- | | | |
|------------|------------------------------|---|
| 1.0 | GENERAL | .1 Section 01 33 01 addresses general requirements for submittal of record information, operating and maintenance manuals. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein. |
| 1.1 | Section Includes | .1 Record documents, samples, specifications.
.2 Equipment and systems manuals.
.3 Product data, materials and finishes, and related information.
.4 Operation and maintenance data and instructions. |
| 1.2 | Related Sections | .1 Individual Specifications Sections: Specific requirements for operation and maintenance data. |
| 1.3 | Submission | .1 Prepare instructions and data by personnel experienced in maintenance and operation of described products.
.2 Submit one copy of completed volumes in final form 15 days prior to date of Total Performance.
.3 Copy will be returned within 15 days after date of Total Performance, with Contract Administrator's comments.
.4 Revise content of documents as required prior to final submittal.
.5 Two weeks after receipt of Contract Administrator's comments submit to Contract Administrator, three final copies of operating and maintenance manuals. |
| 1.4 | Format | .1 Organize data in form of instructional manual.
.2 Use binders: 3-ring, hard cover for equipment and systems manuals, product data and related information.
.3 When multiple binders are used, correlate data into related consistent groupings.
.4 Cover: Identify each binder with printed title; list title of Project, identify subject matter of contents.
.5 Include Table of Contents.
.6 Provide tabbed fly leaf for each separate section.
.7 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages. |
| 1.5 | Contents, Each Volume | .1 Table of Contents: provide title of project; names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume
.2 For each product or system: list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts. |

- .3 Product data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
 - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - .5 Typewritten text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- 1.6 Record Documents and Samples**
- .1 Maintain at site for Contract Administrator one record copy of all Contract Documents including:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Field Memos.
 - .4 Addenda.
 - .5 Change Orders.
 - .6 Reviewed shop drawings, product data, and samples.
 - .7 Field test records.
 - .8 Inspection certificates.
 - .9 Manufacturer's certificates.
 - .2 Store record documents and samples in site office apart from documents used for construction. Provide files, racks, and secure storage.
 - .3 Label and file in accordance with relevant Section number. Label each document "PROJECT RECORD" in neat, large, printed letters.
 - .4 Maintain Record Documents in a clean, dry and legible condition. Do not use Record Documents for construction purposes.
 - .5 Keep Record Documents and samples available for inspection by Contract Administrator.
- 1.7 Recording Actual Site Conditions**
- .1 Record information concurrently with construction progress. Do not conceal work until required information is recorded.
 - .2 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .2 Field changes of dimension and detail.
 - .3 Changes made by Addenda and Change Orders.
 - .4 Details not on original Contract Drawings.
 - .5 References to related shop drawings and modifications.

- .3 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each project actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and Change Orders.
 - .4 Other Documents: maintain manufacturer's certifications, inspection certifications and field test records, required by individual specifications sections.

1.8 Payment

- .1 Payment for all work performed under this Section will be incidental to payment for work described in other Sections unless shown otherwise in the Schedule of Quantities and Prices.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

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END OF SECTION 01 33 01

REFERENCE SPECIFICATIONS

1.0 GENERAL

- .1 The Master Municipal Specifications contain references to standard specifications for testing, materials, manufacturing and installation procedures. These references have been abbreviated to identify only the referenced Association and specification designation. This Section provides the full descriptive title of each referenced specification.
- .2 When references to 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.
- .3 The numbers and letters following the abbreviations denote the Association's serial designation for the Specification or Standard to which reference is made.
- .4 All references to these Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.
- .5 The specifications and standards published by these organizations and other specified specifications and standards referred to in the Master Municipal Specifications are hereby made part of the Master Municipal Specifications as far as they are applicable to and not inconsistent with the Master Municipal Specifications.

REFERENCE SPECIFICATIONS

1.1 Nomenclature	.1	AAFC	<u>Agriculture and Agri-Food Canada</u>
	.2	AASHTO	<u>American Association of State Highway and Transportation Officials</u>
	.3	ACI	<u>American Concrete Institute.</u>
	.4	AI	<u>Asphalt Institute.</u>
	.5	ANSI	<u>American National Standards Institute.</u>
	.6	ASTM	<u>ASTM International formerly known as American Society for Testing and Materials</u>
	.7	AWG	<u>American Wire Gauge.</u>
	.8	AWWA	<u>American Water Works Association.</u>
	.9	BCLNA	<u>BC Landscape and Nursery Association</u>
	.10	CAN	<u>Prefix signifying endorsement of other current standard as a Canadian National Standard.</u>
	.11	BCMOT E&SMS V1	<u>BC Ministry of Transportation Electrical and Sign Material Specification Volume 1.</u>
	.12	CCIL	<u>Canadian Council of Independent Laboratories.</u>
	.13	CCTV	<u>Closed Circuit Television.</u>
	.14	CEC	<u>Canadian Electrical Code.</u>
	.15	CGSB	<u>Canadian General Standards Board.</u>
	.16	CSA	<u>Canadian Standards Association.</u>
	.17	CAN3 = CAN/CSA	
	.18	C-SHRP	<u>Canadian Strategic Highway Research Program.</u>
	.19	IMSA	<u>International Municipal Signal Association.</u>
	.20	JPEG	<u>Joint Photographic Experts Group.</u>
	.21	LCD	<u>Liquid Crystal Display.</u>
	.22	LED	<u>Light Emitting Diode.</u>
	.23	MPEG-2	<u>Moving Picture Experts Group standard for transmitting digital video and sound in a compressed format.</u>
	.24	MSCC	<u>Manual of Sewer Condition Classification, Third Edition, 1993 including Addendum - February 1996.</u>
	.25	MUTCDC	<u>Manual of Uniform Traffic Control Devices of Canada</u>
	.26	NAAPI	<u>North American Association of Pipeline Inspectors</u>
	.27	NACE	<u>National Association of Corrosion Engineers</u>
	.28	NASSCO	<u>National Association of Sewer Service Companies</u>
	.29	NCHRP	<u>National Cooperative Highway Research Program</u>
	.30	NEMA	<u>National Electrical Manufacturers Associations</u>
	.31	WRc	<u>Water Research Centre.</u>

1.2 Referenced Specifications

.1 ACI

.1 ACI 315R Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 AI

.1 Asphalt Institute Manual SP-2 Superpave Level 1 Mix Design.

.3 ANSI

.1 ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.

.2 ANSI B16.5 Pipe Flanges and Flanged Fittings.

.4 ANSI/ACI

.1 ANSI/ACI 117 Tolerances for Concrete Construction and Materials.

.2 ANSI/ACI 315 Details and Detailing of Concrete Reinforcement.

.5 ANSI/AWWA

.1 ANSI/AWWA C151 Ductile-Iron Pipe, Centrifugally Cast, for Water.

.2 ANSI/AWWA C219 Bolted, Sleeve-Type Couplings for Plain-end Pipe.

.3 ANSI/AWWA C213 Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.

.4 ANSI/AWWA B300 Hypochlorites

.5 ANSI/AWWA C300 Reinforced Concrete Pressure Pipe - Steel-cylinder Type.

.6 ANSI/AWWA B301 Water Treatment – Liquid Chlorine.

.7 ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

.8 ANSI/AWWA C105/A21.5 Polyethylene encasement for Ductile-Iron Piping for Water and Other Liquids.

.9 ANSI/AWWA C110/A21.10 Ductile-Iron and Gray Iron Fittings, 3 inches through 48 inches for Water and Other Liquids.

.10 ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.

.11 ANSI/AWWA C150 Thickness Design of Ductile - Iron Pipe.

.12 ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Moulds or Sand Lined Moulds for Water or other Liquids.

.13 ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3 inches through 16 inches, for Water and Other Liquids.

.14 ANSI/AWWA C200 Water Pipe 6 inches and Larger, Steel.

.15 ANSI/AWWA C203 Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.

.16 ANSI/AWWA C205 Cement Mortar Protective Lining and Coating for Steel Water Pipe - 4 inches and larger - Shop Applied.

.17 ANSI/AWWA C206 Field Welding of Steel Water Pipe.

.18 ANSI/AWWA C207 Steel Pipe Flanges for Waterworks Service, 4 inches through 144 inches.

.19 ANSI/AWWA C208 Fabricated Steel Water Pipe Fittings, Dimensions for.

.20 ANSI/AWWA C210 Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

REFERENCE SPECIFICATIONS

- | | | |
|-----------|------------------------|---|
| .21 | <u>ANSI/AWWA C301</u> | Pre-stressed Concrete Pressure Pipe Steel Cylinder Type for Water and Other Liquids. |
| .22 | <u>ANSI/AWWA C303</u> | Reinforced Concrete Pressure Pipe Steel Cylinder Type, Pretensioned for Water and Other Liquids. |
| .23 | <u>ANSI/AWWA C500</u> | Gate Valves for Water and Sewage Systems. |
| .24 | <u>ANSI/AWWA C502</u> | Dry-Barrel Fire Hydrants. |
| .25 | <u>ANSI/AWWA C504</u> | Butterfly Valves. |
| .26 | <u>ANSI/AWWA C508</u> | Swing-Check Valves for Waterworks Service, 2 in. (50mm) Through 24 in. (600mm) NPS. |
| .27 | <u>ANSI/AWWA C509</u> | Resilient-Seated Gate Valves for Water and Sewerage Systems. |
| .28 | <u>ANSI/AWWA C510</u> | Double Check Valve Backflow-Prevention Assembly. |
| .29 | <u>ANSI/AWWA C511</u> | Reduced-Pressure Principle Backflow-Prevention Assembly. |
| .30 | <u>ANSI/AWWA C512</u> | Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service. |
| .31 | <u>ANSI/AWWA C550</u> | Protective Epoxy Interior Coatings for Valves and Hydrants. |
| .32 | <u>ANSI/AWWA C600</u> | Installation of Ductile-Iron Water Mains, and their Appurtenances. |
| .33 | <u>ANSI/AWWA C602</u> | Cement Mortar Lining of Water Pipelines - 100 mm and larger - In Place. |
| .34 | <u>ANSI/AWWA C605</u> | Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water. |
| .35 | <u>ANSI/AWWA C651</u> | Disinfecting Watermains. |
| .36 | <u>ANSI/AWWA C800</u> | Underground Service Line Valves and Fittings. |
| .37 | <u>ANSI/AWWA C900</u> | Pressure Pipe, 4 inches through 12 inches for Water, Polyvinyl Chloride (PVC). |
| .38 | <u>ANSI/AWWA C901</u> | Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inches for Water Service. |
| .39 | <u>ANSI/AWWA C902</u> | Polybutylene (PB) Pressure Pipe and Tubing, ½ inch through 3 inches for Water Service. |
| .40 | <u>ANSI/AWWA C905</u> | Pressure Pipe, 14 inches through 36 inches for Water, Polyvinyl Chloride (PVC). |
| .41 | <u>ANSI/AWWA C906</u> | Polyethylene (PE) Pressure Pipe and Fittings, 4 inches through 63 inches, for Water Distribution. |
| .42 | <u>ANSI/AWWA C907</u> | Standard for Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 inches through 8 inches (100mm through 200mm). |
| .43 | <u>ANSI/AWWA M17</u> | Installation, Field Testing, and Maintenance of Fire Hydrants. |
| .44 | <u>ANSI/AWWA M23</u> | PVC Pipe - Design and Installation. |
| .45 | <u>ANSI/AWWA M41</u> | Ductile-Iron Pipe and Fittings. |
| .6 | <u>ASTM (A)</u> | |
| .1 | <u>ASTM A36</u> | Standard Specification for Structural Steel. |
| .2 | <u>ASTM A48</u> | Specification for Gray Iron Castings. |
| .3 | <u>ASTM A53</u> | Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless. |
| .4 | <u>ASTM A90</u> | Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles. |
| .5 | <u>ASTM A120</u> | Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses. |

REFERENCE SPECIFICATIONS

.6	<u>ASTM A121</u>	Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
.7	<u>ASTM A283/A283M</u>	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.
.8	<u>ASTM A307</u>	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
.9	<u>ASTM A325</u>	Standard Specification for High-Strength Bolts for Structural Steel Joints.
.10	<u>ASTM A354</u>	Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
.11	<u>ASTM A536</u>	Ductile Iron Castings.
.12	<u>ASTM A585</u>	Specification for Aluminum-Coated Steel Barbed Wire.
.13	<u>ASTM A563</u>	Carbon and Alloy Steel Nuts.
.14	<u>ASTM A615M</u>	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
.15	<u>ASTM A653/A653M</u>	Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.16	<u>ASTM A716</u>	Specification for Ductile - Iron Culvert Pipe.
.17	<u>ASTM A746</u>	Specification for Ductile - Iron Gravity Sewer Pipe.
.18	<u>ASTM A760</u>	Corrugated Steel Pipe, Metallic-coated for Sewers and Drains.
.19	<u>ASTM A775/A775M</u>	Specification for Epoxy-Coated Reinforcing Steel Bars.
.7	<u>ASTM (B)</u>	
.1	<u>ASTM B62</u>	Specification for Composition Bronze or Ounce Metal Castings.
.2	<u>ASTM B88M</u>	Specification for Seamless Copper Water Tube.
.3	<u>ASTM B221M</u>	Specifications for Aluminium and Aluminium-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
.4	<u>ASTM B633</u>	Electrodeposited Coatings of Zinc on Iron and Steel.
.5	<u>ASTM B766</u>	Electrodeposited Coatings of Cadmium.
.8	<u>ASTM (C)</u>	
.1	<u>ASTM C14M</u>	Specification for Concrete Sewer, Storm Drain and Culvert Pipe
.2	<u>ASTM C76M</u>	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
.3	<u>ASTM C88</u>	Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
.4	<u>ASTM C109</u>	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inches or 50 mm Cube Specimens).
.5	<u>ASTM C117</u>	Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
.6	<u>ASTM C123</u>	Test Method for Lightweight Pieces in Aggregate.
.7	<u>ASTM C127</u>	Test Method for Specific Gravity and Absorption of Coarse Aggregate.
.8	<u>ASTM C128</u>	Test Method for Specific Gravity and Absorption of Fine Aggregate.
.9	<u>ASTM C131</u>	Test Method for Resistance to Degradation of Small Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
.10	<u>ASTM C136</u>	Method for Sieve Analysis of Fine and Coarse Aggregates.
.11	<u>ASTM C139</u>	Specification for Concrete Masonry Units for Construction of Catchbasins and Manholes.

- 1.0 GENERAL**
- .1 Section 33 11 01 refers to those portions of the work that are unique to the supply and installation of water mains, hydrants, valves and valve boxes, service connections and related appurtenances. This Section must be referenced to and interpreted simultaneously with all other Sections pertinent to the works described herein.
 - .2 All details of waterworks facilities not specifically covered in this Section to comply with respective AWWA standards and/or manuals of practice as specified in Contract Documents.
- 1.1 Related Work**
- .1 Excavating, Trenching and Backfilling Section 31 23 01
 - .2 Manholes and Catchbasins Section 33 44 01
 - .3 Concrete Reinforcement Section 03 20 01
 - .4 Cast-in-Place Concrete Section 03 30 53
 - .5 Aggregates and Granular Materials Section 31 05 17
 - .6 Cathodic Protection Section 26 42 13
- 1.2 References**
- .1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 - Reference Specifications – Site and Infrastructure.
- 1.3 Samples**
- .1 Samples may be required.
- 1.4 Material Certification**
- .1 Products having CSA certification to be used where readily available. Product to be certified to CSA standard(s) by an approved independent third party certification body accredited by the Standards Council of Canada and that is acceptable to the Contract Administrator. Products to be marked with certification body logo and CSA standard markings.
 - .2 At least 2 weeks prior to commencing work, submit manufacturer's recent test data and certification that materials to be incorporated into works are representative and meet requirements of this Section. Include manufacturer's drawings where pertinent.
- 1.5 Shop Drawings and Technical Data**
- .1 Shop drawings and technical data are not required unless specified otherwise in Supplementary Specifications.
 - .2 Where specified, refer to General Conditions, Clause 5, Shop Drawings.
- 1.6 Record Drawings**
- .1 Provide record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions.
- 1.7 Scheduling of Work**
- .1 Schedule work to minimize interruptions to existing services.
 - .2 Submit schedule of expected interruptions to Contract Administrator for approval and adhere to approved schedule.

WATERWORKS

- .3 Notify Contract Administrator, affected residences and businesses minimum of 24 h in advance of any interruption in service.
- .4 Do not interrupt water service for more than 3 h and confine this period between 09:00 and 16:00 h unless otherwise authorized.
- .5 Notify fire department of any planned or accidental interruption of water supply to hydrants.

1.8 Measurement and Payment

- .1 Payment for watermain will be made separately for various sections of watermain consistent with pipe materials and diameters, depths of mains and backfill requirements shown on Contract Drawings and described under the individual payment items in the Schedule of Quantities and Prices.
- .2 Payment for watermain and service connection include saw cutting pavement, trench excavation, disposal of surplus excavated material, bedding, supply and installation of all pipe, bolts, gaskets and tie rods, imported or native backfill as shown on the Drawings, cleaning, pressure and leakage testing, flushing, disinfection, all surface restoration as specified under Section 31.23.01 - Excavating, Trenching and Backfilling - 3.6, except permanent pavement restoration, and all other work and materials necessary to complete the installation as shown on the Drawings and specified under this Section.

Measurement for watermain will be made along centreline of main, through valves and fittings, with no deduction for length of valves or fittings, over surface after work has been completed.

- .3 Payment for inline gate valves or butterfly valves including valve boxes; and for crosses, tees, bends, reducers, blind flanges and caps will be made for items identified on Contract Drawings and installed as part of watermain as described under 1.8.2 of this Section.

Measurement will be for each respective item installed without deduction of length of valves and fittings from length of pipe measured for payment under 1.8.1 & 1.8.2 of this Section.

- .4 Payment for service connection includes mainline saddles where specified, corporation stops, curb stops, service pipes and all related fittings and appurtenances specified and/or shown on Standard Detail Drawings W2a or W2b, as applicable. Payment includes all applicable work described in 1.8.2 of this Section.

Measurement for service connections will be for each complete service installed, with no regard to length of service pipe installed.

- .5 Payment for test points, air-release/air-vacuum and combination air valves and apparatus and blow-off assembly as separate items includes all materials, works and appurtenances shown on Standard Detail Drawings W5 to W8 and W10 with valve chambers to be paid for under separate items. Payment includes all applicable work described in 1.8.2 of this Section.
- .6 Payment for air valve chamber complete with drain arrangement includes all materials, work and incidentals shown on Standard Detail Drawings W6 and W7 as separate items for each location. Payment includes all applicable work described in 1.8.2 of this Section.

- .7 Payment for blow-down chamber complete with backflow prevention device and drain arrangement includes all materials, work and incidentals shown on Standard Detail Drawings W9 and W10 as separate items for each location. Payment includes all applicable work described in 1.8.2 of this Section.
 - .8 Payment for concrete bedding, or controlled density fill, where shown on Contract Drawings will be made as extra over payment to watermain under 1.8.2 of this Section. No payment will be made for concrete bedding or controlled density fill required as a result of unauthorized excavation beyond neat lines or limits of excavation shown on Contract Drawings or Standard Detail Drawing G4.
 - .9 Payment for localised concrete encasement, thrust and anchor blocks and support blocks as shown on Contract Drawings or directed by Contract Administrator includes all necessary extra excavation and formwork and supply and placement of concrete as specified in Section 03 30 53 – Cast-In-Place Concrete. Payment will be based on volume calculated from actual measurement of the dimensions of the components constructed as detailed in the Contract Drawing
 - .10 Payment for watermain undercrossing other underground services will only be made for crossing with use of a pipe casing as shown on the Contract Drawings or directed by Contract Administrator. Payment item includes the pipe casing and all other work and materials as specified in 3.9 of this Section. Payment will be extra over the watermain item under 1.8.2 of this Section for each undercrossing installation.
 - .11 Payment for under pressure branching includes branch saddle with integral isolation valve, special under pressure branching equipment, all necessary excavation and backfill and surface restoration requirements in 1.8.2 of this Section.
 - .12 Payment for tie-ins to existing mains where all pipework is to be undertaken by Owner's crew includes exposing the existing system to confirm conditions and location, shoring, all labour, materials, equipment, reinstatement to facilitate the Owner's crew to carry out the tie-in work, remaining in attendance and co-ordinating with Owner's crew to complete tie-in as shown on Contract Drawings.
 - .13 Payment for tie-ins to existing mains where all pipework is to be undertaken by the Contractor will be as 1.8.13 of this Section, including all pipes, fittings and necessary tie-in work to complete tie-in as shown on Contract Drawings.
- 1.9 Inspection and Testing** .1 Refer to General Conditions, Clause 4.12, Inspections.
- 2.0 PRODUCTS**
- 2.1 General**
- .1 Pipe material as shown on Contract Drawings, excluding main pipe within chambers which shall be steel, and leads to fire hydrants which shall be ductile iron or PVC.
 - .2 All products are specified by reference to approved specifications and/or standards. Refer to Supplementary Specifications and/or Contract Drawings for specified or approved manufacturers or trade names.
 - .3 All mainline pipe, joints and fittings regardless of material, will have a cast iron outside diameter.

- 2.2 Mainline Pipe, Joints and Fittings**
- .1 Ductile iron pipe:
 - .1 Pipe: to AWWA C151, to Pressure Class or Special Thickness Class specified in Contract Documents, and standard cement mortar lined to AWWA C104/A21.4.
 - .2 Joints: Single rubber gasket for push-on bell and spigot type joint and/or mechanical pipe joints: to AWWA C111 Tyton.
 - .2 Polyvinyl Chloride (PVC) Pressure Pipe:
 - .1 Pipe:
 - .1 Pipe to be manufactured to specifications for pipe size ranges as follows:
 - .1 Pipes 100 to 300mm dia. - AWWA C900
 - .2 Pipes 350 to 1200 mm dia. - AWWA C905
 - .3 AWWA C900 pipe to Pressure Class or AWWA C905 pipe to pressuring rating specified in Contract Documents.
 - .4 Pipes to be certified by Canadian Standards Association for pipe size ranges 100mm to 1200mm dia. - CSA B137.3.
 - .2 ULC listed.
 - .3 Cast iron pipe equivalent outside diameter.
 - .4 To be compatible with specified mechanical joint and push-on joint fittings and valves without use of special adapters.
 - .2 Joints: Push-on integrally thickened bell and spigot type to ASTM D3139 with single elastomeric gasket to ASTM F477.
 - .3 High Density Polyethylene Pipe:
 - .1 Pipe:
 - .1 To AWWA C906 pressure class specified in Contract Documents.
 - .2 Pipes to be certified by Canadian Standard Association CSA B137.1
 - .3 To be compatible with specified mechanical joint fittings and valves without special adapters.
 - .2 Joints: Heat butt fusion to ASTM D2657 and in accordance with manufacturer's recommendations.
 - .3 Fittings:
 - .1 Fabricated HDPE mitred fittings to AWWA C906 suitable for pressure rating specified in Contract Documents.
 - .2 Moulded HDPE fittings to ASTM 3261 suitable for pressure rating specified and fusion to main pipe, dimensions as specified in Contract Documents.
 - .3 Flanged joints to AWWA C906 flat faced stub end and loose hot-dip galvanized ductile iron (ASTM A536) backup ring drilling to ANSI B16.1, ANSI B16.5, or AWWA C207, class suitable for pressure rating specified in Contract Documents.

