Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavation.

.2 Section 31 23 33.02 – Fill and Backfill.

.3 Section 31 32 19.01 – Geotextiles.

.4 Section 40 27 00 – Leachate Collection System.

1.2 MEASUREMENT AND PAYMENT

.1 Leachate Collection System Granular Drainage Material (coarse, clean gravel):

.1 Measurement Basis: Backfilling to the specified thickness, as shown on the drawings and confirmed by measurements made by the Contract Administrator.. It will be measured in cubic metres compacted in place. No deduction to be made for volume occupied by specified drain pipe.

.2 Payment Basis: Unit price. Includes supply, testing, stockpiling, placement and compaction.

1.3 REFERENCES

.1 Definitions:

.1 SMDD: Standard Maximum Dry Density and in the context of this Contract means the maximum dry unit weight determined according to ASTM D698.

.2 Reference Standards:

.1 ASTM International:

.1 ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.

.2 ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3)).

.3 ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

.4 ASTM D2974 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.

.5 ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

.6 ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.7 ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

.2 City of Winnipeg Standard Construction Specifications:

.1 CW3110 - Sub-Grade, Sub-Base and Base Course Construction.

.2 CW3170 - Earthwork and Grading.

.3 CW2030 – Excavation Bedding and Backfill

.3 International Centre for Agricultural Research in the Dry Areas (ICARDA):

.1 Methods of Soil, Plant, and Water Analysis.

1.4 SEQUENCING

.1 Coordinate interruptions of utility services to existing facilities which become necessary either directly or indirectly due to work required under the Contract, through Contract Administrator. Down time duration and time (weekend, nights, or holidays) for service disruptions may be limited. Perform work of this Section during scheduled times.

.2 Coordinate and sequence excavation operations to minimize temporary stockpiling of excavated materials until required for backfilling. Make every effort to balance cut and fill operations and ensure excavated material designated for backfill is immediately placed in the Works. Minimize time excavations remain open.

1.5 SCHEDULING

.1 Do not allow or cause work performed to be covered up or enclosed prior to required inspections, tests, or approvals.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Materials Source: Submit name of proposed imported fill material source at least 14 days prior to commencing transport of materials to the Site.

.2 Provide schedule of service disruptions to utilities no later than 1 weeks prior to proposed date of disruption. Contract Administrator will review schedule with the City and respond within 7 days.

.3 Geotechnical Data: Submit geotechnical data at least 7 days prior to commencing transport to the Site.

.1 Aggregate Materials: Submit grain size distribution curves, density, and moisture content for each aggregate material. Show average distribution and minimum and maximum variation in gradation for each grain size distribution curve.

.4 Test Reports: Submit test reports certifying compliance with specified requirements at least 7 days prior to commencing transport to the Site.

.5 Samples: Submit 5 kg Sample of Leachate Collection System Granular Drainage in airtight bag or container.

.6 Suppliers' Certificates: Submit certificate indicating that each type of imported fill material meets or exceeds specified requirements.

.7 Weigh Tickets: At the end of each work day submit delivery weigh tickets of imported fill materials delivered to the Site.

.8 Field Quality Control: Submit field data on same day testing is performed. Submit laboratory data within 24 hours of completion of test.

.9 Qualification Statements:

.1 Independent Geotechnical Testing Firm: At least 14 days prior to commencing transport of soil materials to the Site, submit name and qualifications of independent geotechnical testing firm to provide geotechnical testing services for work of this Section.

.2 Independent Analytical Laboratory: At least 14 days prior to commencing transport of soil or aggregate materials to the Site, submit name and qualifications of independent testing laboratory to provide chemical analysis for work of this Section.

.10 Certificates: Certify that products meet or exceed specified requirements.

1.7 QUALIFICATIONS

.1 Geotechnical Testing Firm: Company specializing in performing work of this Section and complying with ASTM D3740 to perform testing of fill materials including density, moisture content, permeability, and particle size analysis for both soil and aggregate samples.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, and transport fill materials in a manner and with equipment that will prevent intermixing of soil, aggregate, segregation, or contamination.

.2 Minimize stockpiling requirements. Transport material from source directly to final position where possible.

.3 Stockpile fill materials in on-site locations approved by Contract Administrator.

1.9 AMBIENT CONDITIONS

.1 Suspend operations whenever climatic conditions, as determined by Contract Administrator, are unsatisfactory for placing fill to the requirements of this Section.

.2 Do not operate equipment on approved excavations after heavy rain until material has dried sufficiently to prevent excessive rutting.

Part 2 Products

2.1 GRANULAR DRAINAGE MATERIALS

.1 Granular material for leachate collection system shall be 19 mm to 51 mm clean stone, natural, manufactured, or processed clean, dry, unfrozen, sound, non-cohesive, dense granular material. Contractor shall provide the proposed material gradation to Contract Administrator for approval.

.2 Imported from an approved source.

.3 Free of unsuitable materials including:

.1 Frozen material or material containing snow or ice.

.2 Trees, stumps, branches, roots or other wood or lumber.

.3 Wire, steel, cast iron, cans, drums or other foreign material.

.4 Materials containing hazardous or toxic constituents at hazardous or toxic concentrations.

.5 Silt, clay, shale and siltstone

2.2 SOURCE QUALITY CONTROL

.1 Testing and Analysis of Coarse Aggregate:

.1 Maximum Dry Density and Optimum Moisture Content, ASTM D698: One sample per 1,000 m^3 or portion thereof of material required.

.2 Grain Size, ASTM C117 and ASTM C136: One sample per 1,000 m^3 of material required.

.3 Carbonate content, ASTM D4373, ICARDA/NARC or other method approved by Contract Administrator: One sample per 1,000 m^3 (minimum one sample) of material required.

.4 Los Angeles degradation: to ASTM C131: One sample.

.2 If tests indicate materials do not meet specified requirements, change material or material source and retest.

.3 Provide materials of each type from the same source throughout the Works.

.4 In the event of changes to approved sources of materials during performance of the Works, immediately advise Contract Administrator of revised locations and obtain approval of such locations and materials prior to use in the Works.

.5 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that survey control points and intended elevations for the Works are as shown on the Drawings.

.2 Verify manholes are anchored to their own foundations to avoid flotation after backfilling.

.3 Verify that excavations, dimensions, and elevations are as shown on the Drawings.

.4 Verify that prepared soil base is ready to receive the work of this Section.

3.2 PREPARATION

.1 Locate, identify, and protect utilities that remain from damage. Confirm locations of buried utilities and structures by careful test excavations or other suitable means. Provide support for aboveground utility poles and lines. Provide documentation to Contract Administrator.

.2 Identify required lines, levels, contours, and datum locations.

.3 Notify Contract Administrator of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

.4 Maintain and protect existing utilities designated to remain.

.5 Obtain direction from Contract Administrator before moving or otherwise disturbing utilities or structures.

.6 Protect plant life, trees, lawns, and other features remaining as portion of final landscaping.

.7 Protect survey control points, hydrants, existing structures, fences, paving, and curbs from excavating equipment and vehicular traffic.

.8 Maintain and protect from damage wells, utilities, and structures encountered. In event of disturbance or damage to well, utility, or structure, immediately notify Contract Administrator. Repair or replace well, utility, or structure damaged by Contractor operations.

.9 Protect monitoring wells and other structures and pipelines from uplift and displacement or disturbance during excavation operations.

.10 Protect existing structures where temporary unbalanced earth pressures may develop on walls or other structures utilizing bracing, shoring, or other approved method to counteract imbalance.

.11 Protect excavations and trenches from contamination.

.12 Employ procedures for excavation and trenching that avoid disturbance of utilities and structures.

.13 Remove surface features or obstructions including, but not necessarily limited to, trees, shrubs, bush, and other vegetation from surfaces to be excavated, as required to construct the Works. Dispose of such obstructions as directed by Contract Administrator.

3.3 BACKFILLING DRAINAGE LAYER

.1 Obtain approval from Engineer for completed excavations and previously placed material prior to placement of successive lifts of fill materials.

.2 Do not cause excavations to be backfilled until Engineer has approved excavation as complete and completed field measurements for payment purposes, and sampling and testing for analytical purposes.

.3 Remove debris or water from areas to be backfilled.

.4 Ensure areas to be backfilled are free from debris, snow, ice, water, soft soils, organic materials or frozen ground.

.5 Cut out soft areas of subgrade not capable of compaction in place. Backfill with approved native fill and compact to density equal to or greater than requirements for subsequent fill material.

.6 Compact subgrade to density requirements for subsequent backfill materials.

.7 Backfill areas to contours and elevations. Use unfrozen and unsaturated materials.

.8 Employ a placement method that does not disturb or damage other Work.

.9 Do not use backfill material which is determined unsuitable by Engineer.

.10 Except as specified otherwise, place backfill continuously and in uniform layers not exceeding specified compacted thickness up to grades shown on the Drawings.

