Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

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RETOURNER LES SOUMISSIONS À:

Bid Receiving Public Works and Government Services Canada/Réception des soumissions Travaux publics et Services gouvernmentaux Canada
800 Burrard Street, Room 219
800, rue Burrard, pièce 219
Vancouver
British Columbia
V6Z 0B9
Bid Fax: (604) 775-9381

SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address
Raison sociale et adresse du fournisseur/de l'entrepreneur

Issuing Office - Bureau de distribution

Public Works and Government Services Canada - Pacific Region
800 Burrard Street, Room 219
800, rue Burrard, pièce 219
Vancouver
British C
V6Z 0B9

Title - Sujet Watermain Replacement Watermain Replacement	
Solicitation No. - N° de l'invitation EZ899-220997/A	**Amendment No. - N° modif.** 001
Client Reference No. - N° de référence du client	**Date** 2021-12-20
GETS Reference No. - N° de référence de SEAG PW-$PWY-039-9092	
File No. - N° de dossier PWY-1-44119 (039)	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à** 02:00 PM Pacific Standard Time PST **on - le** 2022-01-13 Heure Normale du Pacifique HNP	
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☑ **Other-Autre:** ☐	
Address Enquiries to: - Adresser toutes questions à: Park (PWY), Isabell	**Buyer Id - Id de l'acheteur** pwy039
Telephone No. - N° de téléphone (604) 365-0073 ( )	**FAX No. - N° de FAX** ( ) -
Destination - of Goods, Services, and Construction: **Destination - des biens, services et construction:** CSC – Mission Institution – Mission, BC	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée	**Delivery Offered - Livraison proposée**
Vendor/Firm Name and Address **Raison sociale et adresse du fournisseur/de l'entrepreneur** **Telephone No. - N° de téléphone** **Facsimile No. - N° de télécopieur**	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) **Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)** **Signature** **Date**	

Canada

Amendment 001
This amendment is issued to extend the closing date and to publish Addendum No.01.

On Page 1,

"Solicitation Closes - L'invitation prend fin
at - à 02:00 PM
on - le 2022-01-06" and
"Time Zone
Fuseau horaire
Pacific Standard Time PST"; and

Insert:
"Solicitation Closes - L'invitation prend fin
at - à 02:00 PM
on - le 2022-01-13" and
"Time Zone
Fuseau horaire
Pacific Standard Time PST".

Attachment
Addendum No.01 dated December 20, 2021

December 20, 2021

ADDENDUM NO. 1

TO ALL TENDERERS:

The following changes, additions and/or deletions are hereby made a part of the Contract Documents for ***Mission Medium Institution Watermain Replacement PWGSC Project No. R.089147.001 Pacific***, as fully and completely as if the same were fully set forth therein:

Note to Tenderer's

1. Civil drawing C-05 has been revised with addition of a Fire Service Profile #1-1. See attached.

2. Specifications 33 05 23 Horizontal Drilling Part 2.1 regarding Pipe, Joints and Fitting products have been revised. See attached.

3. Specifications 33 11 16 Watermains Part 2.1 regarding Pipe, Joints and Fitting products have been revised. See attached.

