



Shearwater Outdoor Storage - Project Summary

Fisheries and oceans Canada (DFO) owns a parcel of property within CFB Shearwater currently used both for a Coast Guard (CCG) helicopter hangar, and a storage area within the Department of National Defence (DND) airfield perimeter (outdoor storage, as well as a repurposed hangar, and fenced storage compound.) A significant portion of the DFO owned property is currently not in use.

The two major components of this project are construction of a fence inside the DND airfield along the boundary of the DFO owned property, and site servicing and grading work at three locations on the property to provide for additional gravel surfaced outdoor storage space.

Fence installation

The fence installation will consist of approximately 475M of 10' high barbed wire topped chain link fence erected according to the DND provided "Class B" specification with 2 vehicle access gates (to accommodate large transport vehicles and DND emergency vehicles). Security lighting will not be installed at this time. See the attached drawings and DND fencing specification for additional details.

Site Service, Grading and Gravel Placement

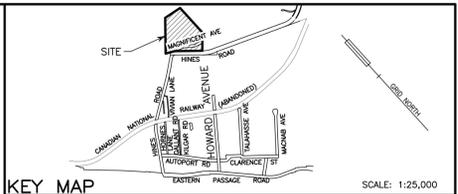
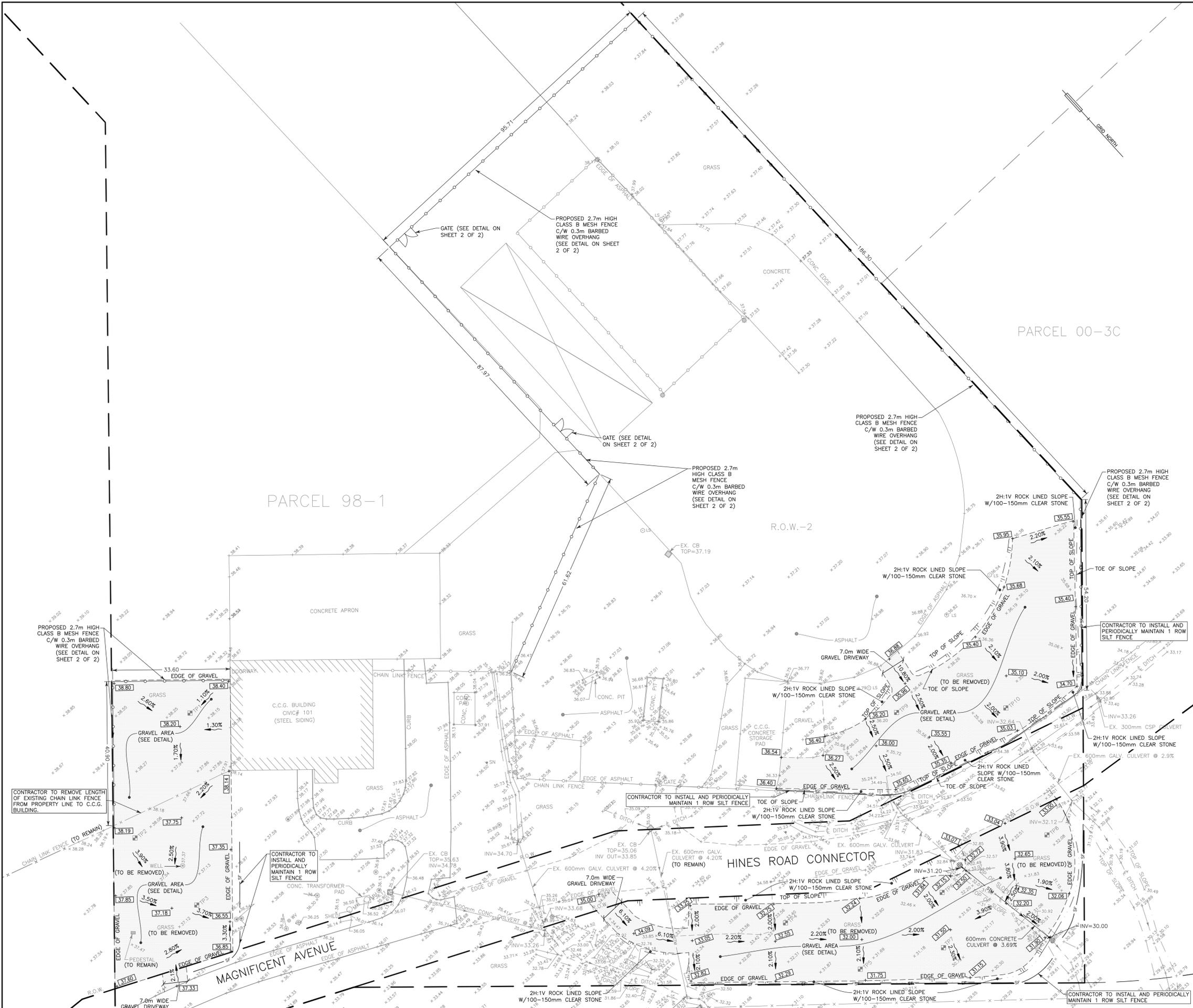
There will be site improvements in three areas to provide a gravel surface laydown area for DFO equipment and supply materials. Each area will be several hundred square meters and will be transformed from irregularly sloped grassy areas, to uniformly sloped and solid gravel surfaces suitable for use as storage space. One area will be directly adjacent to the CCG helicopter hangar, another will be an expansion/improvement of a storage area within the DND airfield fence, and the third will be just across the road outside the fence. See the attached drawings and specification for further detail.



Attachments

Please review the attached specifications and drawings for additional details of the work to be completed

- A. Shearwater Outdoor storage - Construction Notes and Details.pdf
- B. Shearwater Outdoor storage – Site Service & Grading Plan.pdf
- C. Shearwater Outdoor Storage - Specifications.pdf
- D. Shearwater Outdoor Storage DND Fence Specification Excerpt