.11 Drop height for leachate collection system granular drainage material to be no more than 300 mm.

.12 Protect geotextiles during placement operations.

.13 Do not operate heavy compaction equipment closer than 1 m to foundations, underground utilities, or monitoring wells.

.14 Backfill around exposed utilities by placing layers simultaneously on all sides to equalize loading. Do not dump directly against cleanout, manhole, monitoring wells, utilities, or foundations.

.15 Make gradual grade changes. Blend slope into level areas.

.16 Remove sheeting and shoring required during excavation during backfilling operations. Do not remove bracing until backfilling has reached the respective level of such bracing. Pull sheeting in increments that will ensure compacted backfill is maintained at an appropriate elevation above toe of sheeting.

3.4 COMPACTION

.1 Granular drainage material does not require compaction.

3.5 TOLERANCES

.1 Top of Granular Drainage and Backfill: Plus 25 mm.

.2 Correct surface irregularities by loosening and adding or removing material until the surface is within the specified tolerances.

.3 Payment will not be made for material placed outside the tolerance limits unless directed by Contract Administrator.

.4 All grading will be performed to maintain slopes and positive drainage as shown on the Drawings.

3.6 FIELD QUALITY CONTROL

.1 City of Winnipeg will carry out and submit topographic survey of final drainage material grades.

.2 Perform laboratory material tests according to ASTM D698.

.3 Perform in place compaction tests according to the following:

.1 Density Tests: ASTM D6938.

.4 Testing by Contractor:

.1 Select samples of uncompacted fill intended for the Works and samples of compacted fill in the Works.

.2 Perform tests in the field and in the laboratory on samples of backfill and imported fill to determine if materials meet specification. Testing of imported fill will include analyses for the presence of contaminants, grain size analyses, moisture content determination, bulk wet density, maximum dry density, and hydraulic conductivity. Testing for backfill will include moisture content determination, maximum dry density, and bulk wet density.

.5 Testing by Contract Administrator:

.1 Contract Administrator will select samples of uncompacted fill intended for the Works and samples of compacted fill in the Works.

.2 Contract Administrator will perform quality assurance tests in the field and in the laboratory on samples of backfill and imported fill to determine if materials meet specification. Quality assurance testing will include analysis for moisture content determination, bulk wet density, maximum dry density, and hydraulic conductivity.

.3 Testing by Contract Administrator will in no way relieve Contractor of responsibility to test all material prior to notifying Contract Administrator of materials' suitability for the work involved.

.6 Methods of Testing:

.1 Maximum dry density and optimum moisture content will be determined in the laboratory according to ASTM D698.

.2 Bulk wet density will be determined in the field according to ASTM D6938.

.3 Particle size analysis will be performed according to ASTM D422 or ASTM C117 and ASTM C136, whichever is appropriate to material being tested.

.7 Frequency of Testing:

.1 At least one particle size analysis.

.8 Failure to Meet Specified Requirements: If tests indicate that material specifications have not been achieved or cannot be obtained with equipment in use, procedure being followed, or material being incorporated, remove and replace work and modify operations so that equipment, procedures, and materials will produce required results. Additional testing required by Contract Administrator will be at no additional cost to the City.

3.7 ADJUSTING

.1 Leave work areas in a properly graded condition sloped as required to permit proper drainage and free of depressions that will pond or collect water or debris that will restrict flow.

3.8 CLEANING

.1 Clean and reinstate work areas and areas affected by equipment outside areas specified to be excavated, to specified restoration condition.

.2 Upon completion of backfilling, remove excess material and debris from work areas and travel routes.

3.9 PROTECTION

.1 Reshape and re-compact fills subjected to vehicular traffic.

.2 Protect pipe and bedding from damage or displacement until backfilling operation is complete.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.02 – Fill and Backfill

.2 Section 31 32 19.01 – Geotextiles

.3 Section 31 23 23 – Drainage Material

.4 Section 33 46 16 – Leachate Collection System

1.2 SUMMARY

.1 Section Includes:

.1 Excavation of overburden, reusable clay and till of the proposed trenches footprint within the Phase I area.

.2 Stockpiling of surplus excavated material.

.3 Surface water runoff control from adjacent BRRMF Area D Phase II.

1.3 MEASUREMENT AND PAYMENT

.1 Excavation and Stockpiling:

.1 Measurement Basis: By cubic metre of excavated material by subtracting survey readings taken before and after excavation by the Contract Administrator. Quantities will be actual volume of material excavated and the volume will be measured after clearing and grubbing, and topsoil stripping.

.2 Payment Basis: Unit price. Includes general excavation, de-watering, loading, hauling, stockpiling and shaping in on-site stockpiles of excess soil.

.1 Over-excavating: No payment will be made for over-excavated work or for replacement materials.

.2 Surface water runoff and seepage control

.1 Payment Basis: Lump sum.

1.4 REFERENCES

.1 Definitions:

.1 Common Excavation: Excavation of materials, of whatever nature, required to complete the Works.

.2 Unclassified Excavation: Excavation of deposits, of whatever nature, encountered in the Works.

.3 Unsuitable Materials for Reuse as Fill or Backfill:

.1 Weak, chemically unstable, and compressible materials.

.2 Refuse, asphalt, concrete or granular materials.

.3 Material containing loam, roots, or organic matter.

.4 Frozen material or material containing snow or ice.

.5 Clays that are classified as inorganic clays of high plasticity in accordance with applicable ASTM specifications.

.6 Soft and/or organic clays and silts of low strength.

.7 Frost susceptible silts or clays.

.8 Swelling clays.

.9 Rock and lumps of material with dimensions greater than 100 mm.

.10 Trees, stumps, branches, roots, or other wood or lumber.

.11 Wire, steel, cast iron, cans, drums, or other foreign material.

.12 Materials containing hazardous or toxic constituents at hazardous or toxic concentrations.

.13 Waste Material: Excavated material unsuitable for use in work or surplus to requirements.

.14 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.4 SMDD: Standard Maximum Dry Density and in the context of this Contract means the maximum dry unit weight determined according to ASTM D698.

.2 Reference Standards:

.1 ASTM International:

.1 ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.2 ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.

.3 ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3)).

.4 ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.5 ASTM D1140 - Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-μm) Sieve.

.6 ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

.2 City of Winnipeg Standard Construction Specifications:

.1 CW1120 - Existing Services, Utilities and Structures.

.2 CW3110 - Sub-Grade, Sub-Base and Base Course Construction.

.3 CW3170 - Earthwork and Grading.

.4 CW2030 – Excavation Bedding and Backfill.

1.5 **COORDINATION**

.1 All utilities shown in the drawings are approximate and must be field verified prior to construction. Contractor is responsible for providing all necessary field locates for all work areas prior to construction.

.2 Coordinate interruptions of utility services to existing facilities which become necessary either directly or indirectly due to work required under the Contract through Contract Administrator. Down time for service disruptions may be limited as to duration and time (weekend, nights, or holidays). Perform the Works during the period designated.

.3 Coordinate and sequence excavation operations to minimize the need for temporarily stockpiling excavated materials until required for backfilling. Make every effort to balance cut and fill operations and to ensure that excavated material designated for backfill is immediately placed as backfill or berm development in the Works. Keep the time during which excavations remain open to the practicable minimum.

1.6 **SCHEDULING**

.1 Sequence and schedule excavation activities with work of other Sections.

.2 Do not commence excavation operations until the Safe Work Plan has been reviewed by the City and Contract Administrator and implemented.

.3 Do not allow or cause any of work performed to be covered up or enclosed prior to required inspections, tests, or approvals.

1.7 **AMBIENT CONDITIONS**

.1 Protect open excavations against damage due to surface runoff and run-on. Take necessary precautions to prevent erosion of excavated or disturbed surfaces.

.2 De-watering services are considered incidental to the Contract Work and included in all unit rates. De-watering services must conform with applicable regulatory requirements and other Sections.

.3 Suspend operations whenever climatic conditions, as determined by Contract Administrator, are unsatisfactory for placing fill to the requirements of this Section.

.4 After occurrence of heavy rains, do not operate equipment on approved excavations until the material has dried sufficiently to prevent occurrence of excessive rutting.

.5 Where excavations have been softened or eroded, remove soft and yielding material or otherwise objectionable or damaged areas and replace with fill as specified by Contract Administrator.

.6 Do not obstruct flow of surface drainage or natural watercourses.

.7 Remove, replace, and compact softened, eroded, or otherwise objectionable or damaged areas or previously placed material, as determined by Contract Administrator at no additional cost to the City.

Part 2 Products

Not Used

Part 3 Execution

3.1 **EXAMINATION**

.1 Verify that survey bench marks and intended elevations for the Works are as shown on the Drawings.

.2 Do not allow or cause any of the work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, measurements, tests, or approvals.

.3 Obtain approval from Contract Administrator for completed excavations and previously placed material prior to placement of successive lifts.

