1. GENERAL

1.1 Scope of Work

.1 Excavation, bedding, and backfill to be in accordance with City of Winnipeg Standard Construction Specifications CW2030 unless otherwise indicated. This section outlines the requirements for excavation, backfilling, and compaction for works related to trenching of underground piping only.

1.2 Protection

.1 Existing Buried Utilities:

.1 Size, depth and location of existing utilities as indicated are for guidance only; completeness and accuracy are not guaranteed.

.2 Prior to commencing any excavation work, notify applicable utility authorities, establish location and state of use of buried services. Clearly mark such locations to prevent disturbance during work.

.3 Confirm locations of buried utilities by careful test excavations and according to applicable utility guidelines.

.4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities encountered.

.5 Obtain direction of owner of utility and Contract Administrator before moving or otherwise disturbing utility. Repair any damage to utilities in accordance with the direction of the utility owner at no cost to the City of Winnipeg.

.6 Remove abandoned utility service lines encountered from areas of construction. Cap, plug or seal such lines and identify at grade with markers.

.7 Accurately locate and record abandoned and active utility lines re-routed or extended on record drawings.

.2 Existing Surface Features:

.1 Protect existing buildings, trees and other plants, lawns, fencing, poles, wires, sidewalks, curbs, bench marks and monuments, paving and other surface features located within right-of-way or adjoining properties from damage while work is in progress and repair damage resulting from work as an incidental. Excavations are not to encroach on normal 45 degree bearing support under any foundation.

.2 Make good all damage occurring as a result of inadequate, unauthorized or defective methods of protection.

.3 Protect open excavation against flooding and damage from surface water run-off.

2. PRODUCTS

2.1 Bedding and Backfill

.1 Bedding and backfill to be in accordance with City of Winnipeg Standard Construction Specifications CW2030

3. CONSTRUCTION METHODS

3.1 General

.1 Construction methods to be in accordance with City of Winnipeg Standard Construction Specifications CW2030 unless otherwise indicated.

.2 Strip topsoil from within limits of excavation and stockpile. Spread over limits of excavation after backfilling.

.3 Strip and salvage existing granular material for re use from driveways and roadways which will be affected by trenching operations.

3.2 Alignment

.1 Do not deviate from the proposed trench or tunnel centre line alignment by more than 100 mm unless otherwise approved by the Contract Administrator.

.2 Where elevations are given on the stakes or a proposed pipeline profile is provided, install piping within 25 mm of the required elevations unless otherwise approved by the Contract Administrator.

.3 In cases where no profile of the proposed pipeline is provided, the plans or specifications shall specify a minimum depth of cover for the pipeline. The minimum pipe depth shall be 2.5 m from the top of the pipe to existing ground surface prior to construction unless otherwise approved by the Contract Administrator. In cases where the pipeline crosses a road or driveway, the pipe shall be laid at a uniform gradient between the elevations of the pipe on either side of the road or driveway. The minimum pipe depth under roadways shall be 3.0 m.

.4 Provide minimum horizontal distance between the trench sidewall and pipe of 100 mm or one-half the pipe diameter for pipes greater than 200 mm.

3.3 Stockpiling

.1 Stockpile fill materials in areas designated. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Do not damage existing roadways or surface features with stockpiled material.

3.4 Foundation and Pipe Bedding

.1 Foundation and Pipe Bedding to be in accordance with City of Winnipeg Standard Construction Specifications CW 2030 unless otherwise indicated.

.2 Forcemain piping 250 mm diameter or smaller may be installed utilizing a chain trencher or by trenchless installations. Piping shall be placed utilizing Class B sand bedding. Contractor is responsible to ensure installation techniques comply with manufacture's installation criteria.

.3 For trenchless installation methods, provide foundation consisting of Type 3 material over the entire bottom of the shaft. Utilize Class B Bedding at all shaft location for horizontal directional boring.

3.5 Backfilling

.1 Do not proceed with trench backfilling operations until piping installations have been reviewed by the Contract Administrator.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Backfill excavations in accordance with City of Winnipeg Standard Construction Specifications CW2030

3.6 Culverts

.1 When existing culverts must be removed in the course of construction, salvage and place them in their original location and grade subsequent to the completion of construction.

.2 If the existing culvert has deteriorated, i.e. rusted and is not salvageable as determined by Contract Administrator, dispose of the culvert and purchase a replacement culvert as directed by the Contract Administrator. Install the new culvert in place of the original as an incidental.

3.7 Clean –Up and Restoration

.1 As backfilling proceeds, keep roads, streets and sidewalks clean of dirt and excavated material.

.2 Upon completion of work, remove surplus materials and debris, trim slopes, and correct defects. Clean and reinstate areas affected by work.

.3 Complete restoration works as indicated elsewhere in the specification.

END OF SECTION

EARTH WORK

1. GENERAL

1.1 Scope of Work

.1 This Section outlines the requirements for earthworks related to driveway construction. This includes excavation of organic and saturated materials, placement of suitable site and imported fill for subgrade construction.

1.2 Measurement and Payment

.1 Subgrade Compaction will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3110.

.2 Placement and compaction of fill material in general areas and ditches will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3170 for Suitable Site Fill Material and Imported Fill Material.

2. PRODUCTS

2.1 Fill Material

.1 Suitable Site Material to be as per City of Winnipeg Standard Construction Specification CW 3170.

.2 Imported Fill Material to be as per City of Winnipeg Standard Construction Specification CW 3170.

3. EXECUTION

3.1 General

.1 Do not perform work during inclement weather conditions or under adverse field conditions such as frozen ground or ground covered with snow, ice, or standing water.

3.2 General Excavation

.1 All vegetation and topsoil shall be removed from driveway sideslopes. The sideslopes of existing ditches are to be cut to approximately 4H:1V or flatter to provide a transition zone between the in-situ and fill material.

.2 Prior to placement of fill material the subgrade shall be benched in order to key in the fill material to the in-situ material. The bench dimensions shall be as determined in the field by the Geotechnical Engineer. Benching shall be considered incidental to excavation and no further payment shall be made.

.3 Removal of gravel shoulders shall be considered incidental to the excavation work associated with the driveway widening and no further measurement or payment will be made.

3.3 Placement of Fill Material

.1 Fill material in subgrade shall be placed in 300 mm maximum depth loose lifts at or near to optimum water content and compacted to a minimum of 95% of its Standard Proctor density to the elevation of bottom of the sub-base material for sub base and base materials.

3.4 Subgrade Compaction

.1 Subgrade Compaction will be completed in accordance with CW 3110.

END OF SECTION

WATERWAYS PROTECTION

1. GENERAL

1.1 Scope of Work

.1 This Section outlines the requirements to mitigate the potential for waste excavated material, sedimentation, and debris from construction operations from entering the drainage ditches and adjacent watercourses during construction activities, and rainfall and related run off events. Note: Site specific mitigative measures for work in and adjacent to the floodway channel are identified elsewhere in the document.

1.2 Waterways

.1 All work adjacent to or crossing waterways including creeks and ditches draining into waterways is regulated by the Federal Department of Fisheries and Oceans (DFO).

.2 Complete works in accordance to DFO guidelines / regulations.

.3 Complete works within the floodway channel in accordance with Section 02532 – Forcemain Crossing Floodway Channel.

1.3 Measurement and Payment

.1 Work performed under this Section excluding silt fencing will be incidental to work involved in Sections.

.2 Silt Fencing; will be measured in lineal metres along the centerline of the fence and paid at the Contract Unit Price per lineal metre. Payment shall be considered full compensation for furnishing and installing silt fence, including any wire reinforcement; maintenance of silt fence; and all other work necessary or incidental thereto for which separate payment is not elsewhere provided shall be considered incidental to the works. Payment for silt fencing related to floodway works in **not** included under this item.

2. PRODUCTS

2.1 Silt Fencing

.1 Silt Fencing to be woven polypropylene synthetic fibre fabric with UV stabilizers and reinforcing mesh as per Armtec Heavy Duty or approved equal in accordance with B6.

.2 The fabric shall be inert to commonly encountered soil chemicals, hydrocarbons, mildew and bacteria.

.3 Wood Posts: minimum 50 mm x 50 mm (2” x 2”) by 1.5 m in length.

2.2 Erosion Control Blanket

.1 Utilize blanket consisting of 70% straw/30% coconut matrix with UV stabilized black top and photodegradable green bottom nets. Blanket to be model SC32 as manufactured by Erosion Control Blanket or approved equal in accordance with B6.

3. EXECUTION

3.1 General

.1 Complete erosion control works to be in accordance with current DFO and Manitoba Environment guidelines.

.2 The following mitigation measures must be adhered to protect fish habitat:

.1 Use sediment and erosion control measures to prevent soil laden run off and silt from affecting downstream areas of the watercourse. Halt construction during periods of heavy rain or run off.

.2 Use and maintain effective sediment control measures until vegetation is established on disturbed areas to prevent soil laden run off from entering the watercourse. Disturbed areas are to be sloped, stabilized and seeded as soon as possible and reclaimed to vegetation within one growing season. Effective, long term erosion control measures must also be implemented.

.3 Monitor the work site to evaluate the effectiveness of erosion control measures and the physical stability of the creek bed and banks. Any problems are to be rectified immediately.

.4 Conduct the cleaning, fuelling, and servicing of equipment a minimum of 100 m from any watercourse. Equipment operating near any watercourse should be free of external grease, oil, mud, or fluid leaks.

.5 Take necessary precautions to ensure deleterious substances, including silt, does not enter any watercourse. The deposit of deleterious substances into water frequented by fish is prohibited under the **Fisheries Act**.

.6 Remove excess material from the excavation and place where it will not erode into any watercourse. Dispose all spoil materials above the high water mark and located such that they do not re-enter any watercourses.

.3 Maintain silt fences and erosion control measures through out construction until satisfactory grass growth / re vegetation of the trenches has occurred.

3.2 Erosion Control Blanket Installation

.1 Install erosion control blanket as per Manufacturer's recommendations. Ensure blanket is securely stapled in place to prevent movement during high flow events in drainage ditches.

3.3 Silt Fence Installation

.1 Install silt fences as per manufacturer's recommendations.

.2 Excavate trench to place bottom of fabric a minimum of 150 mm below existing grade and backfill with compacted soil to prevent sediment flow underneath the silt fence.

.3 Install all supporting posts on the down slope side of the fencing. Post to extend a minimum of 0.75 m below ground or until fabric reach the bottom of the trench excavated in Item .2 above.

.4 Maintain silt fences through out construction and until placement of erosion control blanket. Complete reseeding of embankment as soon as weather conditions permit upon completion of construction.

.5 Remove silt fences after installation of all permanent erosion control measures (including rip rap and satisfactory grass growth / re vegetation) and prior to project close out

END OF SECTION

FORCEMAINS

1. GENERAL

1.1 Sampling

.1 At least four (4) weeks prior to commencing Work, inform Contract Administrator of proposed source of bedding materials and provide access for sampling.

1.2 Material Certification

.1 At least two (2) weeks prior to commencing Work, submit Manufacturer's test data and certification that pipe materials meet requirements of this Section. Include Manufacturer's Drawings, information and Shop Drawings where pertinent.

1.3 Shop Drawings

.1 Submit Shop Drawings in accordance with Section 01300 – Submittals.

1.4 Record Drawings

.1 Provide data necessary to produce record Drawings showing locations of all mains and appurtenances, including directions for operating valves, list of equipment required to operate valves, details of pipe material, and location of air and vacuum release valves.

1.5 Measurement and Payment

.1 "Sewage Forcemains" will be measured on a per lineal meter basis for each class along the centre line of the main including the length through fittings. Length shall be horizontal measurement with no allowance for slope. Payment shall be made at the Contract Unit Price per lineal metre for each size of pipe, type of pipe, method of installation (if indicated on drawings), which shall be full compensation for excavation, trenching, trenchless installation and horizontal directional drilling, laying, jointing, bedding, backfilling, compaction/jetting (as required), flushing if required, pressure testing, restoration, and all materials including pipe, fittings, thrust blocks, bedding, backfill, removal of surplus excavated material plus, and all other work necessary or incidental thereto for which separate payment is not elsewhere provided. Note: If the method of installation has **not been** specifically indicated on the drawings and the installation method is optional to the Contractor, it shall not be considered for payment under the items where a specific method of listed on Form B: Prices. Likewise there shall be no differentiation in measurement or payment based on method of installation for locations where a specific method of installation is not specified on the drawings.

.2 "Valves" will be measured in units installed and shall be paid for at the Contract Unit Price for each size of valve, which shall be full compensation for excavation, trenching, laying, jointing, bedding, backfilling, compaction and all materials including valve, valve box and all other work necessary or incidental thereto for which separate payment is not elsewhere provided.