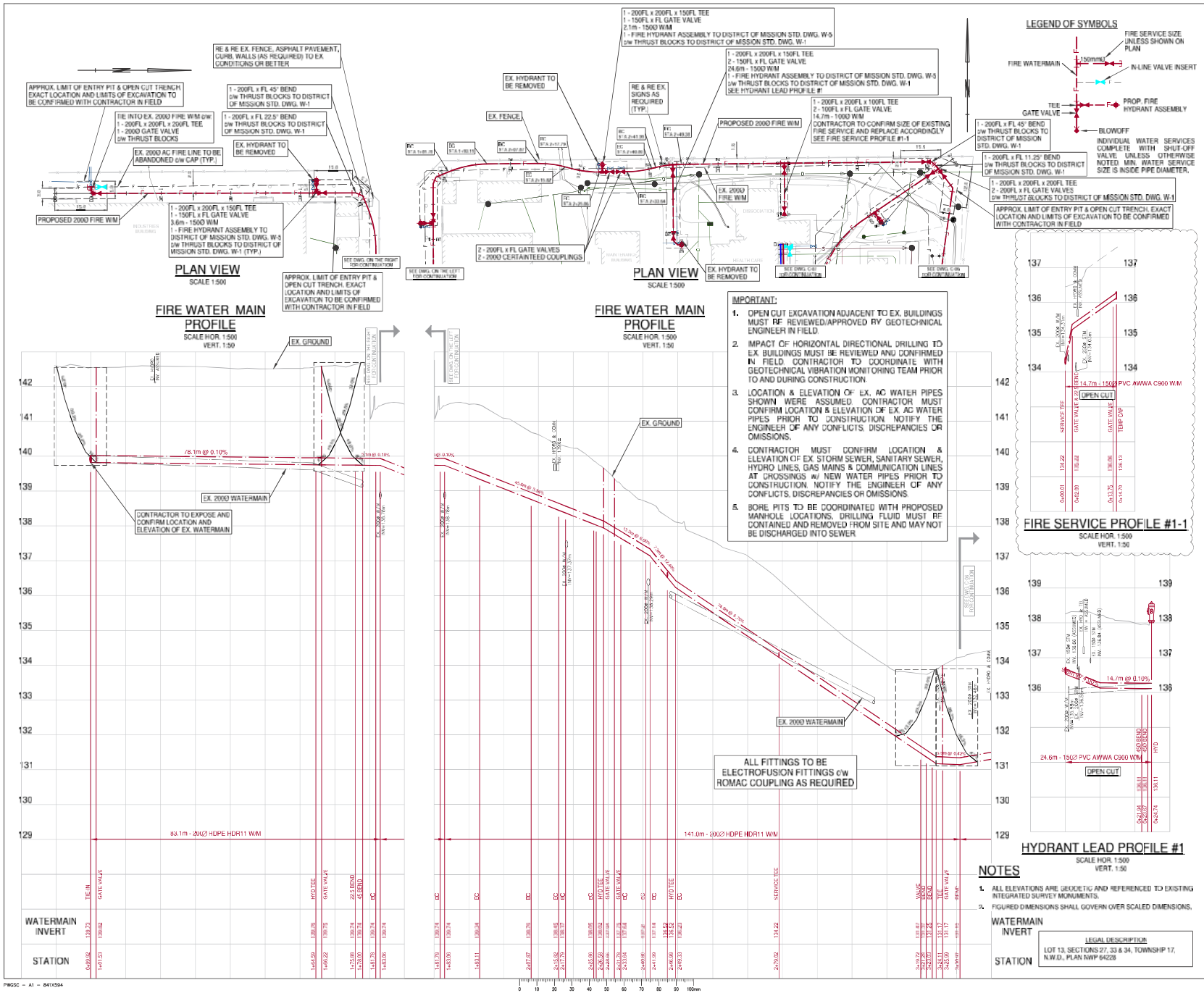
4. Yes, HDPE DR11 can be used for fittings (bends and tees).

ALL Tenderers shall acknowledge receipt and acceptance of this Addendum by signing in the space below and submitting the signed Addendum with the Tender. Tenders submitted without this Addendum will be considered incomplete.

Receipt acknowledged and conditions agreed to this _____ day of _____, 2021.

_____ _____
Tenderer (Company) Signature

Bidder's Initials _____



REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique

WSP CANADA INC.

Revision/Revision	Description/Description	Date/Date
8	FIRE SERVICE PROFILE #1-1 ADDED	21/12/17
7	RE-ISSUED FOR TENDER	21/11/23
6	ISSUED FOR TENDER	21/05/21
5	RE-ISSUED FOR REVIEW	21/03/05
4	ISSUED FOR TENDER	19/07/06
3	100% DESIGN SUBMISSION	18/12/07
2	99% DESIGN SUBMISSION	18/08/31
1	60% DESIGN REVIEW	18/06/21
0	30% DESIGN REVIEW	17/11/17

Client/Client
CORRECTIONAL SERVICES OF CANADA
8751 STAVE LAKE ST.
MISSION, B.C.

Project title/Titre du projet
8751 STAVE LAKE ST.
MISSION, B.C.

MISSION MEDIUM INSTITUTION WATERMAIN REPLACEMENT

Consultant Signature Only

Designed by/Concept par
G.R.

Drawn by/Dessiné par
B.D

PWGSC Project Manager/Administrateur de Projets TPSGC
TONY TANG

Regional Manager, Architectural and Engineering Services
Gestionnaire régionale, Services d'architectural et de génie, TPSGC

Drawing title/Titre du dessin
WATERMAIN
FIRE

SCALE 1:500

Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
R.089147.001	C-05 OF 10	8

PWGSC – A1 – 841X594

PART 1 GENERAL

1.1. SECTION INCLUDES

.1 Materials and installation for watermains, hydrants, valves, valve boxes, and valve chambers, including service connections.

1.2. RELATED SECTIONS

.1 Section 01 01 50 – General Instructions.

.2 Section 01 78 00 – Closeout Submittals.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.4 Section 03 20 00 – Concrete Reinforcing.

.5 Section 03 30 00 – Cast-in-Place Concrete.

1.3. REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA):

.1 ANSI/AWWA B300, Hypochlorites.

.2 ANSI/AWWA C153/A21.53-11, Ductile-Iron Compact Fittings for Water Service.

.3 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service

.4 ANSI/AWWA C651-14, Disinfecting Watermains.

.5 ANSI/AWWA C800-12, Underground Service Line Valves and Fittings.

.6 ANSI/AWWA C900-16, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inch through 60 inch (100mm – 1200mm).