.4 Obtain approval from Contract Administrator prior to placing fill against structures or around exposed buried utilities.

.5 Ensure areas to be backfilled are free from debris and water.

.6 Do not permit traffic in restored/repaired area without approval from Contract Administrator.

3.2 **TEMPORARY EROSION AND SEDIMENTATION CONTROL**

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Following vegetation establishment, remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 **DEWATERING AND HEAVE PREVENTION**

.1 Keep excavations free of water while Work is in progress.

.2 Protect open excavations against flooding and damage due to surface run-off.

.3 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.4 **PREPARATION**

.1 Identify required lines, levels, contours, and datum locations.

.2 Locate, identify, and protect utilities that remain from damage. Confirm locations of buried utilities and structures by careful test excavations or other suitable means.

.3 Arrange for utility company to identify utilities.

.4 Protect plant life, trees, and other features remaining as a portion of final landscaping.

.5 Protect bench marks, survey control points, existing structures, fences, paving, and curbs from excavating equipment and vehicular traffic.

.6 Maintain and protect from damage wells, utilities, and structures encountered. In event of disturbance or damage to well, utility, or structure, immediately notify Contract Administrator. Repair or replace well, utility, or structure damaged by Contractor operations.

.7 Protect existing surface features which may be affected during progress of work.

.8 Protect existing structures where temporary unbalanced earth pressures may develop on walls or other structures utilizing bracing, shoring, or other approved method to counteract imbalance.

.9 Identify, mark, and protect monitoring wells and other structures and pipelines from uplift and displacement or disturbance during excavation operations.

.10 Employ procedures for excavation and trenching that avoid disturbance of utilities and structures.

.11 Protect excavations and trenches from contamination.

.12 Obtain direction from Contract Administrator before moving or otherwise disturbing utilities or structures.

.13 Remove surface features or obstructions including, but not necessarily limited to, trees, shrubs, bush, and other vegetation from surfaces to be excavated, as required to construct the Works. Dispose of such obstructions as directed by Contract Administrator.

.14 Remove debris, snow, ice, water, soft soils, organic materials, or frozen ground from areas to be backfilled.

3.5 **TRENCHING**

.1 Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with work.

.2 The banks of trenches shall be as nearly vertical as allowable and in accordance with the Workplace Safety and Health Act and other applicable regulations and standards.

.3 In no case during performance of the Works shall trenching advance ahead of the active installation more than necessary to facilitate proper placement.

.4 Accurately excavate and grade the bottom of trenches to provide uniform bearing and support for each section of the pipe on full thickness of approved bedding material at every point along its entire length.

.5 Hand trim, make firm, and remove loose material and debris from trenches. Where natural or fill material at bottom of excavation is disturbed, compact disturbed soil to density at least equal to undisturbed soil or to the density specified for the succeeding layer of backfill, whichever is greater, or remove disturbed soil and refill the space as directed by Contract Administrator. Underpin adjacent structures at risk of damage during excavation work, including service utilities and pipe chases.

.6 Do not disturb soil within the branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.7 Open trenches shall be Contractor's sole responsibility.

.8 Restrict vehicle operations directly adjacent to open trenches.

.9 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Contractor Administrator.

.10 Temporarily stockpile excavated material that is approved for backfilling adjacent to the Works.

.11 Dispose of surplus material, including all excavated waste, as directed by Contract Administrator.

.12 Do not obstruct flow of surface drainage or natural watercourses.

.13 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

3.6 **EXCAVATION**

.1 Perform excavation in accordance with Province of Manitoba “W210 The Workplace Safety and Health Act” and “Guidelines for Excavation Work”.

.2 Excavate to lines, grades, elevations, and dimensions shown on the Drawings or as directed by Contract Administrator.

.3 Slope banks with machine to safe angle, as determined by a competent person.

.4 Grade top perimeter of excavation to redirect surface water and to prevent it from draining into excavation.

.5 Trim excavation. Remove loose matter.

.6 Remove lumped subsoil, boulders, and rock. Remove debris and other obstructions encountered. Stockpile in location(s) approved by Contract Administrator.

.7 Notify Contract Administrator of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

.8 Stockpile excavated material in designated on-Site areas as directed by Contract Administrator. **The Contractor must coordinate with the Contract Administrator and the City the location of the stockpiles, as most of the excavated material is expected to be used as fill for berm development or replaced and recompacted over the waste surface following installation of leachate collection system. These locations for stockpiling are within a distance of 500 metres, considered within the free haul distance.**

.9 Repair or replace items designated to remain, damaged by excavation.

.10 Hand trim, make firm, and remove loose material and debris from excavations. Where natural or fill material at bottom of excavation is disturbed, compact disturbed soil to density at least equal to undisturbed soil or to the density specified for the succeeding layer of backfill, whichever is greater, or remove disturbed soil and refill the space as directed by Contract Administrator.

.11 Material generated as a result of excavation, grading, and construction activities associated with completing the Work that are deemed unsuitable for use by Contract Administrator will be loaded, hauled, and placed in an area on the Site designated by Contract Administrator. This includes water or frost impacted material as a result of Contractor negligence.

.12 Do not disturb soil within the branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.13 Open excavations shall be Contractor's sole responsibility. Secure using temporary fencing in accordance with the Workplace Safety and Health Act.

3.7 **OVER-EXCAVATION**

.1 Correct unauthorized over-excavated areas at no cost to the City.

.2 Notify Contract Administrator when soil at base of excavation appears unsuitable; proceed as directed by Contract Administrator. Where, in Contract Administrator's opinion, the undisturbed condition of the soils is inadequate to support installations, over-excavate to adequate supporting soils as directed by Contract Administrator and refill the excavated space with approved material to the proper elevation, as specified for backfilling.

.3 When directed by Contract Administrator and except as otherwise specified, the excavation and removal of inadequate material as specified, and supply and installation of such material in excess of limits shown on the Drawings, will be paid for by Change in Work. Use over-excavated material in the Work or stockpile on the Site as approved by Contract Administrator.

.4 Should unauthorized excavation be carried below the lines and grades as shown on the Drawings and in excess of the specified depth and tolerance because of Contractor's operations including errors, methods of construction, or to suit his convenience, correct unauthorized excavation as follows:

.1 Fill under unauthorized over-excavation areas by extending the indicated bottom elevation of the base of the material specified to be placed to the unauthorized excavation bottom without altering the required top elevation and compact as specified unless otherwise directed by Contract Administrator.

.5 Additional excavation to remove weakened or disturbed soil caused by unsuitable construction methods or procedures or to suit Contractor's convenience and subsequent

additional backfill and compaction to correct deficiencies shall be to Contractor's account at no additional cost to the City.

3.8 **STOCKPILING**

.1 Obtain Contract Administrator's approval for locations of all stockpiles. Obtain Contract Administrator's approval prior to placing surplus excavated materials in such stockpiles.

.2 Coordinate placement of excavated material stockpiles with the City of Winnipeg Landfill Operations department.

.3 Construct stockpile sites so that they are level, well drained, free of foreign materials, and of adequate bearing capacity to support the weight of the materials to be placed thereon prior to adding new materials to the stockpile area.

.4 Stockpiles shall be constructed with two access points, one on each end.

.5 Existing stockpiles shall be stripped of topsoil prior to stockpiling additional excavated material.

.6 Protect the perimeters of the soil stockpiles in the stockpile area with silt fence approved by Contract Administrator following the stockpiling of the material.

.7 Provide and maintain access to stockpiles.

.8 Prevent intermixing of soil types or contamination or segregation.

.9 Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

.10 Materials that are wet within the work area or require dewatering prior to placement in the stockpiles to be temporarily placed within bermed areas constructed by Contractor in the stockpile area. Control all runoff water from the bermed area including operation of pumps, placement of additional silt fencing, and construction of settling ponds as required to control the runoff and dewater the materials.

.11 All stockpiles will be constructed with 3:1 side slopes providing adequate slope stability and drainage.

.12 Upon completion of stockpiling and restoration, the remaining soil stockpiles will receive a final shaping to a maximum 3:1 slope by Contractor. All perimeter silt fencing will remain in place.

.13 Maintain area surrounding stockpiles in neat and tidy condition.

3.9 **UTILITIES**

.1 Any interruption or damage to an existing service due to Contractor's negligence is Contractor's responsibility. Immediately notify the City and Contract Administrator and mitigate condition before end of working day. Repair promptly. Contractor shall submit repair plan to Contract Administrator and employ a certified trade, as necessary, to make the repair.

3.10 **TOLERANCES**

.1 Correct surface irregularities by loosening and adding or removing material until the surface is within the specified tolerances.

.2 Payment will not be made for material placed outside the tolerance limits unless directed by Contract Administrator.

.3 The final locations of all excavations will be constructed to within a tolerance of +/- 25 mm. All grading will be performed to maintain slopes and positive drainage as shown on the Drawings.