.3 "Air/vacuum Release Chambers" will be measured in units installed and shall be paid for at the Contract Unit Price for each chamber, which shall be full compensation for excavation, installation, jointing, backfilling, compaction, insulation, valve markers, and all materials within the chamber including air/vacuum release valves, shut off valves, fittings, concrete, frame and covers, and all other work necessary or incidental thereto for which separate payment is not elsewhere provided.

.4 "Discharge Manhole" will be measured in units installed and shall be paid for at the Contract Unit Price for each chamber, which shall be full compensation for excavation, installation, jointing, backfilling, compaction, supply and installation of chamber, supply and installation of piping between discharge manhole and existing manhole, overflow piping, drain piping, connection to existing manhole, drop piping in existing manhole, and all materials within the chamber including piping, knife gate valve, fittings, concrete, frame and covers, and all other work necessary or incidental thereto for which separate payment is not elsewhere provided.

.5 "Surcharge for Crossing No. 1 – Aqueduct and Railway" will be measured on a lump sum basis which shall include supply and installation of encasement piping and pipe supports (if specified), restoration of shafts and disturbed areas, encasement pipe joining, end seals, utility representatives (if required) and all other materials and work necessary or incidental thereto for which separate payment is not elsewhere provided. NOTE: Payment will be as a surcharge lump sum price in addition to the unit price bid for supply and installation of force main.

.6 "Surcharge for Crossing No. 2 – Perimeter Highway (north and nouthbound Lanes and service Road)" will be measured on a lump sum basis which shall include supply and installation of encasement piping (3 locations), pipe supports (if specified), restoration of shafts and disturbed areas, encasement pipe joining, end seals, utility representatives (if required) and all other materials and work necessary or incidental thereto for which separate payment is not elsewhere provided. NOTE: Payment will be as a surcharge lump sum price in addition to the unit price bid for supply and installation of force main.

.7 "Surcharge for Crossing No. 3 - Floodway" will be measured on a lump sum basis which shall include mobilization and demobilization of specialized equipment, restoration of shafts and disturbed areas, completion of works as specified in Section 02532 – Forcemain Crossing Floodway Channel and all other materials and work necessary or incidental thereto for which separate payment is not elsewhere provided. NOTE: Payment will be as a surcharge lump sum price in addition to the unit price bid for supply and installation of dual containment piping.

.8 "Surcharge for Crossing No. 4 – Aqueduct" will be measured on a lump sum basis which shall include supply and installation of encasement piping and pipe supports (if specified), restoration of shafts and disturbed areas, encasement pipe joining, end seals, utility representatives (if required) and all other materials and work necessary or incidental thereto for which separate payment is not elsewhere provided. NOTE: Payment will be as a surcharge lump sum price in addition to the unit price bid for supply and installation of force main.

2. PRODUCTS

2.1 Forcemain Pipe and Fittings

.1 Forcemain piping outside limits of floodway - Minimum 250 mm nominal diameter polyethylene pipe and fittings as per the following:

.1 Use DR 11 for all piping unless otherwise stated.

.2 To be iron pipe sized, certified for potable water use, made in accordance with AWWA C906, CSA/Warnock Hersey/or NSF International certified.

.3 Pipe to be made from polyethylene resin compound with a minimum cell classification of PE 346564C for PE 3408 materials in accordance with ASTM D3350.Materail to have a Long Term Hydrostatic Strength of 11 MPa when tested and analyzed by ASTM D2837. Resin to have a minimum hydrostatic design stress of 800 psi @140 F (i.e. 1600 PSI @ 73F) and shall be a Plastic Pipe Institute (PPI) listed compound.

.4 Minimum carbon black shall not be less than 2% when determined in accordance with ASTM D1603 as per CSA B137.1, 4.2 and 5.2.

.5 Shall contain no recycled material except that generated in the Manufacturer's own plant from the resin of the same specification and same raw material supplier.

.6 Compounds used shall meet the requirements of clause 7.2 of CSA B137.0 for toxicity for potable water service.

.7 Manufacture pipe to ASTM F714.

.8 Markings: continuously or at 1.5 m intervals indent print the following: pipe Manufacturer, nominal pipe size, dimension ratio, PE grade per ASTM D3350, followed by the Hydrostatic Design basis in 100’s of psi, CSA/Warnock Hersey/or NSF International certification complete with certification trademark logo, Manufacturing reference standard ASTM F714, and date of manufacture.

.9 Maximum pipe ovality for polyethylene pipe prior to joining shall be not exceed 4%.

.10 Polyethylene Fittings: To be iron pipe sized, certified for potable water use, made in same manner and materials as pipe. Fittings to have same certification as piping. Polyethylene to polyethylene joints to be as per the following:

.1 Joints to be thermal butt fusion welded.

.2 Electrofusion fittings as per AWWA C207-78.

2.2 Gate Valves and Valve Boxes

.1 To AWWA C509, standard iron body, resilient seated wedge gate valve with non-rising stem, suitable for 1 MPa with joints to match pipe selected. End to be flanged when utilizing in conjunction with polyethylene piping.

.2 Valve body to be epoxy coated in accordance with AWWA C550.

.3 Valves to open counter clockwise with red operating nut.

.4 Valve boxes to ASTM A 48 cast iron, bituminous coated, two-piece sliding type adjustable over a minimum of 450 mm complete with valve operating extension rod, of such length that when set on valve operating nut top of rod will be between 150 mm and 450 mm below cover. Top of box to be marked "S".

2.3 Air and Vacuum Release Valves

.1 Air and vacuum release valves: Use Apco Model 400 series (401Wa, 402WA, or 403WA) or approved equal in accordance with B6, sizing as indicated on the drawings. Valves to be fabricated of cast iron body and cover, with bronze trim, stainless steel floats with shock-proof synthetic seat suitable for 2 MPa working pressure. Valves shall permit venting of air at high rate during filling, and venting at low rate during operation and permit unrestricted entry of air during vacuum conditions. Valves to be heavy duty combination air release valves employing direct acting kinetic principle. Valve to be complete with surge check unit. Ends to be flanged to AWWA C110-82. Provide inlet and blow off valves, quick disconnect couplings and minimum 3 m of hose for flushing. Unit to be rated for operating range of 0 to 1000 kPa. Equip valve and hose with quick disconnect Utilize couplings. Utilize electrofusion saddle for connection to the forcemain. Shut off valves to be brass or approved equal in accordance with B6. Couplings to be compression type.

2.4 Encasement Piping

.1 Encasement pipe for pipe crossings under Manitoba Transportation highways and roadways to be minimum PVC C-900 DR-25 or approved equal in accordance with B6.

.2 Encasement Pipes for pipe crossings under all railways and aqueducts to be Standard Black Steel A50 3 Grade B ERW, wall thickness 9.5 mm, nominal diameter as per plans.

.3 Sizing of the encasement pipe shown on plans is for guidance only. Size encasement pipe to provide a minimum 50 mm clearance over largest outside diameter of carrier pipe used.

.4 Ends of casing to be sealed against the forcemain pipe by wrapping the casing and forcemain with two wraps of geotextile drainage fabric meeting City of Winnipeg Standard Construction Specification CW 3120.

2.5 Valve Chambers

.1 Precast manhole sections: to ASTM C478-84. Top sections to be flat slab top type with opening offset for vertical ladder installation.

.2 Sizing and sections: sizing and sections as indicated on the drawings.

.3 Aggregate for manholes: to CSA A179-93.

.4 Cement: to CAN/CSA-A5-M93, Sulphate Resistant Portland, Type 50.

.5 Joints to be made watertight using bituminous compound. Bituminous joint sealing compound; to CGSB 56-CP-4a.

.6 Ladder rungs: to CSA G30.18-M92, 25M billet steel deformed bars, hot dipped galvanized to CAN/CSA-G164-M92. Rungs to be safety pattern (drop step type).

.7 Adjusting rings: to CAN/CSA A257.4 and ASTM C478-84.

.8 Concrete Brick: to CAN3-A165.

.9 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment. Frame and cover to be as per the following:

.1 Gray iron castings to ASTM A48-83 strength class 30B machine fit with two (2) applications of asphalt varnish.

.2 Castings to be sand blasted or cleaned and ground to eliminate surface imperfections and coated with two applications of asphalt varnish.

.3 Manhole frames and covers: heavy duty municipal type for road service; cover cast without perforations and complete with two (2) 25 mm lifting holes.

.4 Cover to be marked "Sewer".

.10 Insulate manhole frame and cover utilizing DICA (Debris Inflow Control Inserts) as available from Emco or Manhole Sewer Guard, available from Brock White or approved equal in accordance with B6. Fill inset with polyurethane insulation and install in manhole. Provide pull out handle for ease of removal.

.11 Concrete Waterproofing at lifting holes and joints to be Xypex Concentrate as supplied by Specialty Construction Products.

.12 Waterproofing on all exterior and interior surface of the manhole to be two (2) factory applied coats of “U seal” or “Thoroseal”. Field coat lifting holes after applying Xypex concentrate.

2.6 Polyethylene Pipe Couplings

.1 Polyethylene Couplings: Couplings to have same certification as piping. Coupling locations to be approved by the Contract Administrator. Utilize electrofusion fittings to AWWA C207-78 and couplings unless otherwise approved by the Contract Administrator. The following alternative joint types suitable for use on polyethylene piping require approval prior to use:

.1 Approved epoxy coated cast iron or stainless steel mechanical couplers complete with metal insert stiffeners in accordance with Manufacturer's recommendations. Submit written Manufacturer's recommendations for coupler to be used for review of the Contract Administrator. Mechanical coupling will not be permitted for joints submerged in water.

.2 Back-up Rings: Use epoxy coated ductile iron back up rings unless otherwise indicated on the drawings or as directed by the Contract Administrator. Back-up rings approved in locations were piping may be periodically submerged shall be stainless steel.

2.7 Coupling PVC to Polyethylene Pipe

.1 Couple by means of a flange to flange connection. Utilize Uni-flange C-900 series flange on PVC DR 25 piping. For Polyethylene pipe utilize a flange with ductile iron backing rings. Supply denso paste or tape to coat all rings supplied. Bolts, Nuts: To be 304 or better stainless steel bolts, nuts and washers on all couplers or materials which are to be buried or submerged. Provide "certification" to the Contract Administrator that materials used for bolts, nuts and washers are stainless steel 304 or better.

2.8 Valve Markers

.1 Provide galvanized U-channel posts and sign mounting hardware. Total length of posts to be 3.3 m.

.2 Signs to be supplied by the City.

3. EXECUTION

3.1 Preparation

.1 Clean pipes, fittings, valves and appurtenances of accumulated debris and water before installation. Inspect materials for defects. Remove defective materials from site.

3.2 Trenching, Bedding, and Backfill

.1 Do excavation, bedding, backfill and compaction work to be in accordance with Section 02223 – Excavation, Bedding, and Backfill and City of Winnipeg Standard Construction Specifications CW2030.

.2 Trenching and trenchless installation methods to be in accordance with City of Winnipeg Standard Construction Specifications CW2110.

3.3 Gas Transmission Pipeline Crossing

.1 Maintain a minimum of 500 mm vertical separation between invert of gas transmission main and crown of forcemain.

.2 Maintain a minimum of 600 mm cover over all gas transmission pipelines at equipment crossing. If equipment must cross gas transmission mains with less than 600 mm cover, place steel plates above gas transmission main and extend a minimum of 1.0 m beyond either edge of transmission main to disperse vertical loading.

.3 Contact Manitoba Hydro 2 weeks prior to commencing construction at 204-480-5902. Arrange for Manitoba Hydro personnel to be onsite during crossing of 300 mm diameter transmission pipeline.

.4 Complete all works in and around gas transmission pipelines / mains in accordance with Manitoba Hydro requirements.

3.4 Pipe Installation

.1 Lay and join pipes in accordance with applicable AWWA specification for type of pipe selected and latest Manufacturer's standard instructions and specifications.

.2 Handle pipe by approved methods. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends. Do not drag pipe in a manner which may scratch or otherwise damage the pipe.

.3 Prior to installation clean the interior of all pipes and appurtenances of dirt and foreign material and wipe dry.

.4 Keep jointing materials and installed pipe free of dirt and 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 foreign materials.

.5 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time and entry of foreign material.

.6 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. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows undue settlement after installation.

.7 Do not exceed permissible deflection at joints as recommended by pipe Manufacturer.

.8 Cut pipes as required for specials, fittings or closure pieces, in a neat manner as recommended by pipe Manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe. Minimum length of cut pipe to be 1.0 m.

.9 Position and join pipes with approved equipment utilizing hand slings or crane during lowering as required.

.10 High density polyethylene Type III pipe joints:

.1 Thermal butt fusing to be in accordance with ASTM F-2620.