.2 American Society for Testing and Materials International, (ASTM).

.3 American Water Works Association (AWWA)/Manual of Practice:

.1 AWWA M17-2006, Installation, Field Testing, and Maintenance of Fire Hydrants.

.4 Canadian General Standards Board (CGSB).

.5 Canadian Standards Association (CSA International).

1.4. SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.2 Submit complete construction schedule for watermains. Include method for installation of watermain.

.3 Submit samples in accordance with Section 01 01 50 – General Instructions.

.4 Contractor to provide to the Departmental Representative for approval 1 week prior to start of laying pipe the results of a sieve analysis of the proposed bedding materials.

.5 Submit manufacturer's pipe certification.

.6 Pipe certification to be on pipe.

1.5. CLOSEOUT SUBMITTALS

.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 in accordance with Section 01 78 00 – Closeout Submittals.

.1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.

1.6. WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Handle and dispose of hazardous materials in accordance with the Canadian Environmental Protection Act (CEPA), Transportation of Dangerous Good Act (TDGA), Regional and Municipal regulations.

.4 Ensure emptied containers are sealed and stored safely.

.5 Divert unused materials from landfill to metal recycling facility.

.6 Divert unused concrete materials from landfill to local facility.

.7 Divert unused aggregate materials from landfill to facility for reuse.

.8 Dispose of unused disinfection material at official hazardous material collections site.

.9 Do not dispose of unused disinfection material into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

.10 Fold up metal banding, flatten and place in designated area for recycling.

1.7. SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions to Departmental Representative for approval and adhere to interruption schedule as approved by Departmental Representative.

.3 Notify Departmental Representative a minimum of 48-hours in advance of interruption in service.

.4 Do not interrupt water service for more than 3-hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized.

.5 Notify fire department of any planned or accidental interruption of water supply to hydrants.

.6 Provide "Out of Service" sign on hydrant not in use.

.7 Advise local police department of anticipated interference with movement of traffic.

PART 2 PRODUCTS

2.1 PIPE, JOINTS AND FITTINGS

.1 Polyvinyl chloride pressure pipe: to ANSI/AWWA C900, pressure class 150, DR 18, 1 MPa gasket bell end.

.2 HDPE DR11 pressure pipe: to AWWA C906, ASTM F714 type PE 4710 min. series, and certified to CSA-B137.1. Pressure rating 200 psi.

.3 CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket coupling.

.4 Ductile Iron fittings: to ANSI/AWWA C153/A21.53-06.

.5 150 & 200 num dia. Watermain - DR11

.6 Polyethylene to polyethylene joints: to be thermal butt fusion joined, to ASTM D2657 where indicated ends to be flanged with ductile iron backing flanges.

.7 Polyethylene fittings: to CAN/CSA B137.1.

.8 Tensile strength and minimum bending radius shall satisfy project requirements. DR ratio indicated is the minimum required to satisfy operational conditions.

.9 The pipe shall be free from visual defects such as foreign inclusions, concentrated ridges, pitting, discoloration, varying wall thickness and other deformities.

.10 Diameters as indicated.

.11 All water mains shall conform to NFPA 24

2.2 VALVE BOXES

.1 Valves to open counter clockwise.

.2 To be Terminal City or approved equal suitable for buried service complete with key operated nut, 100mm diameter riser pipe and 100MM diameter TC flagged surface box.

.3 Air and vacuum release valves: heavy duty combination air release valves employing direct acting kinetic principle.

- .1 Fabricate valves of cast iron body and cover, with bronze trim, stainless steel floats with shock-proof synthetic seat suitable for 2 MPa working pressure.
- .2 Valves to expel air at high rate during filling, at low rate during operation, and to admit air while line is being drained.
- .3 Valve complete with surge check unit.
- .4 Ends to be flanged to ANSI/AWWA.

2.3 TRACER WIRE

.1 Direct Burial #12 AWG Solid (.0808” diameter), steel core hard drawn extra high strength tracer wire, 1150# average tensile break load, 45 mil high molecular weight-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating.

.2 Tracer Box shall include:

.1 Tube material shall be of high grade ABS, or equivalent rigid plastic that meets or exceeds ASTM D-1788, Type 1 requirements.

.2 Lid material shall be of cast iron or ductile iron. Tensile strength or ductility of such material shall be equal or superior to hi-tensile cast iron ASTM A126-B requirements.

.3 Lid-locking bolt material shall be made of aluminum material equal or superior to ASTM B253.

.4 Lid-locking mechanism material shall be made of plastic to meet or exceed ASTM A126-B requirements.

.5 Box shall be designed to be easily detected by magnetic and electronic locators even when box is covered by a minimum of 100mm of soil, sod and / or paving material.

.6 A magnet shall be securely attached at the top of the upper tube of the box for locating purposes.