3.11 **ADJUSTING**

.1 Leave work areas in a properly graded condition sloped as required to permit proper drainage and free of depressions that will pond or collect water or debris that will restrict flow.

3.12 **PROTECTION**

.1 Prevent displacement or loose soil from falling into excavation; maintain soil stability.

.2 Protect bottom of excavations from freezing.

.3 Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

.4 Verify that survey bench marks and intended elevations for Works are as shown on the Drawings.

.5 Groundwater monitoring wells shall be identified, marked, and protected from damage during Site Works.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavation.

.2 Section 40 27 00 – Leachate Collection System.

1.2 SUMMARY

.1 This section includes:

.1 Requirements for the fill operations required to construct a 1 meter thick clay cover over the existing waste pile within Area D Phase I footprint, and the berms.

1.3 MEASUREMENT AND PAYMENT

.1 Common Fill and Backfill:

.1 Measurement Basis: By cubic meters measured in place calculated by the Contract Administrator from measurements taken by the Contract Administrator in filling areas after compaction. Quantities will be actual volume of material installed.

.2 Payment Basis: Tendered unit price. Includes supply, stockpiling, de-watering, placement and grading.

1.4 REFERENCES

.1 Definitions:

.1 SMDD: Standard Maximum Dry Density and in the context of this Contract means the maximum dry unit weight determined according to ASTM D698.

.2 Reference Standards:

.1 ASTM International:

.1 ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

.2 ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

.3 ASTM D422 - Standard Test Method for Particle Size Analysis of Soils.

.4 ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.5 ASTM D6938 Standard Test Method for In Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth).

.6 ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft lbf/ft3 (600 kN m/m3)).

1.5 SEQUENCING

.1 Coordinate interruptions of utility services to existing facilities which become necessary either directly or indirectly due to work required under the Contract, through Contract Administrator. Down time for service disruptions may be limited as to duration and time (weekend, nights or holidays). Perform work of this Section during scheduled times.

.2 Coordinate and sequence excavation operations to minimize the need for temporarily stockpiling excavated materials until required for backfilling. Make every effort to balance cut and fill operations and ensure excavated material designated for backfill is immediately placed as backfill in the Works. Minimize time excavations remain open.

1.6 SCHEDULING

.1 Do not allow or cause work performed to be covered up or enclosed prior to required inspections, tests, or acceptances.

1.7 SUBMITTALS

.1 Materials Source:

.1 Common fill materials from the South Borrow Pit immediately south of the Area D Phase I area.

.2 Backfill material from the Area D Phase I trenching excavation.

.3 Imported fill material:

.1 Submit name of proposed imported fill material source at least 14 business days prior to commencing transport of materials to the Site.

.2 Provide schedule of service disruptions to utilities no later than 3 weeks prior to proposed date of disruption. Contract Administrator will review schedule with the City and respond within 7 days.

.3 Field Quality Control: Submit field data on same day testing is performed. Submit laboratory data within 24 hours of completion of test.

.4 Test Reports: Submit test reports certifying compliance with specified requirements at least 5 business days prior to commencing transport to the Site.

.5 Suppliers' Certificates: Submit certificate indicating that each type of imported fill material meets or exceeds specified requirements.

.6 Weigh Tickets: At the end of each work day, submit delivery weigh tickets of imported fill materials delivered to the Site, where applicable.

.7 Qualification Statements:

.1 Independent Geotechnical Testing Firm: At least 7 days prior to commencing transport of soil materials to the Site, submit name and qualifications of independent geotechnical testing firm to provide geotechnical testing services for work of this Section.

.2 Independent Analytical Laboratory: At least 7 days prior to commencing transport of soil or aggregate materials to the Site, submit name and qualifications of independent testing laboratory to provide chemical analysis for work of this Section.

.8 Certificates: Certify that products meet or exceed specified requirements.

1.8 QUALIFICATIONS

.1 Geotechnical Testing Firm: Company specializing in performing work of this Section and complying with ASTM D3740 to perform testing of fill materials including density, moisture content, permeability and particle size analysis.

1.9 HANDLING, TRANSPORT AND STORAGE

.1 Handle and transport fill materials in a manner and with equipment that will prevent intermixing of soil, aggregate, segregation, or contamination.

.2 Minimize stockpiling requirements. Transport material from source directly to final position where possible.

.3 Stockpile fill materials in on-site locations that has been reviewed and accepted by Contract Administrator.

1.10 AMBIENT CONDITIONS

.1 Suspend operations whenever climatic conditions, as determined by Contract Administrator, are unsatisfactory for placing fill to the requirements of this Section.

.2 Do not operate equipment on approved excavations after heavy rain until material has been de-watered and dried sufficiently to prevent excessive rutting.

Part 2 Products

2.1 MATERIALS

.1 Proposed borrow area – South Borrow Pit immediately south of the Area D Phase I.

.2 Imported from an accepted source or native material.

.3 Compactable to specified density at specified moisture content.

2.2 COMMON FILL AND BACKFILL

.1 Common Fill and Backfill: material for construction of clay cover and berm fill is native, to be obtained from proposed borrow area, or supplied by Contractor from source that has been reviewed and accepted by the Contract Administrator.

.1 Native or imported soil consisting of clay (CL, CI, CH), free of unsuitable materials, sufficient low permeability and is stable when placed and compacted as specified.

.2 Permeability of achieving a remoulded hydraulic conductivity of less than 1×10^{-7} cm/s as determined in accordance with ASTM D5084.

.3 Maximum particle size no greater than 12.5 mm.

.2 Contract Administrator will direct excavation operations in areas of unsuitable materials. Material that is unsuitable is to be excavated and stockpiled in locations that has been reviewed and accepted by the Contract Administrator.

.3 Unsuitable Materials:

.1 Unsuitable materials mean materials which are not accepted for use as determined by Contract Administrator and include the following:

.1 Refuse, asphalt, concrete, sand, gravel, or rock with dimensions greater than 12.5 mm.

.2 Material containing loam, roots, weeds, foreign material, topsoil or organic matter.

.3 Frozen material or material containing snow or ice.

.4 Trees, stumps, branches, roots or other wood or lumber.

.5 Wire, steel, cast iron, cans, drums, ash or other foreign material.

.6 Materials containing hazardous or toxic constituents at hazardous or toxic concentrations.

.2 Material generated as a result of excavation, grading and construction activities associated with completing the Works that are deemed unsuitable for use by

Contract Administrator will be loaded, hauled and placed in an area on the Site designated by Contract Administrator. This includes water or frost impacted material as a result of Contractor negligence.

2.3 SOURCE QUALITY CONTROL

.1 Testing and Analysis of Common Fill and Backfill:

.1 Maximum Dry Density and Optimum Moisture Content, ASTM D698: One sample per 1,000 m^3 or portion thereof of material required.

.2 Moisture Content, ASTM D2216.

.3 Particle Size Analysis, ASTM D422: One sample per 1,000 m^3 or portion thereof of material required.

.4 Atterberg Limits, ASTM D4318: One sample per 1,000 m^3 or portion thereof of material required.

.5 Hydraulic Conductivity (Lab, remoulded), ASTM D5084: One sample per 1,000 m^3 or portion thereof of material required.

.6 Presence of Unsuitable Materials and Contaminants.

.2 If changes are required to accepted material source during completion of the Works, immediately advise Contract Administrator of revised location(s) and obtain acceptance of such locations and materials prior to use in the Works.

.3 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that intended elevations for the Works are as shown on the Drawings.

.2 Verify that excavations, dimensions and elevations are as shown on the Drawings.

.3 Verify that prepared soil base is ready to receive the work of this Section.

3.2 PREPARATION

.1 Locate, identify or mark, and protect remaining utilities from damage. Confirm locations of and protect all buried utilities, appurtenances, and structures by careful test excavations or as instructed by utility owners in writing. Provide support for aboveground utility poles and lines. Provide documentation to the Contract Administrator.

.2 Identify required lines, levels, contours and datum locations.

.3 Notify Contract Administrator of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

.4 Maintain and protect existing utilities designated to remain.

.5 Obtain direction from Contract Administrator before moving or otherwise disturbing utilities or structures.

.6 Protect plant life, trees, lawns and other features remaining as portion of final landscaping.

.7 Protect benchmarks, survey control points, hydrants, existing structures, fences, paving and curbs from excavating equipment and vehicular traffic.

.8 Maintain and protect from damage wells, utilities and structures encountered. In event of disturbance or damage to well, utility or structure, immediately notify Contract Administrator. Repair or replace well, utility or structure damaged by Contractor operations.

.9 Protect monitoring wells and other structures and pipelines from uplift and displacement or disturbance during excavation operations.

.10 Protect existing structures where temporary unbalanced earth pressures may develop on walls or other structures utilizing bracing, shoring or other accepted method to counteract imbalance.

.11 Protect excavations and trenches from contamination.

.12 Employ procedures for excavation and trenching that avoid disturbance of utilities and structures.