.2 Use qualified personnel for all welding operations (butt-fusion jointing of polyethylene pipe), submit qualifications of personnel to Contract Administrator for review. Welding personnel to be trained specifically for the fusing machine being utilized by qualified technician from the pipe Manufacturer. Jointing machine to be approved by pipe Manufacturer. Provide a written verification from Manufacturer certifying that the Contractor's personnel who will perform the jointing, is qualified and that the jointing equipment has been inspected and is suitable for the pipe supplied.

.3 Prior to commencement of the works provide Manufacturer's written bulletins on required heat and pressures. Use procedures to allow pressure readings during fusion to be accurately measured.

.4 Ensure pipe ends are clean and dry prior to commencing fusing and do not allow ends of pipe to become wet during fusion operation.

.5 Do not weld pipe in long sections which become unmanageable for maneuvering and placement.

.6 During cold or inclement weather, provide adequate shelter over the pipe joining equipment while fusing for protection from the elements (i.e. cold, rain, or wind, etc.).

3.5 Installation of Forcemain in a Casing Pipe Under Branch Aqueducts

.1 Install casing pipe under Branch Aqueducts in a manner that will not produce detrimental uplift forces or settlement of the Aqueduct.

.2 While either jacking or coring methods shall be considered as acceptable methods of installation, submit a Method Statement, in accordance Section 01300 – Submittals, Shop Drawing Submissions, four (4) weeks prior to the commencement of the crossings identifying the proposed method of installation and means taken to meet the technical objectives outlined herein:

.1 As minimum technical requirements shall include:

.1 Prior to putting shafts down adjacent the Branch Aqueducts provide adequate excavation by traditional (e.g. smooth excavator bucket and handwork) or

hydrovac methods to verify the location and invert of the Branch Aqueduct relative to the proposed jacking or coring shafts.

.2 Locate launching shafts a sufficient distance away from the Branch Aqueduct or in such a manner (e.g. sufficiently shored vertical face) to preclude loss of side support for the Aqueduct.

.3 Do not stockpile materials on top of the Aqueduct.

.4 Individual crossings with appropriate equipment will be permitted subject to submission to the Contract Administrator of equipment specifications in sufficient detail to facilitate a loading review.

.5 Do not locate equipment over the Aqueduct while performing the work.

.6 "Plugging", "reaming" or other construction methods that displace soil shall not be permitted.

.7 Where a core hole is utilized, the annulus of core hole shall be grouted for the full length of the casing pipe under the Aqueduct.

3.6 Thrust Blocks

.1 Thrusts blocks to be in accordance with the City of Winnipeg Standard Construction Specification Standard detail SD-004 and SD-005.

3.7 Encasement Pipe End Seal

.1 Seal the ends of the encasement piping against the force main piping by wrapping the encasement pipe and forcemain with 2 wraps of geotextile fabric. Secure the geotextile fabric in place utilizing three rows of minimum 10 mm wide stainless steel banding spaced 150 mm apart along each of the carrier pipe and encasement pipe. Loosely place the fabric at the end of each casing such that the fabric is not in tension when backfilled.

.2 Backfill pipe and casing with sand to a minimum of 200 mm.

3.8 Gate Valves and Valve Boxes

.1 Install in accordance with the City of Winnipeg Standard Construction Specification Section CW 2110. Ensure valve box adjustable range is suitable for pipe burial depth.

.2 Install valve box lids that are marked "S" for sewer.

3.9 Valves Chambers

.1 Position precast units on 150 mm minimum of compacted granular material.

.2 Construct precast concrete chambers as indicated plumb and centered true to alignment and grade.

.3 Make each joint between precast sections watertight with approved materials.

.4 Apply two (2) coats of approved waterproofing compound on all interior and exterior surfaces. Ensure waterproof coatings are applied to underside of manhole floor prior to installation. See detail on plans.

.5 Plug lifting holes on exterior and interior of manhole with mortar.

.6 Place frame and cover on top section to elevation indicated or as directed by the Contract Administrator. If adjustment is required use concrete ring.

.7 Insulate valve chamber including cover with 75 mm of foamed in place urethane insulation as indicated on the plans. Arrange for insulation to be supplied and installed as specified by the manufactured by an approved applicator. Surface to be insulated shall be clean and dry when insulation is applied. Protect adjacent exposed surfaces.

.8 Spray polyurethane insulation of force main exterior inside manhole.

.9 Install valve and related appurtenances as per plans. Provide concrete support under valve.

.10 Clean surplus mortar and joint compounds from interior surface, remove debris and foreign materials; and all fins and sharp projections.

.11 Complete infiltration test and exfiltration test to ensure chamber is watertight, as directed by Contract Administrator. Complete any additional sealing required to make chamber watertight.

3.10 Insulation

.1 Obtain approval from the Contract Administrator prior to deviating from the specified depth. If approval has been obtained from the Contract Administrator, Contractor to be responsible for purchasing and installing the insulation as an incidental to the Works.

.2 Install a minimum of 50 mm thick insulated box around piping or as directed by the Contract Administrator.

3.11 Valve Markers

.1 Install valve marker perpendicular with air release valve chambers and adjacent valve. Along GWWD rail line post to be set 0.5 m from edge of ballast for rail line.

.2 Posts to be hydraulically driven to a depth of 1.0 m. Set posts straight and plumb.

.3 Install signs (supplied by the City) at 2.3 m height above ground.

3.12 Hydrostatic Leakage Testing

.1 After the system has been installed and backfilled to the satisfaction of the Contract Administrator, pressure test the system. Test piping in sections not exceeding 700 m in

length or between successive valves unless otherwise authorized by the Contract Administrator.

.2 Provide labour, equipment and materials required to perform hydrostatic leakage tests hereinafter described. Ensure system will pass test prior to requesting Contract Administrator to witness test.

.3 Notify Contract Administrator at least two (2) working days in advance of all proposed tests. Perform tests in presence of Contract Administrator.

.4 Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least five (5) days after placing concrete or two (2) days if high early strength concrete is used.

.5 Open mainline valves.

.6 Expel air from main by slowly filling main with potable water and complete flushing by running water to waste. Install temporary or use existing mainline access points as required for flushing and testing. Obtain Contract Administrator's approval for location of mainline access points. Do not damage Environment with chlorinated water. Dechlorinate water at the point of disposal discharge to thoroughly neutralize the chlorine residual to non detectable levels.

.7 In preparation for the pressure test, after pressurizing the mainline to the test pressure, bleed off the quantity of water equivalent to allowable leakage or 20 L, whichever is less. Bleed location to be remote from the gauge location. Verify that the pressure indicated on the gauge drops the corresponding amount to provide an indication that all air has been bled from the system.

.8 Polyethylene piping - To accommodate the initial expansion of the pipe under test, sufficient make-up water shall be added to the system at hourly intervals for three (3) hours to return to the test pressure. After completion of the initial expansion phase the pipe shall be tested for a period of two (2) hours.

.9 Apply a leakage test pressure of 1,000 kPa, based on the elevation of highest point in main and corrected to elevation of gauge, for a period of two (2) hours. Do not exceed the test pressure within 72 hours prior to completing the pressure testing.

.10 Leakage is defined as amount of water supplied in order to maintain test pressure for two (2) hours. The pressure shall not drop by more than 2% of test pressure at any time.

.11 No leakage shall be permitted in polyethylene piping.

.12 Locate and repair defects if leakage is greater than amount specified. Report leaks to Contract Administrator prior to excavating to allow Contract Administrator to be on Site if so desired. Provide written summary of all repair works completed.

.13 Record tests whether acceptable or not on leakage test form City of Winnipeg Standard Construction Specification CW2125.1. Sign and submit leakage test form to the Contract Administrator.

.14 Repeat test in the presence of the Contract Administrator until leakage is within specified allowance.

.15 Remove all temporary access points after satisfactorily completion of test and seal holes with brass plugs or as otherwise directed by the Contract Administrator.

.16 For dual containment piping the carrier pipe shall be tested independently of the carrier pipe. Carrier pipe to be tested at mainline pressure specified above. Containment shall be tested at 500 kPa.

END OF SECTION

HORIZONTAL DIRECTIONAL DRILLING

1. GENERAL

1.1 Scope of Work

.1 This Section outlines the requirements for installation of underground piping by horizontal directional drilling.

1.2 Quality Assurance

.1 Install HDPE pipe using the horizontal directional drilling method in general accordance with ASTM Standard Guide F 1962 for "Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings".

.2 Supervisor and horizontal directional drilling personnel to have a minimum of three (3) years experience in horizontal directional drilling for similar sized piping.

.3 Submit to the Contract Administrator for review experience of personnel related to horizontal directional drilling for past three (3) years including project names, date and duration of work, location, pipe information, contact person and telephone number.

1.3 Submittals

.1 Submit working drawings and written procedures describing proposed method and operations.

1.4 Record Drawings

.1 Provide data necessary to produce record drawings, including details of depths of pipe at location not exceeding 20 m increments along the pipe route and 10 m increments at river and highway/roadway crossings.

1.5 Measurement and Payment

.1 Measurement and payment to be as outlined in Section 02531 – Forcemain

2. PRODUCTS

2.1 Drilling Fluids

.1 Drilling fluids shall be non hazardous and suitable for landfill or similar disposal.

3. EXECUTION

3.1 Direction Drilling Procedures

.1 Perform directional drilling to install piping to grades and alignment indicated on the drawings or as directed by the Contract Administrator. Drilling operations shall include all excavation and dewatering, drilling calculations, pilot hole and pullback operations. Contractor shall be responsible for selection of type of reamer, diameter and other pertinent operations as required for completion of the installation works. Equipment to include a full range of drill stems and reaming heads to allow for various factors and soil types which may be encountered. Drill stems shall be of proper size and diameter to allow for full thrust and torque capabilities of the drilling machines.

.2 Maintain alignment of directional drilling as close as possible to the proposed plan and profile shown on the drawings taking into account the capabilities of drilling equipment and the allowable stresses of HDPE pipe and drilling rods. Advise the Contract Administrator of deviations to line and grade as they occur for discussion and approval.

.3 Provide electronic survey equipment inside the drill pipe head. The electronic survey equipment shall transmit to a computer the drill paths magnetic azimuth, vertical inclination and orientation of the bend. Contractor to calculate location of drill bit from information provided and complete steering adjustments as required to maintain specified alignment and grade.

.4 Provide the Contract Administrator with the following information before beginning installation:

.1 Equipment specifications and capabilities

.2 Size of pilot hole

.3 Number and size of pre-reams

.4 Calculations showing determination of the appropriate back-ream rate for each pre-ream and product pullback

.5 Method of suspending, supporting and directing pipe during pullback

.6 Type and capabilities of tracking system

.7 Drilling fluid and cuttings management plan including type of drilling fluid, drilling fluid pressure, fluid containment storage recycling, and transport and disposal

.8 Management plan for frac-outs

.9 Sketch of Work Site including equipment layout, slurry containment pits and entry and exit locations

.5 Prepare and submit bore plan to the Contract administrator for review prior to commencement of the works. Upon completion of pilot hole, prepare and review updated bore plan to verify conformance with design alignment and grade. Provide comparison to the original bore plan with all deviations from the original bore plan to the Contract Administrator. Complete remedial works when deviations have occurred outside the design tolerances.

.6 Continuously monitor and track the drill bore in the pilot hole. Record the depth to the nearest 0.10 m from ground surface at major changes in surface elevation, at maximum 20 m intervals along flat surfaces, maximum 10 m increments at river and highway/roadway crossings, and at horizontal and vertical changes in alignment. Indicate the location that the depth was recorded by spray paint, marker buoy, or other method to allow the Contract Administrator to obtain the coordinates of the location.

.7 Drilling shall be conducted at a rate to minimize or eliminate bore hole pressures and minimize potential loss of slurry (frac out) during the drilling process.

.8 Continuously monitor and track the following during boring operation:

.1 Monitor bore hole pressures during drilling to ensure minimization of frac-outs

.2 Thrust and Pullback Pressure

.3 Rotational torque

.4 Time/duration when drilling fluid was lost

.5 Drilling fluid composition

.6 Ground conditions encountered

.9 Operate and maintain a closed loop drilling fluid system if possible.

.10 Be responsible for mixing the required drill fluids to suit the proposed drilling application and type of soils encountered. Mix drill fluids in accordance with Manufacturer's printed instructions.

.11 Obtain water required for drilling operation/bentonite slurry mixture from approved locations. All costs for hauling and supply of water shall be incidental to the works.

.12 Provide a suitable mixing tank unit to allow for on site mixing and pumping of the slurry mixture and drill mud. Mud to be contained in steel tanks or other suitable vessels.