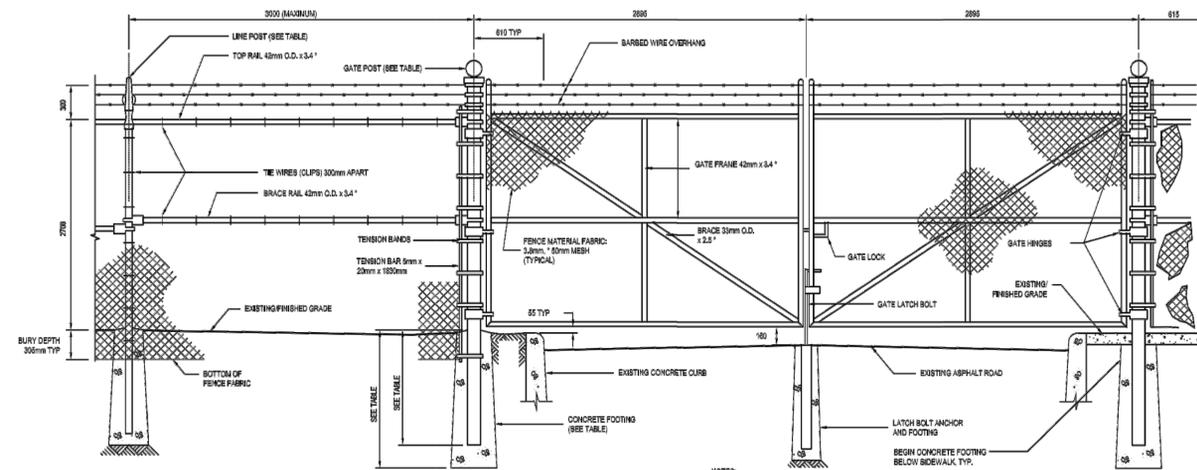
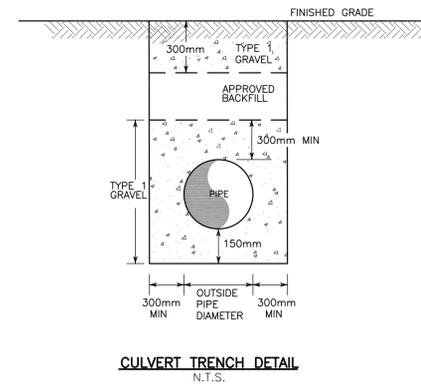
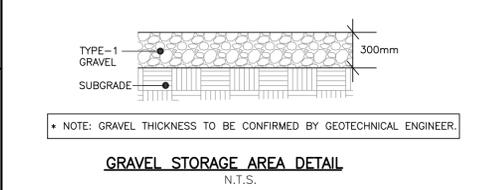
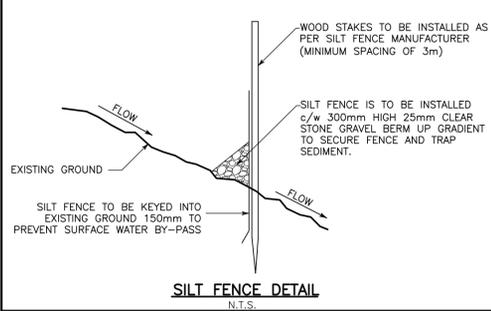
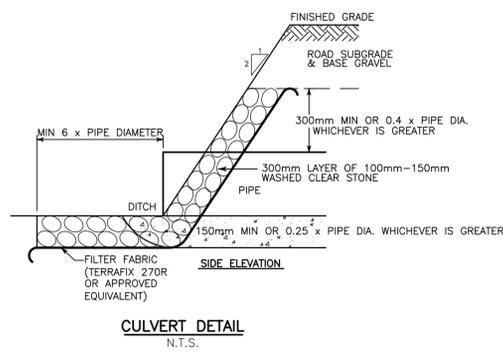
EXISTING		PROPOSED	
⊗/⊗BF	CURB STOP/GATE/BUTTERFLY VALVE	⊗/⊗BF	
⊕	FIRE HYDRANT	⊕	
⊥	THRUST BLOCK	⊥	
⊕	SIAMSE SPRINKLER CONNECTION	⊕	
⊕/⊕	CATCH BASIN/PIT	⊕/⊕	
⊔	CULVERT	⊔	
⊕/⊕	ROCK LINING/DAM	⊕/⊕	
⊕	ROCK WALL	⊕	
⊕/⊕	POWER POLE/LIGHT POLE	⊕/⊕	
⊕	TREE	⊕	
+	STREET SIGN	+	
+131.82	ELEVATION/GRADE	125.00 / 125.00	
→	DRAINAGE/SWALE FLOW DIRECTION	→	
W	WATER MAIN/SERVICE	W	
SAN	SANITARY MANHOLE & PIPE	SAN	
STM	STORM MANHOLE & PIPE	STM	
FM	FORCE MAIN	FM	
RL	RIDGE LINE	RL	
FL	100YR. FLOOD LIMIT	FL	
SF	SILT FENCE	SF	
C	UNDERGROUND CONDUIT	C	
---	OVERHEAD WIRES	---	
---	PROPERTY LINE/BOUNDARY	---	
⊕	CHAINLINK FENCE	⊕	
⊔	BUILDING	⊔	
---	TOP OF SLOPE	---	
---	TOE OF SLOPE	---	
⊕	MONITORING WELL	⊕	
⊕	TEST PIT	⊕	

NOTES:
 1. SEE SHEET 2 OF 2 FOR CONSTRUCTION NOTES AND DETAILS.

No.	Date	Revision	Description	Appr'd
3	AUG.28/15		REVISED FENCING LAYOUT	
2	AUG.07/15		ADDED PROPOSED FENCING	
1	JUL.28/15		ISSUED FOR TENDER	
	NOV.19/10		ISSUED FOR REVIEW	

SDMM
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SHEARWATER C.C.G. STORAGE AREAS DARTMOUTH, NOVA SCOTIA	
SITE SERVICING AND GRADING CIVIC 101 MAGNIFICENT AVENUE	
Date NOVEMBER 12, 2010	Drawn S.S.
Scale 1:500	Engineer A. PULSIFER
Reference	Approved
Surveyed SDMM	Sheet 1 OF 2
Project No. FILE No. 1-16-20 (31257)	Plan No. 16-876-3
	HRM No.

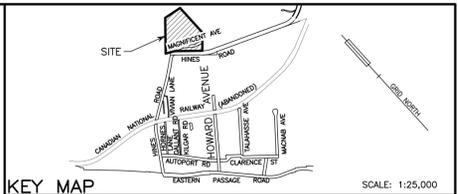


CONCRETE FOOTINGS (AVERAGE SOIL CONDITIONS)				POSTS	
POST	DIA. OF TOP	DIA. OF BOTTOM	DEPTH OF FOOTING	SIZE DIA.	DEPTH IN FOOTING
CORNER, END, STRAINING AND PERSONNEL GATE	300	400	1225	89mm O.D. x 11.2"	1125
VEHICLE GATE	300	400	1225	114mm O.D. x 11.2"	1125
LINE	250	350	915	60mm O.D. x 5.0"	815
CENTRE GATE STOP AND REST	200	250	915		815

- NOTES:
1. CONCRETE: 25 MPa COMPRESSIVE STRENGTH AT 28 DAYS, 54% ENTRAINED AIR, TYPE 10 CEMENT, CLASS C2 EXPOSURE, 20mm # NO. 10 COARSE AGGREGATE SIZE 80mm SLUMP ± 30mm AT POINT OF DISCHARGE, A SUPERPLASTICIZER MAY BE ADDED TO IMPROVE WORKABILITY.
 2. IN SOLID ROCK CONDITIONS; DEPTH OF POSTS IN ROCK TO BE 450mm MIN. DRILL HOLES 10mm LARGER THAN POST, GROUT POSTS AND BRACES IN PLACE.
 3. WHERE SOLID ROCK CONDITIONS OCCUR WITHIN 600mm OF SOIL SURFACE, PROVIDE 150mm DEEP EMBEDEDMENT IN ROCK (SEE NOTE 2); COMPLETE WITH CONCRETE FOOTINGS AS SHOWN FOR CORNER POSTS.
 4. (*) THE VALUES INDICATED BY ASTERISKS REPRESENT APPROXIMATIONS OF IMPERIAL SIZE GAUGES TO WITHIN A REASONABLE DEGREE OF ACCURACY AND ARE NOT METRIC SIZES.
 5. ALL FENCE FABRIC SHALL BE BURIED 305mm IN GROUND EXCEPT AT PERSONNEL GATES AND VEHICLE GATES.
 6. ALL MATERIAL AND HARDWARE FOR CHAIN LINK FENCES SHALL BE GALVANIZED.
 7. ALL DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

NOTE: IN ADDITION TO THIS DETAIL, CONTRACTOR MUST REFER TO THE LATEST DND SPECIFICATION FOR ADDITIONAL INFORMATION.

CLASS B FENCE DETAIL N.T.S.