.13 Remove surface features or obstructions including, but not necessarily limited to, trees, shrubs, bush and other vegetation from surfaces to be excavated, as required to construct the Works. Dispose of such obstructions as directed by Contract Administrator.

.14 Proof roll subgrade surface to identify soft spots. Over-excavate areas of soft subgrade not capable of compaction in place by a minimum of 300 mm. Backfill with accepted native fill and compact to density equal to or greater than specified requirements for subsequent fill material.

.15 Compact subgrade to required density for subsequent backfill materials.

.16 Utilize excavated material suitable for common fill and backfill prior to importing fill materials.

.17 Upon reaching subgrade elevations as shown in the Drawings, remove loose boulders as required in order to create a level surface satisfactory to the Contract Administrator in advance of final subgrade compaction.

.18 Survey control points will be provided by Contract Administrator within the limits of the Work area. All detailed survey control shall be the responsibility of the Contractor.

3.3 PLACEMENT OF FILL MATERIALS

.1 Obtain acceptance from the Contract Administrator for completed excavations and previously placed material prior to placement of successive lifts of fill materials.

.2 Do not start fill placement until the Contract Administrator has reviewed and accepted the subgrade preparation as complete and completed field measurements for payment purposes, and sampling and testing for analytical purposes.

.3 Obtain acceptance from the Contract Administrator prior to placing fill against structures or around exposed buried utilities or new utility lines. Place fill against structures or around exposed buried utilities in presence of Contract Administrator.

.4 Remove debris or water from areas to be backfilled.

.5 Ensure areas to be filled or backfilled are free from debris, snow, ice, water, soft soils, organic materials or frozen ground.

.6 Compact subgrade to density requirements for subsequent fill and backfill materials.

.7 Employ a placement method that does not disturb or damage other work.

.8 Do not use fill or backfill material which is determined unsuitable by Contract Administrator.

.9 Use fill types as specified. Completely use select native fill accepted for backfilling before using imported fill.

.10 Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

.11 Except as specified otherwise, place backfill continuously and in uniform layers not exceeding specified compacted thickness up to grades shown on the Drawings.

.12 Protect geotextiles during placement operations.

.13 Do not operate heavy compaction equipment closer than 1 m to foundations, underground utilities or monitoring wells.

.14 All equipment used by Contractor for placement of common fill and backfill shall be reviewed and accepted by the Contract Administrator.

.15 Backfill around exposed utilities by placing layers simultaneously on all sides to equalize loading. Do not dump directly against monitoring wells, utilities or foundations.

.16 Make gradual grade changes. Blend slope into level areas.

.17 Backfill around installations as follows:

.1 Place bedding and surround material as specified in this Section.

.2 Place layers simultaneously, on both sides of installed work to equalize loading and minimize movement.

.3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Obtain acceptance from the Contract Administrator to backfill.

.2 If accepted by the Contract Administrator, erect bracing or shoring to counteract unbalance, and leave in place until removal is reviewed and accepted by the Contract Administrator.

.4 Place material under, around and over installations until 0.6 m of cover is provided. Do not dump material directly on installations.

.18 Proof roll compacted fill surfaces under slabs on grade and around structures.

.19 Remove sheeting and shoring required during excavation during backfilling operations. Do not remove bracing until backfilling has reached the respective level of such bracing. Pull sheeting in increments that will ensure compacted backfill is maintained at an appropriate elevation above toe of sheeting.

.20 Common Fill and Backfill material:

.1 Placement of common fill and backfill on a soft, muddy subgrade is not permitted. Subgrade to be reviewed and accepted by the Contract Administrator prior to placing.

.2 Place common fill and backfill to thickness and grade as indicated on the Drawings. Each lift to be compacted shall not be more than 150 mm thick.

.3 Shape each layer to smooth contour and compact to specified density.

.4 Proof roll using standard roller appropriate for sloped, compacted surface. Make sufficient passes with roller to subject every point on the surface to three separate passes of loaded tire.

.5 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

.1 Compact fill material to a density not less than 98% of the maximum dry density, within -1% and +2% of optimum moisture content, as determined by the Standard Proctor Method (ASTM D698). Each lift to be tested according to Field Quality Control, and results are reviewed and accepted by the Contract Administrator prior to placement of subsequent lifts of fill.

.2 Shape and roll to obtain a uniformly prepared surface prior to placement of subsequent lifts of fill.

.3 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

.4 Finished surface must be firm and uniform, constructed to grades and cross sections as in the Drawings, and shall be reviewed and accepted by the Contract Administrator. Surfaces that do not conform to the requirements of the grade, cross section, moisture content, or density shall be reworked by the Contractor until requirements are met.

.5 In areas not accessible to rolling equipment, compact to specified density with accepted mechanical tampers.

.1 Shape and roll alternately to obtain smooth, even and uniformly compacted fill lifts.

.2 Apply water as necessary during compacting to obtain specified density.

3.5 TOLERANCES

.1 Correct surface irregularities by loosening and adding or removing material until the surface is within the specified tolerances.

.2 Payment will not be made for material placed outside the tolerance limits unless directed by Contract Administrator.

.3 All grading will be performed to maintain slopes and positive drainage as shown on the Drawings.

3.6 FIELD QUALITY CONTROL

.1 Perform laboratory material tests according to ASTM D698.

.2 Perform in place compaction tests according to the following:

.1 Density Tests: ASTM D6938 (Nuclear Methods).

.3 Testing by Contractor:

.1 Select samples of uncompacted fill intended for the Works and samples of compacted fill in the Works.

.2 Perform tests in the field and in the laboratory on samples of common fill, backfill, and imported fill to determine if materials meet specification.

.3 Testing of imported fill will include analyses for the presence of contaminants, grain size analysis, moisture content determination, maximum dry density, and hydraulic conductivity.

.4 Testing for backfill will include moisture content determination, and maximum dry density.

.5 Contractor shall repair all locations sampled.

.4 Testing by Contract Administrator:

.1 Contract Administrator can select samples of uncompacted fill intended for the Works and samples of compacted fill in the Works.

.2 Contract Administrator can perform quality assurance tests in the field and in the laboratory on samples of backfill and imported fill to determine if materials meet specification. Quality assurance testing will include analysis for moisture content determination, maximum dry density and hydraulic conductivity.

.3 Testing by Contract Administrator will in no way relieve Contractor of responsibility to test all material prior to notifying Contract Administrator of materials' suitability for the work involved.

.5 Methods of Testing:

.1 Maximum Dry Density of fill containing more than 12 percent by weight passing No. 200 sieve will be determined in accordance with ASTM D698.

.2 Bulk density will be determined in the field in accordance with ASTM D1556 or with ASTM D2167 or with ASTM D6938, whichever is most suitable to obtain representative density of soil tested.

.3 Particle size analysis will be performed in accordance with ASTM D422 or ASTM D1140, whichever is appropriate to material tested.

.4 Moisture content of fill in place will be determined in accordance with ASTM D6938.

.5 Compaction testing of fill in place will be determined in accordance with ASTM D6938.

.6 Hydraulic conductivity will be determined according to ASTM D5084 on representative samples remoulded in the laboratory to the field bulk wet density and moisture for samples of uncompacted fill intended for the Works.

.7 Hydraulic conductivity will be determined according to ASTM D5084 on representative undisturbed Shelby Tube samples in the laboratory for samples of compacted fill utilized for the Works.

.6 Frequency of Testing:

.1 Native or Imported Fill for Clay Cover Over the Buried Waste Pile Area and the Berms:

.1 At least one in-place density and moisture for each lift for each 500 m^2 of area.

.2 At least one maximum dry density and optimum moisture content for each change of material.

.3 Up to twenty undisturbed hydraulic conductivity samples will be taken by Shelby Tubes from the full depth of the finished final compacted clay cover.

.2 Native or Imported Soil for Fill/Backfill (if necessary):

.1 At least one in-place density and moisture for each lift for each 1,000 m^2 of area.

.2 At least one maximum dry density and optimum moisture content for each change of material.

.7 Contractor to notify the Contract Administrator up to 5 business days in advance of completing the preparation of subgrade surface, and up to 5 business days in advance of completing the installation of final lift of the compacted fill or backfill layer. Further work shall not proceed.

.8 Contractor shall notify the Contract Administrator in writing or by email regarding the test results for each lift of the compacted fill or backfill layer. The test results shall be appended with the written communication for the Contract Administrator's review and records. Work shall not proceed until the Contract Administrator has reviewed the test results.

.9 Failure to Meet Specified Requirements: If tests indicate that material specifications have not been achieved or cannot be obtained with equipment in use, procedure being followed or material being incorporated, remove and replace work and modify operations so that equipment, procedures and materials will produce required results. Additional testing required by Contract Administrator will be at no additional cost to the City.

3.7 ADJUSTING

.1 Finish compacted surfaces to within 25 mm of grades shown on the Drawings but not uniformly high or low. Correct surface irregularities by loosening and adding or removing material until the surface is within specified grade.