.13 Ensure drilling fluids and cuttings are contained and stored at entrance and exit hole locations in accordance with the management plan. Drilling fluid shall at no time be directed to the low flow channel, watercourses, sewers, manholes, or catch basins. Drilling fluid and cuttings shall be loaded, hauled from the Site and disposed of as per CW 1130.

.14 Steer drill piping for pilot hole by utilizing drilling mud and pumping through drill pipe to provide rotational energy in a drill bit mounted to the end of the drill pipe. A jet bit shall force the mud through the small orifices and jet the earth away allowing the drill path to curve in the desired direction and the drill pipe is thrust forward.

.15 Pipe radius for the 250 mm diameter forcemain shall be 25 m or greater during construction and after installation. Pipe radius for dual containment piping is as per Section 02533 – Forcemain crossing floodway Channel.

.16 Begin reaming operations to enlarge pilot hole after the Contract Administrator has accepted the pilot bore.

.17 After completing pilot hole, utilize larger diameter reaming heads to enlarge the hole as required for pipe pullback. Complete multiple reaming operations as necessary to obtain required hole size for utility piping. The number and size of reaming heads is at the discretion of the Contractor.

.18 Carry out pullback operations immediately following the pre ream. Pullback operations shall be continuous until completion regardless of time of day works are commenced. Attach a pullback head (pipe grip) to piping to allow for fastening to a swivel head reamer. The head shall be closed to prevent drilling mud from entering the main during pullback operation. Rating of the swivel shall be somewhat larger than the lower of either the pull force capability of the drill rig or strength of the pipe.

.19 The pipe grip shall consist of a fused polyethylene adapter, internal/external clamp, or bolting device. Basket type or internal only grips are not allowed.

.20 Provide pipe rollers, side booms or other devices to support and protect pipe while pulling into bore hole.

.21 If required, fill carrier pipe with water when pulling into bore hole to help prevent flotation. Notify Contract Administrator prior to pipe filling and pull in.

.22 Provide a weak link between swivel back reamer and pulling head (pipe grip) to ensure the pull back force on the pipe does not exceed the maximum tensile force allowed by the pipe manufacture. Wink link to be designed such that failure will occur prior to strain on piping exceeding acceptable tolerances during pullback. Provide shop drawing including calculations on strain required for failure of the weak link.

.23 Allow HDPE forcemain pipe a minimum 24 hours to recover and rebound after pull-in before making connections to ends of pipe. Measure location of both pipe ends to ensure pipe recovery is complete.

END OF SECTION

1. GENERAL

1.1 Sampling

.1 At least four (4) weeks prior to commencing Work, inform Contract Administrator of proposed source of bedding materials and provide access for sampling.

1.2 Material Certification

.1 At least two (2) weeks prior to commencing Work, submit Manufacturer's test data and certification that pipe materials meet requirements of this Section. Include Manufacturer's Drawings, information and Shop Drawings where pertinent.

1.3 Shop Drawings

.1 Submit Shop Drawings in accordance with Section 01300 – Submittals.

.1 HDPE Dual Containment Piping

.2 Silt Fence

.3 Drilling Fluid Containment

.4 Frac-Out Response Plan

.5 Horizontal Directional Drilling (HDD) Method Statement

.6 Identify source of straw mulch and a sample of the straw material as well as proposed power mulching placement and crimping methods

.7 Submit manufacturers' product specifications and recommended installation methods for the proposed silt fence and associated materials

1.4 Record Drawings

.1 Provide data necessary to produce record Drawings showing locations of all mains and appurtenances, including directions for operating valves, list of equipment required to operate valves, details of pipe material, and location of air and vacuum release valves.

1.5 Measurement and Payment

.1 Joining HDPE Pipe Sections:

.1 Fusion joining of HDPE sections will not be measured for separate payment and will be included with "Installation of HDPE Dual Containment Forcemain Pipe".

.2 Installation of HDPE Dual Containment Forcemain Pipe:

.1 HDPE forcemain installation will be measured for payment on a length basis paid for at the Contract Unit Price per metre for "Installation of HDPE Dual Containment Forcemain Pipe". Length to be paid for will be the total number of linear metres of HDPE Dual Containment Forcemain pipe installed in accordance with this Specification, accepted and measured by the Contract Administrator. Note: If the method of installation has **not been** specifically indicated on the drawings and the installation method is optional to the Contractor, it shall not be considered for payment under the item where a specific method is listed on Form B: Prices. Likewise there shall be no differentiation in measurement or payment based on method of installation for locations where a specific method of installation is not specified on the drawings.

.2 Installation of HDPE fittings will not be measured for separate payment and will be included with "Installation of HDPE Dual Containment Forcemain Pipe".

.3 Hydrostatic Testing:

.1 Hydrostatic testing of the forcemains will not be measured for separate payment and will be included with "Installation of HDPE Dual Containment Forcemain Pipe".

.4 Surcharge for Crossing No. 3 – Floodway – See Section 02531 – Forcemains, Item 1.5. Measurement and Payment.

.5 Site Restoration including Seeding and Straw Mulch:

.1 Site Restoration including Seeding and Straw Mulch will not be measured for separate payment and will be included with the Surcharge for Crossing No. 3 – Floodway.

.6 Silt Fencing and Environmental Protection Consideration:

.1 Silt Fencing and Environmental Protection Consideration will not be measured for separate payment and will be included with the Surcharge for Crossing No. 3 – Floodway.

2. PRODUCTS

2.1 HDPE Forcemain Pipe and Fittings

.1 450 m of dual containment HDPE plain end pipe consisting of a 400 mm diameter (IPS) DR 11 containment pipe with a 250 mm diameter (IPS) DR 17 carrier pipe. The pipe material used shall be Driscoplex 4100 Series Model # DCS-SF or approved equal in accordance with B6.

.2 Pipe to be made from polyethylene resin compound with a minimum cell classification of PE 346564C for PE 3408 materials in accordance with ASTM D3350.

.3 Material to have a long-term hydrostatic strength of 1600 psi when tested and analyzed by ASTM D2837 and shall be a Plastic Pipe Institute (PPI) listed compound.

.4 The raw material shall contain a minimum of 2%, well dispersed, carbon black. Additives which can be conclusively proven not to be detrimental to the pipe may also be used, provided the pipe produced meets the requirements of the standard.

.5 Manufacture pipe to ASTM F714.

.6 The following markings shall be continuously printed on the pipe spaced at 1.5 m intervals:

.1 Name and/or trademark of the pipe manufacturer.

.2 Nominal pipe size (OD).

.3 Dimension Ratio.

.4 The letters PE followed by the polyethylene grade per ASTM D3350, followed by the Hydrostatic Design basis in 100's of psi.

.5 Manufacturing reference standard ASTM F714.

.6 Production code from which the date and place of manufacture can be determined.

.7 Dual containment pipe configuration to be as follows:

.1 Containment pipe – Minimum 400 mm diameter (IPS) with DR 11.

.2 Carrier pipe – Minimum 250 mm diameter (IPS) with DR 17.

.3 Finish pipe ends for joining using the butt fusion method.

.4 Notwithstanding the above, the annulus between the carrier pipe and the containment pipe shall not be obstructed by the butt fusion bead on the carrier pipe to such an extent that would preclude the monitoring of pressure in the annulus area with a single pressure sensor as noted herein.

2.2 Seed

.1 Grass Seed shall consist of pre-mixed grass or legume based mixes specifically designed for application on two different zones within the Contract Limits, described as follows:

.1 Channel Slope Mix – this mixture is to be applied on the main channel slopes (i.e. the outer edge of the widened channel base to the top of the channel slope which is approximately located at original prairie level). This mixture shall generally consist of the following species and approximate proportions:

.1 Creeping Red Fescue – 20%

.2 Smooth Brome – 10%

.3 Meadow Fescue – 10%

.4 Slender Wheatgrass – 15%

.5 Tall Wheatgrass – 15%

.6 Alfalfa (creeping variety) – 15%

.7 Alsike Clover – 5%

.8 Red Clover – 5%

.9 Birdsfoot Trefoil – 5%

.2 Forage Mix – this mixture shall be applied on all disturbed portions of the work area outside the main channel slopes (i.e. from the top of the channel slope to the outer edge of the Floodway Right-of-Way. This mixture shall generally consist of the following species and approximate proportions:

.1 Smooth Brome – 20%

.2 Meadow Brome – 10%

.3 Timothy – 10%

.4 Orchard Grass – 10%

.5 Alfalfa (tap root variety) – 30%

.6 Alfalfa (creeping variety) – 20%

.3 Oats (Canada No. 1 Grade) to be utilized as a Nurse or Cover Crop.

.2 Fertilizer consisting of a 25-40-0 formulation shall be supplied, delivered to site, and applied by the Contractor.

2.3 Straw Mulch

.1 Straw mulch shall consist of wheat or barley straw. The straw mulch shall be air dried, reasonably light in colour, and shall not be musty, mouldy, caked or otherwise of low quality. The mulch shall be free of coarse (chaff) material and free of noxious weeds and/or seeds to prevent the introduction of weeds into previously seeded and planted areas. Dry mulching material that breaks down and does not bend will not be acceptable. The power mulching process shall produce a minimum of 75% of the straw being between 150 mm and 200 mm in length.

2.4 Silt Fence

.1 Silt fence shall be installed by machine slicing methods and constructed with silt fence fabric, posts, and fasteners. The silt fence fabric shall be manufactured from a woven

polypropylene material and shall conform to the following requirements below. The colour of the silt fence fabric shall be high visibility green, orange or other high visibility colour.

Specification	Requirements
Grab tensile strength (25-mm grip), kN, min. in each direction ASTM Designation: D 4632	0.550
Elongation, percent minimum in each direction ASTM Designation: D 4632	15/20
Permittivity, 1/sec., min. ASTM Designation: D 4491	.20
Flow rate, liters per minute per square meter, min. ASTM Designation: D 4491	400
UV stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	70

Suitable products shall be AGES Premium Silt Fence, Cascade Premium 550/450 Orange

.2 Posts for the temporary silt fence shall be constructed of steel. Posts having a "U", "T", "L" or other cross sectional shape that can resist failure by lateral loads will be accepted. Steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.5 m. One end of the steel posts shall be pointed and the other end shall be visibly marked (e.g. orange or red safety cap, painting). The maximum spacing between the posts shall be 1.8 m.

.3 Wooden survey lath used for securing the silt fence to the steel posts shall be 38 mm long x 8 mm thick x 600 mm (minimum).

.4 Tie wire shall be used to fasten the wooden survey lath and the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post. The tire wire shall be 16 Gauge black annealed wire with a minimum tensile strength of 55,000 psi (CSA G30.3-M1983 (R1998) or approval equivalent.

3. EXECUTION

3.1 EXCAVATION AND REGRADING WITHIN FLOODWAY CHANNEL

.1 Plan and implement all Work of this Contract within the Floodway right-of-way in strict accordance with the Manitoba Floodway Authority's (MFA) Environmental Protection Specifications as outlined in MFA's General Requirement MFA-130.

.2 Delineate required staging areas to facilitate construction within the Floodway Channel prior to commencement of construction including all access and egress routes to preclude causing inadvertent damage to any areas outside of the Contractor's intended work area. Adequate delineation shall be by means of temporary fencing sufficient to prevent unauthorized access.

.3 All perimeter erosion control devices including silt fencing and silt curtains as required shall be installed prior to commencement of any within the Floodway Channel. The control devices shall be extended a minimum of 500 m beyond the active work area prior to the disturbance of any vegetation within the work area. Install MFA approved termination details for sediment and erosion control.

.4 Minimize the removal of existing vegetation to the greatest extent possible.

.5 Within the limits of the work area, remove any fallen timber, logs, and other surface litter and/or debris and dispose of off site. This is considered incidental to the work, and no separate payment will be made.

.6 After installation of pipe grade all areas to grades that existed prior to construction.

.7 Seeding and straw mulch application shall be placed on all graded surfaces within channel immediately after trimming. In the event that straw mulch cannot be effectively applied as specified as specified herein, an alternate, approved soil stabilizer shall be used.

.8 Perform final grading and trimming only when weather conditions permit the installation of the straw mulch on the final graded surface. If freezing conditions do not allow effective crimping of the straw mulch, then alternate surface protection methods may be implemented, subject to the approval of the Contract Administrator. Straw mulch applied with crimping methods shall be performed on all exposed soils in the spring as soon as conditions permit.

.9 Locate site work roads to minimize disturbance of vegetation beyond the designated work area

.10 Designate work area to preclude any work activities occurring within 10 m of the Low Flow Channel of Floodway

3.2 SEEDING WITHIN FLOODWAY RIGHT-OF-WAY AND FLOODWAY CHANNEL

.1 Seeding shall commence immediately upon completion of excavation and trimming operations. The seeding operation shall consist of an initial harrowing, application of the seed and fertilizer, and a second harrowing. Straw mulch application and crimping shall follow the second harrowing, in accordance with this specification.