- NOTES:
1. CONTRACTOR TO OBTAIN AND PAY FOR NECESSARY BASE, HALIFAX REGIONAL MUNICIPALITY (HRM) PERMITS PRIOR TO CONSTRUCTION AND NOTIFY SDMM AND BASE OF SCHEDULED STREET WORK AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION.
 2. CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING STORM SEWER UNDERGROUND PIPING IN THE FIELD.
 3. TOPOGRAPHIC SURVEY COLLECTED BY SDMM NOVEMBER 4, 2010. TOPOGRAPHIC SURVEY REPRESENTS EXISTING SITE GRADE PRIOR TO CONSTRUCTION. PROPERTY BOUNDARIES RELATE TO WALLACE MACDONALD & LIVELY, LTD PLAN No. S-4187-3, DATED NOVEMBER 30, 2000.
 4. CONTRACTOR MUST PREVENT EROSION OR SILTATION OF SURFACE RUNOFF FROM LEAVING THE CONSTRUCTION SITE THROUGH THE USE OF EROSION AND SEDIMENTATION CONTROLS (SEE NSDOE EROSION AND SEDIMENTATION CONTROL HANDBOOK FOR CONSTRUCTION SITES). EXCAVATION DEWATERING TO MUNICIPAL STORM SEWER SYSTEMS MUST ADHERE TO HRM BY-LAW W-101.
 5. ELEVATIONS ARE GEODETIC (METERS) AND ESTABLISHED BASED ON NSCM 4362, ELEVATION = 32.805m.
 6. ELEVATIONS AND GRADING SHALL BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION.
 7. ALL CONSTRUCTION ACTIVITIES MUST BE SCHEDULED TO MINIMIZE SERVICE/PUBLIC ACCESS INTERRUPTION.
 8. CONTRACTOR SHALL NOTIFY SDMM 48 HOURS PRIOR TO THE START OF CONSTRUCTION TO SCHEDULE REQUIRED INSPECTION AND DATA COLLECTION TO PREPARE RECORD OF NEW STORM SERVICES.
 9. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH NOVA SCOTIA REGULATIONS AND HRM BY-LAWS, HALIFAX WATER DESIGN AND CONSTRUCTION SPECIFICATIONS (LATEST EDITION) AND HRM MUNICIPAL SERVICE SYSTEM GUIDELINES "RED BOOK" (LATEST EDITION).
 10. LANDSCAPING SHALL BE CONSTRUCTED IN SUCH A WAY AS TO ENSURE POSITIVE DRAINAGE OF STORM WATER AWAY FROM THE BUILDINGS. CONSTRUCTED GRADES SHALL BE A MIN. OF 2% AND A MAX. OF 2%+V, UNLESS OTHERWISE STATED. ALL DISTURBED AREAS SHALL BE FINISHED WITH EITHER GRAVEL OR TOPSOIL AND SEED, UNLESS OTHERWISE STATED.
 11. CONTRACTOR TO CONTACT ALL UTILITY COMPANIES (BASE, BELL, ALMANT, ROGERS, EASTLINK, NSPI & HERITAGE GAS ETC.) TO CONFIRM IF ANY UNDERGROUND SERVICES EXIST IN THE VICINITY OF PROPOSED WORK PRIOR TO EXCAVATION.

AUG.07/15		ISSUED FOR TENDER		
No.	Date	Revision	Description	Appr'd

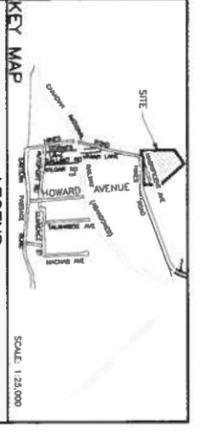
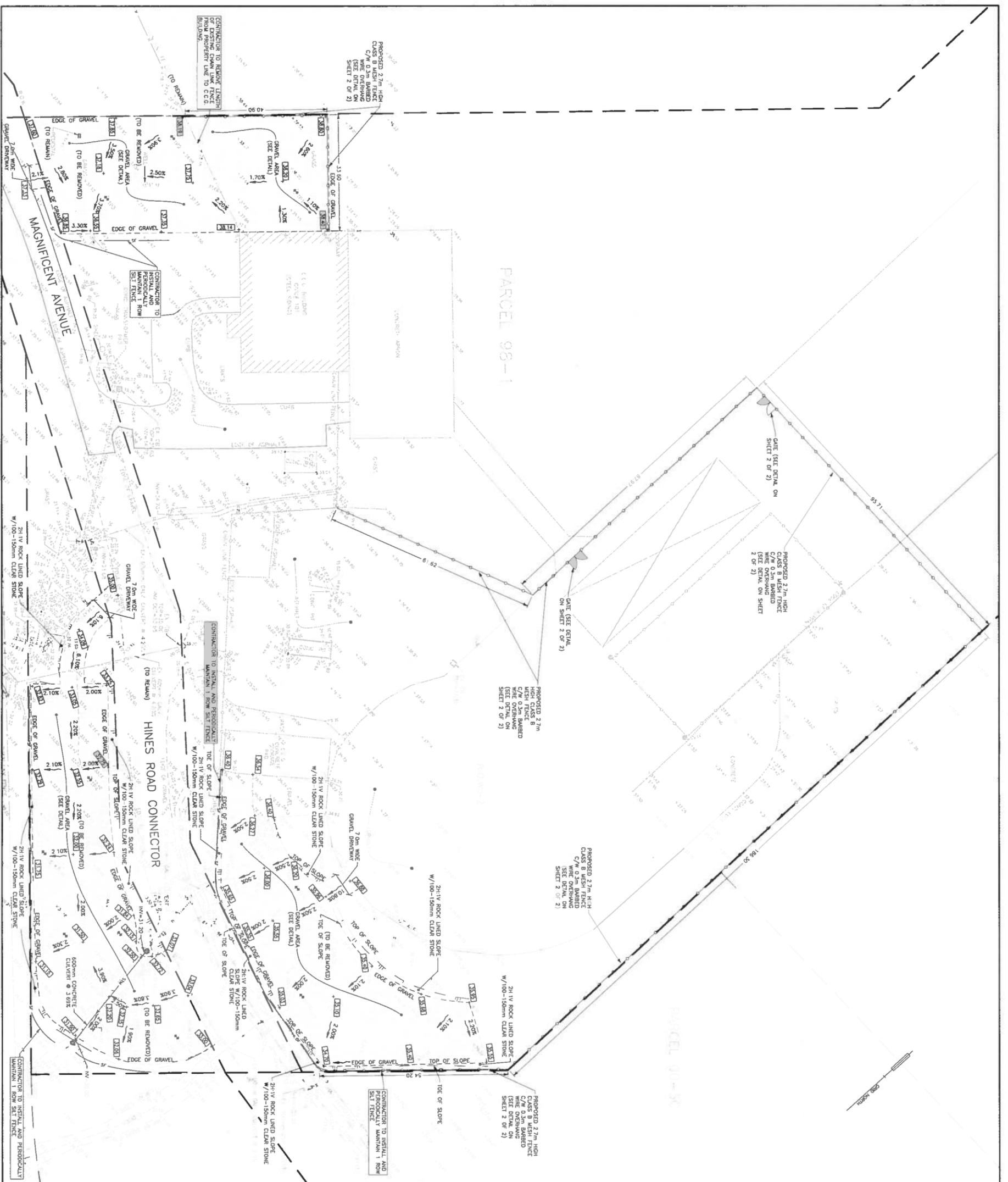