.2 Leave work areas in a properly graded condition sloped as required to permit proper drainage and free of depressions that will pond or collect water or debris that will restrict flow.

3.8 CLEANING

.1 Clean and reinstate work areas and areas affected by equipment outside areas specified to be excavated, to specified restoration condition.

.2 Upon completion of backfilling, remove excess material and debris from work areas and travel routes.

3.9 PROTECTION

.1 Reshape and recompact fills subjected to vehicular traffic.

.2 Protect pipe and bedding from damage or displacement until backfilling operation is complete.

.3 Maintain finished clay cover surfaces in condition conforming to this Section until accepted by the Contract Administrator.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Non-woven geotextile for filtration and stabilization between clay backfill and the granular material layer.

1.2 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavation and Backfilling

.2 Section 31 23 23 – Drainage Material

.3 Section 33 46 16 – Leachate Collection System

1.3 MEASUREMENT AND PAYMENT

.1 Nonwoven Geotextile Filter:

.1 Measurement Basis: Geotextile will be measured by the Contract Administrator by the square meter in place for the surface area installed. No separate measurement will be made for any required overlapping, anchoring or seams of non-woven geotextile.

.2 Payment Basis: Unit price. Includes supply, installation, seaming, testing, anchoring, overlaps, repairs, and manufacturer's field services.

1.4 REFERENCES

.1 Definitions:

.1 AOS: Apparent Opening Size.

.2 Geotextile: Synthetic fabric for use in geotechnical filter, separation, stabilization, or erosion control applications.

.3 MARV: Minimum Average Roll Value, means the average value for a specified parameter less two standard deviations.

.2 ASTM International

.1 ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in an Xenon Arc Type Apparatus.

.2 ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.3 ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

.4 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.5 ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

.6 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.7 ASTM D4873, Guide for Identification, Storage and Handling of Geotextiles.

.8 ASTM D5261 - Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Manufacturer's Qualifications: Submit no later than 14 days prior to ordering, list of previous projects including name of project, description of project, area, client's name and address, contacts, and telephone numbers; engineer 's name, address, contact, and telephone number; installer's name, address, contact, and telephone number; and date installed.

.2 Manufacturer's Quality Assurance Plan or Manual: Submit no later than 15 days prior to ordering.

.3 Installer's Quality Assurance Plan or Manual: Submit no later than 15 days prior to ordering.

.4 Submit samples as follows at least 2 weeks prior to commencing the Works.

.1 Minimum length of 2 m of geotextile roll width.

.5 Product Data: Submit no later than 15 days prior to ordering.

.6 Interface Shear Testing: Submit 10 days prior to ordering.

.7 Manufacturers Installation Instructions: Submit at least 10 days prior to installation. Include written installation, handling, storage, and repair instructions.

.8 Daily Field Installation Report: Submit no later than 1 day following date covered by report, include:

.1 Total amount and location of geotextile placed.

.2 Identifiers of rolls.

.3 Changes in layout drawings.

.4 Record of defects caused during transportation and handling.

.5 Observations of weather conditions, and results.

.6 Observations of anchor trench excavation, backfilling, and compaction.

.7 Observations of repairs, including locations and name of repairer.

.8 Observations of placement around appurtenances and connection to appurtenances.

.9 Installer Qualifications: submit a copy of manufacturer's approval letter or license to Contract Administrator no later than 10 days prior to installation.

.10 Submit copies of manufacturer's test data and certificate at least 4 weeks prior to commencing the Works.

.9 Manufacturer's Certificates: Certificates pertaining to rolls of material delivered to the Site shall accompany rolls. Each roll shall be identified by a unique manufacturing number.

.10 Quality Control Certificate:

.1 Include results of at least the following tests:

.1 Mass per unit area, percent open area, apparent opening size, permittivity, puncture, trapezoid tearing strength, grab tensile/elongation, M288 survivability class.

.2 Include manufacturer's records for storage, handling and shipping of geotextile.

.3 Sign quality control certificates by a responsible party employed by geotextile manufacturer. Materials and rolls which are in non-compliance with minimum required properties will be rejected.

1.6 CLOSEOUT SUBMITTALS

.1 Record Documents: Indicate panel layout, including panel identifier, date placed, installer's name, location of seams and location and details of repairs.

.2 Warranties: Completed original warranty forms filled out in City of Winnipeg's name and registered with manufacturer.

.3 Photo log: Photograph conditions of each finger trench, and 100m-lengths of perimeter trenching (if applicable) showing prepared subgrade, installed geotextile, and following wrapping of backfill or drainage rock.

1.7 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 20 projects, 3 million square metres of installation, and 3 years documented experience.

.2 Installer: Trained and qualified to install the type of geotextile to be used for the Project and an approved or licenced installer of geotextile manufacturer with minimum five projects, 1 million square metres of installation, and 2 years documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 The geotextile shall be labeled, stored and handled in accordance with ASTM D 4873, "Guide for Identification, Storage and Handling of Geotextiles".

.2 Geotextile rolls shall be furnished with suitable wrapping for protection against moisture and extended exposure from the sun, and contamination from dirt, dust and any other deleterious materials. The geotextile shall remain wrapped in a protective covering and out of direct sunlight until it is used. Torn wrapping shall be repaired as quickly as possible using an approved protective covering.

.3 Rolls should be stored on supports that will not damage the material. The material must be elevated at least 2 inches above the sub grade.

.4 If any material is found to be damaged during unloading, a notation should be made as to the roll number, location of damage and type. This information should be given to Contract Administrator.

.3 Use appropriate handling equipment when moving geotextile from one place to another.

.4 Notify Contract Administrator 3 days in advance of delivery to the Site. Perform joint inspection with Contract Administrator upon delivery. Defects or damage from shipping

and handling will be grounds for rejection of a portion of geotextile or of entire geotextile roll at discretion of Contract Administrator. Remove roll from the Site and replace with new material.

1.9 AMBIENT CONDITIONS

.1 Install geotextile in dry conditions and according to manufacturer's written installation instructions.

.2 Suspend installation operations whenever climatic conditions, as determined by Contract Administrator, are unsatisfactory for placing geotextile to the requirements of this Section.

.3 Weather conditions for seaming must comply with manufacturer's installation instructions.

1.10 WARRANTY

.1 Provide 1 year manufacturer's warranty.

.2 Include coverage for:

.1 Defective product found to be not in compliance with the requirements of this Section.

.2 Replacement of the geotextile with new material including costs associated with geotextile installation.

Part 2 Products

2.1 MATERIAL

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.

.1 Width: 4.5 m minimum.

.2 Composed of: polypropylene with inhibitors added to base plastic to resist deterioration by ultra-violet, rotting, biological degradation and are inert to commonly encountered soil chemicals.

.2 Physical properties:

.1 Mass per unit area: to ASTM D5261, minimum 271 g/m^2 (8 oz/yd^2).

.2 Tensile strength and elongation (in any principal direction): to ASTM D4632.

.1 Tensile strength: minimum 911 N.

.2 Elongation at break: maximum 50%.

.3 Seam strength: equal to or greater than tensile strength of fabric.

.3 Puncture resistance: to ASTM 6241, minimum average roll value of 2224 N.

.4 Trapezoid Tear: to ASTM 4533, minimum average roll value of 356 N.

.3 Hydraulic properties:

.1 Apparent opening size (AOS): to ASTM D4751, maximum, 0.180 mm.

.2 Permittivity and Water Flow: to ASTM D4491

.1 Permittivity: minimum, 1.4 per sec.

.2 Water Flow: minimum, 3870 L/min/m².

2.2 SOURCE QUALITY CONTROL

.1 Manufacturer Quality Control:

.1 Sample and test geotextile material, at a minimum, once every 10,000 m2 for unit weight, tensile strength, elongation, hydraulic burst strength, puncture strength, and trapezoid tear strength to demonstrate that the material conforms to requirements specified in this Section. Test for UV stability and apparent opening size, at a minimum, once every month.

.2 In general, perform sampling on sacrificial portions of the material such that repair of the material is not required.

.3 If geotextile sample fails to meet the quality control requirements of this Section, sample and test each roll manufactured in the same lot, or at the same time, as the failing roll. Continue sampling and testing of rolls until a pattern of acceptable test results is established.

.4 At geotextile manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify non-complying rolls and/or to qualify individual rolls.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

.2 Obtain Contract Administrator’s approval prior to installing geotextile and prior to placing subsequent materials on geotextile.

3.2 INSTALLATION

.1 Notify Contract Administrator at least 24 hours in advance of intention to commence placement of geotextile.

.2 No material is to be deployed until Contract Administrator has inspected and approved installation of the geotextile.

.3 Material will not be deployed when moisture, high winds or other adverse weather conditions are expected. This determination will be made by Contract Administrator.