2.4 VALVE CHAMBERS

.1 Concrete and reinforcing steel to Section 03 30 00 – Cast-in-Place Concrete and Section 03 20 00 – Concrete Reinforcing.

.2 Precast concrete sections to ASTM C478M. Cast ladder rungs integral with unit; field installation not permitted.

.3 Valve chamber frames and covers:

.1 Design and dimensions as indicated.

.2 Cover to be marked "WATER"/"EAU".

.4 Ladder rungs for valve chambers: 20mm diameter deformed rail steel bars to CAN/CSA-G30.18, hot-dipped galvanized after fabrication to CAN/CSA-G164. Rungs to be safety pattern.

2.5 SERVICE CONNECTIONS

.1 Polyvinyl chloride pressure pipe: to ANSI/AWWA C900, pressure class 150, DR 18, 1 MPa gasket bell end.

.2 HDPE DR11 pressure pipe: to AWWA C906 and certified to CSA-B137.1.

.3 CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket coupling.

.4 Ductile Iron fittings: to ANSI/AWWA C153/A21.53-06

.5 Copper tubing joints: compression type suitable for 1 MPa working pressure.

.6 Polyethylene pipe joints: thermal butt fusion welded.

.7 Brass corporation stops: compression type having threads to ANSI/AWWA C800.

.8 Brass inverted key-type curb stops: compression type with drains.

.1 Curb stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury.

.2 Top of cast iron box marked "WATER"/"EAU".

.9 Polyethylene tapping tees or multi-saddle tees: for Polyethylene pipe. Tees to be socket fused to pipe.

.10 Service connections for PVC pipe:

.1 Service connections less than 100mm: Mueller Corporation stop or equivalent, tapped to main using AWWA threads, complete with stainless service saddle. Service saddle to consist of circumferential band type complete with side bars and fingers, keeper bar, stud bolts, nuts, washers and gaskets.

.2 Service connections 100mm and over: Use tee fitting or tapping valve and sleeve. Provide Mueller corporation stop or equivalent.

.11 Bronze type service clamps: for PVC pipe service connections.

.1 Service clamps to be of strap-type, with confined "O" ring seal cemented in place.

.2 Clamps to be tapped with threads to ANSI/AWWA C800.

.12 Tee connections: for services above NPS 1. Tee connections to be fabricated of same material and to same standards as specified pipe fittings and to have ends matching pipe to which they are joined.

.13 All water mains shall conform to NFPA 24

2.6 YARD HYDRANTS

.1 Yard Hydrants: Terminal City type C71P or equivalent as approved by departmental representative self-draining stand pipe, factory assembled unit:

.1 Hydrants to open threads to local standard, Provide metal caps and chains.

.2 Yard Hydrant to be manufactured with bronze operating and draining components.

.3 The stuffing box and draining mechanism to have “O” ring rubber gaskets for sealing purposes.

.4 Polyurethane anti-score seating material is used for the valve disc facing.

.5 Provide key operated gate valve located 1m from hydrant.

.6 Depth of bury 1.2m.

.2 Hydrant paint: exterior enamel to CAN/CGSB-1.88, MPI #96.

2.7 PIPE, BEDDING AND SURROUND MATERIAL

.1 Granular material to: Section 31 05 16 – Aggregate Materials and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Table:

SIEVE DESIGNATION	PERCENT PASSING	
	*Type 1**	*Type 2**
25.0mm	100	100
19.0mm	90-100	90-100
12.5mm	65-85	70-100
9.5mm	50-75	-
4.75mm	25-50	40-70
2.36mm	10-35	25-52
1.18mm	6-26	15-38
0.600mm	3-17	6-27
0.300mm	-	3-20
0.075mm	0-5	0-8

**Type 1: Standard Gradation*
**Type 2: To be used only in dry trench conditions and with prior approval of Departmental Representative.*

2.8 BACKFILL MATERIAL

.1 In accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

2.9 PIPE DISINFECTION

.1 Contractor must submit a copy of final pipe disinfection procedure per ANSI/AWWA 651 for review and comments/acceptance by the Departmental Representative. Water samples, to confirm successful disinfection procedures, to be collected by consultant and submitted to an accredited laboratory for analysis. Results must be reviewed by Departmental Representative prior to commissioning.

PART 3 EXECUTION

3.1 PREPARATION

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.

.1 Inspect materials for defects to approval of the Departmental Representative.

.2 Remove defective materials from site as directed by Departmental Representative.

3.2 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 – Excavating Trenching and Backfilling.

.2 Trench depth to provide cover over pipe of not less than 1.2m from finished grade or alternative to meet H-20 live load requirements as approved by the Departmental Representative.

.3 Trench alignment and depth require Departmental Representative approval prior to placing bedding material and pipe.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete work in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.2 Place concrete to details as indicated.

.3 Do not backfill over concrete within 24-hours after placing.