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**SHEARWATER C.C.G. STORAGE AREAS
 DARTMOUTH, NOVA SCOTIA**

**CONSTRUCTION NOTES AND DETAILS
 CIVIC 101 MAGNIFICENT AVENUE**

Date	AUGUST 7, 2015	Drawn	S.S.	Project No.	FILE No. 1-16-20 (31257)
Scale	AS NOTED	Engineer	A. PULSIFER	Plan No.	16-1371-0
Reference	Approved			HRM No.	
Surveyed	SDMM	Sheet	2 OF 2		



LEGEND	
EXISTING	PROPOSED
CHUB STOP/TEMPORARY WALL	●/●
FREE HEIGHT	▲
TRUNK BLOCK	□
SWISS SPRAWLER CONNECTION	⊕
DITCH BASH/PT	⊖
CLAYVERT	⊙
ROCK LINING/DW	⊗
ROCK WALL	⊘
POWER POLE/LIGHT POLE	○/○
STREET	○
STREET SIGN	○
ELEVATION/SURFACE	⊕/⊖
4.11.82	⊕/⊖
SHANNON/SHALE FLOW DIRECTION	→
WATER MAIN/SERVICE	—
SEWER MAIN/PIPE	—
STORM MAIN/PIPE	—
FOURK MAIN	—
ROCK LINE	—
100% FLOOD LIMIT	—
SILT FENCE	—
UNDERGROUND CONDUIT	—
DEBRIS/ROCK	—
PROPERTY LINE/BOUNDARY	—
CHANNEL FENCE	—
BUILDING	—
TOP OF SLOPE	—
TOE OF SLOPE	—
WORKING WELL	—
TEST PIT	—

NOTES:
1. SEE SHEET 1 OF 2 FOR CONSTRUCTION NOTES AND DETAILS

No	Date	Revision Description
3	AUG 28/15	REVISED FINISHING LAYOUT
2	AUG 07/15	ADDED PROPOSED FINISHING
1	JUL 28/15	ISSUED FOR REVIEW
	NOV 19/10	ISSUED FOR REVIEW

SDPAM
 David McKenzie & M
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 Dartmouth, Nova Scotia

SHEARWATER C.C.G. STORAGE AREAS
DARTMOUTH, NOVA SCOTIA

SITE SERVICING AND GRADING
CMC 101 MAGNIFICENT AVENUE

Date	NOVEMBER 12, 2010	Drawn	S.S.	Project No.	FILE No. 1-18-20 (13257)
Scale	1:500	Engineer	A. PALSTER	Plan No.	16-B76-3
Reference		Approved		Sheet	1 OF 2
Surveyed	SOMM				

Shearwater Outdoor Storage DND Fencing specification Excerpt

SPECIFICATIONS

6. Where a chain-link fence is required for a security purpose, it must be constructed of a minimum of 9 gauge wire mesh, having openings not larger than 5 cm., and must be supported by metal posts and braces on the interior. The chain-link fabric must be taut and securely anchored to the underlying concrete, pavement or other hard surface. When the fence passes over soil surfaces, it must be anchored by burying the lower 30 cm. of fabric in the soil.
7. The overhang or outrigger, must be constructed of metal and angled outward at 45 degrees. It must contain three strands of 12 gauge barbed wire, spaced 15 cm. apart, and must be securely fixed to the overhang supports.
8. Posts must be firmly anchored in concrete bases to a sufficient depth to counteract frost heaving.
9. The interior side of fences should be painted with a dark, non-glare paint to eliminate reflection that may impair the outward vision of security forces during the hours of darkness.
10. Where ditches, ravines, ridges, etc., cannot be avoided, the ground must be levelled to remove all contours that would obstruct vision or afford concealment.
11. Openings such as culverts, ditches, sewers, etc., that pass through or beneath the fence and have a dimension greater than 15 cm.. or an overall area of 225 square cm.. must be secured by steel grating, grills or equivalent barriers.
12. Vegetation within the interior and exterior clear zones must be cut to a maximum height of 20 cm.
13. Snow accumulation must be removed from the interior and exterior sides of fences as is necessary to maintain their effectiveness.
14. Trees and shrubs provide concealment, obstruct vision, and limit the effect of security lighting. Therefore trees and shrubs are not to be cultivated within the exterior clear zone nor between security lighting fixtures and the fence.

APPROVED SECURITY FENCING

15. Type A. This is a chain-link fence consisting of 2.4 m.(8 feet) of chain-link fabric with a 30 cm.. overhang. When installed in accordance with paragraph 9 of this Annex, Type A fence will have an overall height of 2.1 m. Type A fences are recommended for operations zones and as perimeter fencing where a basic security fence is required.
16. Type B. This is a chain-link fence consisting of 3.0 m.(10 feet) of chain-link fabric with a 30 cm.. overhang. When installed in accordance with paragraph 9 of this Annex, Type B fence will have an overall height of 2.7 m. Type B fences are recommended for:
 - a. operations zones and perimeter fencing where extra height is required to discourage intrusion by animals;
 - b. service prisons and detention barracks;
 - c. security zones and high security zones, where a security fence is required; and
 - d. explosive storage areas, supply depots, petroleum, oil and lubricants (POL) facilities, and other Restricted areas and similar compounds where dangerous materials or attractive and valuable materiel is stored.

PART 1- GENERAL

NOTE: Prevention of sediment leaving the construction site is mandatory. As a prevention measure to ensure erosion and sediment is controlled during site construction the contractor **MUST** stage the grubbing, topsoil removal and mass earthwork cut/fill operation so that **no more than 2,000 m² (max) of site soils are exposed at any one time**. Prior to proceeding to expose additional area the previously exposed area must be covered with gravel, stone or 100mm of straw. Careful planning and scheduling of the site work is required by the contractor to ensure compliance with this stipulation. Non compliance will not be tolerated, no exceptions.

1.1 RELATED SECTIONS

- .1 Section 31 00 00.01 - Earthwork.

1.2 REFERENCES

- .1 “Erosion and Sedimentation Control Handbook for Construction Sites” (Nova Scotia Department of the Environment - Latest Edition).
- .2 Division 7 of the Standard Specification Highway Construction and Maintenance (Nova Scotia Department of Transportation and Public Works - Latest Edition).

1.3 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.4 SUBMITTALS

- .1 Contractor must have on site a person who has successfully completed the *Erosion and Sediment Control Course* provided by the NSTPW and the Centre for Water

- Resources, Dalhousie University, Halifax, NS. The contractor must submit a copy of this person's Certificate prior to starting work on site as part of the Environmental Protection Plan.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Consultant. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
 - .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
 - .4 Environmental protection plan: include:
 - .1 Name and contact number of person responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name and qualifications of person responsible for training site personnel.
 - .3 Descriptions of environmental protection personnel training program.
 - .4 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
 - .5 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
 - .6 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
 - .7 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
 - .8 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and

regulations for storage and handling of these materials.

- .9 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .10 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

1.5 FIRES

- .1 Fires and burning of rubbish on site **NOT** permitted.

1.6 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
- .3 Do not dispose of construction debris; wood, concrete, asphalt, etc., on site, but at a licensed disposal facility.

1.7 DRAINAGE

- .1 Provide erosion and sediment control plan that identifies type and location of erosion and sediment controls to be provided. Plan: include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .3 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .4 Measures must be implemented around the construction site to direct surface water away from excavations. The Site Contractor must include this work as part of the lump sum cost.

- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .6 During construction, dewatering must be provided to control groundwater seepage into excavations with appropriate sump and pump arrangements. The Site Contractor must include this work as part of the lump sum cost.
- .7 Excavation dewatering must abide by HRM bylaw W101.

1.8 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties where indicated . Prior to any tree removal, the site construction must visit the site and confirm with the Consultant the area of trees to be cleared as well as those that are to be saved and protected during construction.
- .2 Minimize stripping of topsoil and vegetation.