- .4 Nuts and bolts as specified for "Fittings" in this section.
- .4 Fittings:
 - .1 Gray-iron (cast iron) fittings to AWWA C110/A21.10-93 suitable for 1035 kPa minimum pressure rating or higher as specified in Contract Documents. Where specified in Contract Documents, to be cement mortar lined and externally seal coated, both to AWWA C104/A21.4.
 - .2 Ductile iron fittings to AWWA C110 suitable for pressure rating of 2415 kPa, cement mortar lined to AWWA C104/A21.4.
 - .3 Compact ductile iron fittings to AWWA C153/A21.53-94 suitable for pressure rating of 2415 kPa, cement mortar lined to AWWA C104/A21.4.
 - .4 PVC injection-moulded fittings shall be DR18, conforming to AWWA C907 and certified to CSA B137.2. PVC compound is 12454B according to ASTM D1784.
 - .5 PVC fabricated fittings shall conform to either AWWA C900 or AWWA C905 and be certified to CSA B137.3. Fabricated fittings to be made from CSA certified PVC pipe of the same pressure class or pressure rating as the pipe.
 - .6 Single rubber gasket for push-on bell and spigot type joint and/or mechanical pipe joints: to AWWA C111. All push-on joint hubs to be equipped with tie-rod lugs.
 - .7 Flanged Joints:
 - .1 Flat faced conforming to the face dimension and drilling of ANSI B16.1, Class 125
 - .2 On AWWA C110 fittings to AWWA C110 with minimum pressure rating 1035 kPa or higher as specified in Contract Documents.
 - .3 On AWWA C153 fittings to AWWA C153 with minimum pressure rating of 1723 kPa or higher as specified in Contract Documents.
 - .8 Flange gaskets:
 - .1 Flange gaskets to be manufactured from black natural rubber 3.175 mm thick with layer of cotton on both sides.
 - .2 Gaskets to be nitrile or NBR.
 - .9 Bolts and nuts:
 - .1 Bolts to be carbon steel, Grade B to ASTM A307, heavy hex style, zinc plated to ASTM B633 or cadmium plated to ASTM B766. Bolt sizes to AWWA C110.
 - .2 Nuts and washers: Nuts to be carbon steel, Grade A to ASTM A563. Washers to be flat hardened steel to ASTM F436. Nuts and washers to be zinc plated to ASTM B633 or cadmium plated to ASTM B766.
 - .10 Tie Rods and Nuts:
 - .1 Tie rods to be continuous threaded, quenched and tempered alloyed steel to ASTM A354, Grade BC. To be zinc plated to ASTM B633 or cadmium plated to ASTM B766. Tie rod sizes to be minimum 19 mm diameter or greater as shown on Contract Drawings.

- .2 Nuts and internally threaded couplings to be heavy hex finish to ASTM A563. Washers to be flat hardened steel to ASTM F436. All to be zinc plated to ASTM B633 or cadmium plated to ASTM B766.
- .11 Fabricated steel pipe fittings: to AWWA C208 and AWWA C207 if flanged, interior and exterior protected with hot applied coal tar enamel to AWWA C203 or liquid epoxy coating to AWWA C210.
- .12 Couplings and Flanged Coupling Adapters:
 - .1 General Requirements:
 - .1 Suitable for pressure class specified in Contract Documents.
 - .2 Flanges and full face flange gaskets where applicable to Clauses 2.2.4.7 and 2.2.4.8 of this Section.
 - .3 To AWWA C219
 - .4 Anti-corrosion coating of interior and exterior centre sleeve and end rings to AWWA C219, AWWA C213, AWWA C210, or AWWA C550 as specified in Contract Documents.
 - .5 Compression gaskets to AWWA C219.
 - .6 Bolts and nuts high strength low alloy steel to AWWA C111, stainless steel to ASTM F593 or ASTM F738 for bolts and ASTM F594 or ASTM F836M for heavy hex nuts, as specified in Contract Documents. Rolled threads, fit and dimensions to AWWA C111.
 - .7 Ductile iron castings to ASTM A536, Grade 65-45-12.
 - .2 Plain end or transition couplings as specified in Contract Documents.
 - .3 Flanged coupling adapters as specified in Contract Documents.
- .13 Joint Restraint Devices: General Requirements:
 - .1 Ductile iron castings to ASTM A536.
 - .2 Anti-corrosion coating of ductile iron castings to AWWA C219, AWWA C210, AWWA C213 or AWWA C550 as specified in Contract Documents.
 - .3 Bolts and nuts high strength low alloy steel to AWWA C111 or as specified in Contract Documents, stainless steel to ASTM F593 or ASTM F738 for bolts and ASTM F594 or ASTM F836M for heavy hex nuts. Rolled threads, fit and dimensions to AWWA C111.
 - .4 Tie rods to 2.2.3.8 of this Section.
 - .5 Restrainers for ductile iron pipe with mechanical joint fittings as specified in Contract Documents.
 - .6 Restrainers for PVC pipe to 2.2.2 of this Section with mechanical joint fittings as specified in Contract Documents.
 - .7 Restrainers for ductile iron pipe with push-on joint fittings with tie rod lugs as specified in Contract Documents.
 - .8 Restrainers for PVC to 2.2.2 of this Section with push-on joint fittings with tie rod lugs as specified in Contract Documents.

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- .9 Restrained harnesses or integral restraint systems manufactures as part of the pipe joint as specified in Contract Documents.
- .10 Restrainers for bell joints in PVC pipe to 2.2.2 of this Section.
- .11 All joint restraint systems for PVC forcemain be approved by the PVC pipe manufacturer they are to be used on, and that they do not derate the pipe manufacturer's recommended working pressures.
- .14 Tapping sleeves for branch connections 75 mm and larger:
 - .1 General Requirements:
 - .1 Location, type and pressure class as specified in Contract Documents. (Exterior condition of existing water mains as found in the field may alter type and/or materials. Refer to General Conditions, Clause 11, Concealed or Unknown Conditions.)
 - .2 To AWWA C219 for sleeve and gasket materials and generally for design, manufacture and performance.
 - .3 Flanges and flange gaskets to 2.2.4.7 and 2.2.4.8 of this Section and AWWA C207 and AWWA C208 for fabricated carbon steel sleeves. Flange gaskets for use with epoxy coated flanges to be annular ribbed type.
 - .4 Anti-corrosion coating of fabricated carbon steel and ductile iron sleeve assemblies to AWWA C213 (Fusion-Bonded Epoxy) or shop coated to AWWA C219 if field applied dressings are specified in Contract Documents.
 - .5 Bolts and nuts high strength low alloy steel to AWWA C111 or as specified in Contract Documents, stainless steel to ASTM F593 or ASTM F738 for bolts and ASTM F594 or ASTM F836M for heavy hex nuts. Rolled threads, fit and dimensions to AWWA C111.
 - .6 Ductile iron castings to ASTM A536, grade 65-45-12.
 - .7 Flanged branches for welding to steel pipe mains to AWWA C207 and AWWA C208.
 - .8 Branches shall include a threaded test plug 19 mm NPS minimum if tapping machine to be used does not have provision for pressure testing.
 - .2 Tapping sleeves for cast iron, ductile iron, asbestos cement, PVC to AWWA C900, pre-stressed concrete pressure pipe or steel mains for taps other than size-on size:
 - .1 Split assembly to incorporate an annular gasket cemented or mechanically held in place on the branch end **or** split assembly incorporating ring seal and wrap around sleeve length gasket liner.
 - .2 Acceptable models: as specified in Contract Documents.
 - .3 Tapping sleeves for size on size taps on cast iron, ductile iron, asbestos cement, PVC to AWWA C900, pre-stressed concrete pressure pipe or steel:

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- .1 Split assembly incorporating ring seal and wrap around sleeve length gasket/liner.
- .2 Acceptable models: as specified in Contract Documents.
- .4 Tapping sleeves for size on size tap on ductile iron pipe and PVC to AWWA C900 only:
 - .1 Acceptable models: as specified in Contract Documents.
- .15 Repair clamps shall be constructed of 18-8 stainless steel passivated for corrosion resistance. Stainless steel components shall be Type 304 or 304L. All surfaces including weld areas shall be thoroughly cleaned of scale, grease or other contaminants. Welding must be performed in a controlled environment to prevent sensitization. Nuts and bolts shall be Type 304 18-8 stainless steel 5/8 X 11 NC rolled thread lubricated to prevent galling. Gasket shall be SBR (Buna) rubber per ASTM D2000.
- .5 Pre-stressed Concrete Pressure Pipe
 - .1 Pipe to AWWA C300, AWWA C301 and AWWA C303
 - .2 Joints: push-on bell and spigot joints complete with rubber gasket
- .6 Steel Pipe:
 - .1 To AWWA C200 wall thickness as specified in Contract Documents electrically welded. Steel to ASTM A36.
 - .2 Steel pipe flanges to AWWA C207. Dimensions for fabricated steel water pipe fittings to AWWA C208.
 - .3 Finishes - exterior and interior: hot applied coal tar enamel to AWWA C203 or liquid epoxy coating to AWWA C210.
- 2.3 Valves and Valve Boxes
 - .1 Mainline Valves - General Requirements:
 - .1 Valves to open counter-clockwise.
 - .2 All valves to have manufacturer's name, year of manufacture, size and working pressure on the bonnet or body.
 - .3 Valves 400 mm and larger to have by-pass sized to AWWA C500.
 - .4 Gate valves 400 mm and larger to have gear operators.
 - .2 Mainline Gate valves:
 - .1 Locations of solid wedge or double disc valves and resilient-seated valves as shown on Contract Drawings.
 - .2 To AWWA C500: 75 to 300 mm to working pressure 1380 kPa; 400 mm and larger to working pressure 1035 kPa, gray cast iron or cast ductile iron body, bronze mounted solid wedge, or double disc, non-rising stem, hub or flanged ends.
 - .3 To AWWA C509: 75 to 300 mm to working pressure 1380 kPa; Gray cast iron or ductile iron body, resilient seated, non-rising stem, hub or flanged ends.
 - .4 Stem seal to be O-ring type.

- .5 Hydrant valves - to be as specified for mainline gate valves.
- .6 Valves to be complete with 50 mm square operating nut for underground service.
- .7 Acceptable manufacturers are as specified in Contract Documents.
- .3 Mainline butterfly valves: Butterfly valves: to AWWA C504 Class 150B, as specified in Contract Documents.
- .4 Blowdown or Blow-Off Valves: 50 mm to AWWA C800 for working pressure 1035 kPa threaded ends, 75 mm to 300 mm as specified for mainline gate valves.
- .5 Air Release, Air/Vacuum and Combination Air Valves:
 - .1 Gray cast iron or ductile iron body.
 - .2 Threaded or flanged connections.
 - .3 Maximum working pressure 2070 kPa.
 - .4 To AWWA C512.
- .6 Mainline Valve Boxes:
 - .1 To be as specified in Contract Documents: telescoping, cast iron, top flange type service box:
 - .1 Rectangular type to be as specified in Contract Documents.
 - .2 Circular type to be as specified in Contract Documents.
 - .2 Valve box riser pipe to be 150 mm diameter PVC DR 35 or better.
- .7 Service Valve Boxes:
 - .1 Curb stop valve boxes (300 mm from property line) on 25 mm diameter or smaller services to be telescoping assembly comprised of threaded cast iron top with bronze pentagon centre plug, 25 NPS iron pipe, cast iron base allowing threaded insertion of 25 NPS pipe and accommodation for curb stop valve (cast iron base section may thread onto curb stop valve) and 14 mm diameter steel operating rod attached to curb stop valve with bronze cotter pin, as specified in Contract Documents.
 - .2 Curb stop valve boxes (300 mm from property line) on 32 mm dia. to 50 mm dia. services to be assembly specified in 2.3.7.1 of this Section, except with 19 mm dia. steel operating rod, or as specified in Contract Documents.
 - .3 Curb stop valve boxes (300 mm from property line) alternative on 19 mm dia. to 50 mm dia. services without operating rods to be assembled as specified in 2.3.6.1.2 and 2.3.6.2 of this Section.
 - .4 Curb stop valve boxes (300 mm from property line) on services 75 mm dia. and larger as specified for Mainline Valve Boxes.
 - .5 Corporation stop valve boxes (at mainline tees or tapplings) on services 75 mm dia. and larger as specified for Mainline Valve Boxes.
- .8 Check Valves:

- .1 To AWWA C508: 50 to 300 mm to working pressure 1200 kPa; 400 to 500 mm to working pressure 1035 kPa; gray cast iron or ductile cast iron body, clear waterway type, metal to metal seat, mechanical joint ends to AWWA C111 or flanged ends to AWWA C110.
- 2.4 Valve and Large Meter Chambers**
- .1 Applicability: for mainline butterfly valves or mainline gate valves 400 mm and larger and for meters 200 mm and larger.
- .2 As specified in Contract Documents, valve chambers for pressure reducing valves, meters and backflow prevention devices may have special and additional requirements and features.
- .3 Materials and installation for Cast-in-place chambers to Section 33 44 01 - Manholes and Catchbasins.
- .4 Concrete and reinforcing steel: to Section 03 20 01 - Concrete Reinforcement and Section 03 30 53 - Cast-in-Place Concrete.
- .5 Precast concrete sections to ASTM C478M. Ladder rungs be cast integral with unit; field installation not permitted. Precast concrete lids to H-20 loading conditions.
- .6 Jointing materials:
- .1 Manufacturer's rubber ring gaskets,
- .2 Mastic joint filler,
- .3 Cement mortar or,
- .4 Combination of above types.
- .7 Mortar: aggregate to CAN/CSA-A82.56, masonry cement to CAN/CSA-A8.
- .8 Ladder rungs for valve chambers: minimum 20 mm diameter, for 76 mm minimum embedment in precast or cast-in-place concrete, minimum rung length 250 mm, minimum projection 100 mm, maximum vertical spacing 300 mm, minimum design liveload 1334N, cold rolled steel to CAN/CSA-G40.20, hot-dip galvanized after fabrication to CAN/CSA-G164 or aluminum alloy #6061-T6 to CAN3-S157 and NBC 1990. Rungs to be safety pattern. Hand holds at top entry to conform to minimum design liveload and dimensions.
- .9 Valve chamber frames and covers: as specified in Contract Documents.
- .10 Mechanical and Electrical: as specified in Contract Documents.
- 2.5 Service Connections, Pipe, Joints and Fittings**
- .1 Pipe diameter 19 mm to 75 mm to be Polyethylene to AWWA C901, Pressure Class 160 tubing certified to CSA B137.1 or Type K annealed copper, to ASTM B88M or Polyethylene/Aluminum/Polyethylene composite pipe certified to CSA B137.9 or CSA B137.10
- .2 Pipe diameter 100 mm and larger to be of material specified for mainline pipe.
- .3 Service saddles:
- .1 Tapping threads to be tapered to AWWA C800.
- .2 Saddles for ductile iron pipe:
- .1 Saddles for 19 to 50 mm services to have a ductile iron body to ASTM A536.

- .2 Anti-corrosive coating to AWWA C219, AWWA C210, or AWWA C213, as specified in Contract Documents.
- .3 Two high strength low alloy steel straps to AWWA C111, or Type 304 stainless steel U-bolt straps, with minimum width per strap of 50 mm, as specified in Contract Documents.
- .3 Saddles for PVC pipe to AWWA C900/AWWA C905:
 - .1 To provide full support around circumference of pipe; saddles with lugs or U-bolt straps that may gouge or deform the pipe are not allowed.
 - .2 Saddles for 19 to 50 mm services as specified in Contract Documents:
 - .1 Bronze body to ASTM B62 and two stainless steel straps to ANSI T304 with minimum width per strap of 50 mm.
 - .2 Ductile iron body to ASTM A536:
 - .1 Anti-corrosive coating to AWWA C219, AWWA C210, or AWWA C213, as specified in Contract Documents.
 - .2 Two high strength low alloy steel straps to AWWA C111, or Type 304 stainless steel U-bolt straps, with minimum width per strap of 50 mm, as specified in Contract Documents.
 - .3 All-stainless steel broadband saddle to ANSI T304; 19 and 25 mm services to have single bolt and minimum band width of 125 mm; 37 and 50 mm services to have double bolt and minimum width of 190 mm.
- .4 For services 75 mm and larger use tapping sleeves to 2.2.4.14 of this Section.
- .5 Copper tubing joints to be flared or compression type suitable for 1100 kPa working pressure.

2.6 Hydrants

- .1 Hydrants to: AWWA C502, standard specifications for dry barrel Fire Hydrants for ordinary waterworks service; typical fire hydrant detail drawing and B.C. Standard for Fire Hydrants with following supplementary details:
 - .1 Shut-Off: compression type or slide gate as per supplementary specifications or contract documents.
 - .2 Inlet Connection: to be 150 mm nominal diameter, bell type with harness lugs.
 - .3 Bury Length: nominal bury length as shown on Contract Drawings.
 - .4 Delivery Classification: two hose nozzles and one pump nozzle. Each outlet nozzle to be locked or screwed in place to safeguard against blowing out, turning or backing out.
 - .5 Diameter:
 - .1 hose nozzles to be 65 mm nominal diameter.
 - .2 pump nozzles to be 100 mm nominal diameter.
 - .6 Hose and Pump Nozzle Threads:

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- .1 Hose nozzle to B.C. standard for Fire Hydrants (76.20 mm outside diameter and 8 threads per 25.4 mm)
 - .2 Pump nozzle to be 117.475 mm outside diameter and 6 threads per 25.4 mm.
 - .3 As an alternate pump nozzle may be specified in Municipal Supplementary Specifications as an alternate dimension thread ratio or a "quick connect" STORZ type.
 - .7 Nozzle Cap Gasket: to be provided with each nozzle cap.
 - .8 Opening Direction: counter-clockwise.
 - .9 Operating Nut and Cap Nuts: to B.C. Standard for fire hydrants. Pentagonal 3.75 mm point to flat.
 - .10 Working parts to be removable without disturbing barrel or base of hydrant and without excavation. Main operating stem to be non-rising. Hydrant to be so designed that its top section may, without excavation, be rotated at any angle relative to the inlet pipe if desired and bolted or locked in place without decreasing its strength or causing it to leak when under pressure.
 - .11 Hydrants to be subjected to hydrostatic pressure test of 2070 kPa in compliance with AWWA C502. Provide "Affidavit of Compliance" if requested by Contract Administrator.
 - .2 Colour: as specified in Contract Documents.
 - .3 Approved standard 150 mm Fire Hydrants are as specified in Contract Documents or Municipal Supplementary Specifications.
- 2.7 Underground Service Line Valves and Fittings**
- .1 Underground service line valves and fittings 19 to 50 mm to AWWA C800 suitable for 1035 kPa working pressure.
 - .2 Corporation Stops:
 - .1 19 to 50 mm: bronze to ASTM B62, AWWA thread inlet, compression type outlet.
 - .2 To be as specified in Contract Documents.
 - .3 Curb Stops:
 - .1 19 and 25 mm to be bronze to ASTM B62; inverted key, ball or cylinder type construction utilizing rubber O-ring seals.
 - .2 37 and 50 mm to be bronze to ASTM B62; ball or cylinder type construction utilizing rubber O-ring seals.
 - .3 To be full flow, full port, as specified in Contract Documents.
 - .4 Fittings: to be compression type for underground services.
 - .5 All fitting and valve connections on polyethylene to have solid fluted stiffening liners manufactured from stainless steel to ANSI T304 designed for the appropriate type and inside dimension of pipe, warranted by the manufacturer for that use.
 - .4 Underground service line valves 75 mm and larger to 2.3.1 and 2.3.2 of this Section.

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| 2.8 | Granular Pipe Bedding and Surround Material | <ul style="list-style-type: none"> .1 As shown on Contract Drawings. .2 Refer to <u>Section 31.05.17</u> - Aggregates and Granular Materials for materials specifications. |
| 2.9 | Backfill Material | <ul style="list-style-type: none"> .1 As shown on Contract Drawings. .2 Refer to <u>Section 31.05.17</u> - Aggregates and Granular Materials for material specifications. |
| 3.0 | EXECUTION | |
| 3.1 | General | <ul style="list-style-type: none"> .1 Pipe bedding details, including granular surround (pipe cushion) and material specifications to be as shown on Contract Drawings, including Standard Detail Drawing <u>G4</u>. |
| 3.2 | Preparation | <ul style="list-style-type: none"> .1 Clean pipes, fittings, valves, hydrants, and appurtenances of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site. |
| 3.3 | Trenching | <ul style="list-style-type: none"> .1 Do trenching in accordance with <u>Section 31.23.01</u> - Excavating, Trenching and Backfilling. .2 Trench alignment and depth as shown on Contract Drawings. .3 Trench depth to provide cover over pipe of not less than 1.0 m from finished grade unless shown otherwise on Contract Drawings. |
| 3.4 | Concrete Bedding and Encasement | <ul style="list-style-type: none"> .1 Do concrete work in accordance with <u>Section 03.30.53</u> - Cast-in-Place Concrete. Place concrete to details as shown on Contract Drawings. .2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed. .3 Do not backfill over concrete within 24 h after placing. |
| 3.5 | Granular Bedding | <ul style="list-style-type: none"> .1 Fill over-excavation below design elevation of bottom of specified bedding with granular bedding placed and compacted in accordance with 3.5.2 and 3.5.5 of this Section. Drain rock may be used for backfill of over-excavation only with Contract Administrator's approval. .2 Place granular bedding material across full width of trench bottom in uniform layers to depth shown on Standard Detail Drawings. .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe. Do not use blocks when bedding pipe. .4 Shape transverse depressions in bedding as required to suit joints. .5 Compact each layer full width of bed to minimum 95% Modified Proctor Density in compliance with <u>ASTM D1557</u>. (All following references to density imply in compliance with <u>ASTM D1557</u>). |

- .6 Place watermain pipe and water service tubing on prepared flat bottomed trench free of rock in excess of 50 mm without bedding and backfill with approved native or imported material and compact as specified. Use hand tools to compact material under 'haunch' area of pipe and around fittings and other materials.
- .7 Use imported bedding material when native material is deemed unsuitable for backfill by Contract Administrator or when trench has been excavated in rock.
- .8 Use imported bedding material when using pipe materials other than ductile iron or copper.
- .9 Use imported bedding when proposed work is installed through paved areas, when native material is deemed unsuitable for backfill by Contract Administrator or when trench has been excavated in rock.

3.6 Pipe Installation

- .1 Handle pipe in accordance with pipe manufacturer's recommendations. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .2 Lay and join pipes to manufacturer's instructions and specifications except as noted otherwise herein. PVC pipe to AWWA M23 and AWWA C605; ductile iron pipe to AWWA C600.
- .3 Horizontal tolerance: plus or minus 50 mm from specified alignment.
Vertical tolerance: plus or minus 25 mm from specified grade.
- .4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .5 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends up-grade.
- .6 Do not exceed maximum joint deflection recommended by pipe manufacturer. Refer to AWWA C600 for ductile iron pipe: and AWWA C605 for PVC pipe. For PVC pipe deflections exceeding manufacturer's recommendation, use:
 - .1 PVC High Deflection coupling rated at 1380kPa (100mm-300mm)
 - .2 PVC long radius 5 degree bend rated at 1620kPa (100mm-750mm)
- .7 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of water and foreign materials.
- .8 Position and join pipes with equipment and methods specified in 3.6.2 of this Section.
- .9 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe or its coating and leave smooth end at right angles to axis of pipe.
- .10 Joints:
 - .1 Install gaskets as recommended by manufacturer.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes carefully before joining.

- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .9 For ductile iron pipe do not install bronze wedges or other conductivity devices unless specified in Contract Documents.
- .10 Butt-fuse high density polyethylene in strict accordance with manufacturer's instruction by manufacturer or by manufacturer trained personnel.
- .11 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as specified otherwise.
- .12 When any stoppage of work occurs, restrain pipes in an approved manner to prevent "creep" during down time.
- .13 Recheck components assembled above ground after placing in trench to ensure that no movement of joints has taken place.
- .14 Test and/or bleed points consisting of Corporation cocks, sized to achieve minimum flushing velocities of 0.8 m/s in accordance with AWWA C651, to be provided where shown on Contract Drawings or as required by Contractor for pressure testing and flushing.

3.7 Valve Installation

- .1 Install valves to manufacturer's recommendations at locations shown on Contract Drawings.
- .2 Support valves located in valve boxes by means of either concrete or pressure treated and end treated wood blocks, located between valve and solid ground. Maximum length of pipe on each end of valve to be 1 m. Valves not to be supported by pipe.
- .3 Support valves located in valve chambers by means of either concrete blocks or fabricated steel pipe stands as shown on Contract Drawings.
- .4 Valves to be installed in vertical position with actuating stem plumb.

3.8 Valve Chambers

- .1 Use cast-in-place or precast units as shown on Contract Drawings. Precast units to be in accordance with Section 33 44 01 - Manholes and Catchbasins. Cast-in-Place units to be in accordance with Section 03 20 01 - Concrete Reinforcement and Section 03 30 53 - Cast-in-Place Concrete.
- .2 Construct units as shown on Contract Drawings, plumb and with valve chamber openings centred over valve nut, true to alignment and grade. Valve chambers not to rest on pipe.
- .3 Place reinforcing steel and miscellaneous metals required to be embedded in concrete to details shown on Contract Drawings and in accordance with Section 03 30 53 - Cast-in-Place Concrete.

- .4 Cast bottom slabs for precast units directly on undisturbed ground where shown on Contract Drawings, set precast concrete slab on 100 mm minimum of compacted granular material.
- .5 Set bottom section of precast unit in bed of cement mortar and bond to bottom slab. Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar, or combination thereof.
- .6 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.
- .7 Plug lifting holes with precast concrete plugs set in non-shrink non-staining grout or non-shrink, non-staining mortar.
- .8 Set frame and cover to required elevation on at least two and not more than four courses of brick or precast concrete riser rings. Make brick or riser ring joints and join brick or riser rings to frame with cement mortar, parge and trowel smooth.
- .9 Cover to be marked as specified in Contract Documents.
- .10 Clean valve chambers of debris and foreign materials; remove fins and sharp projections.
- .11 Set valve boxes centrally over valve nut. Set valve boxes and any other boxes around appurtenances and complete backfill within 24 h of setting appurtenance.
- .12 Install sump drainer assemblies to manufacturer's instructions and to AWWA C510 and AWWA C511.

3.9 Under-crossing

- .1 Excavate working pit to dimensions shown on Contract Drawings, outside right-of-way to be crossed.
- .2 Excavate working pit to not less than 0.6 m below lowest invert of encasing pipe.
- .3 Dewater excavation.
- .4 Dewater area of under-crossing.
- .5 Install heavy timber or steel frame backstop.
- .6 Place encasing pipe to exact line and grade shown on Contract Drawings. Encasing pipe to cross under obstruction at angle shown on Contract Drawings.
- .7 Install encasing pipe by jacking, boring or tunnelling methods approved by Contract Administrator.
- .8 Encasing pipe not to be in tension.
- .9 Joints for encasing pipe to be welded to AWWA C206.
- .10 Submit shop drawings showing proposed method of installation of carrier pipe.
- .11 For ductile iron carrier pipe only, install continuous zinc strip sacrificial anode electrically bonded to carrier pipe shown on Contract Drawings. Install sacrificial anodes for encasing pipe per Section 26.42.13 – Cathodic Protection.
- .12 Insert carrier pipe into encasing pipe, in end with largest open area, after placing levelling pad.

- .13 Use approved chromated copper arsenate salt treated blocking method or fabricated high density polyethylene casing spacers to maintain carrier pipe in true alignment and uniform separation from encasing pipe.
- .14 Clearance between blocks or casing spacers and encasing pipe to be maximum 15 mm when carrier pipe is in position.
- .15 Join carrier pipe one length at a time outside encasing pipe. Push or pull carrier pipe into position.
- .16 Couplings of carrier pipe not to rest on levelling pad when carrier pipe is in position.
- .17 Place 20 MPa concrete cradle around carrier pipe after it is positioned. Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.
- .18 Fill open annular space at each end of encasing pipe with burlap bags filled with 20 MPa concrete.

3.10 Service Connection Installation

- .1 Install service connections to 3.6 of this Section and as shown on Standard Detail Drawings as directed by Contract Drawings or Contract Administrator.
- .2 Construct service connections at right angles to watermain unless otherwise directed. Locate curb stops as shown on Contract Drawings.
- .3 Complete service connections before pressure testing of water main.
- .4 Tappings in cast iron or ductile iron mains 200 mm or greater in diameter may be threaded without service clamps provided specified pipe wall thickness is sufficient to conform to ANSI/ASME B1.20.1 for at least 3 threads as shown in Appendix A to AWWA C151.
- .5 Tappings in cast iron or ductile iron mains smaller in diameter than 200 mm; or cast iron or ductile iron mains with wall thickness which will not allow at least 3 full threads; or tap sizes beyond those shown in the following table are to be made using double strap saddles to 2.5.3 of this Section or tapping sleeves to 2.2.14 of this Section.

Pipe Diameter (mm)	Maximum Tap Without Clamp (mm)	Maximum Tap With Clamp (mm)
100	19	25
150	25	32
200	25	50
250	25	50
300	32	75

- .6 Tappings in PVC mains to AWWA C900/AWWA C905 pipe to be with service saddles specified in 2.5.3.3 of this Section. Nuts on service saddle straps to be tightened to torque range specified by manufacturer and in no case in excess of that torque. Use core-out type bit, provide coupons to Contract Administrator.

- .7 Tap main as shown on Standard Detail Drawings W2a and W2b, not closer to a joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m, whichever is greater. No two adjacent connections on same pipe length to be on same plane of pipe.
 - .8 Leave corporation stop valves fully open.
 - .9 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
 - .10 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.
 - .11 Install curb stop with curb stop valve box on services 50 mm or less in diameter. Equip larger services with a gate valve and cast iron valve box. Set box plumb over stop or valve and adjust top flush with final grade elevation. Leave curb stop or service valves fully closed.
 - .12 Place temporary location marker at ends of plugged or capped unconnected water lines. Each marker to consist of 40 x 90 mm stake extending from pipe end at pipe level to 500 mm above grade. Mark and paint blue exposed portion of stake with designation "WATER".
- 3.11 Tapping Sleeve Installation**
- .1 Thoroughly clean the exterior of the main to be tapped. Grind or file any protrusions or irregularities in the pipe exterior which may interfere with uniform seating of gaskets or clamping bands. In accordance with Section 10 of AWWA C651, dust interior surface of the tapping sleeve annulus with calcium hypochlorite powder before attaching to the main.
- 3.12 Hydrants**
- .1 Install hydrant assemblies at locations shown on Contract Drawings.
 - .2 Install hydrant assemblies in accordance with AWWA M17 and in accordance with Standard Detail Drawing W4.
 - .3 Set hydrants plumb, with hose nozzles parallel with edge of pavement or curb line, with pumper nozzle facing roadway at right angles to road centreline and with body flange set at elevation of 50 to 150 mm above final grade.
 - .4 Place concrete thrust blocks as shown and as specified ensuring that drain holes are unobstructed.
 - .5 To provide proper draining for each hydrant, excavate a pit as shown and backfill with coarse gravel or crushed stone to a level 150 mm above drain holes.
 - .6 For hydrants not in service, place an orange painted sign, 30 cm x 30 cm , lettered "Not In Service" on the main port. Remove when water main is accepted by the Contract Administrator.
- 3.13 Thrust Blocks**
- .1 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as shown on Contract Drawings or as directed by Contract Administrator and as detailed on Standard Detail Drawing W1.
 - .2 Place 6 mil polyethylene between interface of concrete and fitting.
 - .3 Where shown in Contract Documents, joint restraint devices to 2.2.13 of this Section.

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| | | .4 | Do concrete work in accordance with <u>Section 03 30 53</u> - Cast-in-Place Concrete. |
| | | .5 | Keep joints and couplings free of concrete. |
| | | .6 | Do not backfill over concrete within 24 h after placing. |
| 3.14 | Corrosion Protection | .1 | Where specified, provide corrosion protection measures per <u>Section 26 42 13</u> – Cathodic Protection. |
| 3.15 | Pipe Surround | .1 | Upon completion of pipe laying and after Contract Administrator has inspected work in place, surround and cover pipes as shown on Standard Detail Drawing <u>G4</u> . |
| | | .2 | Hand place surround material in uniform layers simultaneously on both sides of pipe. Do not dump material within 1 m of exposed pipe. |
| | | .3 | Compact each layer from pipe invert to underside of backfill to minimum 95% Modified Proctor Density. |
| | | .4 | Install concrete encasement where shown on Contract Drawings or as directed by Contract Administrator. For PVC mainline or service pipe install high deflection PVC coupling 0.3 m minimum to 0.5 m maximum from end of encasement. For ductile iron mainline or service pipe ensure hub joint occurs 0.3 m minimum to 0.5 m maximum from end of encasement. |
| 3.16 | Backfill | .1 | Place and compact backfill material in accordance with <u>Section 31 23 01</u> - Excavating, Trenching and Backfilling. |
| | | .2 | Backfill requirements, including type of material and compaction requirements as shown on Contract Drawings, including Standard Detail Drawing <u>G4</u> . |
| 3.17 | General Procedure
Flushing, Testing, and
Disinfection | .1 | All cleaning, flushing, pressure and leakage testing, disinfection and final flushing to be done by Contractor. Costs are included in payment for items described in 1.8 of this Section. |
| | | .2 | Perform all tests in presence of Contract Administrator. Notify Contract Administrator 24 h in advance of proposed test. |
| | | .3 | Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least 5 days after placing concrete or 2 days if high early strength concrete is used. |
| | | .4 | Obtain municipal approval prior to discharging flushing water to municipal sewers or drainage ditches. |
| | | .5 | Comply with <u>General Conditions, Clause 20.4, Environmental Laws</u> , in regard to discharge of flushing water. |
| | | .6 | Provide Contract Administrator with all required approvals prior to discharging flushing water. |
| 3.18 | Cleaning and
Preliminary Flushing | .1 | Before flushing and pressure testing, ensure waterworks system is completely finished except tie-ins to existing watermains and make arrangements with Contract Administrator for scheduling of testing and disinfection of mains. Testing and disinfection to be witnessed by Contract Administrator. |

- .2 Isolation of existing water system where required will be performed by Municipality. Do not operate any existing valves without Contract Administrator's authorization.
- .3 Water may be supplied from municipal fire hydrants upon application for a Hydrant Use Permit and presentation of valid test certificate for reduced pressure principle backflow prevention device conforming to AWWA C511.
- .4 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water sources. Minimum velocity to be 0.8 m/s and/or in accordance with AWWA C651. Continue flushing at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

3.19 Testing Procedure

- .1 Upon completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, make section ready for testing. Carry out testing in accordance with 3.19.2 of this Section.
- .2 Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Submit pipeline to a test of 1.5 x working pressure applied at highest elevation in each section, with a minimum of 1380 kPa applied at lowest point of test section. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 litres per millimetre diameter of pipe per kilometre per 24 hour period. Minimum duration of test period to be 2 hours. Maximum test pressures should not exceed those specified in CSA B137.3 - Table 9
- .3 Perform pressure and leakage testing of ductile iron piping to AWWA C600 and AWWA M41.
- .4 Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23 and AWWA C605.
- .5 Perform testing of welded steel piping to AWWA C206; no leakage allowed.
- .6 Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirement is achieved.

3.20 Disinfection, General

- .1 After Contract Administrator has certified that pipes and appurtenances have passed all specified tests, flush and disinfect pipes and appurtenances.
- .2 Disinfect and flush in accordance with 3.21 of this Section.

3.21 Disinfection and Flushing Procedures

- .1 Do not use granular hypochlorite for disinfection of PVC pipe with solvent welded joints, as there is an explosive reaction potential.
- .2 Retain water containing not less than 25 mg/L free chlorine in water system for a period of at least 24 h, in accordance with AWWA C651, Continuous Feed Method. Submit outline of proposed disinfection procedure accompanied by marked up schematic drawing to Contract Administrator for approval 48 h in advance of commencement of disinfection.

- .3 Allow water from existing distribution system, isolated by reduced pressure principle backflow prevention device or other approved source of supply, to flow at constant, measured rate into newly laid watermain. In absence of a meter, rate may be approximated by methods such as placing Pitot gauge in discharge, measuring time to fill container of known volume, or measuring trajectory of discharge and using formula presented in AWWA C651.
- .4 At a point not more than 3 m downstream from beginning of new main, ensure water entering new main receives dose of chlorine fed at constant rate such that water will have not less than 25 mg/L free chlorine. To assure that this concentration is provided, measure chlorine concentration at regular intervals as specified in AWWA C651.
- .5 Amount of chlorine required to produce 25 mg/L concentration in 30 m of pipe of various sizes is given in following table:

Pipe Size (mm)	100 Percent Chlorine (kg)	1 Percent Chlorine Solution (Litres)
100	0.006	0.61
150	0.014	1.36
200	0.024	2.46
250	0.039	3.86
300	0.054	5.45
400	0.098	9.85

- .6 Allow flow of water containing chlorine to continue until entire main, all service connections, extremities and hydrants to be treated are filled with 25 mg/L chlorine solution. To ensure that this concentration has been attained throughout, measure free chlorine residual at a number of points and extremities along main. Retain chlorinated water in main for at least 24 h. During this time operate all valves, curb stops and hydrants in section treated in order to disinfect them thoroughly.
- .7 At end of this 24 h period, treated water to contain no less than 10 mg/L free chlorine throughout main. If chlorine content is less than 10 mg/L repeat chlorination procedure until specifications are met.
- .8 After completion of chlorination, flush chlorinated water from system, hydrants and services until chlorine concentration in remaining water is less than 0.3 mg/L chlorine residual.
- .9 Upon completion of disinfection and flushing, Contractor to remove test and bleed point apparatus and backfill and complete any other work required for placing of waterworks system in service.

3.22 Servicing Fire Hydrants

- .1 Immediately following completion, all hydrants installed as part of the project will be serviced by Municipality. All repair costs (parts and labour) to remedy defective parts or installation will be charged to Contractor.

3.23 Connections to Existing Mains

- .1 Connections to existing waterworks systems will normally be made by the Waterworks owner; or at the direction of the Contract Administrator by the Contractor. Make all necessary arrangements with Contract Administrator to schedule work to prevent construction delays.

END OF SECTION 33 11 01

STORM SEWERS

- 1.0 GENERAL**
- .1 Section 33 40 01 refers to those portions of the work that are unique to the supply and installation of storm sewers and storm sewer service connections. Related appurtenances are included in other sections. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- .2 All details of storm sewer facilities not specifically covered in this section to comply with ASTM and CGSB standards and/or manuals of practice as specified in Contract Documents.
- 1.1 Related Work**
- .1 Excavating, Trenching and Backfilling Section 31 23 01
- .2 Manholes and Catchbasins Section 33 44 01
- .3 Concrete Reinforcement Section 03 20 01
- .4 Cast-in-Place Concrete Section 03 30 53
- .5 CCTV Inspection of Pipelines Section 33 01 30.1
- .6 Cleaning of Sewers Section 33 01 30.2
- .7 Sanitary Sewers Section 33 30 01
- .8 Aggregates and Granular Materials Section 31 05 17
- .9 Pipe Culverts Section 33 42 13
- 1.2 References**
- .1 The abbreviated standard specifications for testing, References materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 –Reference Specifications – Site and Infrastructure.
- 1.3 Samples**
- .1 Samples may be required.
- 1.4 Material Certification**
- .1 Products having CSA certification to be used where readily available. Product to be certified to CSA standard(s) by an approved independent third party certification body accredited by the Standards Council of Canada and that is acceptable to the Contract Administrator. Products to be marked with certification body logo and CSA standard markings.
- .2 At least 14 days prior to commencing work, submit to Contract Administrator the material manufacturer's recent test data and certification that materials to be incorporated into works are representative and meet requirements of this section. Include manufacturer's drawings where pertinent.
- 1.5 Scheduling of Work**
- .1 Schedule work to minimize interruptions to existing services.
- .2 Maintain existing flow during construction.
- .3 Submit schedule of expected interruptions to Contract Administrator for approval and adhere to approved schedule.
- 1.6 Measurement and Payment**
- .1 Payment for storm sewer will be made separately for various sections of storm sewers consistent with pipe materials and diameters, depths of storm sewers and backfill requirements shown on Contract Drawings and described under individual payment items in Schedule of Quantities and Prices.

STORM SEWERS

- .2 Payment for storm sewer includes saw cutting pavement, trench excavation, disposal of surplus excavated material, supply and installation of all pipe, fittings and related materials, bedding, imported or native backfill as shown on Contract Drawings, cleaning and flushing, testing, (if applicable), all surface restoration as specified under Excavating, Trenching and Backfilling Section 31 23 01 – 3.6, except permanent pavement restoration, and all other work and materials necessary to complete installation as shown on Contract Drawings and specified under this Section.

Measurement for storm sewer will be made horizontally from manhole centreline to manhole centreline over surface after work has been completed.

- .3 Payment for service connections includes tee to main line and all related fittings and components specified and/or shown on Standard Detail Drawings S8. Payment includes all applicable materials and work described in 1.6.2 of this Section.

Measurement for service connections will be for each complete service installed, with no regard to length of service pipe installed.

- .4 Payment for inspection chambers (where specified) includes all materials and works and components specified and/or shown on Standard Detail Drawing S10. Payment includes all applicable work described in 1.6.2 of this Section. and will be made under Manholes and Catchbasins Section 33 44 01 – 1.5.2.

- .5 Payment for catchbasin and lawn drain leads includes a applicable materials and work described in 1.6.2 of this Section.

Measurement for catchbasin leads and lawn drain leads will be made horizontally from centreline of mainline pipe to centreline of catchbasin or lawn drain chamber, for each pipe size installed with no regard to depth range

- .6 Payment for perforated drain pipe includes applicable materials and work described in 1.6.2 of this Section and will be made separately for each size of pipe and will include drain pipes, drain rock and filter fabric surround as shown in Contract Drawings.

- .7 Payment for concrete bedding or controlled density fill, where shown on Contract Drawings, will be made as extra-over payment to storm sewer under 1.6.2 of this Section. No payment will be made for concrete bedding or controlled density fill required as a result of unauthorized excavation beyond neat lines or limits of excavation shown on Contract Drawings or Standard Detail Drawing G4.

- .8 Payment for localized concrete encasement and thrust and support blocks where shown on Contract Drawings or directed by Contract Administrator, includes all necessary extra excavation and formwork and supply and placement of concrete as specified in Section 03 30 53 – Cast-in Place Concrete. Payment will be based on volume calculated from actual measurement of dimensions of components constructed as detailed in Contract Drawing.

- .9 Payment for tie-ins to existing or new storm sewer systems includes all the materials, work and components but excludes the necessary manhole, all as shown on Contract Drawings. Payment for manholes, if required for tie-in, will be made separately under Section 33 44 01-Manholes and Catchbasins.

- .10 Payment for grillage/trash screen includes supply, fabrication and installation of all metal work as shown on Standard Detail Drawing S13 or on Contract Drawings.
- .11 Payment for CCTV Inspection of Pipelines shall be made separately under Section 33.01.30.1 - CCTV Inspection of Pipelines.
- 1.7 Inspection and Testing** .1 Refer to General Conditions, Clause 4.12, Inspections.
- 2.0 PRODUCTS**
- 2.1 Concrete Pipe**
- .1 Non-reinforced circular concrete pipe and fittings: to ASTM C14M maximum diameter 900 mm, strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM C443M.
- .2 Reinforced circular concrete pipe and fittings: to ASTM C76M for all pipe greater than 900 mm diameter, strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM C443M.
- .3 Reinforced concrete arch pipe: to ASTM C506M.
- .4 Reinforced concrete elliptical pipe: to ASTM C507M.
- .5 Lifting holes:
- .1 Pipe 900 mm or less: no lift inserts required.
- .2 Pipe greater than 900 mm diameter: engineered lift insert systems designed for the weight of the pipe cast into the pipe walls during manufacture. Not to exceed two in each piece of pipe.
- .3 Manufacturer to provide properly rated lifting clutches to be used with lift insert cast into pipe.
- .4 Lift insert opening not required to be grouted provided it does not extend beyond the depth of the engineered design.
- .5 At request of the Contract Administrator or the Owner, manufacturer shall supply design information confirming suitability of lift insert system used.
- .6 Pretesting: not required unless specified in Supplementary Specifications. If specified, pretest in accordance with Sanitary Sewers - Section 33.30.01 - 2.1.4.
- 2.2 PVC Pipe, Mainline Smooth Wall**
- .1 Polyvinyl chloride pipe up to 1200 mm in diameter, DR35. Pipe to have minimum pipe stiffness (F/Y) of 320 kPa at 5.0% deflection, ASTM D2412. Pipe to be manufactured to specifications for pipe size ranges as follows:
- 100 mm dia. - 375 mm dia. to ASTM D3034
- 450 mm dia. - 1200 mm dia. to ASTM F679
- Pipes to be certified to CSA B182.2 for pipe size diameter 100 mm to 1200 mm
- .2 Joints: To conform to ASTM D3212; pipe to include integral bell and spigot ends with stiffened wall section and formed groove for a rubber gasket; elastomeric gaskets to ASTM F477.