3.4 GRANULAR BEDDING

.1 Place granular bedding material in uniform layers not exceeding 150mm compacted thickness to depth of 150mm below bottom of pipe.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D 698.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 – Excavating Trenching and Backfilling.

3.5 PIPE INSTALLATION

.1 Lay pipes to manufacturer's standard instructions and specifications. Do not use blocks except as specified.

.2 Join pipes in accordance with manufacturer's recommendations.

.3 Bevel or taper ends of PVC pipe to match fittings.

.4 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.5 Lay pipes on prepared bed, true to line and grade:

.1 Minimum grade on watermains to be 0.1%.

.2 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.3 Take up and replace defective pipe.

.4 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10mm in 3m.

.6 Minimum clearances to be as follows (unless otherwise noted):

.1 3.0m wall to wall horizontal and 1.0m wall to wall vertical clearance from storm and sanitary sewers.

.2 1.0m wall to wall horizontal and 0.3m wall to wall vertical clearance from other utilities.

Where minimum vertical or horizontal separation are not achieved relative to any storm and sanitary mains and utilities, or the watermain crosses under a sewer main, the watermain joints are to be wrapped with TC Envirotape (50Mil) manufactured by Tapecoat Canada Inc. or equivalent.

.7 All watermains at tie-in points to be capped 1.5m from existing watermains unless otherwise specified. Tie-ins to existing watermains to be performed by the contractor under direct supervision by the site representative unless otherwise directed. A minimum notice of 72 hours shall be given for any tie-in. Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.

.8 Do not exceed one half of permissible deflection at joints as recommended by pipe manufacturer.

.9 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.10 Position and join pipes with equipment and methods approved by Departmental Representative.

.11 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.12 Align pipes before jointing.

.13 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.14 Avoid displacing gasket or contaminating with dirt or other foreign material.

.1 Remove disturbed or contaminated gaskets.

.2 Clean, lubricate and replace before jointing is attempted again.

.15 Complete each joint before laying next length of pipe.

.16 Minimize deflection after joint has been made.

.17 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.18 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by the Departmental Representative.

.19 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

.20 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.

.21 Install tracer wire along entire length of watermain with Test boxes located at maximum 1000m separation.

.22 Do not lay pipe on frozen bedding.

.23 Do hydrostatic and leakage test and have results approved by the Departmental Representative before surrounding and covering joints and fittings with granular material.

.24 Backfill remainder of trench.

3.6 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations as indicated.

3.7 VALVE CHAMBERS

.1 Use precast units as approved by the Departmental Representative.

.2 Construct units as indicated, plumb and centered over valve nut, true to alignment and grade, and not resting on pipe.

.3 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.

.4 Plug lifting holes with precast concrete plugs set in cement mortar.

.5 Place frame and cover on top section to elevation indicated. If adjustment is required use concrete ring.

.6 Clean valve chambers of debris and foreign materials; remove fins and sharp projections.

3.8 SERVICE CONNECTIONS

.1 The contractor is to confirm with the Mechanical Engineer prior to construction, the location and size of all building connections.

.2 Terminate building water service 1m outside building wall or as indicated opposite point of connection to main.

.1 Locate point of connection in advance and advise Departmental Representative.

.2 Cap or seal end of pipe and place temporary marker to locate pipe end.

.3 Complete with shut-off valve. Building service manifold and chamber to be as per Mechanical consultants drawings, to be installed by Plumbing contractor.

.3 Do not install service connections until satisfactory completion of hydrostatic and leakage tests of watermain.

.4 Construct service connections at right angles to watermain unless otherwise directed.

.5 Tappings on ductile iron, or PVC-C900 pipe, may be threaded without service clamps:

.1 Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.

.2 Tappings PVC-C900 pipe to conform to following:

PIPE DIAMETER (mm)	MAX. TAP WITHOUT CLAMP (mm)	MAX. TAP WITH CLAMP (mm)
100	20	25
150	20	40
200	25	50
250	25	50
300	40	75

.6 Tappings on PVC pipe to be either PVC valve tees or bronze type service clamps, strap type with "O" ring seal cemented in place.

.7 Tappings for PE pipe: PE tapping tees or multi-saddle tees.

.8 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.

.9 Install single and multiple tap service connections on top half of main, between 45 degrees and 90 degrees measured from apex of pipe.

.10 Install multiple corporation stops, 30 degrees apart around circumference of pipe and minimum of 300mm apart along pipe.

.11 Tap main at 2:00 o'clock or 10:00 o'clock position only; not closer to joint nor closer to adjacent service connections than recommended by manufacturer, or 1m, whichever is greater.

.12 Leave corporation stop valves fully open.

.13 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.

.14 Install rigid stainless-steel liners in small diameter plastic pipes with compression fittings.

.15 Install curb stop with corporation box on services NPS 2 or less in diameter.

.1 Equip larger services with gate valve and cast-iron box.

.2 Set box plumb over stop and adjust top flush with final grade elevation.