.2 No seeding shall be completed if the work area cannot be covered with straw mulch.

.3 Seeding that is not completed in the fall or winter periods shall be completed the following spring as soon as atmospheric and site conditions allow for seeding operations to commence.

.4 All weed growth in areas to be seeded shall be destroyed as required so that proper seeding can be done. If herbicide applications are used to destroy weed growth then all work and materials shall be in accordance with GR130 Environmental Protection Specifications.

.5 The seed bed shall be prepared by harrowing the finished grade prior to seed application.

.6 The Channel Slope (or Forage) seed and Cover Crop seed shall be sown separately utilizing conventional seed drill equipment capable of uniformly applying all species contained within the specified mixtures. Only if the equipment is capable of sufficient adjustment as to ensure uniform application will the Cover Crop seed and the Channel Slope (or Forage) seed be permitted to be mixed and sown together. The drill shall accurately and uniformly place the seed (both grass/forage, and cover crop) to a depth of 10 to 20 mm. The seed drill shall be fitted with on-row packers, in order to achieve adequate seed to soil contact. Seed shall not be applied by broadcasting methods.

.7 Channel Slope or Forage seed and Cover Crop seed shall be sown at the following rates:

.1	Channel Slope or Forage Seed	32 kg per hectare
.2	Cover Crop seed	38 kg per hectare

.8 New seeding shall blend applications 300 mm into adjacent grassed areas and previous applications to form uniformly covered surfaces.

.9 Harrowing after the seeding operation shall be undertaken, either as a separate operation or in conjunction with the seeding operation.

.10 In order to discourage downslope erosion, on all sloped areas, the direction of equipment travel for seeding and final harrowing operations must be perpendicular to the slope.

.11 No supplementary packing or rolling shall be done after seeding operations.

.12 No seeding shall be done on frozen soils, or when any other conditions unfavourable to the successful planting of seed exist.

.13 Fertilizer shall not be mixed with seed but applied as a separate broadcast operation or by a fertilizer attachment on the seed drill.

.14 The fertilizer application shall achieve a rate of 225 kg/ha (200 lbs/acre).

.15 Rutting or damage caused during seeding and fertilizing operations shall be repaired.

3.3 STRAW MULCH

.1 General:

.1 Supply and place straw mulch material immediately after seeding and fertilizer application.

.2 Straw mulch shall be placed ensuring that there is a minimum of 90% ground coverage by area.

.3 Mulched areas shall be inspected periodically and after runoff producing storm events by the Contractor. Damaged areas shall be repaired immediately. Areas requiring reseeding and/or remulching shall be rectified.

.2 Spreading of Straw Mulch Material:

.1 The straw mulch material shall be spread with power mulching equipment at a rate of 4500 kg/ha, to a layer 25 to 50 mm in thickness. Mulch that remains clumped or bunched after application shall be separated and respread. The Contractor shall blow the straw mulch from the top of the channel side slope or embankment down slope and from the bottom of the channel side slope or embankment upslope to ensure uniform coverage.

.3 Crimping or Anchoring of Straw Material:

.1 All straw mulch shall be crimped into the ground to a nominal depth of 50 mm.

.2 After spreading of the straw mulch material, the straw mulch shall be crimped or anchored to the ground with a straw crimper (crimp disc). The straw crimper should have a Coulter (serrated) blade spacing between 100 to 200 mm and a blade diameter of ± 50 cm. The blades should be notched and tapered for easy soil penetration. The roller punching method of straw anchoring will not be accepted.

.3 Crimping shall be completed in two directions perpendicular to each other with the final pass conducted parallel the slope rather than up and down. A minimum of 75% of the straw shall remain visible at ground surface after crimping.

.4 The Contractor shall complete all work necessary to crimp the straw mulch, including but not limited to light discing as required.

.5 This method of straw mulch anchoring or crimping shall be used until such a time that the crimping of the straw specified herein is ineffective due to frozen ground conditions. After such time that the straw mulch cannot be effectively applied an anchored as specified, an alternate soil stabilizer shall be used.

.6 Those areas not effectively protected after spring run-off shall be remulched and crimped as specified herein.

3.4 SILT FENCE

.1 General:

.1 Supply, install, and maintain all silt fence as required by the specifications and to comply with all regulatory requirements

.2 Installed in a smile configuration along equal contours. Each smile shall have a maximum length of 40 m and maximum amplitude (width) of 3 m.

.2 Machine Slicing Method:

.1 Silt fence shall be installed prior to initiation of the work within the designated work area

.2 The mechanical installation machine shall be used to embed the fabric into the ground.

.3 The slit shall be created such that the horizontal chisel point at the base of a soil slicing blade slightly disrupts the soil upward as the blade slices through the soil.

.4 The geotextile shall be mechanically inserted into the slit directly behind the soil slicing blade in a simultaneous operation, achieving consistent placement and depth. No overturning (plowing) of soil will be allowed. The soil immediately adjacent to the silt fence fabric shall be compacted by operating the wheel of a tractor or skid steer on each side of the silt fence a minimum of two passes.

.3 Maintenance:

.1 The Contractor shall maintain the silt fences until they are no longer necessary and are removed. Maintenance shall consist of all work necessary to keep the devices functioning effectively. The Contractor shall repair or correct plugged, torn, displaced, damaged, or non-functioning devices.

.2 In the event that the Contractor does not maintained the silt fences properly or has damaged the devices from construction or sediment removal activities resulting in sediment releases beyond the work area, the Contractor shall retrieve all sediment that has left the construction area, to the fullest extent possible, at his own cost. This shall include but is not limited to the removal of all deltas and sediment deposited in drainage ways and regrade and/or reseed the areas where sediment removal results in exposed soil. The removal and restoration shall take place within two (2) working days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within two (2) working days of obtaining access. The Contractor is responsible for contacting all local, regional, provincial, and federal authorities before working in surface waters and for obtaining applicable permits. The Contractor's restoration work to restore property outside of the designated work area shall be at his own cost.

.4 Sediment Removal during Construction:

.1 During construction the Contractor shall remove sediment from the silt fences when the sediment reaches 30% of the height, or replace. Sediment removal shall occur within 24 hours of discovery or as soon as field conditions allow access and no sediment removal shall be performed without authorization from the Contract Administrator.

.2 Excavated sediment shall be disposed of off site.

.5 Final Removal of Silt Fence:

.1 When 50% of the total area covered by new seeding adjacent to the silt fence has established growth to a height of 50 mm the Contractor shall perform final removal of all silt fence adjacent to the area. All removed materials become the property of the Contractor and shall be removed and properly disposed of off site.

.2 As part of the final removal of the silt fence the Contractor shall spread any accumulated sediment to form a suitable surface for seeding or dispose of the sediment at an acceptable working disposal area.

.3 All areas below and adjacent to the silt fence and any existing grassed areas disturbed by the Contractor during final removal of the silt fence shall be seeded by the Contractor, at his own cost. The seeding mix and construction methods shall be in accordance with Clause 3.2 of this Specification.

3.5 SITE ACCESS

.1 Obtain Approval from appropriate Authority to gain access to the Work Area.

.2 East Floodway Bank at the WTP:

.1 Access east side of low flow channel from Highway 207 on road leading to the WTP.

.2 Follow the same route in and out to not disturb any more of the grounds than necessary.

.3 HDPE pipe to be assembled on east bank of floodway channel.

.4 HDPE to enter drilled bore hole from the east bank of the low flow channel.

.3 West Floodway Bank at Perimeter Highway:

.1 Access site from Highway 101, Perimeter Highway.

.2 Follow the same route in and out to not disturb any more of the grounds than necessary.

.3 Locate horizontal directional drill rig on west bank of low flow channel.

.4 Horizontal directional drill from the west to east bank of the low flow channel and pull the HDPE pipe from the east to west bank of the low flow channel.

3.6 TEMPORARY USE OF CITY EQUIPMENT

.1 City facilities, systems, and equipment shall not be used during construction without the Contract Administrator's written permission. The Contract Administrator reserves the right to withdraw said permission if, in his opinion, proper care and maintenance are not provided.

3.7 SILT FENCE AND CONTAINMENT BERM

.1 Install silt fencing as specified between excavations and the low flow channel to ensure drilling fluids and sediment from excavation do not enter the low flow channel of the floodway. Silt fence shall be also be installed on the west and east banks of the main floodway channel.

.2 Install containment berms at the horizontal directionally drilled entry and exit points to ensure drilling fluids and sediment do not enter the low flow channel of the floodway.

.3 Remove containment berms after excavations have been backfilled and silt fencing after final restoration as specified.

.4 Costs for silt fencing and containment berms will not be measured for payment and will be included with the Work being done.

3.8 FRAC OUT MONITORING AND RESPONSE PLAN

.1 Avoid or minimize the potential for drilling fluids and drill cuttings from escaping the bore hole and entering the Floodway channel due to frac-out of the overlying clay during horizontal directional drilling.

.2 Submit a monitoring and response plan as per Section 01300 – Submittals. Meet the following requirements:

.1 Follow the requirements of the Manitoba Operational Statement Habitat Management Program for High Pressure Directional Drilling by the Department of Fisheries and Oceans.

.2 The drilling fluid pressure shall not exceed 30 kPa at any location within the bore hole.

.3 Conduct on Site Monitoring including:

.1 Maintain a record of drilling progress to always know the location of the drill head relative to the point of entry.

.2 Maintain a record of drilling component usage (type and quantity) throughout each drilling operation.

.3 Maintain a record of drilling fluid volume used and returned to detect any significant fluid losses. Continuously monitor drilling fluid pump pressure. Cease drilling operations and immediately report abnormal loss of returned fluid or loss of fluid pressure that may be indicative of a frac-out to the Contract Administrator.

.4 Continuously check the low-flow channel water for appearance of a muddy plume indicating signs of drill mud escapement to the watercourse. Also check for a muddy plume in the low flow channel water when any significant loss of fluid/cutting returns or drop in pump pressure occurs.

.5 Use a turbidity meter with a ‘down-hole’ sensor where water turbidity prevents visual detection of a potential frac-out. Turbidity monitoring with the meter will only be initiated if an abnormal loss of fluid or pressure indicates that a frac-out may be occurring. Make arrangements with an external consultant familiar with turbidity measurement to use the turbidity meter. If turbidity must be monitored, the consultant will complete a “Turbidity Monitoring Data Sheet (TMDS)”, provided by the Contract Administrator.

.4 Include a Loss of Fluid and Frac-Out Response in the Plan that incorporates the following requirements:

.1 Follow the "Measures to Protect Fish and Fish Habitat when High Pressure Directional Drilling" listed in the Manitoba Operational Statement Habitat Management Program for High Pressure Directional Drilling by the Department of Fisheries and Oceans. If necessary, implement the "Measures to Protect Fish and Fish Habitat for Isolated Trenched Crossings in the Event of a Frac-Out".

.2 Stop drilling immediately if an abnormal loss of fluid, drop in pressure, or visible plume is observed in the low flow channel indicating a frac-out or possible frac-out.

.3 Inform the Contract Administrator of the frac-out condition or potential condition and decide on the appropriate action as follows:

.1 Assign a person to monitor (visually or using a turbidity meter) for the presence of a muddy plume.

.2 Make adjustments to the mud mixture (e.g., add lost circulation material (LCM) to the drilling fluid in an attempt to prevent further loss of fluid to the ground formation and/or the watercourse).

.3 Where conditions warrant and permit (i.e., readily accessible by a vacuum truck, shallow depth, clear water, potentially sensitive habitat, and low water velocity) and where a frac-out has been visually detected, attempt to isolate the fluid release using a large diameter stand-pipe such as a 45 gallon drum with both ends cut out, or a short piece of culvert. Prior to commencing any pumping to deliver LCM to plug the fracture, have the vacuum truck in position to recover any fluids that otherwise may escape to the watercourse.

.5 Under circumstances where a frac-out has occurred (and has been confirmed visually or by turbidity meter measurements), and where conditions do not permit containment and the prevention of drilling fluids release to the watercourse, attempts to plug the fracture by pumping LCM are not to continue for more than 10 minutes of pumping time.

.6 If the frac-out is not contained within this time, halt any further attempts until a corrective course of action is decided.

3.9 Pre-fabrication of Dual Containment Pipe Sections

.1 Pre-fabricate dual containment pipe sections in a factory prior to delivery to Site, consisting of HDPE carrier pipe, containment pipe, centralizers, and fittings. Each containment pipe section shall have the carrier pipe and centralizers in place.

.2 Pipe manufacturer shall provide documentation that the fabricator/welders have a minimum of two (2) years experience fabricating dual containment systems.

.3 Field fabrication of the dual contained pipe sections shall not be acceptable.