- .1 Pipe joints to withstand minimum hydrostatic pressure of 345kPa without leakage.
 - .2 Pipe joints in pipes with pipe stiffness less than 320 kPa to withstand 550kPa
 - .3 Normal pipe length joint to joint to be 4.0 m.
 - .4 Maximum installed short term deflection not to exceed 5.0% of the base inside diameter.
- 2.3 PVC Pipe, Mainline Profile**
- .1 PVC Profile Pipe: PVC profile pipes and fittings conforming to ASTM F794 and certified to CSA B182.4, 200 mm to 1200 mm diameters. Fittings to be certified to CSA B182.2 and conform to ASTM D3034 and ASTM F679.
 - .2 Pipe to have a minimum pipe stiffness of 320 kPa at 5.0% deflection, when tested in accordance with ASTM D2412. Pipe to be marked to clearly indicate class rating as required under ASTM F794.
 - .3 Pipe to have factory assembled spigot gaskets and integral bell joint features; joints to conform to all requirements of ASTM D3212; elastomeric gaskets to conform to ASTM F477.
 - .4 Normal pipe laying length joint to joint to be 4.0 m.
 - .5 Maximum short term installed deflection not to exceed 5.0% of base inside diameter.
- 2.4 HDPE Pipe, Mainline Open Profile**
- .1 HDPE Open Profile Pipe (Corrugated Exterior, Smooth Inner Wall) and Fittings certified to CSA B 182.8, 100mm to 900mm diameter.
 - .2 Pipe to have a minimum pipe stiffness of 320 kPa at 5.0% deflection, when tested in accordance with ASTM D2412. Exterior pipe corrugation to be embossed with a stiffness rating as required by CSA B182.8.
 - .3 Pipe to have factory assembled spigot gaskets and integral bell joint features certified to CSA B182.8. Joints to conform to all requirements of ASTM D3212; elastomeric gaskets to conform to ASTM F477.
 - .4 Maximum short term installed deflection not to exceed 5.0% of base inside diameter.
- 2.5 Spiral Rib Pipe-Steel**
- .1 Spiral Rib Pipe: to CAN3-G401 except external helical corrugation pattern to be 19 mm x 19 mm x 190 mm, as described in AASHTO M36 or ASTM A760.
 - .2 Pipe Material: Galvanized or Aluminized Steel Type II to CAN3-G401.
 - .3 Pipe Wall Thickness: In accordance with manufacturer's recommendations given minimum and maximum cover limits and condition.
 - .4 Couplers: Hugger Band type couplers complete with o-ring gaskets conforming to CAN3-G401. Coupler width to be 500 mm wide.
 - .5 Pipe Laying Lengths: Up to 10 m, or as specified on Contract Drawings.
 - .6 Maximum installed vertical deflection not to exceed 5% of base inside diameter. Maximum installed horizontal deflection not to exceed 3% of base inside diameter.

- 2.6 Service Connections**
- .1 Storm sewer service connections to be 100 mm minimum diameter; maximum diameter as specified on Contract Drawings.
 - .2 Storm sewer service connections 100 mm and 150 mm diameter to be PVC type PSM DR 28 sewer pipe.
 - .3 100 mm and 150 mm DR 28 PVC storm sewer service connection pipe to have a minimum pipe stiffness of 625 kPa. Pipe to be manufactured to ASTM D3034 and certified by Canadian Standards Association to CSA B182.2.
 - .4 Storm sewer service connections greater than 150 mm diameter to be of size and material specified on Contract Drawings and to conform to applicable specifications for mainline pipe.
 - .5 Manufactured connections to non-reinforced or reinforced concrete mainline pipe to be made using sanded PVC pipe male end stub with integral bell by either:
 - .1 Stub grouted into neatly chipped hole in pipe wall by concrete pipe manufacturer. Grout to be Portland cement based grout.
 - .2 Stub epoxy resin cemented into neatly cored hole in pipe wall by concrete pipe manufacturer.
 - .6 Stub and bell orientation to be 45° to centreline of mainline pipe (wyes) for concrete pipe less than 1050 mm diameter. Orientation may be 90° to centreline of mainline pipe (tees) for concrete pipe 1050 mm diameter or larger. No section of service stubs to protrude past inside of concrete pipe wall.
 - .7 Manufactured wye connections to PVC mainline pipe to be made with extrusion moulded PVC or fabricated PVC fittings manufactured to ASTM D3034 and CSA B182.2.
 - .8 Field installed Tees and Wyes
 - .1 In-situ installation of tees and wyes into concrete,, open profile HDPE pipe, PVC pipe or steel spiral rib mainline pipe shall be made with approved PVC saddle installed to the manufacturers specifications into a neatly cored hole in the pipe wall.
 - .2 Connections to profile PVC pipe or open profile HDPE pipe to be made with a preformed tee or wye fitting when connection is up to two sizes smaller than mainline pipe. For connections more than two sizes smaller than mainline pipe, an insertable tee for PVC pipe or open profile HDPE pipe is permitted. When an insertable tee is used, hole cut into mainline pipe to cut as few ribs as possible.
 - .9 PVC service connection pipe and fitting joints: push-on type comprised of integral bell with single elastomeric gasket to ASTM D3212 and ASTM F477. Normal pipe laying length joint to joint to be 4.0 m.
 - .10 Pipe and fitting joints for service connection pipe materials other than PVC type PSM sewer pipe to be as specified for applicable mainline pipe.
- 2.7 Perforated Drain Pipe**
- .1 Pipe to be 100mm minimum
 - .2 PVC Pipe to be certified to CSA B182.1 for 100mm and 150mm diameters. For pipe diameters 200mm and larger, pipe to be certified to CSA B182.2 and CSA B182.4

- | | | | |
|-------------|--|----|---|
| | | .3 | HDPE open profile drain pipe diameter 100mm and larger to be certified to <u>CSA B182.8</u> . |
| | | .4 | Concrete pipe shall conform to either <u>ASTM C76M</u> (Reinforced) or <u>ASTM C14M</u> (Non-reinforced) with perforations conforming to <u>ASTM C444-03</u> "Standard Specification for Perforated Concrete Pipe". |
| 2.8 | Concrete | .1 | Concrete mixes and materials required for bedding cradles, encasement, and incidental uses: to <u>Section 03 30 53</u> - Cast-in-Place Concrete. |
| | | .2 | Concrete to be minimum 20 MPa. |
| 2.9 | Granular Pipe Bedding and Surround Material | .1 | As shown on Contract Drawings. |
| | | .2 | Refer to <u>Section 31 05 17</u> - Aggregates and Granular Materials for material specifications. |
| 2.10 | Backfill Material | .1 | As shown on Contract Drawings. |
| | | .2 | Refer to <u>Section 31 05 17</u> - Aggregates and Granular Materials for material specifications. |
| 3.0 | EXECUTION | | |
| 3.1 | General | .1 | Pipe bedding details, including granular surround (pipe cushion) and material specifications to be as shown on Contract Drawings, including Standard Detail Drawing <u>G4</u> . |
| 3.2 | Preparation | .1 | Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site. |
| 3.3 | Trenching | .1 | Do trenching in accordance with <u>Section 31 23 01</u> - Excavating, Trenching and Backfilling. |
| | | .2 | Trench alignment and depth as shown on Contract Drawings. |
| 3.4 | Concrete Bedding and Encasement | .1 | Do concrete work to <u>Section 03 30 53</u> - Cast-in-Place Concrete. Place concrete to details as shown on Contract Drawings. |
| | | .2 | Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed. |
| | | .3 | Do not backfill over concrete within 24 h after placing. |
| 3.5 | Granular Bedding | .1 | Fill over-excavation below design elevation of bottom of specified bedding with granular bedding placed and compacted in accordance with 3.5.2 and 3.5.5 of this Section. Drain rock may be used for backfill of over-excavation only with Contract Administrator's approval. |

- .2 Place granular bedding material across full width of trench bottom in uniform layers not exceeding 150 mm compacted thickness to depth as shown on Contract Drawings.
- .3 Shape bed true to grade to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to minimum 95% Modified Proctor Density in compliance with ASTM D1557. (All following references to density imply in compliance with ASTM D1557).
- .6 For Spiral Rib Pipe, shape bedding to fit lower segment of corrugated pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding.

3.6 Pipe Installation

- .1 Handle pipe in accordance with manufacturer's recommendations. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends.
- .2 Lay and join pipes to manufacturer's instructions and specifications except as noted otherwise herein. Concrete pipe as specified herein, PVC pipe and open profile HDPE pipe to CSA B182.11, Steel Spiral Rib Pipe to CAN3-G401 and in general compliance with Section 33.42.13 Pipe Culverts.

- .3 Install Pipes to the following tolerances:

Horizontal tolerances: plus or minus 50 mm from specified alignment;

Vertical tolerances: plus or minus 10 mm from specified grade. Reverse grade is not acceptable.

(Refer to Clause 3.13.5 for acceptable post installation ponding tolerances)

- .4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .5 Commence laying at outlet and proceed in upstream direction with bell ends of pipe facing upgrade.
- .6 Pipes on curved alignments:
 - .1 For Concrete, PVC, profile PVC and open profile HDPE pipe do not exceed permissible joint deflection recommended by pipe manufacturer.
 - .2 Smooth profile PVC pipe: for 100 mm to 300 mm sizes conform to required curvature by bending pipe barrel. In no case is radius of curvature to be less than 300 times outside diameter of the barrel.
 - .3 Spiral Rib Pipe: Conform to required curvature by bending pipe barrel in accordance with manufacturer recommendations. In no case is radius of curvature to be less than 45m for pipes greater than 450mm in diameter. Deflection at the coupler not permitted.
- .7 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Whenever work is stopped, install removable watertight bulkhead at open end of last pipe laid to prevent entry of water and foreign materials.

- .8 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe and leave smooth end at right angles to axis of pipe.
- .9 Joints:
 - .1 Install gaskets as recommended by manufacturer on all pipe unless specified otherwise in Supplementary Specifications.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes carefully before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise specified.
- .11 When any stoppage of work occurs, restrain pipes in an approved manner to prevent "creep" during down time.
- .12 Plug lifting holes with approved prefabricated plugs, to pipe suppliers recommendations for sealing methods.
- .13 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available. Core neat circular holes in walls of existing manholes. Do not hammer or chip except as approved by Contract Administrator.

3.7 Pipe Surround

- .1 Upon completion of pipe laying and after Contract Administrator has inspected work in place, surround and cover pipes as shown on Contract Drawings.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness simultaneously on both sides. Do not dump material within 1 m of pipe.
- .3 Compact each layer from pipe invert to underside of backfill to minimum 95% Modified Proctor Density.

3.8 Connections to Existing Mainline Pipes

- .1 Use prefabricated saddles or approved field connection materials and techniques to connect service pipes to existing mainline sewer pipes. Ensure joint structurally sound and watertight without encroachment into inner circle of mainline sewer pipe.

- .2 Where feasible, make connections to existing non-reinforced or reinforced concrete mainline pipe by coring or sawing circular holes in existing pipe walls. Where not feasible, make as follows:
 - .1 Break in to pipe by drilling small diameter holes, spaced at approximately 50 mm along pipe axis, using a drill or chipping gun. Use hammer to strike concrete adjacent to centre holes to create small core, and similarly expand core dimensions of stub.
 - .2 Core dimensions to allow maximum 20 mm clearance around stub at any point.
 - .3 Trim stub to conform closely to shape of pipe interior when installed.
 - .4 Insert stub into core, ensuring that no portion of stub protrudes beyond interior of pipe.
 - .5 Prepare non-shrink, fast-setting cementitious grout to "dry pack" consistency. Pack grout tightly into void between stub and pipe.
 - .6 Hand finish interior and exterior grout surfaces to smooth surface.
 - .7 Allow sufficient time for strength development of grout prior to installation of connecting pipe or trench backfill.
- .3 For new connections to existing PVC mainline sewers, drill hole in mainline to exact dimension of new connection. Use saddle or insertable tee for connections more than two sizes smaller than mainline. Insertable tee may be used for all types of gravity mains provided Insertable tee designed for applicable pipe thickness is used.
- .4 For new connections to existing PVC pipe or open profile HDPE pipe mainline sewers use preformed tee or wye fitting when connection is up to two sizes smaller than mainline pipe. For these pipes, in-situ installation of tees or wyes involving cutting across pipe ribs not permitted. For connections more than two sizes smaller than mainline pipe, an insertable tee for PVC pipe or open profile HDPE pipe is permitted. When insertable tee is used, hole cut into mainline pipe to cut as few ribs as possible.

3.9 Backfill

- .1 Place and compact backfill material in accordance with Section 31.23.01 - Excavating, Trenching and Backfilling.
- .2 Backfill requirements, including type of material and compaction requirements, as shown on Contract Drawings, including Standard Detail Drawing G4.

3.10 Service Connection Installation

- .1 Install service connections to 3.6 and as shown on Standard Detail Drawing S8.
- .2 Install 40 x 90 mm marker stake at service terminus. Paint and mark as shown on Standard Detail Drawing S8.
- .3 Where specified, install inspection chamber at specified location, set plumb and to specified elevation as shown on Standard Detail Drawing S7 or Drawing S10 as applicable. If inspection chamber located in driveway, lane or paved surface install cover or lid as shown on Standard Detail Drawing S9 or Drawing S10 as applicable.
- .4 Sawcut adjacent curb on alignment of service connection and paint green.

- 3.11 Cleaning and Flushing**
- .1 Flush completed storm sewer per Section 33.01.30.2 - Cleaning of Sewers. Before flushing and testing, ensure sewer system is completely finished and make arrangements with Contract Administrator for scheduling of testing.
 - .2 Water may be supplied from Municipal fire hydrants upon application for a Hydrant Use Permit.
 - .3 Obtain municipal approval prior to discharging flushing water to municipal sewers or drainage ditches.
 - .4 Comply with General Conditions, Clause 20.4, Environmental Laws, in regard to discharge of flushing water.
 - .5 Provide Contract Administrator with all required approvals prior to discharging flushing water.
 - .6 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water sources. Continue flushing at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.
- 3.12 Inspection and Testing**
- .1 Video Inspection of completed storm sewers under 900 mm in diameter following completion of installation per Section 33.01.30.1 - CCTV Inspection of Pipelines.
 - .2 Should video inspection indicate apparent deficiencies, Contract Administrator may direct Contractor to perform additional testing as follows.
 - .3 Additional testing may include passing rubber ball, mandrel or test plug having a minimum dimension of 95% of base inside diameter of sewer pipe completely through pipes and appurtenances. A light test may be performed in lieu of ball test at discretion of Contract Administrator.
- 3.13 Installation Standard**
- .1 Repair all deficiencies and visible leaks.
 - .2 Repair procedures and materials subject to approval of Contract Administrator.
 - .3 Contract Administrator reserves right to require Contractor to replace defective installations at Contractor's sole cost.
 - .4 Test procedures, including video inspection, to be repeated and repairs made until satisfactory results are obtained.
 - .5 Acceptable Ponding:
 - .1 Connections: 10mm maximum ponding over 4m length of pipeline.
 - .2 Mainline Plastic sewers:
 - .1 300mm diameter or less: 20mm maximum ponding over 4m length of pipeline
 - .2 Greater than 300mm diameter: 30mm ponding over 4m length of pipeline.
 - .3 Mainline Concrete sewers:
 - .1 300mm diameter or less: 20mm maximum ponding over a 5m length of pipeline

- .2 Greater than 300mm diameter: 30mm maximum ponding over a 5m length of pipeline.
- 3.14 Connections to Existing Mains**
- .1 Make connections to existing storm sewer systems unless shown otherwise on Contract Drawings. Notify Contract Administrator minimum 48 h in advance of scheduled connection.
 - .2 Make connection in presence of Contract Administrator. To prevent damage to existing utilities, excavate last 300 mm over utility by hand.
- 3.15 Perforated Drain Pipe**
- .1 Where shown on Contract Drawings or where directed by Contract Administrator install perforated drain pipe adjacent to sidewalk or curb and gutter.
 - .2 Drain pipe to be 100 mm minimum.
 - .3 Connect to catchbasins.
 - .4 Install other perforated drain pipes as shown on Contract Drawings.
 - .5 Install sweep bend and cap at ground grade at upstream end of run.
 - .6 Install with perforations downward.

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END OF SECTION 33 40 01

MANHOLES AND CATCHBASINS

- 1.0 GENERAL**
- .1 Section 33 44 01 refers to those portions of the work that are unique to the supply and installation of manholes, cleanouts, catchbasins, storm sewer endwalls, lawn drains and related appurtenances. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- 1.1 Related Work**
- .1 Excavating, Trenching and Backfilling Section 31 23 01
- .2 Storm Sewers Section 33 40 01
- .3 Sanitary Sewers Section 33 30 01
- .4 Concrete Reinforcement Section 03 20 01
- .5 Cast-in-Place Concrete Section 03 30 53
- 1.2 References**
- .1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.
- 1.3 Samples**
- .1 Samples may be required.
- 1.4 Material Certification**
- .1 Products having CSA certification to be used where readily available. Product to be certified to CSA standard(s) by an approved independent third party certification body accredited by the Standards Council of Canada and that is acceptable to the Contract Administrator. Products to be marked with certification body logo and CSA standard markings.
- .2 At least 14 days prior to commencing work, submit to the Contract Administrator the manufacturer's recent test data and certification that materials to be incorporated into works are representative and meet requirements of this section. Include manufacturer's drawings where pertinent.
- 1.5 Measurement and Payment**
- .1 Payment for manholes will be made by items or components installed for each type and size as shown on Contract Drawings and specified in Schedule of Quantities and Prices. No payment will be made for excavation and all other associated work required to accommodate manhole in the new sewer system constructed under this Contract for which manhole forms a part.
- .1 Payment for manhole base, lid, slab, frame and cover includes all components shown on Standard Detail Drawings for manholes except riser. Payment includes dewatering, base preparation, all in-situ concrete work.
- .2 Payment for manhole riser sections will be for risers of standard or non-standard heights required to complete manhole from specified invert to finishing level. Payment includes all risers and necessary work for installing risers as shown on e Standard Detail Drawings. Measurement will be made vertically for the length of risers required from the top of the manhole base or tee section to reach the underside of concrete lid or slab.

MANHOLES AND CATCHBASINS

- .3 Payment for precast manhole tee for "Tee" manhole on large sewers will be for additional cost of providing a special mainline pipe section with a tee opening ready to receive the first standard manhole riser including rungs within tee as shown on Standard Detail Drawing S5. Payment for installation of precast tee section will be deemed as sewer installation with no other additional payment.
- Payments for lid, slab, frame and cover and riser sections to complete "Tee" manhole will be made under 1.5.1.1 & 2 of this Section.
- Measurement will be for each unit of precast tee of specified tee and pipe diameters required and installed.
- .4 Payment for re-benching existing manholes includes all the materials and work including dewatering and temporary water diversion to enable re-benching the existing manholes to change the direction or pattern of flows.
- .5 Additional payment for drop or ramp type manhole connections as shown on Standard Detail Drawings S3 and S4 including re-benching will be made for each drop or ramp type manhole connection as shown on the Contract Drawing.
- .6 Payment for constructing additional manholes onto existing sewer system will be made under appropriate items in this Section including all excavation, dewatering, breaking into existing system, disposal of surplus excavated material, supply of all components, cast-in-place concrete, pipe, fittings and related materials, bedding, imported or native backfill as shown on Contract Drawings, cleaning, testing where applicable, surface restoration and all other work and materials necessary to complete the installation.
- .2 Payment for catchbasins, lawn drains, cleanouts, and inspection chambers will be for each type, size and depth range constructed to details shown on Standard Detail Drawings as applicable under respective payment items. Payment includes excavation, disposal of surplus excavated material, supply of all units, cast-in-place concrete, pipes, fittings and related materials, bedding, imported or native backfill as shown on Contract Drawings, cleaning, testing where applicable, surface restoration and all other work and materials necessary to complete the installation as shown on Contract Drawings and specified herein.
- .3 Payment for adjustment of tops of existing catchbasins, lawn drains, cleanouts, and inspection chambers will only be made for adjustments not related to paving work under Section 32.12.16 - Hot-Mix Asphalt Concrete Pavement and 32.13.13 - Portland Cement Concrete Pavement.
- .4 Payment for removal of existing catchbasins, lawn drains, cleanouts, and inspection chambers includes excavation, backfilling and, where applicable, temporary and permanent paving surface restoration.
- .5 Payment for concrete bedding, encasement, backfill, or controlled density fill, where shown on Contract Drawings or directed by Contract Administrator, will be additional to items described above. No payment will be made for concrete bedding, encasement, backfill, or controlled density fill required as a result of unauthorized excavation beyond neat lines or limits of excavation shown on Contract Drawings or Standard Detail Drawing G4.
Payment will be based on volume calculated from actual measurement of dimensions of components constructed as detailed in Contract Drawing.

- .6 Payment for asphalt apron around catchbasin includes the preparation of base, supplying, hand forming and compacting asphalt around the catchbasin to channel the surrounding flow into the catchbasin, all to details as shown on Contract Drawings.

- 1.6 **Inspection and Testing** .1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 Materials

- .1 Concrete: To Section 03 30 53 - Cast-in-Place Concrete.
- .2 Concrete to be minimum 20 MPa or as specified otherwise on Contract Drawings.
- .3 Concrete reinforcement: to Section 03 20 01 - Concrete Reinforcement.
- .4 Precast manhole sections: to be precast reinforced concrete to ASTM C478M complete with ladder rungs.
- .5 Precast "Tee" Sections: precast "Tee" sections constructed as an integral component of mainline pipe will be acceptable where shown on Contract Drawings as an approved alternative.
- .6 Manhole lids manufactured from precast reinforced concrete or PVC shall be designed to withstand H20 loading.
- .7 Cast iron frame and cover: as shown on Standard Detail Drawing S1 and as specified in Municipal Supplementary Specifications.
 - .1 Frame and cover must conform to ASTM A48 and be designed to withstand H20 loading.
 - .2 Frame and cover must bear manufacturer identification on castings
- .8 Ladder rungs to be:
 - .1 As shown on Standard Detail Drawing S1.
 - .2 To conform to ASTM C497, ASTM C478M load test.
 - .3 20 mm cold rolled steel, hot dipped after bending to CSA G164, welded to reinforcing bars and cast with manhole sections or epoxy grouted into manhole walls.
 - .4 20 mm aluminum alloy #6351-T6 (CSA S157 and NBC 1977), complete with polyethylene anchor insulating sleeves and installed in 25 mm or 26 mm precast or drilled holes in manhole sections.
 - .5 Polypropylene encased steel ladder rungs: polypropylene ASTM D4101 steel core to be ½ inch dia grade 60 as per ASTM A615M.
 - .6 Distance from top of manhole cover to top rung to be maximum 500 mm where no handhold provided. Maximum distance may be extended to 660 mm where handhold provided.
 - .7 In compliance with all requirements of Worksafe BC.
- .9 Safety platform: to be installed as shown on Contract Drawings in all manholes in excess of 6 m deep.

- .10 Precast catchbasin sections:
 - .1 As shown on Standard Detail Drawing S11.
 - .2 To be precast reinforced concrete to ASTM C478M.
- .11 Catchbasin leads to be minimum 150 mm diameter and of PVC DR35.
- .12 Catchbasin lids: to be designed to withstand H20 loading.
- .13 Cast iron catchbasin frame and grate: as shown on Standard Detail Drawing S11 or as specified otherwise in Supplementary Specifications.
 - .1 Frame and grate must conform to ASTM A48 and be designed to withstand H20 loading.
 - .2 Frame and grate must bear manufacturers identification on casting.
- .14 Joints: make watertight using cement mortar or rubber gaskets to ASTM C443M.
- .15 Mortar:
 - .1 Aggregate: to CSA A82.56.
 - .2 Cement: to CAN/CSA-A8.
- .16 Adjusting rings manufactured to:
 - .1 Concrete to ASTM C478M
 - .2 HDPE to ASTM D1248
- .17 Concrete Brick: to CAN3-A165 Series.
- .18 Drop manhole pipe: to be as shown on Contract Drawings.
- .19 Lawn drains to be: As shown on Standard Detail Drawing S12.
- .20 Concrete bags to be: Jute, burlap or synthetic bag of suitable size and texture filled to 2/3 capacity with mixture of 1 part Portland cement to 2 parts sand, thoroughly mixed, and weighing approximately 27 kg.
- .21 Concrete blocks: to be H type concrete construction blocks conforming to latest ASTM specifications.
- .22 Prebenched manhole bases:
 - .1 Where precast manhole sections are incorporated into precast base by bonding to concrete benching, use precast reinforced concrete manhole sections to ASTM C478M complete with ladder rungs above benching.
 - .2 Where base benching is cast monolithically with manhole walls, reinforce wall and joint sections as specified in ASTM C478M.
 - .3 Precast concrete base section minimum thickness to be 120 mm, measured from underside of base to lowest point in concrete channelling.
- .23 Pre-fabricated Corrugated Steel Pipe Manholes may be used with installation of Corrugated Steel Storm Sewers. Pre-fabricated Corrugated Steel Pipe Manholes to be as shown on the Contract Drawings and in accordance with the manufacturers specifications.