.3 Leave curb stop valves fully closed.

.16 Place temporary location marker at ends of plugged or capped unconnected water lines.

.1 Each marker to consist of 38 x 89mm stake extending from pipe end at pipe level to 600mm above grade.

.2 Paint exposed portion of stake red with designation "WATER SERVICE LINE" in black.

.17 Service fittings to be set at proposed finished grades

3.9 YARD HYDRANTS

.1 Install yard hydrants at locations as indicated and to be set at proposed finished grades.

.2 Set hydrants plumb, with hose outlets parallel with edge of pavement with outlet facing roadway.

.3 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.

.4 To provide proper draining for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5m deep and backfill with coarse gravel or crushed stone to level 150mm above drain holes.

.5 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.10 THRUST BLOCKS AND RESTRAINED JOINTS

.1 For thrust blocks: do concrete Work in accordance with Section 03 30 00 – Cast-in-Place Concrete and MMCD Std. Dwg W1.

.2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Departmental Representative.

.3 Keep joints and couplings free of concrete.

.4 Do not backfill over concrete within 24-hours after placing.

.5 For restrained joints: only use restrained joints approved by Departmental Representative.

3.11 HYDROSTATIC AND LEAKAGE TESTING

.1 Do tests in accordance with ANSI/AWWA C600 and B.C. Building Code 2018.

.2 The contractor shall ensure that all sections of watermains have test points and temporary blow-offs suitable to ensure adequate pressure testing, chlorination and flushing in accordance with AWWA C651-14.

.3 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.4 Notify Departmental Representative and Engineer at least 48 hours in advance of proposed tests:

.1 Perform tests in presence of Departmental Representative and Engineer.

.5 Where section of system is provided with concrete thrust blocks, conduct tests at least 5-days after placing concrete or 2-days if high early strength concrete is used.

.6 Test pipeline in sections not exceeding 365m in length, unless otherwise authorized by the Departmental Representative.

.7 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed as directed by Departmental Representative.

.8 Leave hydrants, valves, joints and fittings exposed.

.9 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.

.10 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.

.11 Open valves.

.12 Expel air from main by slowly filling main with potable water.

.1 Install corporation stops at high points in main where no air-vacuum release valves are installed.

.2 Remove stops after satisfactory completion of test and seal holes with plugs.

.13 Thoroughly examine exposed parts and correct for leakage as necessary.

.14 Apply hydrostatic test pressure of 1035 kPa based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1-hour.

.15 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.

.16 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.

.17 Repeat hydrostatic test until defects have been corrected.

.18 Define leakage as amount of water supplied in order to maintain test pressure for 2-hours.

.19 Locate and repair defects if leakage is greater than amount specified.

.20 Repeat test until leakage is within specified allowance for full length of watermain.

3.12 PIPE SURROUND

.1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.

.2 Hand place surround material in uniform layers not exceeding 150mm compacted thickness as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D 698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 95% maximum density to ASTM D 698.

3.13 BACKFILL

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150mm compacted thickness up to grades as indicated.

.2 Do not place backfill in frozen condition.

.3 Under roadways and pathways, compact backfill to at least 95% maximum density to ASTM D 698.

3.14 PAINTING OF HYDRANTS

.1 After installation, paint hydrants red.

.2 After hydrant flow tests, paint caps and ports to meet colour selections approved by authority having jurisdiction.

3.15 FLUSHING AND DISINFECTING

.1 Flushing and Disinfecting to Ministry of Health and AWWA standards.

.2 The site representative shall be responsible for taking water samples for testing and presenting them to an approved testing facility. All test results, whether failed or passed shall be submitted to the Departmental Representative. The contractor shall pay for all tests.

.3 Flushing and disinfecting operations: witnessed by Departmental Representative.

.1 Notify Departmental Representative at least 4-days in advance of proposed date when disinfecting operations will begin.

.2 Flush watermains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear. The contractor shall supply all water for flushing and testing.

.3 Flushing flows as follows:

PIPE SIZE NPS	FLOW (L/S) MINIMUM
6 and below	38
8	75
10	115
12	150

.4 Provide connections and pumps for flushing as required.

.5 Open and close valves, hydrants and service connections to ensure thorough flushing.

.6 When flushing has been completed to Department Representative approval, introduce strong solution of chlorine as approved by Departmental Representative into watermain and ensure that it is distributed throughout entire system.

.7 Rate of chlorine application to be proportional to rate of water entering pipe.

.8 Chlorine application to be close to point of filling watermain and to occur at same time.

.9 Operate valves, hydrants and appurtenances while main contains chlorine solution.

.10 Flush line to remove chlorine solution after 24-hours.

.11 Discharge of chlorinated water into storm sewers or watercourses is strictly prohibited.

.12 Measure chlorine residuals at extreme end of pipeline being tested.

.13 Perform bacteriological tests on watermain, after chlorine solution has been flushed out.