1.9 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.10 HISTORICAL / ARCHAEOLOGICAL CONTROL

- .1 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Consultant.

1.11 NOTIFICATION

- .1 Consultant or Regulatory Agency will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations,

- permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Consultant or Regulatory Agency of proposed corrective action and take such action for approval by Consultant or Regulatory Agency.
 - .3 Consultant or Regulatory Agency will issue stop order of work until satisfactory corrective action has been taken.
 - .4 No time extensions granted or equitable adjustments will be allowed to the Contractor for such suspensions.

End of Section

PART 1 - GENERAL

Note: All earthwork for this project will be completed by the site contractor. Contractor will need to coordinate work with other Trades and schedule work with the Construction Manager. Contractor to refer to the Geotechnical Investigation Report to verify required subgrade work for the site preparation. Particular attention is drawn to the water table, depth of bedrock, and fill on the site. The Site Contractor to ensure costs for removal and disposal of excess site fill off site and imported borrow structural fill to complete the work are included in the lump sum bid.

1.1 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 31 11 00 - Clearing and Grubbing
- .3 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m³.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .4 Nova Scotia Department of Transportation and Public Works (NSTPW) Standard Specification for Highway Construction and Maintenance, latest edition.

1.3 QUALITY

ASSURANCE/REGULATORY REQUIREMENTS

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations whichever is more stringent. Excavations in rock must be made at a maximum of 1H:14V. Excavations through till and fill must be made at a maximum of 1H:1V for short term stability, however if seepage is observed they must be flattened to 2H:1V or alternative shoring provided.
- .2 Health and Safety Requirements: do construction in accordance with Occupational Health and Safety Requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 The Site Contractor is responsible for all costs associated with the removal and disposal of excess site fill off site (site location will also be the contractor's responsibility).
- .2 Divert unused vegetation materials from landfill to local facility as directed by Consultant.

1.5 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
- .2 Soil conditions - Contractors must visit the site to satisfy themselves of the types, quantities, and properties of the existing site materials in consideration of the lump sum cost to complete the site to the grades indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Contractor shall supply all required imported material and remove and dispose of all surplus material not required to complete the earthwork off site as part of the lump sum cost.

- .2 Surplus, Borrow and Subgrade to NSTPW Standard Specification for Highway Construction and Maintenance latest Edition, Division 2, Sections 4, 5 and 6.
- .3 Granular Type 1, 1S, 2, and 3 to NSTPW Standard Specification for Highway Construction and Maintenance latest Edition, Division 3, Section 2.
- .4 FILL: approved, sand/gravel, able to be compacted to the specified requirements noted in Part 3.5, free of stones greater than 200 mm in diameter, organic matter and deleterious material, well graded from course to fine. Fill material can be select portions of existing site material or imported material provided they meet the required moisture and compaction criteria.
- .5 ROCK FILL: well graded rock fill may be used as FILL in accordance with the following gradation requirements:
 - .1 Maximum particle size shall be 200mm or less within 500mm of finished subgrade.
 - .2 For rock fill between 500mm to 1200mm below finished subgrade maximum particle size shall be 300mm or less.
 - .3 For rock fill 1200mm or more below finished subgrade maximum particle size shall be 600mm or less.
- .6 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum Portland cement content of 25 kg/m³.
 - .3 Minimum strength of 0.07 MPa at 24 h.
 - .4 Concrete aggregates: to CAN/CSA-A23.1/A23.2.
 - .5 Cement: to CAN/CSA-A3001, Type GU.
 - .6 Slump: 160 to 200 mm.

PART 3 - EXECUTION

3.1 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 sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

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

3.2 PREPARATION/ PROTECTION

- .1 Protect excavations from freezing.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Consultant approval.
- .4 Protect natural and man-made features that are required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.
- .6 The existing site drainage must remain operational during construction and upon final completion. The Contractor is responsible for diverting the drainage around the construction site and provide any temporary measures to control drainage and site runoff as part of his Lump Sum Cost.

3.3 GRUBBING

- .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
- .2 Remove stumps and tree roots below gravel pads and to 400mm below finished grade elsewhere (See section 31 11 00).
- .3 Dispose of grubbed material off site daily to permanent disposal area. Site contractor is responsible to selecting disposal site and all costs associated with it removal from the site.

3.4 EXCAVATION

- .1 Strip topsoil and all other unsuitable materials over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.

- .1 All surplus topsoil or that rendered unsuitable shall be removed from the site and disposed of off site at the Contractor's cost.
- .2 Excavate as required to carry out work.
 - .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Consultant when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be required by the contractor at his cost. This will not be paid as an extra should the material become unsatisfactory because of exposure to weather (e.g. precipitation or freezing).
- .3 Excavate trenches to provide uniform continuous bearing and support for 250 mm thickness of pipe bedding material (for sewers) on solid and undisturbed ground.
 - .1 Trench widths 250mm below the pipe invert or at a point 150 mm above the pipe shall not exceed the diameter of the pipe plus 600 mm.
- .4 Excavate to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.
- .5 All exposed soil surfaces shall be rolled with a static roller and shaped to prevent ingress of moisture and ponding water.
- .6 Immediately after excavation and prior to placement of fill, proof roll subgrade with a 10 ton minimum vibratory roller to detect any soft areas and provide a uniform surface. Proof roll under the supervision of the Consultant. Some additional site fill may have to be removed in areas below this subgrade elevation with poorer quality fill, as determined by field inspection. Any additional excavation and replacement of fill must be quantified with the consultant during removal (daily) to track any additional costs.
- .7 Contractor shall protect subgrade with 150 mm of gravel or 100 mm of straw cover as soon as grading of subgrade is complete.

3.5 BACKFILLING

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Consultant.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing subgrade under gravel pads to same compaction as specified for fill.
 - .1 Fill excavated areas with selected subgrade material compacted as specified for fill in all areas and their respective 1H:1V zone of influence.
 - .2 Fill within the 1H:1V zone of influence MUST be completed using imported well graded sand and gravel with maximum particle size of 150mm containing < 15% fines compacted to 100% of the standard Proctor maximum dry density.
- .5 Placing:
 - .1 Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
 - .2 Place unshrinkable fill in areas as indicated: consolidate and level unshrinkable fill with internal vibrators.
- .6 Compaction: compact each layer of material to following Standard Proctor dry densities:
 - .1 Under landscaped areas: 95%.
 - .2 Under gravel: 98%.
- .7 In trenches:
 - .1 Up to 300 mm above pipe or conduit: Type 1 gravel or sand placed by hand except water up to 450mm above pipe Type 1 gravel.
 - .2 Over 300 mm above pipe or conduit: native material approved by Consultant.
- .8 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.

3.6 GRADING

- .1 Grade so that water will drain away from buildings, walls and gravel pads to disposal areas approved by the Consultant.
 - .1 Grade to be gradual between finished spot elevations and contours shown on drawings.
- .2 Maximum rock lined slope shall be 2H:1V.

3.7 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill and will be carried out by testing laboratory designated by Consultant.
- .2 Not later than one week before backfilling or filling, provide to designated testing agency, samples of backfill.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Consultant.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Consultant so that compaction tests can be carried out by designated testing agency.

3.8 SHORTAGE AND SURPLUS

- .1 Supply necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance. All necessary borrow material is the Site Contractor's responsibility and shall be included in the lump sum contract price.
- .2 Remove and dispose of unsuitable and surplus material off site (site selection is the Contractor's responsibility and costs associated with removal/disposal, reinstatement/erosion Controls to be included in the lump sum contract cost).