.4 Factory fabricated dual containment pipe sections shall be joined into one continuous length on site following the guidelines of ASTM Standard Practice F 2620 for "Heat Fusion Joining of Polyethylene Pipe and Fittings".

.5 A continuous annular space between the carrier pipe exterior and containment pipe interior shall be maintained for the full length of the pipe section. The ends of each pipe section shall maintain a continuous annular space between the carrier and containment pipe when the pipe sections are butt fused during the full pipe length assembly.

.6 Provide centralizers between the containment and carrier pipe sections as follows.

.1 Centralizers shall support the carrier pipe within the containment pipe.

.2 Weld centralizers to carrier pipe 1.20 m apart between pipe ends.

.3 Weld end centralizers to carrier pipe and containment pipe.

.4 Install end centralizer a sufficient distance from pipe section end to allow for facing of the pipe end and fusing such that the bead created when fusing two pipe sections does not seal the ports in the centralizer.

.5 Install centralizers hydraulically using a minimum pressure of 0.83 MPa (120 psi) pressure on fusion machine.

.7 Pipe sections needing field splicing for fit up purposes shall use press fit centralizers recommended and provided by the manufacturer.

.8 Two termination end fittings, one located at the east and one located at the west Floodway bank, shall be provided to seal the Floodway crossing pipe length at both ends. The termination fitting shall be simultaneously butt fused to the carrier and containment pipe to seal the annular space. No other closure termination will be allowed. This fitting will also provide transition to single wall piping.

.9 Termination fittings shall be manufactured with a one foot long section of carrier pipe on one end and simultaneously butt fused dual containment pipe on the other end.

.10 The manufacturer of the dual containment system shall have demonstrated successful installations for a period no less than ten (10) years.

.11 The manufacturer shall provide a representative to provide technical installation training for a period no less than two (2) days. Installation instructions must be provided to the Contract Administrator prior to installation. These instructions are to be used on every fusion joint with no exceptions.

3.10 Handling of Dual Containment HDPE Pipe

.1 Handle pipe in a manner that will not damage or excessively deform the pipe.

.2 Replace at own expense pipe that has been kinked or has scratches, cuts or gouges deeper than 10% of the total wall thickness or has other defects present that will compromise integrity of dual contained system.

.3 Lift pipe sections using at least two slings spread far enough apart to balance the load. Use pads under chains or cables if used to lift pipe. Do not position slings on butt fused joints.

.4 Ensure ground where pipe is placed is level, clean, dry, and free of sharp objects that may damage the pipe. Limit stacking of pipe to a maximum height as recommended by the manufacturer to prevent excessive deformation of pipes on the bottom.

.5 Take precautions to ensure joined sections of pipe are not damaged or over-stressed when dragging into position to install in bore hole. Do not drag pipe over sharp and cutting objects. Do not insert chains, cables and ropes into pipe ends to drag pipe.

.6 Temporarily plug ends of pipe with suitable plugs or stoppers until pipe is joined and installed.

3.11 Joining of Dual Containment HDPE Pipe Sections

.1 Join dual containment HDPE pipe sections together by means of thermal butt-fusion in accordance with the manufacturer's instructions and ASTM Standard Practice F 2620 for "Heat Fusion Joining of Polyethylene Pipe and Fittings".

.2 Check the temperature and uniformity of temperature over the heating surface of the heating tool with a pyrometer on the first joint of the day and periodically during the day in accordance with Section 6.3 of ASTM Standard Practice F 2620 for "Heat Fusion Joining of Polyethylene Pipe and Fittings". Select multiple checkpoints to ensure uniform surface temperature.

.3 Use a datalogging device with the hydraulic joining equipment to record fusion parameters of pressure, temperature, and time for each joint.

.4 Join single wall pipe at end of dual containment pipe to non dual wall containment pipe by electrofusion in accordance with the manufacturer's instructions within the pressure monitoring manhole.

.5 Fusion shall produce a joint weld with strength equal to or greater than the tensile strength of the pipe itself.

.6 Sections of dual containment that are to be installed by HDD methods shall be joined together on Site and temporarily stored to facilitate hydrostatic testing prior to installation.

3.12 Pressure Testing of Forcemain before Installation

.1 Dual containment pipe that is to be installed by HDD methods across the low flow channel of the Floodway shall be subject to a Pressure Test both pre- and post-installation.

.2 Hydrostatic Pressure Testing of Carrier Pipe:

.1 Perform hydrostatic and visual testing of the entire length of dual containment forcemain after fusion joining and before installation in directionally drilled bore hole.

.2 Hydrostatic test procedure shall consist of an initial expansion phase followed by a test phase.

.3 Test pressure shall be 0.70 MPa at the lowest elevation under test.

.4 Testing shall be witnessed by the Contract Administrator. Contract Administrator shall be notified at least three (3) days in advance of hydrostatic, pressure, and visual testing. Final test report shall be delivered within thirty (30) days.

.5 Fill entire carrier pipe with clean water. Bleed any trapped air from the pipe.

.6 The following procedure shall be followed for the initial expansion phase:

.1 The initial expansion phase shall last 3 hours.

.2 Pressurize the pipe to the test pressure of 0.70 MPa.

.3 Add make-up water to the pipe at 1, 2, and 3 hour intervals to restore pressure to 0.70 MPa test pressure.

.7 The following procedure shall be followed for the test phase:

.1 The test phase shall commence 4 hours after initial pressurization and after the initial expansion phase.

.2 The test phase shall last for 3 hours.

.3 At the 3 hour interval, make-up water is added to restore the pressure to the 0.70 MPa test pressure.

.4 If the volume of make-up water added at the 3 hour interval does not exceed 7.9 litres per 30.5 m of pipe, leakage is not indicated and the pipe is considered to have passed the hydrostatic pressure test.

.5 If the volume of make-up water added at the 3 hour interval exceeds 7.9 litres per 30.5 m of pipe, leakage is indicated and the pipe has failed the hydrostatic pressure test. Locate and seal the leak. Repeat hydrostatic test procedure.

.6 Irrespective of volume of make-up water required, repair any known leaks.

.8 If the hydrostatic pressure test is not completed after the pipe has been initially pressurized, the pipe shall be allowed to relax for at least 8 hours before pressurizing the pipe for the next test.

.3 Pneumatic Pressure Testing of Containment Pipe:

.1 Perform pressure and visual test on the containment pipe with an air test to 0.035 MPa and not exceeding 0.070 MPa.

.2 Compressed air shall be used for the test medium. The test medium shall be non-flammable and non-toxic.

.3 Build and release pressure slowly.

.4 Hold pressure for 10 to 60 minutes but not longer than 60 minutes.

.5 Ambient temperature shall be above 0°C for air test. Test procedure to be in accordance with CW 2125.

.6 Detect leaks with mild soap solution (avoid strong detergents) or other non-deleterious leak detecting fluids applied to the joint. Bubbles indicate leakage. Rinse soap solution from pipe surface with clean water after leak testing.

.4 Determine cause of any leaks, repair and re-conduct test until successful pressure test carried out.

3.13 Installation of HDPE Pipe Using HDD

.1 Install Dual Containment pipe under the low flow channel by HDD methods.

.2 Install Dual Containment Pipe up Floodway side slopes by either trenchless methods (including HDD if desired) or open cut methods. If installed by HDD methods, conduct HDD operations for installation up side slopes independently of low flow channel installation to minimize possibility of low flow channel frac-out. If installed by open cut methods, install as per clause 3.14.

.3 Install HDPE pipe using the horizontal directional drilling method in accordance with ASTM Standard Guide F 1962 for "Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings".

.4 Employ experienced personnel to operate the directional drilling and tracking equipment.

.1 Personnel to have previously performed horizontal directional drilling for comparable pipe length and diameter within the past three (3) years.

.2 Contractor to provide references of past work including client contact name, address, and telephone number.

.5 Containment pipe radius shall be 41 m or greater during construction and after installation.

.6 Depth of clay cover above top of pipe shall be 3.0 m or greater beneath the low flow floodway channel and to within 5 m west of the low flow channel and to within 5 m east of

the low flow channel. Depth of cover for the open cut sections for the remainder of the dual containment pipe shall be 2.5 m.

.7 Submit an HDD Construction Method Statement as per Section 1.3 prior to construction. Include the following information:

.1 Equipment specifications, functionality and capacity.

.2 Size of pilot hole.

.3 Number and size of pre-reams.

.4 Calculations showing determination of the appropriate back-ream rate for each pre-ream and product pullback.

.5 Method of suspending, supporting and directing pipe during pullback.

.6 Type and capabilities of tracking system.

.7 Drilling fluid and cuttings management plan including type of drilling fluid, drilling fluid pressure, fluid containment storage recycling, and transport and disposal.

.8 Management plan for frac-outs as specified herein.

.9 Sketch of Work Site including equipment layout, slurry containment pits and entry and exit locations.

.8 Maintain alignment of directional drilling as close as possible to the proposed plan and profile shown on the drawings taking into account the capabilities of drilling equipment and the allowable stresses of HDPE pipe and drilling rods. Advise the Contract Administrator of deviations to line and grade as they occur for discussion and approval.

.9 Continuously monitor and track the drill bore in the pilot hole. Record the depth to the nearest 0.10 m from ground surface at major changes in surface elevation, at maximum 10 m intervals along flat surfaces and at horizontal and vertical changes in alignment. Indicate the location that the depth was recorded by spray paint, marker buoy, or other method to allow the Contract Administrator to obtain the coordinates of the location.

.10 Begin reaming operations to enlarge pilot hole after acceptance of the pilot bore. The number and size of reaming heads is at the discretion of the Contractor.

.11 Continuously monitor and track the following during boring operation:

.1 Thrust and pullback pressure

.2 Rotational torque

.3 Times when drilling fluid circulation was lost

.4 Drilling fluid composition

.5 Ground conditions encountered

.12 Operate and maintain a closed loop drilling fluid system if possible.

.13 Ensure drilling fluids and cuttings are contained and stored at entrance and exit hole locations in accordance with the management plan. Drilling fluid shall at no time be directed to the low flow channel, watercourses, sewers, manholes, or catch basins. Drilling fluid and cuttings shall be loaded, hauled from the Site and disposed of off site.

.14 The pipe grip shall consist of a fused polyethylene adapter, internal/external clamp, or bolting device. Basket type or internal only grips are not allowed.

.15 Install a swivel between the reamer or compactor head and the pipe to reduce torsional loads transmitted to the pipe during pipe pullback. Rating of the swivel shall be somewhat larger than the lower of either the pull force capability of the drill rig or strength of the pipe.

.16 Cap end of pipe before pulling into bore hole to prevent matter and fluids from entering the pipe.

.17 Provide pipe rollers, side booms or other devices to support and protect pipe while pulling into bore hole.

.18 If required, fill carrier pipe with water when pulling into bore hole to help prevent flotation. Notify Contract Administrator prior to pipe filling and pull in.

.19 Install a breakaway link between the swivel and pipe grip to ensure the pull back force on the pipe does not exceed the maximum tensile force allowed by the pipe manufacturer.

.20 Pull the pipe beneath the low flow channel and to the staging area on the west bank where the dual containment pipe will terminate allowing for rebound of the pipe.

.21 Allow HDPE forcemain pipe a minimum 24 hours to recover and rebound after pull-in before making connections to ends of dual containment pipe. Measure location of both pipe ends to ensure pipe recovery is complete.

3.14 Installation of HDPE Pipe in Open Excavations

.1 If installation up the Floodway side slopes is intended to be by open cut methods, installation by open cut is to be completed after pipe has been pulled under the low flow channel.

.2 Excavations shall be a minimum 10m from the edge of the low flow channel.

.3 Bed pipe using Type 3 granular bedding in accordance with specification CW 2030 and SD-001.

.4 Backfill excavations using Class 4 backfill in accordance with CW 2030 and SD-002.

3.15 Hydrostatic Testing of Forcemain After Installation

.1 Hydrostatic Pressure Testing of Carrier Pipe:

.1 Perform hydrostatic testing of the entire length of dual containment forcemain after installation.

.2 Hydrostatic test procedure shall conform to Section 3.12.

.2 Pneumatic Pressure Testing of Containment Pipe:

.1 Perform pressure test on the containment pipe with an air test to 0.035 MPa and not exceeding 0.070 MPa.

.2 Perform pressure test as per Section 3.12 with the proviso that acceptance criteria shall be limited to pressure drop only as visual classification methods will not be feasible.

END OF SECTION

PRESSURE MONITORING MANHOLE AT FLOODWAY

1. GENERAL

1.1 Material Certification

.1 At least two (2) weeks prior to commencing Work, submit Manufacturer's test data and certification that pipe materials meet requirements of this Section. Include Manufacturer's Drawings, information and Shop Drawings where pertinent.