3.0 EXECUTION

- 3.1 Excavation and Backfill** .1 Excavate and backfill in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.
- 3.2 Concrete Work** .1 Place concrete reinforcement in accordance with Section 03 20 01 - Concrete Reinforcement.
.2 Do concrete work in accordance with Section 03 30 53 - Cast-in-Place Concrete.
- 3.3 Manhole Installation** .1 Install manholes as shown on Standard Detail Drawings, concurrently with pipe laying.
.2 Ensure excavation free of water prior to placing concrete.
.3 Place minimum 100 mm of 25 mm bedding gravel compacted to minimum 95% Modified Proctor density in compliance with ASTM D1557.
.4 Construct base to ensure first precast riser section is set plumb.
.5 Set all inlet and outlet pipes to specified alignments and elevations.
.6 Connect concrete pipe into manhole using spigot or bell precast into manhole wall or, alternatively, grout pipe into pre-formed rough core in manhole wall using fast-setting grout.
.7 Connect PVC pipe into manhole using "manhole adapter ring" or approved equal.
.8 Ensure placement of concrete does not disturb connecting pipes.
.9 Set remaining precast riser sections plumb with joints consisting of cement mortar or gaskets to ASTM C443M.
.10 Where possible, form channelling using half-sections of pipe or suitable fittings. Bench to direct flow parallel to main flow of sewer. Form top of benching as high as crown of sewer pipe. Finish concrete to smooth surface using steel trowel.
.11 Brace capped inlets or stubs to withstand testing head.
.12 Installation of Masonry & Cementitious Riser Rings:
.1 Allowable number of courses is three and minimum is one.
.2 Allowable products is; bricks, precast concrete risers, and cast-in-place form system
.3 Due regard must be observed to the maximum distance to the first step.
.4 Pre-wet all joints before placing Mortar.
.5 Butter inside and outside faces of brick with mortar to ensure neat even grout.
.6 Grout inside, outside and between courses or grade rings with mortar to ensure neat even finish.

- .13 Installation of interlocking High Density Polyethylene Manhole Adjustment Riser Rings.
 - .1 Insure base has a flat seating area, remove all protrusions.
 - .2 Dry stack (without sealant) necessary flat and bevelled rings to provide necessary grade and cross fall with casting.
 - .3 Apply a vertical strip of paint to allow identical reassembly, after disassembling casting and rings.
 - .4 Apply a 12mm bead of approved sealant to the underside circumference of the ring against the male lip. A second bead is required for the base ring and may be applied directly to the concrete base.
 - .5 Continue with step 4 until all adjustment rings are sealed together.
 - .6 Also place sealant on the top of the last ring prior to installing the casting
 - .7 Provide a dry mix around the stack, protecting the rings from contact with hot asphalt.
 - .8 Approved sealants as per the manufacturer, conforming to ASTM D1850.
- .14 Plug lifting holes in pipe.
- .15 Install drop structures where required to Standard Detail Drawings S3 and S4.
- .16 Paint manhole covers if specified in Supplementary Specifications.
- .17 Ensure frames conform to design contour of pavement or existing surface.
- .18 Pre-fabricated Corrugated Steel Pipe Manholes to be installed as shown on the Contract Drawings and to manufacturers specifications.
- 3.4 Cleanout Installaton**
 - .1 Install cleanouts as shown on Standard Detail Drawing S6 to standards and installation procedures described in 3.3 of this Section
- 3.5 Catchbasin Installation**
 - .1 Install catchbasins as shown on Standard Detail Drawing S11, to general standards and installation procedures described in 3.3 of this Section.
 - .2 Place minimum of 100 mm bedding gravel under base, compact to 95% Modified Proctor density.
 - .3 Install catchbasin leads in accordance with Section 33.40.01 – Storm Sewers.
- 3.6 Lawn Drain Installation**
 - .1 Install lawn drains as shown on Standard Detail Drawing S12.
- 3.7 Endwall Installation**
 - .1 Install concrete block endwalls as shown on Standard Detail Drawing S14 using H type concrete construction blocks.
 - .2 Install reinforced concrete endwalls as shown on Standard Detail Drawing S13 or as shown otherwise on Contract Drawings and in accordance with Section 03.20.01 - Concrete Reinforcement and Section 03.30.53 - Cast-in-Place Concrete.
 - .3 Precast concrete endwalls may be installed where shown on Contract Drawings as an approved alternative.

- | | | | |
|-------------|---|----|--|
| 3.8 | Grillage Trash Screens | .1 | Where specified, install grillage trash screens as shown on Standard Detail Drawing <u>S13</u> . |
| 3.9 | Adjusting Tops of Existing Units | .1 | Remove existing gratings, frames and store for re-use at locations specified in Supplementary Specifications. |
| | | .2 | Precast units: <ul style="list-style-type: none">.1 Raise or lower precast units by adding or removing precast sections as required..2 When amount of raise is less than 300 mm use standard manhole bricks, precast riser rings or cast-in-place form system. |
| | | .3 | Cast-in-Place units: <ul style="list-style-type: none">.1 Raise cast-in-place units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete..2 Lower cast-in-place units with straight wall by removing concrete to elevation indicated for rebuilding..3 Install additional manhole ladder rungs in adjusted portion of units as required..4 Re-use existing gratings, frames. |
| | | .4 | Re-set gratings and frames to required elevation on not more than 3 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth. |
| | | .5 | Ensure adjustments conform to requirements regarding distance to first step. |
| 3.10 | Remove Existing Units | .1 | Remove existing structures where shown on Contract Drawings. Backfill in accordance with <u>Section 31.23.01</u> - Excavating, Trenching and Backfilling. |
| 3.11 | Leakage Test | .1 | Perform leakage testing of sanitary manholes in accordance with <u>Section 33.30.01</u> - Sanitary Sewers. |

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END OF SECTION 33 44 01

1.0 GENERAL

1.0.1 Section 31 23 01 refers to those portions of the work that are unique to excavating, trenching and backfilling of underground utility installations and related structures. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein. This section shall also refer to installation of pipe and conduit installed for telephone and cable television, gas and electrical services.

1.1 Related Work

1.1.1 Environmental Protection Section 01 57 01

1.1.2 Aggregates and Granular Materials Section 31 05 17

1.1.3 Rock Removal Section 31 23 17

1.1.4 Controlled Density Fill Section 31 23 23

1.1.5 Topsoil and Finish Grading Section 32 91 21

1.1.6 Waterworks Section 33 11 01

1.1.7 Sanitary Sewers Section 33 30 01

1.1.8 Sewage Forcemains Section 33 34 01

1.1.9 Storm Sewers Section 33 40 01

1.1.10 Pipe Culverts Section 33 42 13

1.1.11 Manholes and Catchbasins Section 33 44 01

1.2 References

1.2.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

1.3 Definitions

1.3.1 Rock Excavation: As defined in Section 31 23 17 - Rock Removal.

1.3.2 Common Excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan, partially cemented materials, clay or frozen materials which can be ripped and excavated with heavy construction equipment.

1.3.3 Over-excavation: excavation below design elevation of bottom of specified bedding, and including backfilling of resultant excavation with specified material, as authorized by Contract Administrator.

1.3.4 Removals: removal and disposal at an approved location off-site of surface concrete structures and walks, curbs, gutters, manholes, catchbasins, pipes, culverts, endwalls, and any other structures on surface or underground specifically designated on Contract Drawings for removal. Removals to include backfilling of resultant excavation with specified material.

1.3.5 Native Topsoil: to Section 32 91 21 - Topsoil and Finish Grading.

- 1.4 **Protection of Work Property and Public** 1.4.1 Comply with General Conditions, Clause 4.3, Protection of Work, Property and the Public.
- 1.5 **Safety Requirements** 1.5.1 Comply with General Conditions, Clause 4.2, Safety.
1.5.2 Design and install trench shoring in accordance with the regulations of the WorkSafe BC.
- 1.6 **Blasting** 1.6.1 Ensure all blasting operations comply with Section 31 23 17 - Rock Removal.
- 1.7 **Disposal** 1.7.1 Dispose of all surplus spoil from excavations on-site and/or off-site as shown on Contract Drawings or as specified in Contract Documents. Suitability of excavated material for use as native bedding or trench backfill will be governed by 2.0 of this Section. Dumping of spoil on private property will be permitted only upon written approval from property owner and provided all necessary permits and approvals have been obtained.
- 1.8 **Limitations of Open Trench** 1.8.1 Excavate trenches only as far in advance of pipe laying operation as safety, traffic, and weather conditions permit and, in no case, to exceed 30 m. Before stopping work on last day of work before each weekend or holiday, completely backfill every trench. If circumstances do not permit complete backfilling of all trenches, adequately protect all open trenches or excavations with approved fencing or barricades and, where required, with flashing lights.
- 1.9 **Permits and Approvals** 1.9.1 Comply with General Conditions, Clause 20, Laws, Notices, Permits and Fees.
- 1.10 **Measurement and Payment** 1.10.1 With the exception of pay items specifically identified hereunder, payment for all other work performed under this Section will be included under payment for work involved in trenchwork as described in other Sections.
1.10.2 Additional payment for trench excavation by hand will only be made in addition to the work items involving trenchwork where excavation by machinery is not practicable and only under prior approval by Contract Administrator. Payment will be based on before and after excavation cross-section areas at sufficient equal intervals over the length of trench so excavated.
1.10.3 Payment for over-excavation including backfilling will only be made for over-excavation authorized by Contract Administrator. Payment will be based on before and after excavation cross-section areas at sufficient equal intervals over the length of over-excavation.
1.10.4 Payment for removal and disposal of disused pipes and headwalls encountered during trench excavation to specific disposal site will be

in addition to trenchwork with no deduction of payment from such trenchwork. No payment will be made under this item for removal and disposal carried out as part of the operation for removal and disposal of excavated materials from trenchwork.

- 1.10.5 All costs incurred as a result of unauthorized excavation beyond neat lines or limits of excavation shown on Contract Drawings or Standard Detail Drawings including remedial backfilling will be to Contractor's cost.
- 1.10.6 Measurement for excavation of new channels and ditches will be based on before and after excavation cross-section areas at sufficient equal intervals over the entire length of the channels or ditches.
- 1.10.7 Payment for cleaning and deepening of existing channel or ditch will be made separately for each location or over sections with generally similar cross sections before and after cleaning.
- 1.10.8 Payment for swales in boulevard or other locations as shown on Contract Drawings includes excavation, grading, addition and removal of native materials as required to form swales to suit local conditions and to provide proper drainage.

1.11 Inspection and Testing 1.11.1 Refer to General Conditions, Clause 4.12, Tests and Inspections.

2.0 PRODUCTS

- 2.1 General 2.1.1 Unless shown otherwise on Contract Drawings the materials specified in 2.2 of this Section are approved for their respective uses.
- 2.2 Use of Specified Materials 2.2.1 Backfill for over-excavated trench or structure excavations to be one of the following:
 - (1) Granular pipe bedding and surround material.
 - (2) Pit run sand.
 - (3) Drain rock (only where approved by Contract Administrator).
 - (4) Recycled concrete and asphalt (RCA).
 - (5) Controlled density fill.
- 2.2.2 Pipe bedding and surround: see applicable Sections:
 - (1) Waterworks Section 33 11 01
 - (2) Storm Sewers Section 33 40 01
 - (3) Pipe Culverts Section 33 42 13
 - (4) Sanitary Sewers Section 33 30 01

(5) Sewage Forcemains Section 33 34 01

(6) Roadway Lighting Section 26 56 01

2.2.3 Trench and excavation backfill to be one of the following:

(1) Approved native material.

(2) Pit run gravel.

(3) Pit run sand.

(4) Controlled density fill.

2.2.4 Surface treatment to be:

(1) Restoration to match existing conditions.

(2) Subgrade, subbase and base for works described in other Sections.

(3) Topsoil, grass, sod or requirements for landscaping works described in other Sections.

2.3 Materials

2.3.1 Refer to Section 31 05 17- Aggregates and Granular Materials for specifications for approved granular materials and approved native material.

2.3.2 Other granular materials: granular materials approved for roadwork (subbase, base,) also acceptable for trench backfill subject to approval of Contract Administrator.

2.3.3 Concrete: to Section 03 30 53 – Cast-In-Place Concrete, to be minimum 20 MPa.

2.3.4 Controlled Density Fill: to Section 31 23 23 – Controlled Density Fill, to be maximum 0.5 MPa.

3.0 EXECUTION

3.1 Site Preparation

3.1.1 Remove all brush, weeds, grasses and accumulated debris to an approved offsite location.

3.1.2 Cut pavement or sidewalk neatly along limits of proposed excavation as shown on Standard Detail Drawing G4 in order that surface may break evenly and cleanly. Cut beyond limits shown only if authorized by Contract Administrator.

3.1.3 Where trench passes through lawn, neatly cut and remove sod before trench excavation. Save sod for replacement upon backfilling trench.

3.1.4 Strip topsoil after area has been cleared and stockpile in locations as shown on Contract Drawings. Stockpile height not to exceed 2 m. Avoid mixing topsoil with subsoil. Dispose of unused topsoil as

specified. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

3.2 Stockpiling

3.2.1 Stockpile fill materials in areas designated by Contract Administrator. Stockpile granular materials in manner to prevent segregation.

3.3 Excavation

3.3.1 Connection to existing mains:

- (1) Prior to or at commencement of construction, check existing main for line and elevation at point of connection. If found different from Contract Drawings report such difference to Contract Administrator immediately. Comply with General Conditions, Clause 4.5, Errors, Inconsistencies or Omissions in the Contract Documents.
- (2) Connections to existing waterworks systems to be made by Municipal crews unless shown otherwise on Contract Drawings. Make all necessary arrangements with Contract Administrator to schedule work to prevent construction delays.
- (3) Connections to existing sanitary and storm sewer systems to be made by Contractor unless shown otherwise on Contract Drawings. Notify Contract Administrator minimum 48h in advance of scheduled connection. Make connection in presence of Contract Administrator.
- (4) To prevent damage to existing utilities, excavate last 300 mm over utility by hand.

3.3.2 Surface drainage:

- (1) Provide suitable temporary ditches or other approved means of handling drainage prior to excavation and during construction to protect construction area and adjacent and other affected properties. Provide siltation controls to protect natural watercourses or existing municipal drainage facilities.
- (2) Comply with Section 01 57 01 - Environmental Protection.

3.3.3 Excavation to grade: excavate trenches to allow pipe to be laid to alignment and grades required with allowance for specified pipe bedding.

3.3.4 Excavation below grade: when bottom of excavated trench at subgrade is unstable and in opinion of Contract Administrator, cannot adequately support pipe, install pipe using concrete bedding as shown on Contract Drawings or over-excavate trench to suitable subgrade or as directed by Contract Administrator. Backfill over-excavation with specified materials and compact to minimum 95% Modified Proctor density in compliance with ASTM D1557. Use drain rock backfill only if authorized by Contract Administrator.

3.3.5 Trench width: excavate trench to section and dimensions shown on Standard Detail Drawing G4. If width exceeds maximum allowable, Contractor may be required to demonstrate that specified pipe is still

- adequate or provide pipe with approved higher strength class or provide approved higher class of bedding. All additional requirements as a result of excessive trench width to be to Contractor's cost.
- 3.3.6 Hand excavation: excavate by hand if necessary, to preserve or minimize damage to existing trees, shrubs, buildings and all similar existing features or facilities.
- 3.3.7 Trench bottom conditions: remove disturbed or softened material from trench bottom before placing bedding material. Maintain trench free from water and soft materials during placement of pipe bedding, pipe installation and trench backfill to ensure proper compaction of granular materials.
- 3.3.8 Trench drainage:
- (1) During pipe laying, jointing, bedding and backfilling, keep trench free of water by pumping or other appropriate means. Provide pumps and dewatering equipment and take precautions to prevent any damage to adjoining buildings, structures, roads or land from prolonged or excessive pumping by installing shoring, sheeting or other supportive measures. Discharge water from excavations in such a manner as not to cause nuisance, injury, loss or damage. Contractor to be responsible for any claims or actions arising from such discharge of water.
 - (2) Keep bell holes free from water during jointing. Diverting trench water through newly laid system not allowed, unless authorized by Contract Administrator.
- 3.3.9 Disposal of surplus soil: dispose of surplus excavated soil off-site. Side-casting not allowed in restricted areas where, in opinion of Contract Administrator, side-casting would create interference with flow of traffic. In such case, temporarily store materials or dispose to an approved site. Provisions of Provincial Contaminated Sites Legislation must be met prior to disposal of soil offsite.
- 3.3.10 Native Backfill: Where native backfill is approved for re-use, and side-casting not allowed, transport approved material to other locations where material is required or temporarily store at approved site. Protect stored material from contamination, segregation and weather.
- 3.3.11 Rock Excavation: Rock excavation to Section 31 23 17 - Rock Removal.
- 3.3.12 Maintain roads used for transporting materials and equipment in clean condition. Clean, flush and/or sweep on daily basis and more frequently if directed by Contract Administrator.

3.4 Pipe Installation

- 3.4.1 Related work: Pipe installation, including bedding, pipe laying, and granular surround to be in accordance with following sections:
- (1) Waterworks Section 33 11 01
 - (2) Storm Sewers Section 33 40 01
 - (3) Pipe Culverts Section 33 42 13
 - (4) Manholes and Catchbasins Section 33 44 01
 - (5) Sanitary Sewers Section 33 30 01
 - (6) Sewage Force mains Section 33 34 01
- 3.4.2 Concrete encasement or protection: where specified or required by Contract Administrator provide concrete encasement of pipe or slab protection as shown on Standard Detail Drawings G6 and G7. Do not place backfill material until concrete has taken its initial set and in no case less than 1 h.
- 3.4.3 Anchor blocks: where specified or required by Contract Administrator provide anchor blocks as shown on Standard Detail Drawing G8. Ensure all concrete anchor blocks at least 150 mm into undisturbed ground on bottom and sides of trench. Concrete strength as specified on Standard Detail Drawing G8.

3.5 Backfill and Compaction

- 3.5.1 General: Place backfill carefully in trench to prevent damage to installed pipe.
- 3.5.2 Shoring: during backfill and compaction of trench, remove shoring in such a manner as to allow proper compaction and to prevent trench walls from collapsing. Remove all bracing and/or shoring from trench.
- 3.5.3 Backfill Materials:
- (1) Boulevards and easements: for trenches in boulevards, easements or other areas not subjected to vehicle loading, and outside of ditch lines, backfill with approved native material except as shown otherwise on Contract Drawings.
 - (2) Roads, driveways and shoulders: for trenches in paved or gravelled roads, driveways, shoulders or other areas subjected to vehicle loading, backfill with imported granular material or approved native material as specified on Contract Drawings.
 - (3) Road shoulder is that portion of right-of-way between travelled portion of road, either paved or gravelled, and road ditch. Where no ditch exists, ensure shoulder width minimum of 1.5 m.
 - (4) Ditches: backfill with imported granular material or approved native material as specified on Contract Drawings.

- (5) Contract Administrator may permit native material for all above uses subject to suitability of native material for said use. Native material approved for re-use to be handled, stockpiled and compacted using construction method appropriate for given moisture content and weather conditions.
- (6) Controlled Density Fill: Place controlled density fill in accordance with Section 31 23 23 - Controlled Density Fill.

3.5.4 Compaction: place backfill and compact to following Modified Proctor densities in compliance with ASTM D1557. (All following references to density imply compliance with ASTM D1557).

- (1) Boulevards and easements to minimum 90%.
- (2) Roads, driveways, shoulders, re-shaped ditches and sidewalks to minimum 95%.
- (3) Use caution in pipe zone to ensure no damage to pipe.

3.6 Surface Restoration

3.6.1 General:

- (1) Restore all disturbed surfaces to condition at least equal to that which existed prior to construction.
- (2) Make good any damage to adjacent lands or improvements.
- (3) Resolve all reasonable claims arising from Contractor's actions and obtain written releases from land owners following final restoration.

3.6.2 Boulevards and easements:

- (1) Restore surface to minimum 100 mm depth.
- (2) Restore unimproved surfaces with material equal to that removed at surface.
- (3) Restore gardens with approved topsoil or bark mulch to match existing conditions.
- (4) Restore lawns with approved topsoil and seed or sod to match existing lawn.
- (5) Restore gravel surfaces with matching granular materials.
- (6) Complete final restoration immediately upon completion of trench backfilling.

3.6.3 Gravelled roads and driveways:

- (1) Restore surface with minimum 75 mm to 100 mm thick lift of 19 mm granular road base material.
- (2) Compact to minimum 95% Modified Proctor density.
- (3) Complete final restoration immediately upon completion of trench backfilling.

3.6.4 Ditches:

- (1) Re-shape ditches to specified lines, grades and sections and restore surface with minimum 300 mm of specified material to ensure stability of ditch slopes and bottom.
- (2) Compact to minimum 95% Modified Proctor density.
- (3) Complete final restoration immediately upon completion of trench backfilling.

3.6.5 Base preparation for paved surfaces:

- (1) Paved surfaces to include all paved roads, driveways, sidewalks and parking areas.
- (2) If native material used for backfill provide specified depth of subbase as shown on Contract Drawings.

3.6.6 Temporary pavement patching:

- (1) Patch arterial and collector roads same day excavation made.
- (2) Patch all other roads within 24 h of closing trench.
- (3) Patching material to be hot-mix asphalt on all roads unless specified otherwise, cold-mix may be used only where directed by Contract Administrator.
- (4) Place temporary pavement to 50 mm minimum thickness.
- (5) Maintain temporary patch to ensure safe and smooth conditions.

3.6.7 Permanent pavement restoration:

- (1) Install permanent pavement within 30 days of placement of temporary patch or sooner where directed by Contract Administrator.
- (2) Remove broken or cracked pavement as well as any paved areas showing settlement and dispose off-site.
- (3) Remove underlying granular road base material as required to permit placement of specified thickness of permanent pavement. Ensure remaining base meets specified thickness. Material and placement of road base to Section 32 11 23 – Granular Base.