3.9 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 32 11 16.01 - Granular Sub-base.
- .2 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
 - .2 Nova Scotia Department of Transportation and Public Works (NSTPW) Standard Specification for Highway Construction and Maintenance, latest edition.

1.3 SAMPLES

- .1 Allow continual sampling by Consultant during production.
- .2 Provide Consultant with access to source and processed material for sampling.
- .3 Install sampling facilities at discharge end of production conveyor, to allow Consultant to obtain representative samples of items being produced. Stop conveyor belt when requested by Consultant to permit full cross section sampling.
- .4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
- .5 Provide water, electric power and propane to Consultant laboratory trailer at production site.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused granular materials from landfill to local facility as approved by Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed five times least dimension.

- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel composed of naturally formed particles of stone.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Consultant of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
- .2 If, in opinion of Consultant, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Consultant 4 weeks in advance of proposed change of material source.
- .4 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 PREPARATION

- .1 Handling
 - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .2 Stockpiling
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Consultant. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in

- depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
 - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Consultant within 48 h of rejection.
 - .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Max 1.5 m for coarse aggregate and base course materials.
 - .2 Max 1.5 m for fine aggregate and sub-base materials.
 - .3 Max 1.5 m for other materials.
 - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
 - .9 Do not cone piles or spill material over edges of piles.
 - .10 Do not use conveying stackers.
 - .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Remove any unused aggregates from the site.
- .3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

End of Section

PART 1- GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 23 33.01 - Excavation, Trenching and Backfilling.

1.2 MEASUREMENT PROCEDURES

- .1 All clearing, grubbing and associated work forms part of the lump sum contract.

1.3 REFERENCES

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots to not less than specified depth below existing ground surface.

1.5 SUBMITTALS

- .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.6 QUALITY ASSURANCE

- .1 Do construction in accordance with Occupational Health and Safety Requirements.
- .2 Safety Requirements: worker protection.
 - .1 Workers must wear eye protection and protective clothing when performing clearing operations.

1.7 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, driveways, survey markers, existing pavement, utility lines, site appurtenances, water courses, and root systems of trees which are to remain.
 - .1 Repair damaged items to approval of Consultant.
 - .2 Replace trees designated to remain, if damaged, as directed by Consultant.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
 - .1 Trim limbs and tops, and saw into saleable lengths for saw logs, for pulpwood, for poles, for ties, and for fuel wood.
 - .2 Stockpile adjacent to site.

Part 2 - PRODUCTS

2.1 MATERIALS

- .1 Chipped and mulched material shall be stockpiled on site in an area as directed by the Consultant.
- .2 Timber - Hardwood or Softwood greater than 125mm diameter shall be sold to paper processors or saw mills.
- .3 Soil Material for Fill (Existing Site Fill):
 - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
 - .2 Remove and store soil material for reuse in landscaped areas only. See Section 31 00 00.01 Earthwork and the drawing for suitable areas for Reuse. Site fill is not to remain within the 1H:1V zone of influence. If moisture and compaction levels can be achieved it may be available for landscaped areas only.
 - .3 Site fill left in-situ (undisturbed) may be able to remain 300mm below subgrade of paved areas provided it passes the proof roll test. Proof roll test to be witnessed and confirmed by the Consultant.

Part 3 - EXECUTION

3.1 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, walkways and streets according to sediment and erosion control drawings that complies with requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

- .1 Inspect site and verify with Consultant, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .1 Notify Consultant and Utility immediately of damage to or when unknown existing utility lines are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify Consultant in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep existing roads, driveways and walks free of dirt and debris.

3.3 CLEARING

- .1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.
- .2 Clear as indicated by Consultant, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .3 Cut off branches and cut down trees overhanging area cleared as directed by Consultant.

- .4 Cut off unsound branches on trees designated to remain as directed by Consultant.

3.4 CLOSE CUT CLEARING

- .1 Close cut clearing to within 100 mm of ground surface.
- .2 Cut off branches down trees overhanging area cleared as directed by Consultant.
- .3 Cut off unsound branches on trees designated to remain as directed by Consultant.

3.5 ISOLATED TREES

- .1 Cut off isolated trees as directed by Consultant at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
- .6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.6 UNDERBRUSH CLEARING

- .1 Clear underbrush from areas as indicated at ground level.

3.7 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.8 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials to disposal area off site as selected by Contractor. Costs for removal, disposal, reinstatement, and erosion controls to be included in Lump Sum Cost.
- .2 Cut timber greater than 125mm diameter in saleable lengths and stockpile as indicated. Stockpiled timber becomes property of the Contractor.
- .3 Dispose of cleared and grubbed materials by and burying.
- .4 Burning of materials is **NOT** permitted on site.
- .5 Bury offsite to approval of Consultant by:

- .1 Consolidating.
- .2 Covering with minimum 500 mm of soil.
- .3 Finishing surface (min. 100 mm of straw & hydro seed or as per property owner request).
- .6 Chip or mulch and stockpile cleared and grubbed vegetative material on site as directed by Consultant.
- .7 Remove diseased trees identified by Consultant and dispose of this material to approval of Consultant.

3.9 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for stripping of topsoil to approval of Consultant.

3.10 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 00 00.01 - Earthwork.
- .2 Section 32 11 16.01 - Granular Sub-base.

1.2 MEASUREMENT PROCEDURES

- .1 This item forms part of the lump sum contract.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
 - .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m³).
 - .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .5 Nova Scotia Department of Transportation and Public Works (NSTPW) Standard Specification for Highway Construction and Maintenance, latest edition.
- .6 Nova Scotia Department of the Environment “Erosion and Sedimentation Control Handbook for Construction Sites” - latest edition.

1.4 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock : solid material in excess of 1m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 mm in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work. This will also include materials from off the property.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:

- .1 Weak, chemically unstable site material with excess moisture and compressible materials.
- .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136 : Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	[100]
0.10 mm	[45 - 100]
0.02 mm	[10 - 80]
0.005 mm	[0 - 45]
 - .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated(1 MPa Concrete).

1.5 SUBMITTALS

- .1 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, relocated and abandoned services, as required.
- .2 Samples:
 - .1 Inform Consultant at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
 - .2 Submit samples of type of fill specified including representative samples of excavated material.
 - .3 Ship samples to Consultant in tightly closed containers to prevent contamination and exposure to elements.

- .4 At least 4 weeks prior to beginning Work, inform Consultant source of fly ash and submit samples to Consultant.
 - .1 Do not change source of Fly Ash without written approval of Consultant.

1.6 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where Consultant is employee of Contractor, submit proof that Work by Consultant is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .5 Keep design and supporting data on site.
- .6 Engage services of qualified professional Engineer who is registered or licensed in Province of Nova Scotia, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed and approved by Consultant.
- .8 Health and Safety Requirements:
 - .1 Do construction in accordance with Occupational Health and Safety Requirements.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 The Site Contractor is responsible for all costs associated with the removal and disposal of excess site fill off site (site location will also be the contractor's responsibility).
- .2 Divert excess aggregate materials from landfill to local recycling facility for reuse as directed by Consultant.