.4 Overlap dimensions and the method of joining adjacent sheets shall, as a minimum, be in strict conformance with manufacturer's written instructions. Ballast geotextile according to manufacturer's written instructions and as indicated.

.5 Geotextile materials are to be deployed using methods that will not damage the material. The material will be visually inspected during deployment and any faulty or unsatisfactory areas will be marked for corrective action.

.6 If necessary, temporary sand bags may to be used to prevent material uplift and movement from winds during geotextile installation. The number and location of sand bags will be determined by Contractor.

.7 All folds and excessive wrinkles are to be removed.

.8 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.

.9 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.10 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.11 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.12 Replace damaged or deteriorated geotextile to approval of Contract Administrator.

.13 Do not permit passage of vehicular traffic directly on geotextile at any time.

3.3 CONFORMANCE TESTING AND PERFORMANCE EXPECTATIONS

.1 Conformance Testing:

.1 Samples of geotextiles may be removed by Contract Administrator and sent to laboratory for testing to ensure conformance with requirements of this Section.

.2 Testing will be carried out prior to installation of geotextile.

.3 Samples will be taken at a minimum frequency of one sample per 10,000 m2 with a minimum of one sample per lot.

.4 Contract Administrator may increase the frequency of sampling in the event that test results do not comply with requirements of this Section. Additional testing will be performed at Contractor's expense.

.5 As a minimum, the following conformance tests will be performed on each geotextile sample:

.1 Mass per unit area.

.2 Tensile strength.

.3 Grab strength.

.4 Tear strength.

.5 Puncture strength.

.6 AOS and permittivity tests will be performed at a frequency of one per lot.

.6 Any geotextile material that conformance testing indicates non-compliance with this Section will be rejected by Contract Administrator. Replace rejected material with suitable material, at no additional cost to Contract.

3.4 FIELD QUALITY CONTROL

.1 Contract Administrator may inspect geotextile in place for tears, overlaps and consistency before placing materials thereon. Damaged sections, as judged by Contract Administrator, will be marked and their removal recorded. Repair minor damage and minor defects as specified in manufacturer's procedures when approved by Contract Administrator to Contract Administrator 's satisfaction.

.2 Contract Administrator may verify (or reject) that weather conditions (air temperature, non-excessive wind and lack of precipitation) are acceptable for panel/roll placement.

3.5 PROJECT DOCUMENTATION

.1 Copies of Material Certifications from the Geotextile Manufacturer, if required by the project specifications.

3.6 PROTECTION

.1 Protect finished work from damage.

.2 Maintain sufficient ballast on geotextile to prevent uplift.

.3 Do not permit traffic or construction equipment directly on geotextile.

3.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Remove and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal or recycling paper, plastic, polystyrene, corrugated cardboard, and packaging material.

.4 Fold up metal banding, flatten and remove to appropriate recycling facilities.

3.8 CLEANING

.1 Leave Work area clean at end of each day.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM D5092/D5092M-16. Standard Practice for Design and Installation of Groundwater Monitoring Wells

.2 ASTM D5299-99(2012)e1. Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities

1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.3 GENERAL REQUIREMENTS

.1 This item consists of:

.1 Protection of the existing water supply wells previously installed within or nearby the work area.

.2 Supply and installation of new monitoring wells.

.2 The Contractor shall protect the following monitoring wells during excavation and backfilling works,

.1 Well ID: W12/BR

.3 The Contractor is responsible for installation of two monitoring wells at the Site. The monitoring well locations are to be confirmed with the Contract Administrator and proposed locations are included in the Drawings.

1.4 MEASUREMENT AND PAYMENT

.1 No payment shall be made for protection of existing water supply well. All work related to the protection of the existing well will be considered incidental to the work.

.1 The Contractor will be responsible to replace damaged or destroyed well that has been identified to be protected, and repair any damages at his or her own cost, to the approval of the Contract Administrator.

.2 Installation of Monitoring Wells will be measured in number of wells successfully installed. Payment for Installation of Monitoring Wells will be at the tendered unit price to include mobilization and demobilization of drilling equipment, drilling, supply and installation of well materials, supply and installation of sand and bentonite, supply and installation of flush-mounted or aboveground well covers, and all incidentals to the completion of the work.

Part 2 Products

2.1 WELL MATERIALS

.1 Threaded 50 mm diameter Schedule 40 PVC pipe, 9 m long.

.2 Threaded 50 mm diameter No. 20 slotted screen 9 m long.

.3 End plugs and threaded top caps.

2.2 ANNULUS FILL

.1 Silica sand.

.2 Bentonite.

2.3 If monitoring wells specified to be protected are destroyed or damaged by the Contractor, the products used for replacement or repair shall be submitted to the Contract Administrator for approval.

Part 3 Execution

3.1 DRILLING

.1 Use drilling equipment and methods approved in writing by Contract Administrator.

.2 Drill in locations as directed by Contract Administrator.

.3 Drill holes plumb and straight 125 mm diameter to minimum depth of 6 metres or auger refusal.

.4 Dispose of drill cuttings as directed by Contract Administrator.

.5 Prevent foreign matter from entering bore hole.

3.2 WELL INSTALLATION

.1 Install well materials in accordance with manufacturer's written recommendations.

.2 Well installation shall be completed by a well driller licensed to perform such work in the Province of Manitoba.

3.3 SILICA SAND

.1 Ensure silica sand is clean, and free of silt, clay and other deleterious materials.

.2 Place silica sand from bottom of borehole to minimum depth of 0.15 m above top of screen.

3.4 SEALING OF ANNULUS

.1 Place bentonite from top of silica sand to a depth of 0.15 m below top of well.

.2 Fill the remaining 0.15 m with drill cuttings.

.3 Finish wells by installing top caps and flush-mount steel covers.

3.5 CLEANING

.1 Upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Leachate collection pipe, including perforated and solid pipe, and any fittings, joints, flanges, etc., and manhole.

1.2 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavation

.2 Section 31 23 33.02 – Fill and Backfill

.3 Section 31 32 19.01 – Geotextiles

.4 Section 31 23 23 – Drainage Material

1.3 MEASUREMENT AND PAYMENT

.1 Leachate collection pipe:

.1 Refer to Unit Price Schedule, for the following items:

.1 Item 9 – 250 mm DIA., HDPE, DR 11 pipe (perforated)

.2 Item 10 – 250 mm DIA., HDPE, DR 11 pipe (solid)

.3 Pipe Fittings, End Caps, and Cleanout Accessories (Incidental as described in Section 1.3.2)

.4 Item 12 – Manhole and appurtenances

.5 Item 13 – Retro-reflective posts

.2 Measurement Basis: Supply of pipe will be measured in metres, of each type and size indicated (Item 9 and Item 10). The pipe fittings, end caps, and cleanout accessories are incidental to the payment for items 9, 10 and 12 and no separate payment will be made. For the manhole (Item 12), the lump sum unit to be paid shall be supply and installation in accordance with this specification, drawings, acceptable to the Contract Administrator, and as computed from measurements made by the Contract Administrator.

.3 Payment Basis: Unit price. Includes supply, fusion and installation of each type and size indicated. Supply and install of manhole will be paid for at the Contract Unit Price for “Manhole”, measured as specified herein, which price shall be payment in full for supplying materials and performing all operations herein described and all other items incidental to the Work included in this Specification.

.2 Pipe accessories:

.1 Refer to Unit Price Schedule, for the following item:

.1 Pipe fittings, end caps, and cleanout accessories (fittings, joints, flanges, inflatable plug device, etc.)

.2 Payment Basis: All pipe accessories and fittings are incidental to Items 9, 10 and 12 including supply and installation of pipe accessories including elbows, swept entry tee, Y type lateral tee, blind flange plates, backup rings, flange adapters, neoprene gaskets, stainless steel bolt sets, inflatable pipe plug device, etc.

.3 Retro-reflective posts:

.1 Refer to the Unit Price Schedule, for the following item:

.1 Item 13 – Supply and install retro-reflective posts.

.2 Payment Basis: Unit basis. Includes supply and installation of retro-reflective posts at the manholes and cleanouts in accordance with the Section 027060 of the Manitoba Water Services Board Standard Construction Specifications (Revised May 2015) and Drawings.

1.4 REFERENCES

.1 Definitions:

.1 HDPE: High density polyethylene.

.2 IPS: Iron pipe size. ASTM International.

.2 ASTM International:

.1 ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

.2 ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

.3 ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.4 ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

1.5 SEQUENCING

.1 Sequence and schedule leachate collection system activities with work of other Sections.

.2 Do not allow or cause any of work performed to be covered up or enclosed prior to required inspections, tests, or approvals.

1.6 SCHEDULE

.1 Include detailed sequence of leachate collection system installation in Detailed Work Schedule.

.2 Do not allow or cause work performed to be covered up or enclosed prior to required inspections, tests, or approvals.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for pipes, pipe fittings and aggregate and manholes and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's Certificate: Quality control certificates pertaining to each lot of pipe produced.