1.2 Shop Drawings

.1 Submit Shop Drawings in accordance with Section 01300 – Submittals:

.1 Pressure Monitoring Manhole

.2 Aluminum Pipe Supports

.3 Pressure Monitoring Equipment:

.1 Terminal boxes (battery and electronics)

.2 Pole mounting of terminal boxes, solar panel, and antenna

1.3 Record Drawings

.1 Provide data necessary to produce record Drawings showing locations of all mains and appurtenances, including directions for operating valves, list of equipment required to operate valves, details of pipe material, and location of air and vacuum release valves.

1.4 Measurement and Payment

.1 Installation of pressure monitoring manhole, drain, support saddle, insulation, valve marker, air/vacuum release valve and related appurtenances, and related works will be paid for at the Contract Unit Price for "Pressure Monitoring Manhole" installed in accordance with this Specification, accepted by the Contract Administrator.

.2 Installation of pressure transmitters, Control Cabinet, battery box, pole, metal conduit on pole, valve marker, solar panel, antenna, wiring connections, and related works to install the pressure transmitters shall not be measured for separate payment and will be included with "Pressure Monitoring Manhole".

2. PRODUCTS

2.1 Manhole

.1 Pre-cast concrete sections to CSA A257.4 and ASTM Standard C78 Class II and C478 (circular sections).

.2 Use only those products listed in AT - 4.2.1.70 of Approved Products for Underground Use in the City of Winnipeg found on the City of Winnipeg, Materials management web site at http://www.winnipeg.ca/matmgt/spec/.

2.2 Electrofusion Service Saddles

.1 One 50 mm electrofusion service saddle for air/vacuum release valve.

.2 Two electrofusion saddles for connecting two pressure transmitters with 12 mm NPT connection..

.3 Saddle to be equipped with isolation ball valve for pressure transmitter connection.

2.3 Pressure Measurement

.1 Two Ultra In-Line Gage Pressure Transmitters, Rosemount Model 3051S1TG2A2E11A2AB4K6:

.1 Primary Pressure Range: -14.7 psig to 150 psig

.2 Isolating Diaphragm: 316L SST

.3 HART Protocol

.2 Remote Operations Controller (ROC), Rosemount ROC809 MPU:

.1 With LOI, Ethernet, RS232

.2 With ROC800 12 VDC Power Supply

.3 Input Voltage Range: 11.5 to 14.5 VDC

.4 ROC800 HART Card, 4 Channels, Input or Output Configurable per Channel, 5 Devices per Channel Maximum

.3 Cellular Modem, Bluetree IP4200 CDMA:

.1 One 1xRTT cellular data modem with serial, USB and Ethernet interface modes:

.1 Wireless connectivity utilizing Packet Assembly and Disassembly (PAD) over UDP or TCP, allowing internet communication to non TCP/IP compatible devices.

.2 Modbus RTU protocol support

.3 8-30VDC powered

.4 External antenna connection (TNC 50Ω male)

.5 Compatibility with MTS cellular network

.6 Operating temperature: –30º to +60ºC

.7 LED status indication of: Power, Transmit, Receive, DTR, Network Registration, Link, ACT, SER

.8 Provide 1 Ethernet crossover cable for interconnection to ROC

.2 One thru-hole mount cellular antenna, 6 dB gain

.4 Solar Power System: Complete, functioning 12 VDC solar power system capable of servicing a 500 mA load continuously and consisting of the following components:

.1 75-85 watt, nominally 12 VDC minimum 4 Amp solar module.
Acceptable manufacture; BP, Shell, Kyocera.

.2 Pole mounting brackets for solar module.

.3 Solar Charge Controller; Solid-State, temperature compensated, 6 Amp regulator, Low Voltage Disconnect, reverse polarity protection, PWM charging.
Acceptable manufacture; Morningstar Corp, SunSaver SS6.

.4 Fused disconnects for solar module and batteries.

.5 All interconnecting cables and mounting hardware.

.6 Two group 31, 75 Ah deep cycle 12 Volt batteries; Wound cell configuration, nonspillable, sealed, ⅜" stainless steel stud terminals.
Acceptable manufacture; Optima D31T 8050-160.

.5 Custom Enclosures (Pole Mounted):

.1 Battery box; EEMAC 3R fully insulated (R-7 minimum) fibreglass enclosure, padlockable door, sized to fit required batteries.

.2 Control cabinet; EEMAC 3R fully insulated (R-7 minimum) metallic enclosure, padlockable door, sized to fit cellular modem, Remote Operations Controller (ROC) and Solar Charge Controller. Exterior finish of cabinet shall be off white RAL 9003 high solids two component acrylic coating.

.6 Contractor to provide pressure transmitter wiring, conduit for wire mounting, mounting hardware, and metal conduit to shield cable mounted on pole.

.7 Contractor to supply minimum 200 mm diameter by 4 m long treated wood pole for a minimum height of 2.4 m above ground and 1m depth below ground surface. Pole to support cellular antenna, solar panel, battery box, and control cabinet.

.8 Aluminium Plate:

.1 To CAN/CSA S157 and the Aluminium Association 'Specifications for Aluminium Structures'. Aluminium for plates shall be Type 6061-T651.

.9 Anchor Bolts:

.1 ASTM A276, Type 316 stainless steel, of ample section to safely withstand the forces created by the load to which they will be subjected.

.10 Grout:

.1 Grout to be water tight, non-shrink such as Sika Grout 212 or approved equal in accordance with B6.

.11 PVC Conduit:

.1 Conduit shall be rigid PVC (Unplasticized) to CSA C22.2 No. 211.2-M1984. Minimum conduit size to be 38 mm.

.12 50 mm Thick Spray-On Polyurethane Foam Insulation: BASF Wall Tite CT.

.13 100 mm backwater valve at drain outlet.

.14 Non-woven geotextile at drain outlet.

.15 100mm Clean Stone at drain outlet.

2.4 Air/Vacuum Release Valve

.1 Air/vacuum release valve to be as per Section 02531 – Forcemains, Item 2.3.

2.5 Threaded Valves

.1 Small diameter threaded ball valves (75 mm diameter and less) shall be all cast bronze two-piece type with chromium plated ball complete with lever handle rated for minimum 1.0 MPa non-shock cold water service. Bronze material shall conform to ASTM B62. Acceptable product; Apollo, Red-White.

2.6 Threaded Piping, Fittings and Flanges

.1 Small diameter brass threaded piping, fittings and flanges (75 mm diameter and less) shall be cast red brass conforming to ASTM B43 or cast bronze conforming to ASTM B62. Flange dimension and drilling shall be in accordance with ANSI B16.24 - 150#.

.2 Small Diameter steel threaded fittings and flanges (75 mm diameter and less) shall accordance with ANSI B16.5 - Class 150.

.3 Small diameter steel pipe nipples shall be Schedule 80 steel.

.4 Paint for exposed metal surfaces shall be in accordance to AWWA C210. Coating shall be two (2) or more layers (5 mils dry film thickness minimum each coat) Polyamide Epoxy, Amerlock 400, Tnemec Series 140F Pota-Pox Plus or approved equal in accordance with B6.

3. EXECUTION

3.1 Manhole Sections

.1 Install the manhole in accordance with Section 3.8 of CW 2130 and as shown on the Drawings.

3.2 Electrofusion Saddles

.1 Install electrofusion saddle on the HDPE in accordance with manufacturer's instructions.

.2 Intall the saddle at the pipe spring line of the pipe.

.3 Neatly drill a hole of the required size for each the two pressure transmitters mount onto the HDPE pipes.

.4 Install isolation ball valve onto saddle.

3.3 Pressure Transmitter

.1 Mount pressure transmitters to exterior of containment and carrier pipes in pressure monitoring manhole. Pressure transmitters to be mounted at the pipe spring line.

.2 Lead wires to PVC conduit.

3.4 Terminal Boxes, Solar Panel, and Antenna Mounting

.1 Mount Control Cabinet, battery box, solar panel, and antenna on 200 mm diameter treated wood pole at height above 2.4 m.

.2 Position solar panel facing due south.

3.5 PVC Conduit and Wire

.1 Form conduit to shape of manhole radius and attach to wall with support clips and anchor bolts at 1.2 m intervals. Provide support clip within 300 mm of a direction change.

.2 Run conduit tight to manhole wall including bends at direction changes.

.3 Run conduit up manhole riser to not interfere with access.

.4 Core neat hole in manhole wall where conduit passes through the wall slightly larger than OD of conduit using diamond coring equipment.

.5 Provide expansion or settlement fitting on conduit outside of manhole to allow for settlement of backfill without putting strain on or breaking conduit.

.6 Run one armoured, shielded, single twisted pair #18 AWG stranded cable for each pressure transmitter inside the conduit between the transmitters and the Control Cabinet mounted on the pole.

.7 Install cables leading up pole to Control Cabinet in metal conduit.

.8 Make final wiring connection of pressure transmitters, Control Cabinet and antenna/solar panel in presence of the Contract Administrator.

3.6 Aluminium Fabrication

.1 Provide Shop Drawings of pipe support saddle to Contract Administrator for review before beginning fabrication.

.2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Assemble work in such a way that no disfigurements will show in the finished work, or impair the strength.

.3 Confirm measurements for all fabrications before fabricating.

.4 Cut aluminium plate with edges straight and true, and as far as practical, maintain continuity of the pattern at abutting edges.

.5 Pieces shall be of the sizes indicated on the Drawings and shall not be built up from scrap pieces. Confirm sizes with field measurements.

.6 Where possible, fit work and shop assemble, ready for erection.

.7 Remove and grind smooth burrs, filings, sharp protrusions, and projections from metal fabrications to prevent possible injury. Correct any dangerous or potentially harmful installations.

.8 All aluminium welding shall conform to Welding shall be in accordance with the requirements of CSA W59.2. The fabricator shall be fully certified in conformance with CSA Standard W47.2. All welding shall be done in a licensed welding shop, and no field welding will be permitted unless approved in writing, in advance, by the Contract Administrator.

.9 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.10 All aluminium surfaces in contact with concrete shall be isolated using alkali-resistant bituminous paint meeting the requirements of CGSB 31-GP-3M.

3.7 Grouting Around Pipe and Wiring

.1 Grout around HDPE pipe and PVC conduit where pipes pass through the manhole with Sika Grout 212 to make watertight.

3.8 Spray-On Polyurethane Foam Insulation

.1 Spray polyurethane foam insulation onto manhole exterior including exterior of manhole frame to a thickness of 50 mm.

.2 Spray insulation on underside of manhole cover. Cover lifting hook holes in cover with cups on underside of cover to keep holes clear for lifting hook access.

.3 Spray insulation on forcemain pipe exterior contained inside manhole. Provide covering to instrumentation to allow for future insulation removal and access to instrumentation.

3.9 PVC Drain Pipe

.1 Install 100 mm PVC drain pipe extending from pressure monitoring manhole to WTP Drain line manhole at location noted on Construction Drawings.

.2 Install backwater valve at drain outlet in Drain line manhole.

.3 Protect soil downslope of drain outlet with non-woven geotextile covered with 100 mm clean stone to 300 mm thickness, 1000 mm wide, and 1500 mm downslope.

END OF SECTION

PIPE CULVERTS

1. GENERAL

1.1 Scope of Work

.1 This Specification covers the supply and installation of corrugated steel pipe for culverts required to facilitate drainage works and extend existing culverts.

1.2 Material Certification

.1 At least two (2) weeks prior to commencing work, inform the Contract Administrator of proposed source of bedding materials and provide access for sampling.

1.3 Measurement and Payment

.1 Corrugated steel pipe will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3610.

.2 Connections to Existing Culverts will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3610.

2. PRODUCTS

2.1 Corrugated Steel Pipe

.1 Corrugated Steel Pipe: to CSA CAN3-G401-minimum thickness of 1.6 mm. Utilize prefabricated end sections as indicated.

.2 Fittings, Couplers and Bolts: of same material as pipe.

2.2 Bedding & Backfill

.1 Bedding and backfill shall be in accordance with City of Winnipeg Standard Construction Specification CW 3610.

3. EXECUTION

3.1 Excavation and Trenching

.1 Excavate trenches as narrow as possible, but wide enough to allow for compaction on both sides of the culvert, minimum width is 2 times the diameter of the culvert or span of pipe or as directed by Contract Administrator.

.2 If conditions and safety requirements permit, use vertical trench walls to at least the top of the culvert.

3.2 Bedding

.1 Use culvert bedding material 75 mm below the corrugate steel pipe invert and up to 300 mm above the top of the corrugate steel pipe.

.2 Shape culvert foundation to a constant grade as determined by Contract Administrator ensuring entire length of corrugate steel piping is in contact bedding material.

.3 Place bedding in uniform layers not exceeding 200 mm and compacted to minimum 95% Standard Proctor Density.