1.8 EXISTING CONDITIONS

- .1 Examination of soil conditions on site is the responsibility of the Contractor.
- .2 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with Site Manager and appropriate authority for relocation of buried services that

- interfere with execution of work: pay costs of relocating services as part of the Lump Sum Bid.
- .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
- .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .5 Prior to beginning excavation Work, notify applicable Authorities having jurisdiction to establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
- .6 Confirm locations of buried utilities by careful test excavations.
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .8 Where utility lines or structures exist in area of excavation, obtain direction from Site Manager and Consultant before removing or re-routing. Costs for such Work to be paid by Contractor.
- .9 Record location of maintained, re-routed and abandoned underground lines.
- .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
 - .1 Conduct, with Site Manager and Consultant, condition survey of existing buildings, asphalt, walks, steps, concrete, light standards, plaques, signs, curbs, pipes, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Consultant at Contractor's own expense.
 - .3 Where required for excavation, cut roots or branches as directed by Consultant in accordance with Section 31 11 00 - Clearing and Grubbing.
 - .4 An existing storm drainage channel is located within the proposed construction area. This must be re-routed around the construction site to ensure clean water will by-pass the site prior to starting the building foundations.

Part 2 - PRODUCTS

2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
- .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.

- .3 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-	[100]
50 mm	-	-
37.5 mm	-	-
25 mm	[100]	-
19 mm	[75-100]	-
12.5 mm	-	-
9.5 mm	[50-100]	-
4.75 mm	[30-70]	[22-85]
2.00 mm	[20-45]	-
0.425 mm	[10-25]	[5-30]
0.180 mm	-	-
0.075 mm	[3-8]	[0-10]

- .2 Type 3 fill: selected material from excavation or other sources, approved by Consultant for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Structural Fill: Imported, well graded sand and gravel with maximum particle size of 150mm containing < 15% fines compacted to 100% of the standard Proctor maximum dry density.

- .4 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum cement content of 25 kg/m³ with 40% by volume fly ash replacement: to CSA-A3001, Type GU.
 - .3 Minimum strength of 0.07MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1/A23.2.
 - .5 Cement: Type GU.
 - .6 Slump: 160 to 200 mm.
- .5 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.
- .6 Geotextiles: to Section 31 32 19.01 - Geotextiles.

Part 3 - EXECUTION

3.1 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 sediment and erosion control drawings that complies with the requirements of Nova Scotia Department of the Environment and US EPA 83ZR92005 Storm Water Management for Construction Activities.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Abide by the Halifax Regional Municipality Bylaw W101 for dewatering excavations.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.3 PREPARATION/PROTECTION

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Consultant approval.

- .3 Protect natural and man-made features required to remain undisturbed.
- .4 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as directed by Consultant after area has been cleared of brush, weeds, and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Consultant.
 - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations to not interfere with the staged work schedule.
 - .1 Stockpile height not to exceed 2 m and should be protected from erosion and precipitation.
 - .2 Contractor to cover stockpile with 10 mil poly to prevent excess moisture intrusion.
- .4 Remove and dispose of unused topsoil off site.

3.5 STOCKPILING

- .1 Stockpile fill materials in areas appropriate to the staged work schedule.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination, excess moisture and from freezing.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release beyond construction boundaries and into water bodies.

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Occupational Health and Safety Requirements Health and Safety Act for the Province of Nova Scotia.
 - .1 Where conditions are unstable, Consultant to verify and advise methods.
- .2 Construct temporary Works to depths, heights and locations as directed by Consultant.
- .3 During backfill operation:
 - .1 Unless otherwise indicated or directed by Consultant, remove sheeting and shoring from excavations.

- .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
- .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore watercourses as directed by Consultant.

3.7 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress. Contractor to implement necessary measures to control the water table during construction.
- .2 Provide for Consultant's approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 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.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to adjacent ditches, watercourses or drainage areas.

3.8 EXCAVATION

- .1 Advise Consultant at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Do not disturb soil within branch spread of trees or shrubs that are to remain.

- .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .4 For trench excavation, unless otherwise authorized by Consultant in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Consultant.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Dispose of surplus and unsuitable excavated material off site.
- .8 Do not obstruct flow of surface drainage or natural water courses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify Consultant when bottom of excavation is reached.
- .11 Obtain Consultant approval of completed excavation.
- .12 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Consultant.
- .13 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with Type 2 fill compacted to not less than 100% of Standard Proctor maximum dry density.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95% of Standard Proctor maximum dry density.
- .14 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Consultant.
- .15 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 41 00 - Storm Utility Drainage Piping.
- .2 Place bedding and surround material in unfrozen condition.

Frozen bedding shall be considered unusable and removed from the site.

3.10 BACKFILLING

- .1 Vibratory compaction equipment: minimum 10 ton.
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 Consultant has inspected and approved installations.
 - .2 Consultant has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 500 mm.
- .7 Place unshrinkable fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.
- .9 Install drainage system in backfill as indicated by the Consultant.

3.11 RESTORATION

- .1 Replace topsoil and seeded areas as directed by Consultant.
- .2 Reinststate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .3 Clean and reinststate areas affected by Work as directed by Consultant.
- .4 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation of polymeric geotextiles used in drainage systems. Purpose of which is to:
 - .1 Separate and prevent mixing of granular materials of different grading.
 - .2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.

1.2 RELATED SECTIONS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.3 MEASUREMENT PROCEDURES

- .1 This item forms part of the lump sum contract. No additional cost will be paid for this item.

1.4 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .2 ASTM D4595-86(2001), Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .3 ASTM D4716-01, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .4 ASTM D4751-99a, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-M89(April 1997), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.

- .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
- .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
- .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.5 SUBMITTALS

- .1 Submit to Consultant 1 electronic copy of product data at least 4 weeks prior to start of Work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 MATERIAL

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

- .1 acceptable product: Terrafix 270R or approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip or 300 mm around footing drain gravels.
- .5 Pin successive strips of geotextile with securing pins at intervals recommended by the manufacturer.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 4 h of placement.
- .8 Replace damaged or deteriorated geotextile to approval of Consultant.
- .9 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

3.2 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 00 00.01 - Earthwork.
- .2 Section 31 05 16 - Aggregate Materials.
- .3 Section 32 11 23 - Aggregate Base Courses.

1.2 MEASUREMENT
PROCEDURES

- .1 This item forms part of the lump sum contract. No additional cost will be paid for this item.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m³).
 - .6 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m³).
 - .7 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .8 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest edition.

1.4 WASTE MANAGEMENT
AND DISPOSAL

- .1 Divert unused granular material from landfill to local facility as approved by Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Granular sub-base material (Type 2 gravel): in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified in the Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest Edition.
 - .3 Other Properties as follows:
 - .1 Liquid Limit: to ASTM D4318, Maximum 20.
 - .2 Plasticity Index: to ASTM D4318, Maximum 3.
 - .3 Los Angeles degradation: to ASTM C131.
Max% Loss by mass: 40.

PART 3 - EXECUTION

3.1 PLACING

- .1 Place granular sub-base after subgrade is inspected and approved by Consultant.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.
- .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compact to density of not less than 100% Standard Proctor dry density.
- .5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .6 Apply water as necessary during compaction to obtain specified density.
- .7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Consultant.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 PROOF ROLLING

- .1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.
- .2 Obtain approval from Consultant to use non standard proof rolling equipment.
- .3 Proof roll at level in sub-base as indicated. If non standard proof rolling equipment is approved, Consultant to determine level of proof rolling.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove sub-base and subgrade material to depth and extent as directed by Consultant.
 - .2 Backfill excavated subgrade with sub-base material and compact in accordance with this section.
 - .3 Replace sub-base material and compact.
- .6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.4 SITE TOLERANCES

- .1 Finished sub-base surface to be within 25 mm of elevation as indicated but not uniformly high or low.

3.5 PROTECTION

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Consultant.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS.

- .1 Section 31 05 16 - Aggregate Materials.