- (4) Compact base to minimum 95% Modified Proctor density.
- (5) Restore pavement as detailed on Standard Detail Drawing G5. If thickness of existing pavement permits, grind 35 mm depth along edge of pavement. Dry if necessary and paint clean, dry edge with asphalt emulsion (tack coat).
- (6) Place and compact hot-mix pavement material to minimum thickness as shown on Standard Detail Drawing G5.
- (7) Material and placement of hot-mix pavement to Section 32 12 16 - Hot-Mix Asphalt Concrete Paving.
- (8) Restore surface to smooth condition and match with grade of adjacent pavement.
- (9) Where shown on Contract Drawings place hot-mix overlay over restored trench section and adjacent pavement to Section 32 12 16 - Hot-Mix Asphalt Concrete Paving.
- (10) Maintain restored pavements in complete repair during Maintenance Period. Effect repairs within 14 days from receipt of written notice from Contract Administrator or immediately if so directed by Contract Administrator if dangerous situation exists.

END OF SECTION 31 23 01

1.0 GENERAL

1.0.1 Section 31 05 17 refers to those portions of the work that are unique to the supply and processing of aggregates. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

1.1.1 Section 31 05 17 includes specifications for aggregates and granular materials referred to in the following sections:

- (1) Shrub and Tree Preservation Section 31 11 41
- (2) Excavating, Trenching and Backfilling Section 31 23 01
- (3) Roadway Excavation, Embankment And Compaction Section 31 24 13
- (4) Granular Subbase Section 32 11 16.1
- (5) Granular Base Section 32 11 23
- (6) Portland Cement Concrete Pavement Section 32 13 13
- (7) Unit Paving Section 32 14 01
- (8) Waterworks Section 33 11 01
- (9) Sanitary Sewers Section 33 30 01
- (10) Sewage Forcemains Section 33 34 01
- (11) Storm Sewers Section 33 40 01
- (12) Pipe Culverts Section 33 42 13

1.1.2 Section 31 05 17 does not include specifications for aggregates to be incorporated into controlled density fill, hot-mix asphalt concrete paving, pavement crack filling, ready-mixed concrete or granular materials for landscaping purposes. These specifications are specified as follows:

- (1) Controlled Density Fill Section 31 23 23
- (2) Hot-Mix Asphalt Concrete Paving Section 32 12 16
- (3) Pavement Crack Cleaning and Filling Prior to Overlay Section 32 01 17.7
- (4) Cast-in-Place Concrete Section 03 30 53
- (5) Topsoil and Finish Grading Section 32 91 21
- (6) Seeding Section 32 92 20
- (7) Hydraulic Seeding Section 32 92 19
- (8) Sodding Section 32 92 23
- (9) Planting of Trees, Shrubs and Ground Covers Section 32 93 01

- 1.2 References** 1.2.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.
- 1.3 Approvals** 1.3.1 Inform Contract Administrator of proposed source and provide samples or access for sampling at least 2 weeks prior to commencing production.
- 1.3.2 If materials from proposed source do not meet specified requirements, locate alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- 1.3.3 Should a change of material source be proposed during work, advise Contract Administrator 2 weeks in advance of proposed change to allow sampling and testing.
- 1.3.4 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.
- 1.4 Measurement and Payment** 1.4.1 Payment for all work performed under in this Section will be included under payment for work requiring aggregates and granular materials in other Sections unless specifically shown otherwise as separate pay items.
- 1.5 Inspection and Testing** 1.5.1 Refer to General Conditions, Clause 4.12, Tests and Inspections.

2.0 PRODUCTS

- 2.1 Materials - General** 2.1.1 Gravel to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five-year period for particular source of material, soundness to be tested according to ASTM C88/C88M or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.
- 2.1.2 All crushed gravel when tested according to ASTM C136/C136M and ASTM C117, or latest revised issue, to have a generally uniform gradation and conform to following gradation limits and 60% of the material passing each sieve must have one or more fractured faces. Determination of the amount of fractured material shall be in accordance with the Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "A", which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.
- 2.2 Native Material** 2.2.1 To be any workable soil free of organic or foreign matter; any material obtained within limits of Contract may be deemed native material for purposes of payment if it is approved by the Contract Administrator.

Native material is not acceptable if it is impracticable to control its water content or compact to specified density.

2.3 Pit Run Gravel

- 2.3.1 To be well graded granular material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description (300 mm Pit Run Gravel, 200 mm Pit Run Gravel, 100 mm Pit Run Gravel). Material to compact to specified density and conform to following gradations:

Sieve Designation	Percent Passing		
(300 mm dia)			(100)
(200 mm dia)	---		(100)
(100 mm dia)	---		(100)
75 mm	---		100
50 mm	70	-	100
25 mm	50	-	100
4.75 mm	22	-	100
2.36 mm	10	-	85
0.075 mm	2	-	8

- 2.3.2 Recycled concrete free from contaminated and other extraneous material, conforming to the specified gradations may be used as pit run gravel.

2.4 Pit Run Sand

- 2.4.1 To be well graded pit run sand, free from organic materials and conform to following gradations:

Sieve Designation	Percent Passing		
12.5 mm			100
4.75 mm	35	-	100
2.36 mm	20	-	70
1.18 mm	13	-	50
0.600 mm	8	-	35
0.300 mm	5	-	25
0.150 mm	2	-	15
0.075 mm	0	-	6

2.5 River Sand

2.5.1 River sand to be free of organic material and conform to the following gradation:

2.5.2

Sieve Designation	Percent Passing
19mm	100
4.76mm	80 - 100
0.60mm	20 - 100
0.42mm	10 - 100
0.25mm	0 - 80
0.15mm	0 - 50
0.074mm	0 - 4

2.6 Drain Rock

2.6.1 To consist of clean round stone or crushed rock conforming to following gradations:

2.6.2

Sieve Designation	Percent Passing	
	Coarse	Fine (Torpedo Gravel)
25.0 mm	100	
19.0 mm	0 - 100	
9.5 mm	0 - 5	100
4.75 mm	0	50 - 100
2.36 mm		10 - 35
1.18 mm		5 - 15
0.600 mm		0 - 8
0.300 mm		0 - 5
0.150 mm		0 - 2
0.075 mm		0

2.6.3 Drain rock to be used only where specified on Standard Detail Drawings or Contract Drawings. Use of drain rock other than as specified requires approval of Contract Administrator after examination of soils against which drain rock will be placed.

2.7 Granular Pipe Bedding and Surround Material

2.7.1 Crushed or graded gravels: to conform to following gradations:

Sieve Designation	Percent Passing		
	Type 1*	Type 2*	Type 3*
50.0 mm	100	100	100 - 100
38.0 mm	100	100	90 - 100
25.0 mm	100	100	20 - 60
19.0 mm	90 - 100	90 - 100	0 - 15
12.5 mm	65 - 85	70 - 100	
9.5 mm	50 - 75		0 - 5
4.75 mm	25 - 50	40 - 70	
2.36 mm	10 - 35	25 - 52	
1.18 mm	6 - 26	15 - 38	
0.600 mm	3 - 17	6 - 27	
0.300 mm		3 - 20	
0.075 mm	0 - 5	0 - 8	

**Type 1: standard gradation*

**Type 2: to be used only in dry trench conditions and with Contract Administrator's prior approval*

**Type 3: minimum 40% Porosity*

2.7.2 Recycled concrete free from contaminated and other extraneous material, conforming to the Type 1 gradations, may be used as pipe bedding and surround material.

2.7.3 Other permissible materials: only where shown on Contract Drawings or directed by Contract Administrator shall drain rock, pit run sand, river sand or approved native material be used for bedding and pipe surround.

2.8 Select Granular Sub-base

2.8.1 To be well graded granular material, substantially free from lumps and organic matter, screened if required to conform to following gradations:

Sieve Designation	Percent Passing
75mm	100
25mm	50 - 85
0.150mm	0 - 15
0.075mm	0 - 8

2.9 Crushed Granular Sub-base 2.9.1 To be 75 mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing	
80 mm		100
75 mm		100
38 mm	60 -	100
25 mm	-	
19 mm	35 -	80
12.5 mm	-	
9.5 mm	26 -	60
4.75 mm	20 -	40
2.36 mm	15 -	30
1.18 mm	10 -	20
0.6 um	5 -	15
0.3 um	3 -	10
0.18 um	-	
0.15 um	-	
0.075 um	0 -	5

2.10 Granular Base 2.10.1 To be 19 mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing	
19 mm		100
12.5 mm	75 -	100
9.5 mm	60 -	90
4.75 mm	40 -	70
2.36 mm	27 -	55
1.18 mm	16 -	42
0.600 mm	8 -	30
0.300 mm	5 -	20
0.075 mm	2 -	8

2.10.2

2.10.3 Where shown on the contract drawings or directed by the Contract Administrator, Type 2_19 mm crushed gravel conforming to following gradations is permissible:

Sieve Designation	Type 2 Percent Passing		
25mm			100
19mm	80	-	100
9.5mm	50	-	85
4.75mm	35	-	70
2.36mm	25	-	50
1.18mm	15	-	35
0.300mm	5	-	20
0.075mm	0	-	5

2.11 Recycled Aggregate Material

2.11.1 Aggregates containing recycled material may be utilized if approved by the Contract Administrator. In addition to meeting all other conditions of this specification, recycled material should not reduce the quality of construction achievable with quarried materials. Recycled material shall consist only of aggregates, crushed Portland cement concrete, or asphalt that is free of impurities.

2.11.2 Recycled Concrete and Asphalt (RCA)

2.11.3 To be well graded mixture of aggregates, crushed Portland cement concrete, or asphalt, substantially free from lumps and impurities. The material shall be manufactured to conform to the following gradation.

Sieve Designation	Percent Passing		
25 mm			100
19 mm	80	-	100
9.5 mm	50	-	85
4.75 mm	35	-	70
2.36 mm	25	-	50
1.18 mm	15	-	35
0.300 mm	5	-	20
0.075 mm	0	-	20

2.11.4 California Bearing Ratio of the supplied materials shall be a minimum of 20% and shall be tested at every 5,000 tonnes.

2.11.5 Virgin Materials.

2.11.6 All aggregates and granular materials shall consist of entirely virgin materials, except recycled aggregate materials

2.12 Pit Fines, Overburden and Cyclone sand

2.12.1 **Pit Fines:** Fine aggregate which is a by-product of gravel washing and screening, conforming to the following:

Sieve Designation	Percent Passing		
4.76 mm	100		
0.42 mm	80	-	100
0.074 mm	0	-	4

2.12.2 **Cyclone Sand** Inorganic fine sand produced as a by-product of gravel processing and conforming to the following:

Sieve Designation	Percent Passing		
4.76 mm	100		
0.42 mm	80	-	100
0.25 mm	50	-	100
0.15 mm	0	-	70
0.074 mm	0	-	20

- 2.12.3 **Overburden** Inorganic, silty, native material as a by-product of gravel mining and conforming to the following:

Sieve Designation	Percent Passing		
150 .mm	100		
76.00mm	85	-	100
4.76mm	45	-	100
0.42mm	25	-	100
0.074mm	20	-	60

2.13 Recycled Asphalt Pavement (RAP)

- 2.13.1 Recycled Asphalt Pavement (RAP) shall consist of asphalt concrete free from organic matter, contaminated and other extraneous material.
- 2.13.2 Source of RAP shall be from asphalt removal, surplus generated during plant start-up, transition between mixes, plant clean out, or excess mix produced that could not be placed.
- 2.13.3 RAP gradation shall not exceed the maximum aggregate size for the specified asphalt mix.

3.0 EXECUTION

3.1 Handling

- 3.1.1 Handle and transport aggregates to avoid segregation, contamination and degradation
- 3.1.2 Do not use intermixed or contaminated materials. Remove and dispose rejected materials within 48 h of rejection.
- 3.1.3 Handling:
- 3.1.4 Handling and storage of RAP shall be in accordance with National Asphalt Pavement Association (NAPA) – Best Practices for RAP and RAS Management.

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END OF SECTION 31.05.17

- 1.0 GENERAL**
- 1.0.1 Section 32 11 16.1 refers to those portions of the work that are unique to the supply and placement of granular subbase materials. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- 1.1 Related Work**
- 1.1.1 Traffic Control, Vehicle Access and Parking Section 01 55 00
- 1.1.2 Aggregates and Granular Materials Section 31 05 17
- 1.1.3 Dust Control Section 31 15 60
- 1.1.4 Roadway Excavation, Embankment and Compaction Section 31 24 13
- 1.1.5 Cold Milling Section 32 01 16.7
- 1.1.6 Full Depth Reclamation Section 32 01 16.8
- 1.2 References**
- 1.2.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.
- 1.3 Samples**
- 1.3.1 Samples may be required.
- 1.4 Measurement and Payment**
- 1.4.1 Limit of payment for subbase under 1.4.3 will be 300 mm as shown on Standard Detail Drawing R1 – Paved Shoulders.
- 1.4.2 Measurement for granular subbase of variable thickness will be for actual quantity placed based on weigh tickets provided to Contract Administrator as loads are delivered.
- 1.4.3 Measurement for granular subbase for each specified thickness will be for the actual area placed.
- 1.4.4 Payment for 1.4.1 and 1.4.2 of this Section includes supply of the granular subbase material, adjustment of moisture content and compaction.
- 1.4.5 Payment for removal of unsuitable subgrade including disposal off-site will be made under Section 31 22 16.1 - Reshaping Existing Subgrade – 1.4.2.
- 1.5 Inspection and Testing**
- 1.5.1 Refer to General Conditions, Clause 4.12, Tests and Inspections.

2.0 PRODUCTS

2.1 Specified Materials

2.1.1 Material for road subbase to be:

- (1) Select granular subbase.
- (2) 75 mm pit run gravel
- (3) 75mm minus crushed gravel.
- (4) Pit run sand.
- (5) Approved native material.
- (6) Other approved materials.
- (7) River Sand.
- (8) Recycled concrete and asphalt (RCA)

2.1.2 Refer to Section 31 05 17 - Aggregates and Granular Materials for material specifications.

2.1.3 Other granular materials: granular materials approved for road base or pipe bedding also acceptable for road subbase subject to approval of Contract Administrator.

3.0 EXECUTION

3.1 Inspection of Underlying Subgrade Surface

3.1.1 Ensure underlying subgrade surface true to cross-section and grade and compacted to specified density. Contract Administrator may accept satisfactory proof rolling as evidence of acceptable compaction of undisturbed native subgrade. Do not place granular subbase until subgrade is inspected and approved by Contract Administrator.

3.2 Placing

3.2.1 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.

3.2.2 Begin spreading subbase material on crown line or high side of one-way slope.

3.2.3 Place granular subbase materials using methods which do not lead to segregation or degradation of aggregate.

3.2.4 Place material to full width in uniform layers not exceeding 300 mm compacted thickness. Contract Administrator may authorize thicker layers if specified compaction can be achieved.

3.2.5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

GRANULAR SUBBASE

- 3.2.6 Remove and replace portion of any layer in which material has become segregated during spreading.
- 3.3 Compaction**
- 3.3.1 Compaction equipment to be capable of obtaining required densities in materials on project.
- 3.3.2 Compact to density not less than 95% Modified Proctor density.
- 3.3.3 Shape and roll alternately to obtain smooth, even and uniformly compacted subbase.
- 3.3.4 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.
- 3.3.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.
- 3.4 Finished Tolerances**
- 3.4.1 Ensure finished subbase within plus or minus 15 mm of specified grade and cross-section but not uniformly high or low.
- 3.4.2 Ensure finished subbase surface has no irregularities exceeding 15 mm when checked with a 3 m straight edge placed in any direction.
- 3.4.3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.5 Proof Rolling**
- 3.5.1 For proof rolling use fully loaded single or dual axle dump truck.
- 3.5.2 Contract Administrator may authorize use of other acceptable proof rolling equipment.
- 3.5.3 Proof roll at level in subbase as required. If alternative proof rolling equipment is authorized, Contract Administrator will determine level of proof rolling.
- 3.5.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- 3.5.5 Where proof rolling reveals areas of unsuitable subgrade:
- (1) Remove subbase and subgrade material to depth and extent as directed by Contract Administrator.
 - (2) Backfill excavated subgrade with approved embankment material and compact in accordance with Section 31_24_13 - Roadway Excavation, Embankment and Compaction.
 - (3) Replace subbase material and compact in accordance with this section.
- 3.5.6 Where proof rolling reveals areas of unsuitable subbase, remove unsuitable materials to depth and extent directed by Contract Administrator and replace with new materials in accordance with this section at no extra cost.

3.6 Maintenance

- 3.6.1 Maintain finished subbase in condition conforming to this section until succeeding base is constructed, or until granular subbase is accepted by Contract Administrator.

END OF SECTION 32 11 16.1

- 1.0 GENERAL**
- 1.0.1 Section 32 11 23 refers to those portions of the work that are unique to the supply and placement of granular base materials. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- 1.1 Related Work**
- 1.1.1 Reference Specifications – Site and Infrastructure Section 01 42 00
- 1.1.2 Traffic Control, Vehicle Access and Parking Section 01 55 00
- 1.1.3 Concrete Walks, Curbs and Gutters Section 03 30 20
- 1.1.4 Aggregates and Granular Materials Section 31 05 17
- 1.1.5 Dust Control Section 31 15 60
- 1.1.6 Reshaping Existing Subgrade Section 31 22 16.1
- 1.1.7 Roadway Excavation, Embankment and Compaction Section 31 24 13
- 1.1.8 Cold Milling Section 32 01 16.7
- 1.1.9 Full Depth Reclamation Section 32 01 16.8
- 1.1.10 Granular Subbase Section 32 11 16.1
- 1.2 References**
- 1.2.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.
- 1.3 Samples**
- 1.3.1 Samples may be required.
- 1.4 Measurement and Payment**
- 1.4.1 Limit of payment for granular base under this and sub-section 2 below will be up to 300 mm beyond back of curb as shown on Standard Detail Drawings. Granular Base for sidewalk and walkway construction is included in payment for sidewalk under Section 03 30 20 – Concrete Walks, Curbs and Gutters. Measurement for granular base of variable thickness will be for actual quantity placed based on weigh tickets provided to Contract Administrator as loads are delivered.
- 1.4.2 Measurement for granular base for each specified thickness will be for the actual area placed.
- 1.4.3 Payment for 1.4.1 and 1.4.2 of this Section includes supply of the granular base material, adjustment of moisture content and compaction.
- 1.4.4 Payment for removal of unsuitable subgrade including disposal off-site prior to direct placement of granular base will be made under Section 31 22 16.1 - Reshaping Existing Subgrade.
- 1.5 Inspection and Testing**
- 1.5.1 Refer to General Conditions, Clause 4.12, Tests and Inspections.

2.0 PRODUCTS

- 2.1 Granular Base
- 2.1.1 Material for road base to be:
- (1) 19 mm crushed gravel.
 - (2) Refer to Section 31.05.17 - Aggregates and Granular Materials for +material specifications.

3.0 EXECUTION

- 3.1 Inspection of Underlying Subbase
- 3.1.1 Ensure underlying subbase surface true to cross-section and grade, and of the specified material compacted to 95% Modified Proctor density in compliance with ASTM D1557. Do not place granular base until finished subbase surface is inspected and approved by Contract Administrator.
- 3.2 Placing
- 3.2.1 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.
- 3.2.2 Begin spreading base material on crown line or on high side of one-way slope.
- 3.2.3 Place base material using methods which do not lead to segregation or degradation of aggregate.
- 3.2.4 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Contract Administrator may authorize thicker layers if specified compaction can be achieved.
- 3.2.5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- 3.2.6 Remove and replace portion of any layer in which material has become segregated during spreading.
- 3.3 Compaction
- 3.3.1 Compaction equipment to be capable of obtaining required densities in materials on project.
- 3.3.2 Compact to density not less than 95% Modified Proctor density.
- 3.3.3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- 3.3.4 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.
- 3.3.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.

- 3.4 Finished Tolerances**
- 3.4.1 Ensure finished base surface within plus or minus 10 mm of specified grade and cross-section but not uniformly high or low.
- 3.4.2 Ensure finished surface has no irregularities exceeding 10 mm when checked with a 3 m straight edge placed in any direction.
- 3.4.3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.5 Proof Rolling**
- 3.5.1 For proof rolling use fully loaded single or dual axle dump truck.
- 3.5.2 Contract Administrator may authorize use of other acceptable proof rolling equipment.
- 3.5.3 Proof roll top of base upon completion of fine grading and compaction.
- 3.5.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- 3.5.5 Where proof rolling reveals areas of unsuitable subgrade:
- (1) Remove base, subbase and subgrade material to depth and extent directed by Contract Administrator.
 - (2) Backfill excavated subgrade with approved embankment material and compact in accordance with Section 31 24 13 - Roadway Excavation, Embankment and Compaction.
 - (3) Replace subbase material and compact in accordance with Section 32 11 16.1 - Granular Subbase.
 - (4) Replace base material and compact in accordance with this Section.
- 3.5.6 Where proof rolling reveals areas of unsuitable base or subbase, remove unsuitable materials to depth and extent directed by Contract Administrator and replace with new materials in accordance with Section 32 11 16.1 - Granular Subbase and this Section at no extra cost.
- 3.6 Maintenance**
- 3.6.1 Maintain finished base in condition conforming to this section until succeeding material is applied or until granular base is accepted by Contract Administrator.

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END OF SECTION 32 11 23

APPENDIX L – DRAWINGS

ES-24-09 - AZU POWDER KING UPGRADES

SITE INFRASTRUCTURE

REGIONAL DISTRICT FRASER-FORT GEORGE, BC

FOR TENDER

WSP Project No: CA0008973

Date: 2024-03-04



DRAWING LIST

SHEET NUMBER	SHEET TITLE	REVISION
CA0008973-C-000	COVER SHEET	B
CA0008973-C-001	GENERAL NOTES	B
CA0008973-C-100	EXISTING CONDITIONS PLAN	B
CA0008973-C-101	WATER IMPROVEMENTS PLAN	B
CA0008973-C-102	DRAINAGE IMPROVEMENTS PLAN & PROFILE	B
CA0008973-C-400	DETAILS	B

We see the future more clearly and design for it today.