.4 Maintain the level of bedding on both sides of the corrugate steel piping approximately equal at all times.

3.3 Classes of Backfill

.1 Backfilling to include the material 300 mm above the pipe to the ground surface or top of subgrade as applicable. Following are classes of backfilling:

.1 Class 1 – Backfill utilizing Type 1 material compacted to a density of at least 95% Standard Proctor Dry Density to within 1.0 m of underside of pavement. Fill the remainder of the excavation with cement stabilized fill to required depth below finished pavement as indicated on the drawings or as directed by the Contract Administrator.

.2 Class 2 - Backfill utilizing Type 1 material in maximum 300 mm thick lifts to grades as indicated on the drawings or as directed by the Contract Administrator. Compact each layer to a density of at least 95% Standard Proctor Dry Density. Place and compact layers uniformly and simultaneously on each side of pipe to prevent lateral displacement of pipe.

.3 Class 3 - Backfill utilizing Type 1 material to grades as indicated on the drawings or as directed by the Contract Administrator. Compact backfill material by jetting, flooding, and tamping in accordance with specifications outlined below in item 3.4.

.4 Class 4 - Backfill utilizing suitable excavated material in maximum 300 mm thick layers to ground surface as directed by the Contract Administrator. Compact each layer to a density equivalent to that of the surrounding unexcavated material. Place and compact layers uniformly and simultaneously on each side of pipe to prevent lateral displacement of pipe. Obtain Contract Administrator's approval prior to proceeding with the next layer.

.5 Class 5 - Backfill utilizing suitable excavated material in maximum 300 mm thick layers to ground surface as directed by the Contract Administrator. Compact backfill material by jetting, flooding, or tamping in accordance with specifications outlined below in item 3.4.

3.4 Jetting, Flooding, and Tamping of Backfill

.1 Use a minimum 25 mm diameter rigid pipe of suitable length for jetting excavations. Jetting nozzles to be insert along the centerline of the trench at maximum 1,500 mm spacing between jetting nozzles.

.2 Insert the jetting pipe into the backfill to within 1 m of the top of pipe. Allow water from jetting action to determine rate at which jetting pipe is worked through backfill.

.3 Continue jetting until water migrates to top surface of the backfill and begins to pond.

.4 Tamp backfill with backhoe mounted vibratory compactor after sufficient drying of surface has occurred.

.5 Place and compact additional backfill as required to bring backfill surface to desired grade.

3.5 Backfilling

.1 Do not proceed with trench backfilling operations until Contract Administrator has reviewed and approved installations.

.2 Areas to be backfilled to be free from debris, snow, ice, water, and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow, or debris.

.4 Backfill excavations as per the following:

.1 Trenches and excavations located within existing paved areas and areas proposed to be paved: Utilize Class 2, or Class 3 backfill as indicated on the drawings and specifications or as directed by the Contract Administrator.

.2 Embankment construction for driveway widening area to be as per Section 02300 – Earth Work.

.5 Place layers simultaneously on both sides of installed work to equalize loading.

.6 Dumping material directly on installations will not be permitted. Place material in maximum 200 mm lifts under, around and over installations until 600 mm of cover is provided.

.7 Compact using approved mechanical tamping devices, or by hand tamping to achieve specified compaction.

.8 When a prefabricated cage or shield is used in the trench, special care shall be taken to ensure that there is no lateral or longitudinal movement of the pipe when the cage is moved.

3.6 Pipe Installation

.1 Complete pip installation in accordance with City of Winnipeg Standard Construction Specification CW 3610.

3.7 Joints: Corrugated Steel Culverts

.1 Match corrugations or indentations of coupler with pipe sections before tightening. Tap couplers firmly while tightening to take up slack and to ensure a snug fit. Ensure coupler corrugations engage pipe corrugations. Fully tighten coupler bolts.

.2 Place riveted type culverts so that horizontal seams are located in the upper half of the culvert with inside circumferential laps pointing in the direction of the flow. Butt together culvert sections.

.3 Lay pipe with outside circumferential laps facing upstream.

END OF SECTION

PRESERVATION OF TOPSOIL

1. GENERAL

1.1 Scope of Work

.1 The Work of this Section includes excavation of topsoil from piping routes, stockpiling, and re spreading as directed in the various specification sections.

1.2 Definitions

.1 Top soil: material capable of supporting good vegetation growth and suitable for use in top dressing, landscaping and seeding.

1.3 Measurement and Payment

.1 Stripping and replacing topsoil along pipe routes will be an incidental to the works.

2. PRODUCTS (NOT USED)

3. EXECUTION

3.1 Stripping of Topsoil

.1 Remove topsoil before any construction procedures commence to avoid compaction of topsoil.

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

.3 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal acceptable to authorities having jurisdiction.

.4 Strip topsoil to full depth up to 150 mm or as directed by Contract Administrator. Avoid mixing topsoil with subsoil.

.5 Stockpile topsoil at locations as directed by Contract Administrator. Stockpile height not to exceed 1.5 to 1.8 m.

.6 Protect stockpiles from contamination and compaction.

3.2 Topsoil Spreading

.1 Spread all stripped topsoil after trenching and backfilling operations.

.2 Grade area to elevations and conditions prior to trenching as directed by the Contract Administrator.

.3 Grassed Areas within Aqueduct right of way: Roach (mound) above original grade to a level that does not affect drainage, maximum 250 mm. Top 75 mm or greater to be topsoil if topsoil available.

END OF SECTION

BASE MATERIAL

1. GENERAL

1.1 Scope of Work

.1 This Section outlines the requirements for the placement and compaction of base course material for the construction of the new approaches and restoration of roadways.

1.2 Measurement and Payment

.1 Crushed Limestone Base Course Material will be measured on a weight basis and will be paid for at the Contract Unit Price per tonne for "Crushed Limestone Base Course Material". The total number of tonnes of Base Course Material paid for will be the total number of tonnes of Base Course Material supplied and placed in accordance with this Specification as accepted and measured by the Contract Administrator.

2. PRODUCTS

2.1 Base Course Material

.1 Base Course Material to be as per City of Winnipeg Standard Construction Specification CW 3110 for Crushed Limestone.

3. EXECUTION

3.1 General

.1 Do not perform work during inclement weather conditions or under adverse field conditions such as frozen ground or ground covered with snow, ice, or standing water.

3.2 Placement and Compaction of Base Material

.1 Complete placement and compaction of base material in accordance with City of Winnipeg Standard Construction Specification CW 3110.

END OF SECTION

SUB-BASE MATERIAL

1. GENERAL

1.1 Scope of Work

.1 This Section outlines the requirements for the placement and compaction of sub-base course material for the construction of the new approaches.

1.2 Measurement and Payment

.1 Placement and compaction of sub-base course material will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3110 for Crushed Sub-Base Material, 50 mm Limestone.

2. PRODUCTS

2.1 Sub-Base Material

.1 Sub-Base Material to be as per City of Winnipeg Standard Construction Specification CW 3110 for Crushed Sub-Base Material 50 mm Limestone.

3. EXECUTION

3.1 General

.1 Do not perform work during inclement weather conditions or under adverse field conditions such as frozen ground or ground covered with snow, ice, or standing water.

3.2 Placement and Compaction of Base Material

.1 Complete placement and compaction of sub-base material in accordance with City of Winnipeg Standard Construction Specification CW 3110.

END OF SECTION

TOPSOIL AND FINISH GRADING

1. GENERAL

1.1 Scope of Work

.1 The work of this section outlines the requirements for topsoil placement and finish grading for the purposes of grass growth only. Schedule placing of topsoil and finish grading to undertake seeding operations under optimum soil moisture conditions and weather conditions.

1.2 Measurement and Payment

.1 Topsoil, fertilizer, and finish grading shall be incidental to works.

2. PRODUCTS

2.1 Topsoil

.1 Topsoil to be as per City of Winnipeg Standard Construction Specification CW 3540.

2.2 Fertilizer

.1 Fertilizer to be as per City of Winnipeg Standard Construction Specification CW 3540.

3. EXECUTION

3.1 Preparation of Subgrade

.1 Verify the subgrade elevations are within approved tolerances. Do not commence placement of topsoil until subgrade elevations have been reviewed and approved by the Contract Administrator.

.2 Grade area only when soil is dry to lessen soil compaction. Cultivate entire area to a depth of 100 mm. Cross cultivate area where equipment has compacted soil.

.3 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage. Ensure soil utilized for topsoil is free of all debris and deleterious material in excess of 25 mm diameter.

3.2 Placing of Topsoil

.1 Place topsoil only after the Contract Administrator has accepted subgrade.

.2 The placement of additional topsoil is not required along the aqueduct right of way as topsoil removal and replacement is required. Topsoil placement will be required along the Murdock road right of way and in all other construction areas.

.3 During dry conditions, spread topsoil in uniform layers to a minimum depth as outlined in the City of Winnipeg Standard Construction Specification CW 3540-R5, over unfrozen subgrade free of standing water.

.4 Establish traffic patterns for equipment that will prevent driving on topsoil after it has been spread to avoid compaction.

.5 Fine grade entire topsoiled area to eliminate rough spots and low areas ensuring positive drainage. Grade ditches to depth required for maximum run-off.

3.3 Application of Fertilizer

.1 Apply fertilizer in all areas to be seeded. Application of fertilizer to be in accordance with City of Winnipeg Standard Construction Specification CW 3540.

3.4 Finish Grading

.1 Complete finish grading in accordance with City of Winnipeg Standard Construction Specification CW 3540. Fine grade entire topsoiled area to contours and elevations as requested by Contract Administrator. Eliminate rough spots and low areas to ensure positive drainage.

.2 Fine grade and loosen topsoil bed by means of cultivation and subsequent raking. Roll to consolidate topsoil for areas to be sodded leaving surface smooth, uniform, firm against deep foot printing, and with a fine loose texture.

.3 Feather topsoil as required around perimeter of site into existing areas requiring regrowth of vegetation.

.4 Maintain placed topsoil as specified until seeding is completed. Install erosion control blanket on side slopes of all drainage channels and water courses in accordance with Section 02380 – Waterways Protection or as directed by the Contract Administrator.

3.5 Cleanup

.1 Clean up immediately any soil or debris spilled onto gravel, pavement, or concrete. Do not damage surfaces.

.2 Remove and dispose of all screenings, stones, debris, roots, etc.

END OF SECTION

SEEDING

1. GENERAL

1.1 Scope of Work

.1 This Section outlines the requirements for seeding of all areas impacted by trenching or operation of construction equipment.

1.2 Measurement and Payment

.1 Supply and placement of seed shall be incidental to the works.

2. PRODUCTS

2.1 Topsoil

.1 Topsoil to be as per City of Winnipeg Standard Construction Specification CW 3540.

2.2 Fertilizer

.1 Fertilizer to be as per City of Winnipeg Standard Construction Specification CW 3540.

2.3 Seed

.1 Grass seed to Certified Canada No. 1 grade or Certified Canada No.2 grade and shall come complete with a Certificate of Analysis verifying that the quality standards for Certified Canada No. 1 grade or Certified Canada No. 2 seed are met.

.2 The seed supplied shall be mixed by percentage of weight and free of disease. Seed mixture to be as per the following:

.1 Application No.1:

.1 Timothy 20%

.2 Creeping Red Fescue 20%

.3 Alsike clover 10%

.4 Meadow Fescue 25%

.5 Crested Wheatgrass 25%

.2 Application No.2:

.1 Fall Rye 100%

3. EXECUTION

3.1 General

.1 Do not perform work during inclement weather conditions or under adverse field conditions such as frozen ground or ground covered with snow, ice, or standing water.

.2 Commence seeding operations after finish grading is acceptable.

3.2 Topsoil and Finish Grading

.1 Complete placement of fertilizer, topsoil and finish grading works in accordance with Section 02911 – Topsoil and Finish Grading and City of Winnipeg Standard Construction Specification CW 3540.

3.3 Seed

.1 All disturbed area to be seeded. Seeding shall commence immediately after the work is completed or as directed by the Contract Administrator.

.2 Complete placement of seed in accordance with City of Winnipeg Standard Construction Specification CW 3520. Application rate to be as specified below.

.3 Complete seeding in two (2) separate applications or utilizing two (2) separate seed boxes to ensure the specified application rate for each mixture.

.4 The application rate for the seed mixture shall be 100 kg per hectare and the rate of application for the fall rye shall be 100 kg per hectare.

.5 Maintenance, commencement of maintenance period, and termination of maintenance period, to be in accordance with City of Winnipeg Standard Construction Specification CW 3520.

.6 During both placement and maintenance of the seed, keep all nearby sidewalks, streets, approaches, and driveways free of excess material, topsoil, and debris from seeding operations. Immediately clean up any material spilled.

END OF SECTION