1.2 MEASUREMENT
PROCEDURES

- .1 This item is included in the lump sum contract.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m³).
 - .5 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m³).
 - .6 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .7 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest edition.

1.4 DELIVERY, STORAGE,
AND HANDLING

- .1 Deliver and stockpile aggregates in accordance with Section 31 05 16 - Aggregate Materials. Stockpile minimum 50% of total aggregate required prior to beginning operation.

- .2 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused granular material from landfill to local facility as approved by Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Crushed stone or gravel.
 - .2 Gradations to be within limits specified in the Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest edition.
 - .1 Liquid limit: to ASTM D4318, maximum 20
 - .2 Plasticity index: to ASTM D4318, maximum 3
 - .3 Los Angeles degradation: to ASTM C131. Max. % loss by weight: 40.
 - .4 Crushed particles: at least 60% of particles by mass.
 - .5 Soaked CBR: to ASTM D1883, min 100, when compacted to 100% of ASTM D1557.

PART 3 - EXECUTION

3.1 SEQUENCE OF OPERATION

- .1 Place granular base after sub-base surface is inspected and approved by Consultant.
- .2 Placing
 - .1 Construct granular base to depth and grade in areas indicated.
 - .2 Ensure no frozen material is placed.
 - .3 Place material only on clean unfrozen surface, free from snow and ice.

- .4 Place material using methods which do not lead to segregation or degradation of aggregate.
- .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.
- .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment
 - .1 Compaction equipment to be capable of obtaining required material densities.
 - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.
 - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting
 - .1 Compact to density not less than 100% Standard Proctor dry density.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Consultant.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof rolling
 - .1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
 - .2 Obtain approval from Consultant to use non standard proof rolling equipment.
 - .3 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, Consultant to determine level of proof rolling.
 - .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
 - .5 Where proof rolling reveals areas of defective subgrade:

- .1 Remove base, sub-base and subgrade material to depth and extent as directed by Consultant.
- .2 Backfill excavated subgrade with sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.
- .3 Replace sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-base.
- .4 Replace base material and compact in accordance with this Section.
- .6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Consultant and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this section at no extra cost.

3.2 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.3 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Consultant.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures.

1.2 MEASUREMENT PROCEDURES

- .1 This item forms part of the lump sum contract. No additional cost will be paid for this item.
- .2 No extra compensation will be paid for water ordered and applied on Saturdays, Sundays or holidays.

1.3 DELIVERY STORAGE AND HANDLING

- .1 Supply water in quantities and at times as directed by Consultant.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging or corrugated cardboard in accordance with Waste Management Plan.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

1.5 MATERIALS

- .1 Water: to Consultant's approval.

PART 2 - EXECUTION

2.1 APPLICATION

- .1 Apply water with equipment approved by Consultant when directed by Consultant.
- .2 Apply water with distributors equipped with means of shut-off and with spray system to ensure uniform application.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for storm sewer.

1.2 RELATED SECTIONS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Section 31 05 16 - Aggregate Materials.
- .3 Section 31 23 33.01 - Excavating Trenching and Backfilling.

1.3 MEASUREMENT PROCEDURES

- .1 Supply and installation of storm sewer including testing, excavation and backfilling, granular bedding and surround, and reinstatement will be all inclusive of this lump sum contract.

1.4 PAYMENT PROCEDURES

- .1 After pipe inspections:
 - .1 If no defective work is found, Owner will pay costs for inspectors.
 - .2 If defective work is found, pay Owner a part of total inspection cost proportional to number of defective pipe sections of sewer to total number of pipe sections inspected.

1.5 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C14M-99, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
 - .2 ASTM C76M-02, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
 - .3 ASTM C443M-02, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - .4 ASTM C506M-02, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.
 - .5 ASTM C507M-02, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe (Metric).

- .6 ASTM D1056-00, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- .7 ASTM D1869-95(2000), Standard Specification for Rubber Rings for Asbestos-Cement Pipe.
- .8 ASTM D2680-01, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly Vinyl Chloride (PVC) Composite Sewer Piping.
- .9 ASTM D3034-00, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .10 ASTM F405-97, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
- .11 ASTM F667-97, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
- .12 ASTM F794-01, Standard Specification for Poly Vinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-98(April 2001), Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).
 - .1 CAN/CSA-A5-98, Portland Cement.
 - .2 CAN/CSA-A257 Series-M92(R1998), Standards for Concrete Pipe.
 - .3 CSA B1800-02, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
 - .1 CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).
 - .2 CSA B182.4-02, Profile PVC Sewer Pipe and Fittings.
 - .3 CSA B182.11-02, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.
 - .4 CSA-G401-01, Corrugated Steel Pipe Products.
- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .5 Transport Canada (TC)

- .1 Transportation of Dangerous Goods Act, 1992 (TDGA)
- .6 Standard Specification for Municipal Services - NSRBA and NSCEA, latest edition.

1.6 DEFINITIONS

- .1 A pipe section is defined as length of pipe between successive catch basins and/or manholes.

1.7 SUBMITTALS

- .1 Inform Consultant at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .2 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.
- .3 Certification to be marked on pipe.
- .4 Submit to Consultant 1 copy of manufacturer's installation instructions.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility for disposal approved by Consultant.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

1.9 SCHEDULING

- .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

Part 2 - PRODUCTS

2.1 CONCRETE PIPE

- .1 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257 to diameter and strength classification as indicated on the drawings, designed for flexible rubber gasket joints to CAN/CSA-A257.
 - .1 Acceptable material: C65 or Class III.

2.2 PLASTIC PIPE

- .1 Type PSM Poly Vinyl Chloride (PVC): to CSA-B182.2.
 - .1 Standard Dimensional Ratio (SDR): 35 .
 - .2 Locked-in gasket and integral bell system.
 - .3 Nominal lengths: 4 and 6 m.
- .2 Large diameter, ribbed PVC sewer pipe and fittings: to CSA B182.4.

2.3 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material (Type 1) to Section 31 05 16 - Aggregate Materials.

2.4 BACKFILL MATERIAL

- .1 As indicated.
- .2 Unshrinkable fill: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.5 JOINT MORTAR

- .1 Portland cement: to CAN/CSA-A5, normal type 10 .
- .2 Mortar: one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

Part 3 - EXECUTION

3.1 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Consultant.

3.2 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Do not allow contents of sewer or sewer connection to flow into trench.

- .3 Trench alignment and depth to approval of Consultant prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95% Standard Proctor dry density.

3.4 INSTALLATION

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Consultant.
- .2 Handle pipe using methods approved by Consultant. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipes during construction except as may be permitted by Consultant.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CSA B182.11.
- .9 Joints:
 - .1 Concrete pipe:
 - .1 Install gaskets as recommended by manufacturer.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.

- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 When any stoppage of Work occurs, restrain pipes as directed by Consultant, to prevent "creep" during down time.
- .11 Plug lifting holes with Consultant approved prefabricated plugs, set in shrinkage compensating grout.
- .12 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.5 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Consultant has inspected pipe joints, surround and cover pipes as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% Standard Proctor dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90% Standard Proctor dry density.

3.6 BACKFILL

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

- .3 Under paving and walks, compact backfill to at least 95% Standard Proctor dry density. In other areas, compact backfill to at least 90% Standard Proctor dry density.
- .4 Place unshrinkable backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.7 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Consultant , draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Inspections:
 - .1 Provide means of access to permit Consultant to do inspections.
 - .2 If defective work or dirt/debris is found in the pipe, the Contractor shall pay for any re-inspection and cleaning.

END OF SECTION