LEGEND:

REVISION:

B	2024-03-04	FOR TENDER	CJB
A	2024-03-01	FOR REVIEW	CJB
REV	DATE	DESCRIPTION	BY

SEAL:

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ORIGINAL SCALE:	DATE:
AS NOTED	2024-02-26
APPROVED BY:	
DSR	
CHECKED BY:	
SM	
DRAWN BY (OPTIONAL):	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
CJB	
	25mm

DISCIPLINE: CIVIL

wsp

WSP Canada Inc.
Suite 100 - 989 McGill Place, Kamloops, BC, V2C 6N9
T 250-828-6116 | www.wsp.com

PROJECT NUMBER: CA0008973

CLIENT:

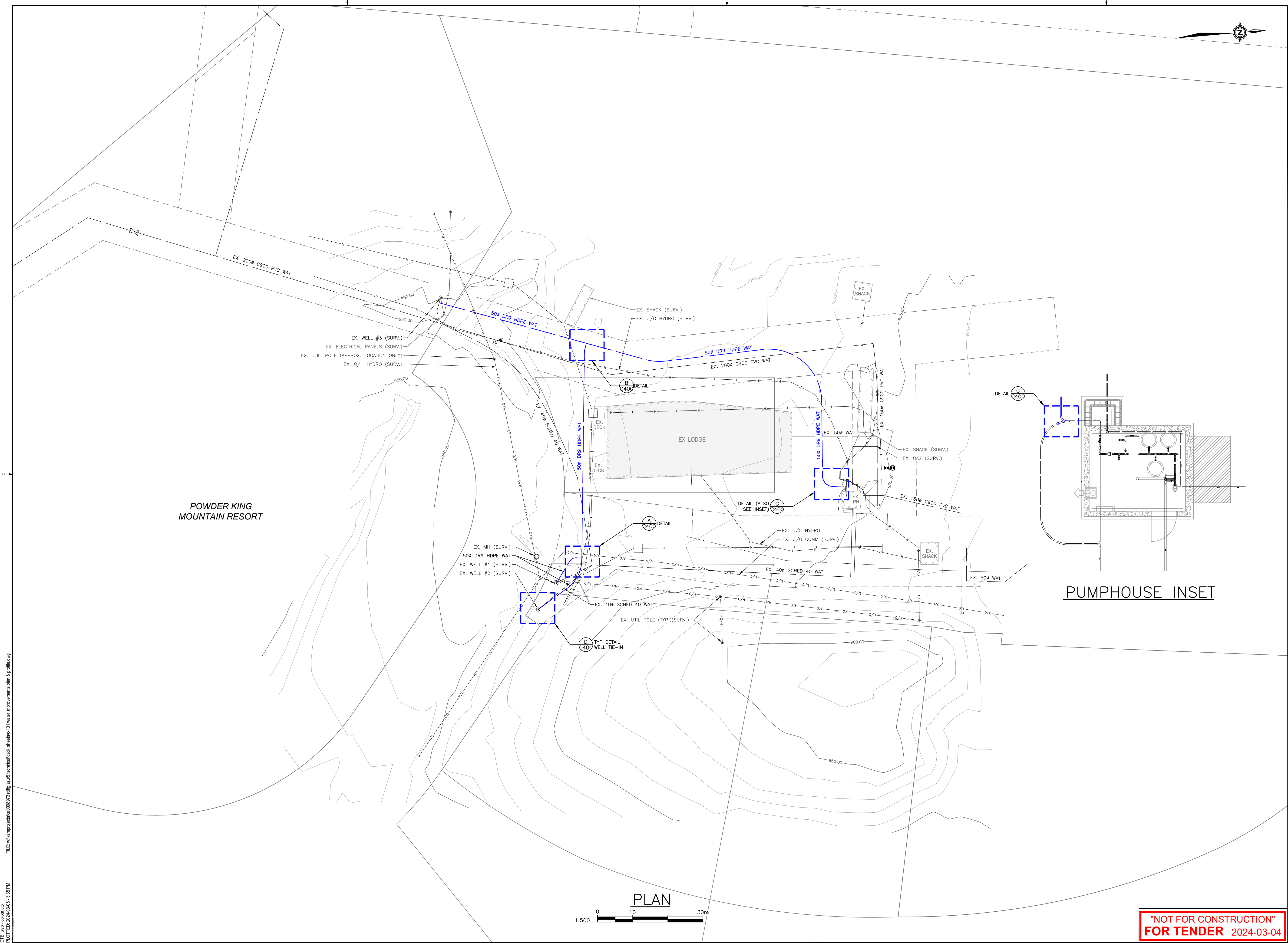
REGIONAL DISTRICT
of Fraser-Fort George

CLIENT REF. #:

PROJECT:	AZU POWDER KING UPGRADES	
TITLE:	EXISTING CONDITIONS PLAN	
DRAWING NUMBER:	C-100	REV. B

"NOT FOR CONSTRUCTION"
FOR TENDER 2024-03-04

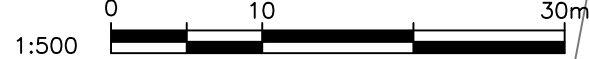
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POWDER KING
MOUNTAIN RESORT

PUMPHOUSE INSET

PLAN



"NOT FOR CONSTRUCTION"
FOR TENDER 2024-03-04

LEGEND:

REV	DATE	DESCRIPTION	BY
B	2024-03-04	FOR TENDER	CJB
A	2024-03-01	FOR REVIEW	CJB

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ORIGINAL SCALE:	DATE:
AS NOTED	2024-02-26
APPROVED BY:	
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SM	25mm LONG, ADJUST
DRAWN BY (OPTIONAL):	YOUR PLOTTING SCALE.
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DISCIPLINE: CIVIL

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PROJECT NUMBER: CA0008973

CLIENT:

REGIONAL DISTRICT
of Fraser-Fort George

CLIENT REF. #:

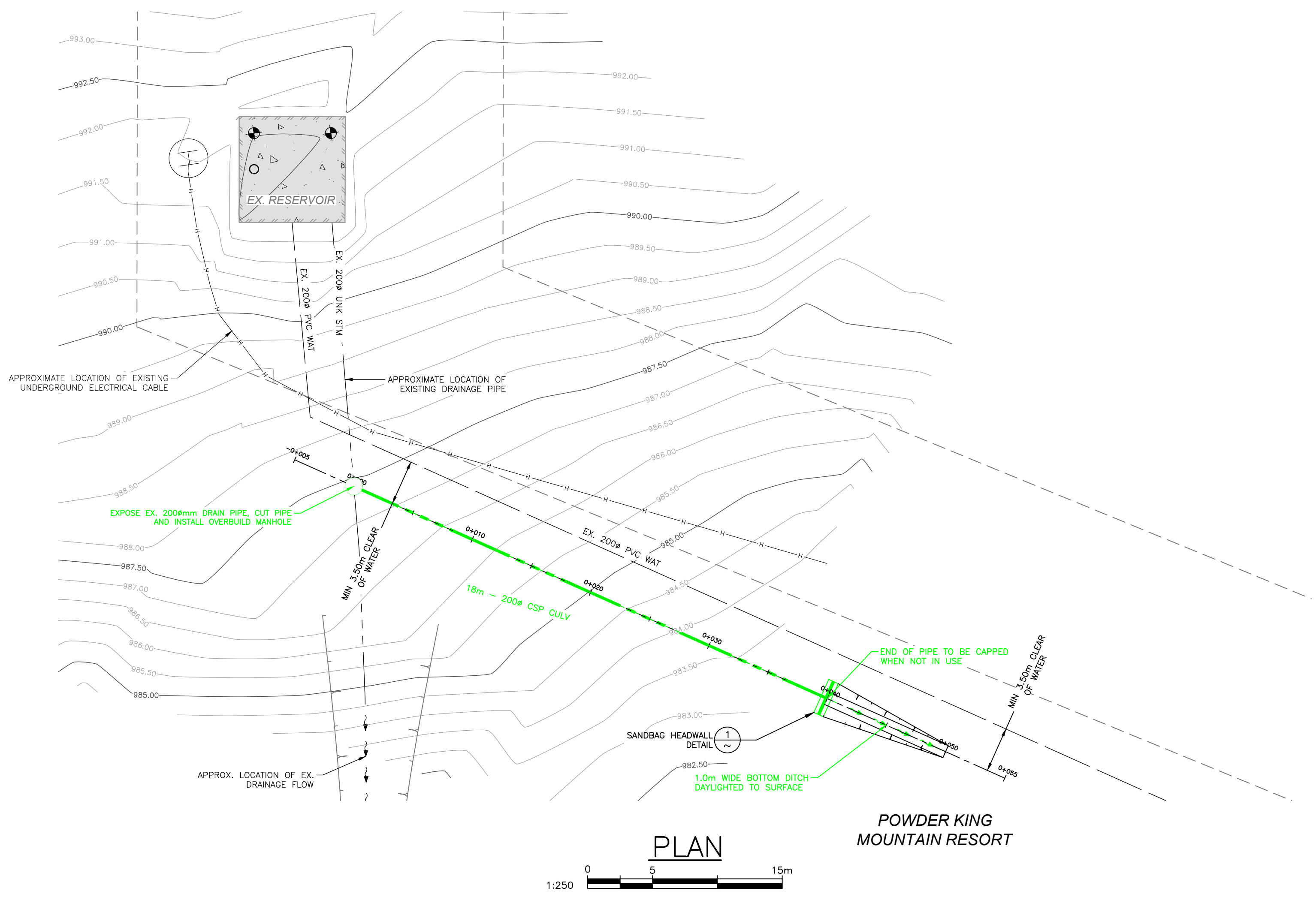
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**AZU POWDER KING
UPGRADES**

TITLE:
**WATER IMPROVEMENTS
PLAN**

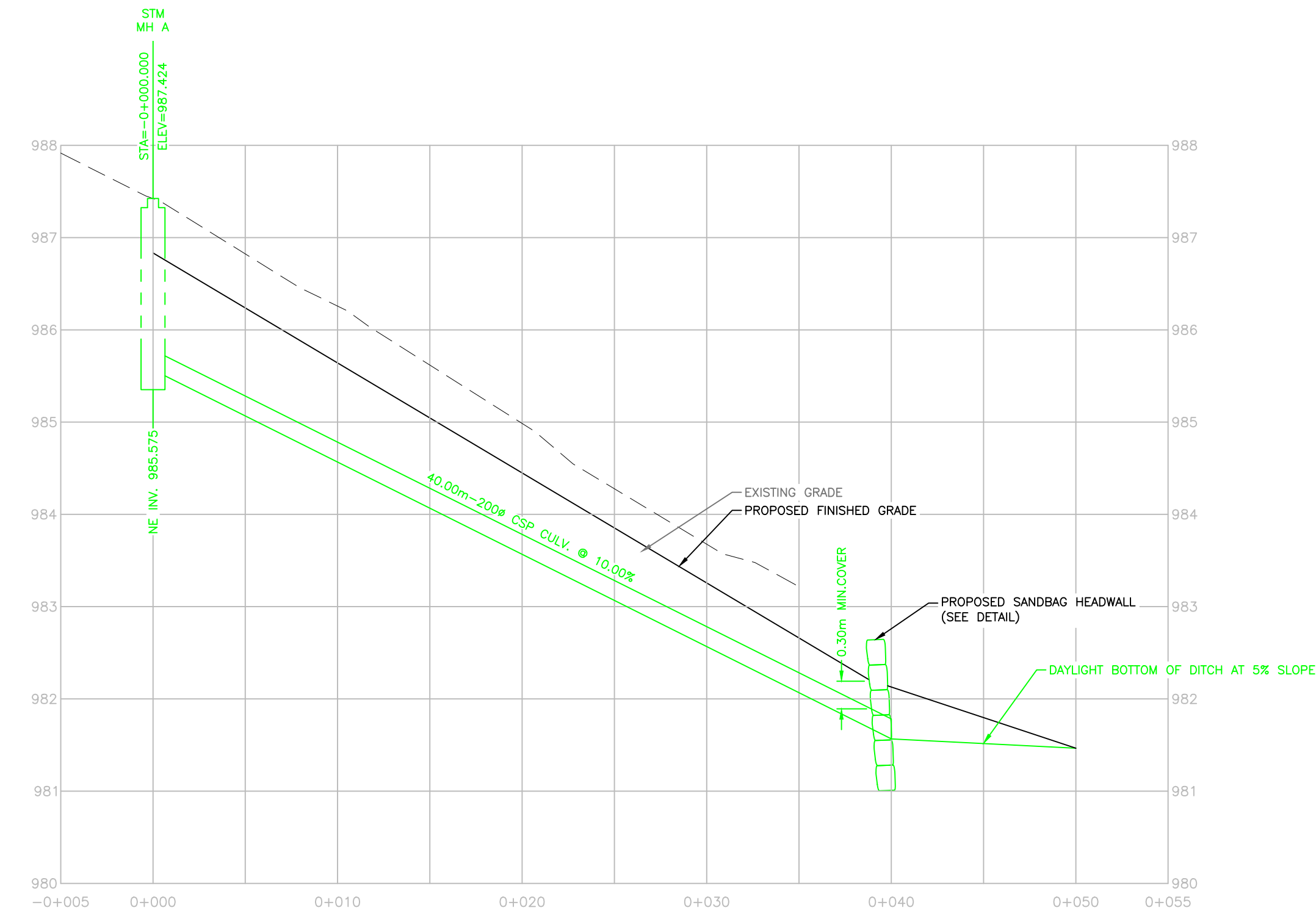
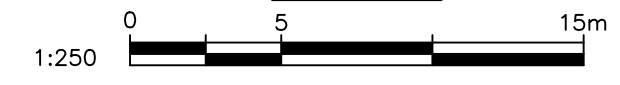
DRAWING NUMBER:	REV.
C-101	B

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PLAN



PROFILE



LEGEND:

REV	DATE	DESCRIPTION	BY
B	2024-03-04	FOR TENDER	CJB
A	2024-03-01	FOR REVIEW	CJB

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ORIGINAL SCALE: AS NOTED
 APPROVED BY: SM
 CHECKED BY: SM
 DRAWN BY (OPTIONAL): CJB

DATE: 2024-02-26
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25mm

DISCIPLINE: CIVIL

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 Suite 100 - 989 McGill Place, Kamloops, BC, V2C 6N9
 T 250-828-6116 | www.wsp.com

PROJECT NUMBER: CA0008973
 CLIENT: REGIONAL DISTRICT of Fraser-Fort George

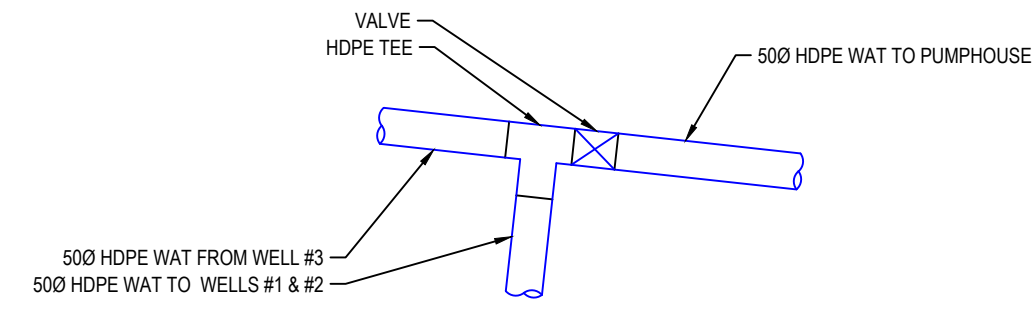
CLIENT REF. #:

PROJECT: AZU POWDER KING UPGRADES

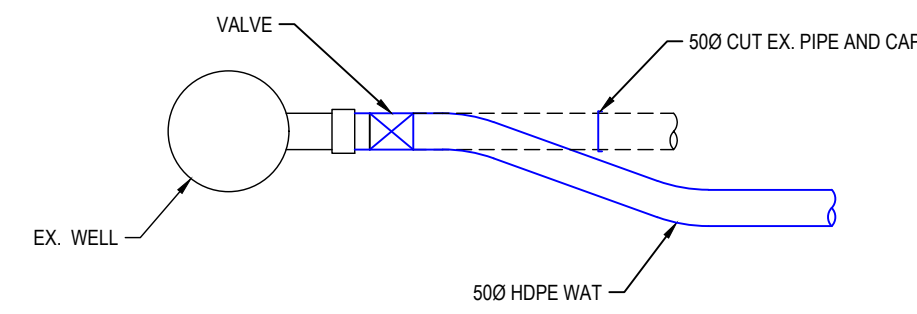
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DRAWING NUMBER: C-102
 REV: B

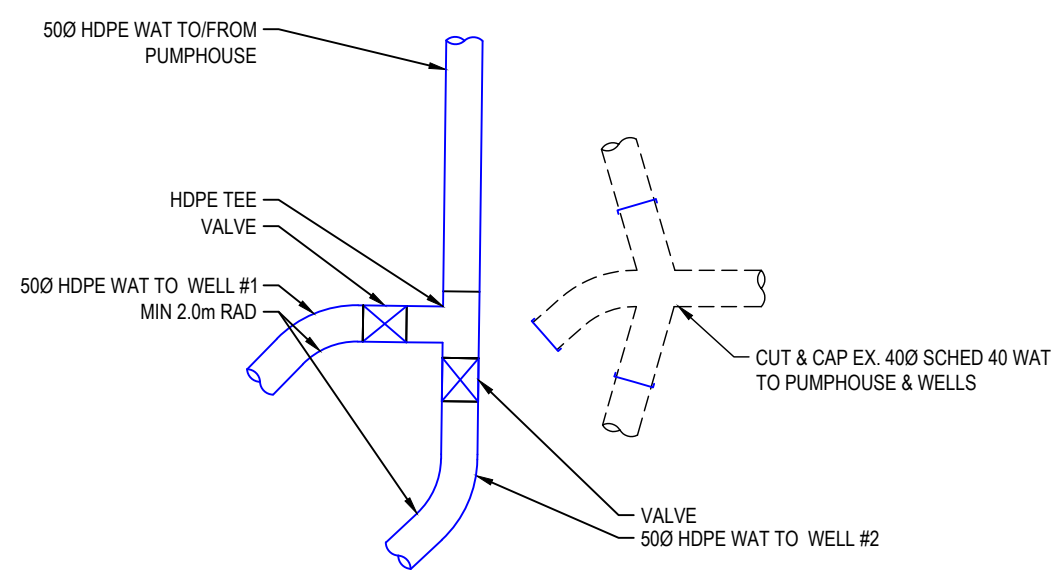
"NOT FOR CONSTRUCTION"
FOR TENDER 2024-03-04



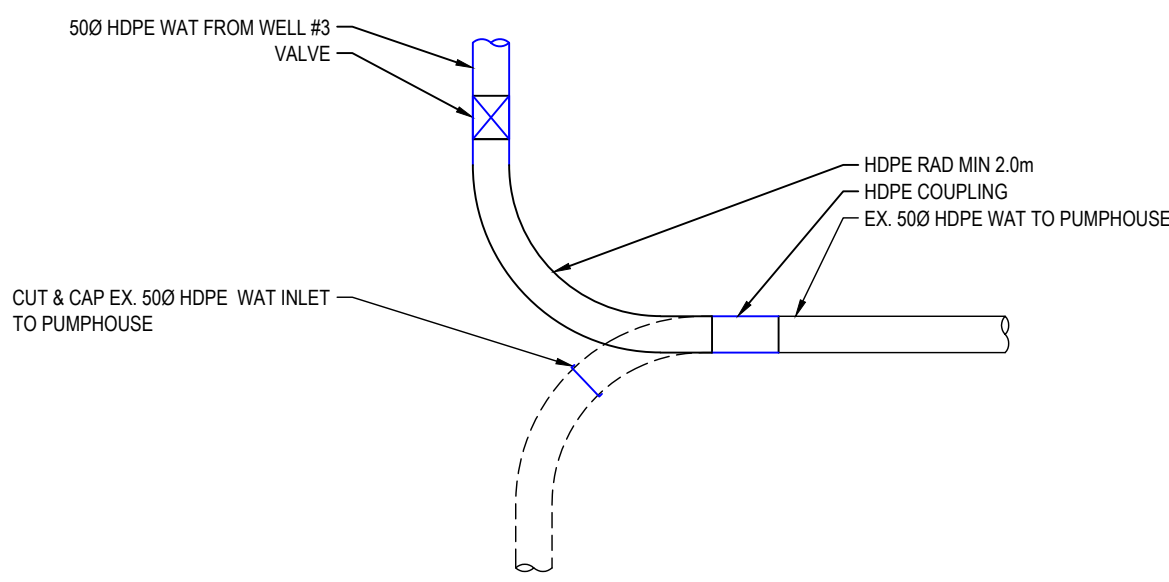
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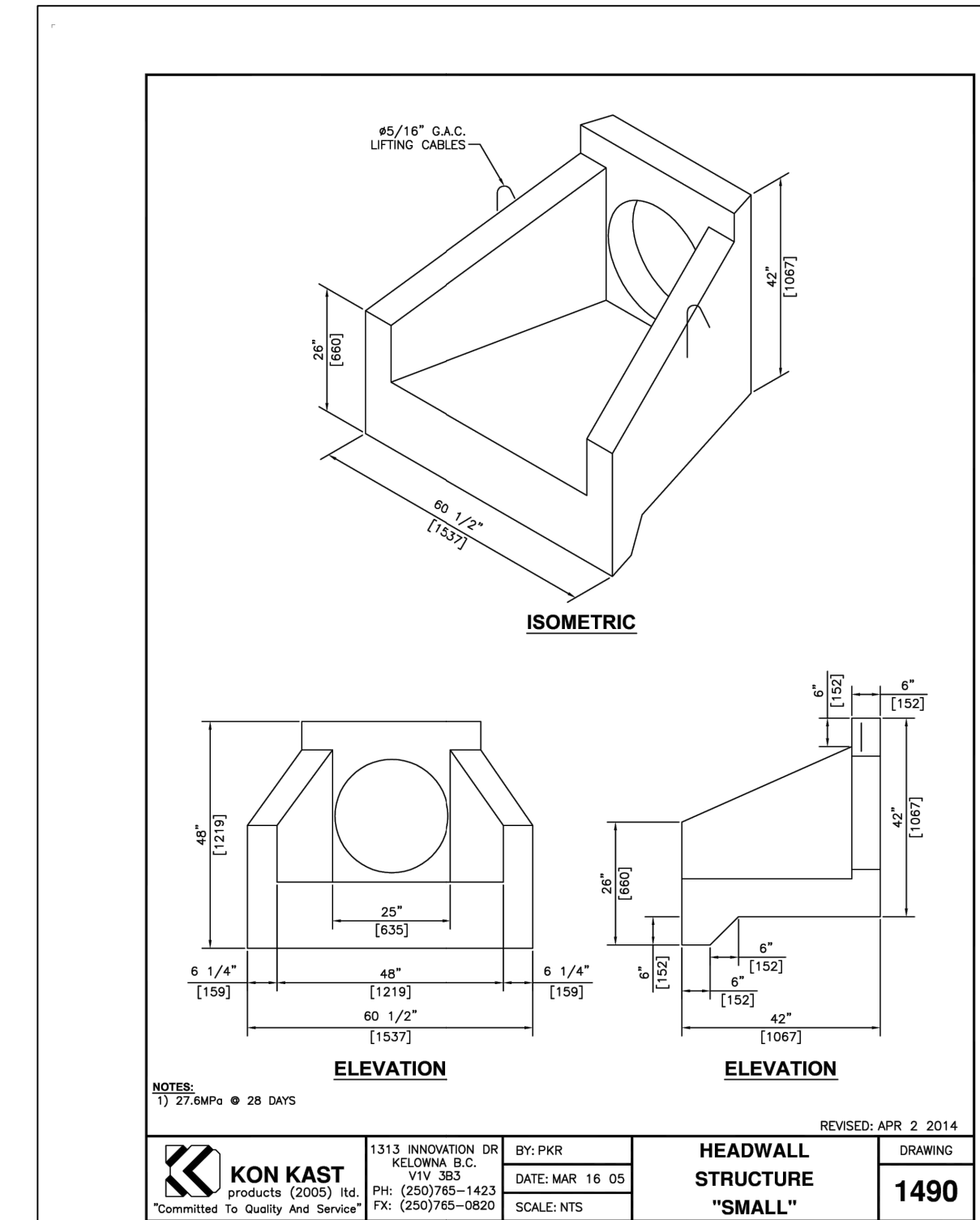
2 TYP. DETAIL AT WELL
C101 SCALE: NTS



3 DETAIL A
C101 SCALE: NTS



4 DETAIL C
C101 SCALE: NTS



 KON KAST products (2005) Ltd. *Committed To Quality And Service*	1313 INNOVATION DR KELLOWA B.C. V1W 3E3	BY: PKR DATE: MAR 16 05	HEADWALL STRUCTURE "SMALL"	DRAWING 1490
	PH: (250) 785-1423 FX: (250) 785-1800	SCALE: NTS		