.3 Manufacturer's Instructions: Indicate special procedures required to install products specified.

.4 HDPE Pipe:

.1 Pipe Resin: ASTM D1248 for material indicating a Type 3, Category 5, Class C, Grade PE3608 (ASTM D3350 Cell Classification 344464C) with long-term hydrostatic strength (LTHS) of 11 MPa (1,600 psi) when tested and analyzed by ASTM D2837.

.2 Raw Material: Containing a minimum 2 percent carbon black, well dispersed by re-compounding to protect the pipe from degradation by ultraviolet light.

.3 Pipe shall not contain any recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material Supplier.

.4 Pipe Sizes: ASTM F714. Pipe sizes are specified in metric units; however, equivalent IPS pipe sizes shall be used.

.5 Hydrostatic Design Stress: 5,513 kPa for PE3608 materials.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging, labelled with manufacturer's name and address.

.3 Store materials in accordance with manufacturer's recommendations.

.4 Store and protect pipes from damage.

.5 Replace defective or damaged materials with new.

Part 2 Products

2.1 LEACHATE COLLECTION SYSTEM PIPE (PERFORATED)

.1 250 mm diameter HDPE DR11, as shown on the Drawings.

2.2 LEACHATE COLLECTION SYSTEM PIPE (SOLID)

.1 250 mm diameter HDPE DR11, as shown on the Drawings.

2.3 FITTINGS

.1 High-density Polyethylene fittings and/or elbows shall be factory made. Fabricated seeps shall be large radius multi-segmented. The ends of the fitting shall not be trimmed to match the pipe section to which they are going to be joined. All polyethylene fittings will have the same or higher pressure rating as the pipe when installed in accordance with the latest technical specifications.

2.4 JOINTS

.1 Thermal butt-fusion or electrofusion in accordance with manufacturer specifications.

2.5 FLANGES

.1 Flanges to be complete with one-piece moulded polyethylene stub ends, backup ring and flange adapter. Flanged connections to have the same pressure ratings as the pipe or greater. Provide blind flange plates, neoprene gaskets and stainless steel bolt sets for all blind flange installations.

2.6 MANHOLE

.1 1.2 m diameter Manhole to be complete with precast concrete manufactured and associated appurtenances in accordance with ASTM C478 “Precast Reinforced Concrete Manhole Sections” as shown on the Drawings. The manhole materials and construction should follow the Standard construction specifications for Sewers included in the CW 2030 and CW 2130 for the City of Winnipeg, except manhole reducer shall be a flat top

reducer in accordance with SD-11 of the Manitoba Water Services Board Standard Construction Specifications.

Manhole and Appurtenances

(a) The following approved or equivalent products for precast concrete sections:
  (i) Inland Pipe Ltd.
  (ii) Lafarge Construction Materials

(b) Pre-cast concrete manhole sections to be CSA A257.4 and ASTM Standard C 76 Class II and C 478 (circular sections).

(c) Cast iron frames and covers in accordance with ASTM A48 Class 30 machine fit with 2 applications of asphalt varnish. Cast iron frames and covers shall be Titan Foundry Ltd., Blanchard Foundry, W.D. Valve Boxes Ltd., Sigma Corp., Round Solid Cover or approved equal.

(d) 19 millimetre diameter galvanized steel ladder rungs with rungs evenly spaced at no more than 300 millimetres installed.

(e) Pre-cast concrete flat top reducer shall be 1,200 mm diameter by 900 mm diameter by 230 mm tall per approved materials in accordance with latest revision of the Manitoba Water Services Board Standard Construction Specifications.

(f) Pre-cast concrete adjusting rings in accordance with CAN/CSA A257.4 and ASTM C478.

(g) Joint gaskets to be Lafarge Construction Materials Inc. Rub'r Nek or Inland Pipe Ltd Kent Seal #2 to be installed as per manufacturers specifications.

(h) Core and seat boot type flexible rubber connection suitable for HDPE pipe in accordance with material requirements of ASTM C923.

(i) Fasteners, tie rods, clamps, straps, bands, nuts and bolts to be stainless steel in accordance with ASTM A320, ANSI Type 316 marked as such with raised or indented numerals.

(j) Cement patching compound to be fast hardening, high strength non-shrink mixture suitable for use on vertical surfaces.

Part 3 Execution

3.1 INSTALLATION OF LEACHATE COLLECTION SYSTEM - PIPE

.1 Keep HDPE pipe clean, both externally and internally to avoid contaminating drainage materials.

.2 Do not bend HDPE pipe in a radius smaller than that recommended by the manufacturer when staged on Site or when being installed and shall be in accordance with the PPI Handbook of Polyethylene Pipe (2nd Edition), Chapter 7.

.3 Join HDPE pipe by thermal fusion performed in an area near the installation location to avoid excessive transportation and possible damage to the pipe. If shelter is not available, do not proceed with joining HDPE pipes by thermal fusion, when ambient temperatures are less than minus 15 degrees C (-15 °C). Pipe joining to be conducted by personnel trained in accordance with manufacturer's standards or by organization accepted by the Contract Administrator.

.4 Water will not be allowed to flow through the pipe during construction. Keep the work area dry and do not lay pipe in water.

.5 Prior to initiating thermal fusion in the field on any pipe on a given day, Contractor may be requested to provide a test weld and operating data to Contract Administrator, including welding temperature, machine number, date of last service and clearance certificate.

.6 Place HDPE pipe on granular material true to line and grade.

.7 Install non-perforated leachate collection system cleanout riser pipe according to the Drawings and include all required fittings/bends, piping, blind flange plates, backup ring and stainless steel bolt sets, fusing, neoprene gasket, and drainage blanket material mounding or build up.

.8 Install in accordance with the Drawings and include all required fittings/bends, piping, blind flange plates, backup ring and stainless-steel bolt sets, fusing, placement and granular drainage blanket mounding or build up.

3.2 INSTALLATION OF MANHOLE

.1 Install in accordance with City of Winnipeg Standard Construction Specification CW2030 and CW 2130 and the following items below under section 3.5 of this specification. In the event of a discrepancy between the two, the more stringent requirement shall apply as determined by the Contract Administrator. The Contractor shall take all necessary measures to protect the installation of the precast concrete and components, including the grout, joint sealer, HDPE pipe joint, rungs, etc., from adverse weather conditions, including freezing temperatures, snow, rain and wind.

.2 Level and compact subgrade in bottom of excavation to grade and elevation shown on the Drawings. Level subgrade to ensure manhole is uniformly supported and the floor is level.

.3 Construct manholes in accordance with the Drawings.

.4 Install manhole sections plumb and level.

.5 Install approved gasket or joint sealer between pre-cast concrete sections including 750 millimetre diameter riser adjusting rings and between frame and pre-cast concrete riser as construction progresses. Alternately install grout between frame and pre-cast concrete risers as approved and directed by the Contract Administrator. Ensure grout completely fills space between frame and riser to make joint watertight and finish flush with inside surface of risers.

.6 Connect drainage pipes to manhole at invert elevations shown on the Drawings and grout in place to make a watertight connection. Coat outside of pipe end for a length equal to the manhole wall thickness plus 150 millimetres with an approved cementing agent to which sand has been added and allow mixture to harden before grouting in place. Alternatively, pipes that are PVC pipe may be connected using an approved pre-treated, gasketed PVC insert or an approved interference fit flexible rubber boot or gasket inserted into a hole cored in the manhole base or wall.

.7 Bench and channel manhole floor with concrete in accordance with the Drawings. Curve flow channels smoothly and provide smooth transition between inlet and outlet pipes.

.8 Grout and plug lifting holes, joints and frame with mortar to make watertight. Remove excess mortar from inside surface of manhole.

.9 Backfill the remainder of the excavation with compacted well graded pit-run material.

.10 Backfill the excavation with graded pit run material in maximum 300 millimetre thick layers to the grade required for backfill in accordance with the Drawings and Specifications or as directed by the Contract Administrator. Compact each layer with a vibratory compactor to at least 95% of Standard Proctor Density. Obtain approval from the Contract Administrator before proceeding with next layer.

3.3 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sub-drainage piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

3.4 CLEANING

.1 Upon completion of the Works, but prior to installation of the inflatable pipe plug device and prior to acceptance, flush with water all pipelines installed under this Contract and remove and dispose of all accumulated debris and other foreign matter to the satisfaction of Contract Administrator.

3.5 DEMONSTRATION

.1 Subsequent to final cleaning, but before the installation of the inflatable pipe plug device, pull or force a steel mandrel or a flusher nozzle, with a diameter 25 mm less than the inside diameter of the pipe, through all installed pipelines to demonstrate the integrity of the system to City and Contract Administrator.

.2 Contractor shall provide all available records submitted by personnel responsible for conducting pipe joining, including but not limited to heat source temperatures, equipment used, ambient temperature at the time of joining, and other information as specified by manufacturer or supplier.

END OF SECTION