.1 Take samples daily for minimum of 2-days.

.2 Should contamination remain or recur during this period, repeat disinfecting procedure.

.3 Specialist contractor to submit certified copy of test results.

.14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.

.15 After adequate chlorine residual not less than 50 PPM has been obtained leave system charged with chlorine solution for 24-hours.

.16 After 24-hours, take further samples to ensure that there is still not less than 10 PPM of chlorine residual remaining throughout system.

3.16 SURFACE RESTORATION

.1 After installing and backfilling over watermains, restore surface to original condition as approved by the Department Representative.

END OF SECTION

PART 1 GENERAL

1.1. DIRECTIONAL DRILLING METHOD

.1 Directional drilling is the installation of a pipe by drilling a pilot bore from the entry pit to a pre-determined exit location. The drilling head is then replaced with a reamer and the drilling string is pulled back to the entry hole, enlarging the hole while simultaneously puling the pipeline product into place.

.2 Horizontal Directional Drilling (HDD) rig is a mechanical drilling device used to create a borehole trough which a pipe or conduit is installed.

.3 Return and spoils are the drilling mud and cuttings collected in the entry and exit pits as well as any fluid, which escapes from the borehole to the surface.

1.2. MATERIAL CERTIFICATION

.1 Submit manufacturer's test data and certification that pipe materials meet requirements of this section at least 4 weeks prior to commencing work. Include manufacturer's drawings, information and shop drawings where pertinent.

1.3. SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

1.4. DESIGN

.1 Submit methodology design and construction details for the proposed directional boring operation.

.2 Methodology to include:

a) Drilling, reaming and pipe pulling procedures.

b) Equipment specifications and capabilities, size of pilot hole, number and size of pre-reams, use of rollers, baskets and side booms to suspend and direct pipe during pull back, type and capabilities of tracking system, and number of sections in which product is to be installed.

c) Schedule of Work.

d) Drawing of work site, including location and footprints of equipment, and the locations of the entry, exit and slurry containment pits.

e) Drawing of pullback installation showing partial or full closure of roadways and their approximate duration

f) Drilling fluid management plan, including drilling fluid containment, recycling/transport and approved disposal site.

g) Emergency procedures for inadvertently boring into a live power line, natural gas line, water line, sewer line, or fibre-optic cables. Procedures must comply with regulations.

h) Method of dealing with inadvertent returns or surface seepage of drilling fluids and spoils.

i) Design to include:

a) Pipe stress calculations for each stage of the installation process as the pipe is pulled through the pilot bore. Stress calculations as follows:

I. Internal pressure stress.

II. Bending stress.

III. Thermal stress.

IV. Net longitudinal compressive stress (bending included).

V. Equivalent tensile stress available to induce progressive creep strain.

VI. Total longitudinal stress from sustained loads.

VII. Short term and long-term external differential pressure.

b) Submit design analysis and calculations in the form of a technical report, under the seal of a professional engineer, registered in the Province of British Columbia.

1.5. SCOPE OF WORK

.1 Include all engineering services, plant, labour, material and services for the following:

.1 Preparation of the site including removal of vegetation, location of all existing utilities along the proposed path, excavation of all utilities crossing, excavation of entry, exit, and slurry containment pits.

.2 Installation of new watermains by the directional drilling method

.3 Testing of installed section and restoration of all affected surfaces to their pre-construction conditions.

1.6. RECORD DRAWING:

.1 Provide record drawings, including details of pipe material, and alignment and location.

PART 2 PRODUCTS

2.1 PIPE, JOINTS AND FITTINGS

.1 Refer to Section 33 11 16 Watermains.

2.2 PIPE BEDDING AND SURROUND MATERIAL

.1 Refer to section 33 11 16 Watermains.

.2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 – Cast-in-Place Concrete.

2.3 BACKFILL MATERIAL

.1 As indicated.

2.4 PIPE DISINFECTION

1 Refer to section 33 11 16 Watermains.

PART 3 EXECUTION

3.1 EQUIMENT

.1 Be responsible for the directional drilling method and equipment. Confirm that the drilling rig and mud mixing system have the capacity required to successfully complete the installation as indicated and considering ground and groundwater conditions that can be reasonably foreseen.

.2 Operating range and degree of accuracy of proposed tracking system shall be adequate to meet project conditions. Tracking/steering equipment shall allow for continuous monitoring of the drilling head along the entire proposed alignment. If a poor contact with the sound is expected to occur at any section, this should be communicated to the engineer prior to commencement of construction.

.3 The drilling unit must be equipped with an electric strike safety package. The package should include warning sound alarm, grounding mats and protective gear.

3.2 PRE-COMMENCEMENT

.1 Notify owners of subsurface utilities along and on either side of the proposed drill path of the impending work. All utilities along and on either side of the proposed drill path are to be located

.2 All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.