LEGEND:

REV	DATE	DESCRIPTION	BY
B	2024-03-04	FOR TENDER	CJB
A	2024-03-01	FOR REVIEW	CJB

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ORIGINAL SCALE: DATE: 2024-02-26

APPROVED BY: DSR

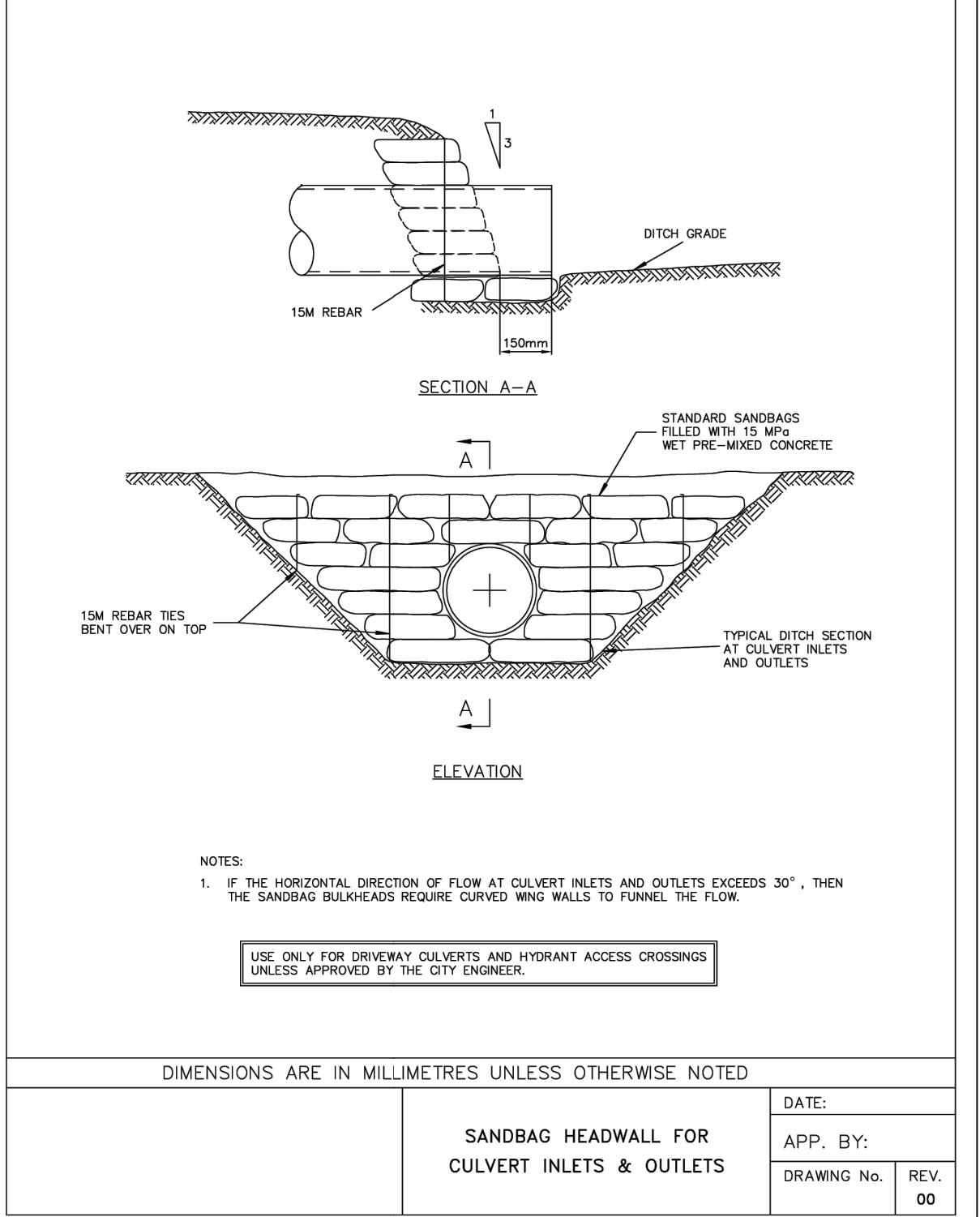
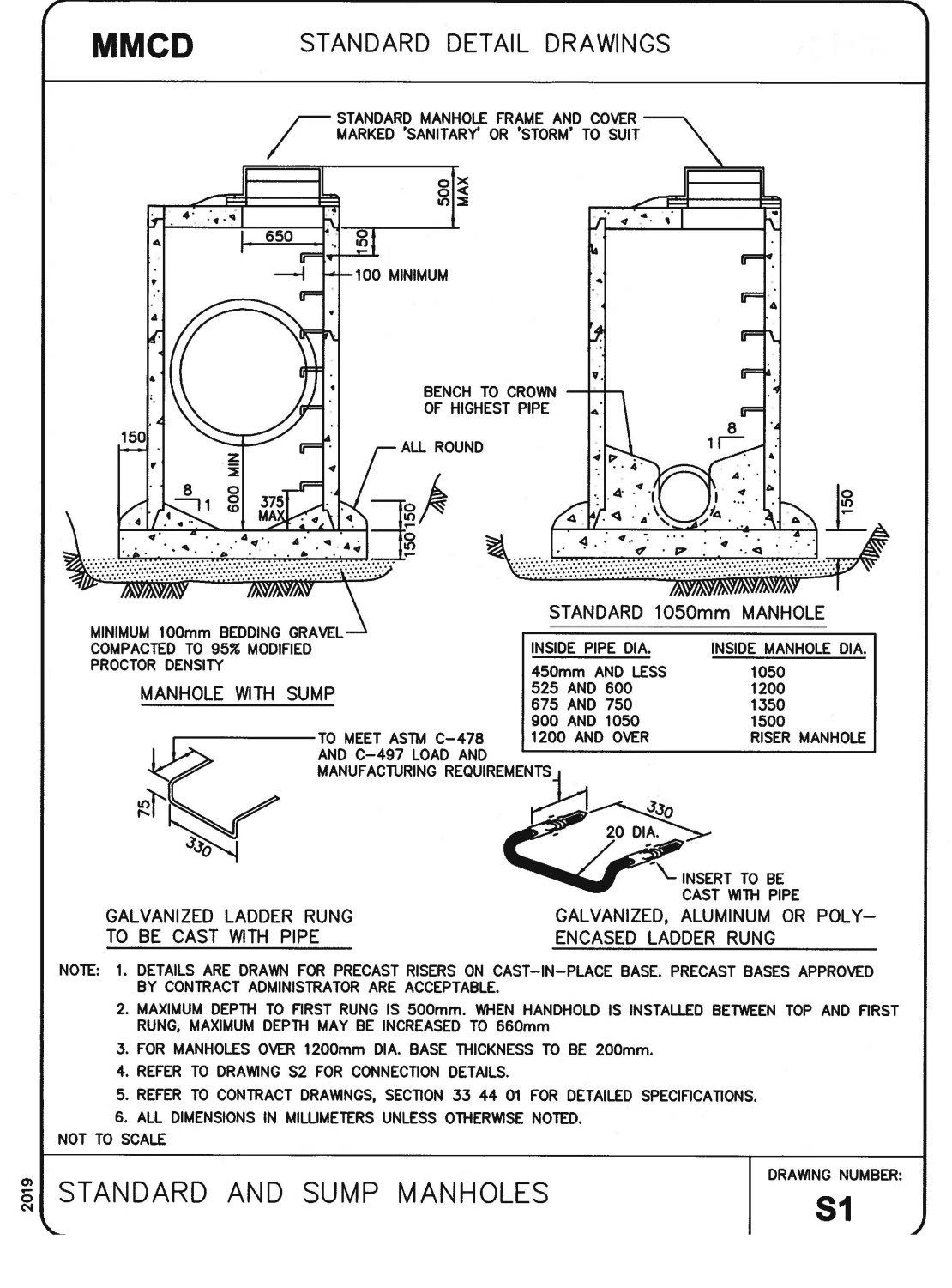
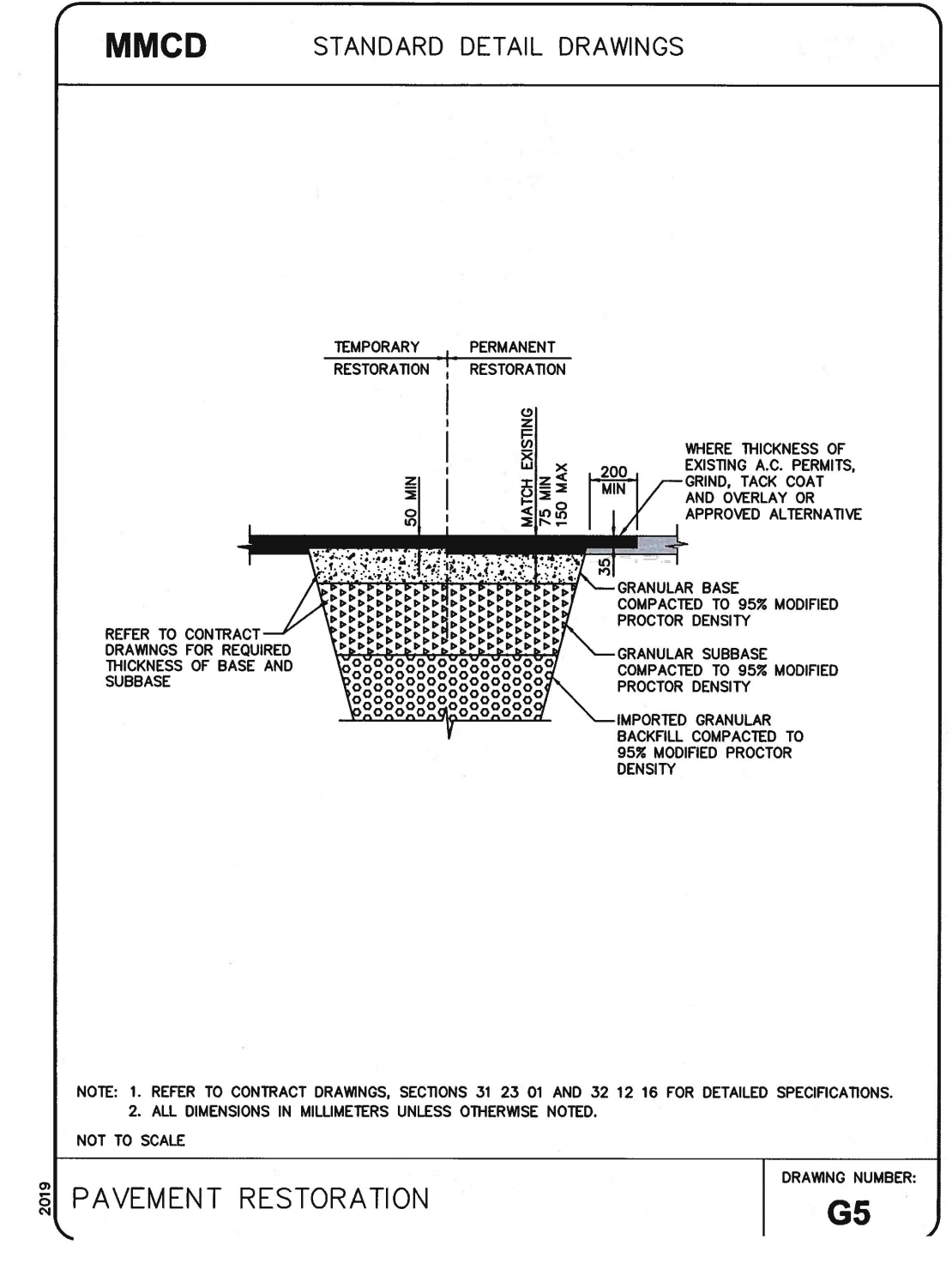
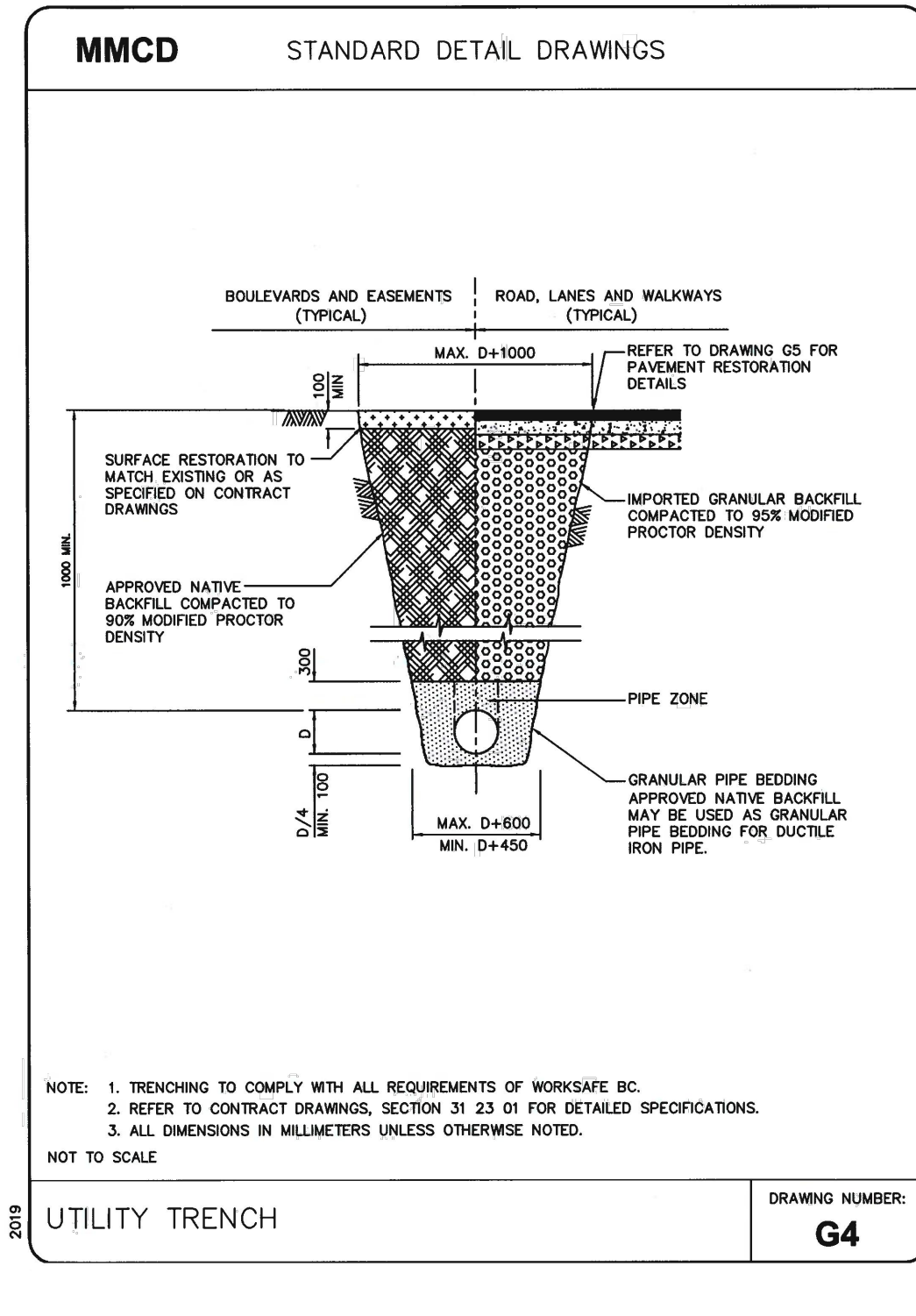
CHECKED BY: SM

DRAWN BY (OPTIONAL): CJB

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25mm

DISCIPLINE: CIVIL



"NOT FOR CONSTRUCTION"
FOR TENDER 2024-03-04

PROJECT: AZU POWDER KING UPGRADES

TITLE: DETAILS

CLIENT REF. #:

DRAWING NUMBER: C-400

REV: B

APPENDIX M – CONTRACT AGREEMENT AND GENERAL CONDITIONS

(MMCD Platinum edition will form part of the final contract)

**APPENDIX M
Agreement
Between Owner and Contractor**

THIS AGREEMENT made in duplicate this _____ day of _____, 2024.

Contract: Construction and Repair Services, Azu Community Water System
Reference No. ES-24- 09

BETWEEN:

The Regional District of Fraser-Fort George
155 George Street
Prince George, BC V2L 1P8
(the “*Owner*”)

AND:

(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 the 30th September, 2024 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:

3.1.1 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

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

3.1.3 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 hereunder 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 pre-paid registered mail to the addresses as set out below:

The *Owner*:

CA0008973 RDFFG Azu Powder King

Regional District of Fraser-Fort George
155 George Street
Prince George, BC V2L 1P8
Attention: Bryan Boyes, Utilities Manager,
Phone: 250-960-4400

The *Contractor*:

Company: _____
Address Line 1: _____
Address Line 2: _____
Attention: _____
Phone: _____

The *Contract Administrator*:

WSP Canada Inc.
989 McGill Place,
Kamloops, BC V2C 6N9
Attention: Shawn Morrow, EIT
Phone: 250-434-8430 Cell: 250-682-0472

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

- 6.2.1 immediately upon delivery, if delivered by hand; or
- 6.2.2 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*.

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:

Witness:

(FULL LEGAL NAME OF CORPORATION, PARTNERSHIP OR INDIVIDUAL)

(FULL LEGAL NAME OF WITNESS)

(AUTHORIZED SIGNATORY)

(AUTHORIZED SIGNATORY)

Owner:

(FULL LEGAL NAME OF OWNER)

(FULL LEGAL NAME OF OWNER)

(AUTHORIZED SIGNATORY)

(AUTHORIZED SIGNATORY)

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.

- 1 Part 1 – Invitation to Tender;
- 2 APPENDIX K - Specifications;
- 3 APPENDIX L- Drawings;
- 4 APPENDIX M – Contract Agreement and General Conditions;
- 5 APPENDIX N – Supplemental General Conditions;
- 6 *Contract Drawings* listed in Schedule 2 to the Agreement -"List of *Contract Drawings*";

Schedule 2

List of Contract Drawings

TITLE	DRAWING NO.	DATE	REVISION DATE	REVISION NO.
Cover Sheet	C-000	2024/03/01	2024/03/04	B
General Notes	C-001	2024/03/01	2024/03/04	B
Existing Conditions Plan	C-100	2024/03/01	2024/03/04	B
Water Improvements Plan	C-101	2024/03/01	2024/03/04	B
Drainage Improvements Plan & Profile	C-102	2024/03/01	2024/03/04	B
Details	C-400	2024/03/01	2024/03/04	B

APPENDIX N – SUPPLEMENTAL GENERAL CONDITIONS



REGIONAL DISTRICT OF FRASER-FORT GEORGE

APPENDIX N

ITT ES-24-09

Construction and Repair Services
Azú Community Water System

Supplemental General Conditions

The ITT and the MMCD Platinum edition overlap on various clauses. Where this occurs, the conditions in the ITT will take precedence.

SGC 1

Refer to the MMCD General Conditions of Contract, which apply to this Contract:

Clause 3.0 Contract Administration

3.3 Contract Administration

3.3.5 Delete this clause and replace with the following:

3.3.5 Unless otherwise specified in the Contract Documents, the Contract Administrator shall set out or cause to be set out survey monuments or control points at the Place of the Work, sufficient to enable the Contractor to determine the required lines and grades, and to set out the Work. The Contractor shall protect and preserve such monuments and control points for so long as they are required for the Work and if any of them must be replaced because they are disturbed or destroyed by the Contractor, then the Contractor shall pay the costs of such replacement.

To 3.3.5, add the following:

Add: The Contractor shall be responsible for survey layout required for the installation and construction of the Azú Powder King upgrades. The Contractor shall furnish all assistance necessary to measure-in and drive stakes and shall furnish such lines, straight edges, and stakes for locating line and grade.

Add: The Contractor shall, before commencing work at any point, satisfy himself as to the meaning and correctness of all stakes and works and no claims shall be entertained for any allowances based on alleged inaccuracies or for alternatives on account of his failure to read same correctly.

Add: If the Contractor, in the course of the work, finds any discrepancy between the drawings and the physical conditions of the locality or any errors or omissions in drawings or in the layout as given by points and instructions, it shall be his duty to immediately inform the Engineer, in writing, and the Engineer shall promptly verify the same. Any work done after such discovery, until authorized will be done at the Contractor's risk.

Add: The Contractor shall protect and preserve such monuments and control points for so long as they are required for the Work and if any of them must be replaced because they are disturbed or destroyed by the Contractor, then the Contractor shall pay the costs of such replacement.

SGC 2

Refer to the MMCD General Conditions of Contract, which apply to this Contract:

Clause 4.0 Contractor

4.12 Tests and Inspections

4.12.4 Delete this clause and replace with the following:

4.12.4 The Contractor shall as part of the Work perform, or cause to be performed, all tests, inspections, and approvals of the Work as required by the Contract Documents, and if a test, inspection or approval requires a representative sample of materials or workmanship the Contractor shall at the Contractor's own cost supply the labour and materials necessary to provide the sample.

To 4.12.4, add the following:

Add: The Contractor shall be required to perform all Standard Proctor Density tests in compliance with ASTM D1557 for compaction of trench, 'roads', and embankments. Frequency of tests is as indicated in the contract document. Additional tests may be requested by the Contract Administrator. Payment for the inspection and testing is provided for in the Measurement and Payment section. If initial tests determine materials or compaction is not as specified, the Contractor to take all the necessary steps to correct deficiencies. Subsequent testing to Contractor's account.

Add: The testing and laboratory Agency(ies) to be subject to the approval of the Contract Administrator. The Agency(ies) are to be accredited with the Canadian Council of Independent Laboratories (CCIL) and follow the standard methods as outlined by the American Standards Testing Methods (ASTM) and Canadian Standards Association (CSA).

SGC 3

Refer to the MMCD General Conditions of Contract, which apply to this Contract:

Clause 18.0 Payment

Delete this clause in its entirety and replace with the entire Clause 11 “Payment” of Part 1, the Invitation to Tender.

SGC 4

Refer to the MMCD General Conditions of Contract, which apply to this Contract:

Clause 20.0 Laws, Notices, Permits and Fees

Delete this clause in its entirety and replace with the entire Clause 29.0 “Permit and Regulations” of Part 1, the Invitation to Tender.

SGC 5

Refer to the MMCD General Conditions of Contract, which apply to this Contract:

Clause 21.0 Workers Compensation Regulations

to the clauses of this section, add clause 21.4, as follows:

21.4 Worksafe BC

Add Clause 15 “Worksafe BC” of Part 1, the Invitation to Tender.

SGC 6

Refer to the MMCD General Conditions of Contract, which apply to this Contract:

Clause 22.0 Indemnification

Clause 22.1 Contractor to Indemnify

Delete Clause 22.1 and replace with Clause 16.0 “Indemnity and Release by Contractor” of Part 1, the Invitation to Tender.

SGC 7

Refer to the MMCD General Conditions of Contract, which apply to this Contract:

Clause 24.0 Insurance

Delete this clause in its entirety and replace with the entire Clause 13 “Insurance” of Part 1, the Invitation to Tender.

*** END SUPPLEMENTAL GENERAL CONDITIONS ***