.3 The proposed drill path should be determined and documented, including its horizontal and vertical alignments and the location of buried utilities and substructures along the path.

.4 Excavations for entrance and exit pits are to be of sufficient size to avoid a sudden radius change of the pipe, and consequently excessive deformation.

3.3 INSTALLATION PROCEDURES

.1 Only trained operators permitted to operate the drilling equipment, follow manufacturer's operating instructions and safety practices shall always be followed.

.2 Limit drilling mud pressure in the borehole to not exceed that which can be supported by the overburden to prevent heaving or hydraulic fracturing of the soil ("Frac-out").

.3 Entrance and exit angles of the drill string should range between 8 and 20 degrees and 5 and 10 degrees, respectively. Any deviation from these values shall first be approved by the Engineer.

.4 If a drilled hole beneath road or railway must be abandoned, fill the hole with grout or bentonite to prevent future subsidence.

.5 Use drilling mud during drilling and back-reaming operations.

.6 Utilize a sufficient number of pre-reams as required to avoid heaving while enlarging the hole to the final diameter.

.7 During back-reaming, seal the conduit either end with a cap or plug to prevent water, drilling fluids and other foreign materials from entering the pipe as it is being pulled back.

.8 Use pipe rollers, skates or other protective devices in the installation of the pipe.

.9 The pilot hole shall be back-reamed to accommodate and permit free sliding of the product inside the borehole according to the following specifications:

Nominal Pipe Diameter (mm)	*Back Ream Hole Diameter (mm)*
50	*75 to 100*
75	*100 to 150*
100	*150 to 200*
150	*250 to 300*
200	*300 to 350*
250	*350 to 400*
> 300	*At least 1.5 times product OD*

3.4 PIPE JOINTING

.1 High density polyethylene

1.1. Assemble and join sections of pipe on the job site above ground, by the butt-fusion method in strict conformance with the manufacturer's printed instructions.

1.2. The butt-fusion method for pipe joining shall be carried out in the field by qualified fusion technicians following the pipe and fittings manufacturer's specifications. The joints shall have a smooth, uniform, double rolled back bead made while supplying the proper melt, pressure and alignment. It shall be the sole responsibility of the contractor to provide an acceptable butt-fusion joint.

1.3. All joints shall be made available for inspection by the Engineer before insertion.

.2 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.3 Shape transverse depressions in bedding as required to suit joints.

.4 Compact each layer full width of bed to at least 95% maximum density to ASTM D 698.

.5 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 – Excavating Trenching and Backfilling.

3.5 DRILLING FLUIDS – COLLECTION AND DISPOSIAL PRACTICES

.1 Excess drilling mud slurry shall be contained in a lined pit or containment pound at exit and entry points until recycled or removed from the site. Entrance and exit pits must be of sufficient size to contain the expected return of drilling mud and spoils.

.1 Take all necessary precautions to keep drilling fluids out of streets, manholes, storm sewers, drainage systems and water courses.

.2 Recycling drilling fluids is an acceptable alternative to disposal.

.3 All diligent efforts to minimize the amount of drilling fluids and cuttings spilled during the drilling operation. Provide complete clean-up of all drilling mud overflow or spills.

3.6 ALIGNMENT TOLERANCES

.1 Install pipe to within plus or minus 0.5 m in any direction of alignment shown on drawings. Provide minimum horizontal clearance of 3.0 m between water main and sewage forcemain.

3.7 HYDROSTATIC AND LEAKAGE TESTING

.1 Refer to Section 33 11 16 – Watermains.

3.8 DEFLECTION TESTING

.1 After the pipe is in place supply and run a sizing pig or mandrel through the completed installation to verify the integrity and roundness of the pipe.

.1 Locate point of connection in advance and advise Departmental Representative.

.2 Cap or seal end of pipe and place temporary marker to locate pipe end.

.2 Do not install service connections until satisfactory completion of hydrostatic and leakage tests of watermain.

.3 Ovality tolerance is 4.5 % measured as ring deflection. Ring deflection is defined as:

$$\Delta R \equiv \frac{D^1 - D^2}{D^1} \, x \, 100\%$$

Where: D1 = pre-installation pipe diameter
D2 = post-installation pipe diameter at its smallest dimension.

3.9 FLUSHING AND DISINFECTING

.1 Refer to Section 33 11 16 – Watermains

3.10 SURFACE RESTORATION

.1 After installing and backfilling over watermains, restore surface to original condition as approved by the Department Representative.

3.11 ACCEPTANCE CONDITIONS

.1 Provide a set of as-built drawings including both alignment and profile. Construct drawings from actual field reading. Submit raw data upon the Engineer's request.

.2 Install pipe markers to identify pipe location on either side of under crossings.

.3 Install pipeline product within the pre-specified alignment and grade tolerances as appear on the drawings and/or project specifications.

.4 The installed pipe shall meet the leakage requirements as specified in this Section.

END OF SECTION