SECTION 02631 - STORMWATER TREATMENT SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK: Work included:

A. The CONTRACTOR, and/or a manufacturer selected by the CONTRACTOR and approved by the RESIDENT, shall furnish all labor, materials, equipment and incidentals required and install the two manufactured stormwater treatment systems and their appurtenances in accordance with the Drawings and these specifications.

1.02 RELATED WORK:

A. Earthwork: Section 02300.
B. Storm Drainage: Section 02630.

1.03 QUALITY CONTROL INSPECTION:

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the RESIDENT. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the RESIDENT's acceptance level, if permitted, or removed and replaced, entirely at the CONTRACTOR's expense.

B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close textured and free of blisters, cracks, roughness and exposure of reinforcement.

C. Imperfections may be repaired, subject to the acceptance of the RESIDENT, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days when tested in 3-inch diameter by 6-inch long cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs.

1.04 SUBMITTALS:

A. Shop Drawings: Shop drawings shall be annotated to indicate all materials to be used and all applicable standards for materials, required tests of materials and design assumptions for structural analysis. Structural design calculations and shop drawings shall be certified by a Professional Engineer. The use of a bypass structure to handle flows in excess of 1-YR storm flows is allowed but must be noted and detailed in the submittal. Any bypass shall be designed by a licensed Professional Engineer and the calculations for sizing determination shall be submitted with the shop drawings. The design of any bypass structure is subject to approval by the RESIDENT.
B. Performance Documentation: The following documentation must be submitted by the CONTRACTOR and approved by the RESIDENT prior to the manufacture and delivery of any materials.

1. Laboratory Data: The stormwater treatment system supplier shall provide documentation of Total Suspended Solids (TSS) removal efficiency from laboratory testing conducted on the supplier's full-scale system.
2. Evidence of Capacity: The stormwater treatment system supplier shall provide documentation that the submitted stormwater treatment system, including bypass structure if proposed, is capable of passing the peak flow associated with the 25-YR storm as presented in this specification.
3. Evidence of Acceptance: The stormwater treatment system supplier shall provide documentation that the submitted stormwater treatment system has been recognized by the State of Maine Department of Environmental Protection (MDEP) as providing a minimum of 60% net annual TSS removal. Recognition and acceptance to be in accordance with the Laboratory Testing Protocol for Manufactured Treatment Systems and based on results of confirmation testing for the removal of OK-110 grade silica sand.
4. Manufacturing Experience: The stormwater treatment supplier shall provide evidence of at least 5 years of successful product design and use. The supplier shall provide an installation list of projects, model sizes installed and installation dates where the same type systems as specified herein have been designed and produced by the supplier.

C. Certificate of Design: The CONTRACTOR shall be responsible for design of all precast structures including antifloatation slabs and may provide the precast structures requiring antifloatation slabs as one complete unit. Submit a certificate of design signed by a Professional Engineer, registered in the State of Maine and having five (5) years minimum experience in the design of similar structures, certifying that all precast structures including the antifloatation slabs, whether provided separately or as a monolithic unit, have been designed to withstand all forces including soil, traffic and hydrostatic in accordance with all applicable laws, regulations, rules and codes.

PART 2 – PRODUCTS

2.01 MANUFACTURER:

A. Manufactured stormwater treatment system shall be of a type that has been installed and used successfully for a minimum of 5 years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff during the aforementioned period.

B. Manufactured stormwater treatment system shall be a Vortechs System as manufactured by Vortechnics, Inc., a Downstream Defender as manufactured by Hydro International, or a Stormgate Separator as manufactured by Stormwater Management, Inc.

2.02 PERFORMANCE:

A. Each stormwater treatment system shall be capable of a minimum of 60% net TSS removal as recognized by the MDEP for all runoff associated with a 1-YR storm. In addition, the stormwater treatment system shall have the hydraulic capacity to pass through the peak runoff of a 25-YR Storm without re-entrainment of previously settled solids. The 25-YR storm hydraulic capacity standard may be accomplished with or without the use of a bypass. The design of a bypass, including applicable hydraulic design calculations stamped and signed by a registered Professional Engineer in the State of Maine must be provided in the submittal.

Rainfall Event	Peak Runoff (cfs)	
	Treatment Unit 1	Treatment Unit 2
1-YR Storm	7.81	4.46
2-YR Storm	9.68	5.46
10-YR Storm	16.21	8.89
25-YR Storm	19.32	10.52

B. Manufactured stormwater treatment system shall be of a hydraulic design that includes flow controls designed and certified by a Professional Engineer using accepted principles of fluid mechanics that raise the water surface inside the tank to a pre-determined level in order to prevent the re-entrainment of trapped floating contaminants.

C. Manufactured stormwater treatment system shall be capable of removing 60% of the net annual Total Suspended Solids (TSS) load. Annual TSS removal efficiency models shall be based on documented removal efficiency performance from full-scale laboratory tests. Annual TSS removal efficiency models shall only be considered valid if they are corroborated by independent third party field-testing. Said field-testing shall include influent and effluent composite samples from a minimum of ten storms at one location. Individual stormwater treatment systems shall not re-suspend trapped sediments or re-entrain floating contaminants at flow rates up to and including the specified Design Treatment Capacity.

D. Individual stormwater treatment systems shall have a minimum usable sediment storage capacity of 1 cubic yard. The systems shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.

E. Measures shall be incorporated into the design of the stormwater treatment system to prevent the introduction of trapped oil and floatable contaminants to the downstream piping during routine maintenance and to ensure that no oil escapes the system during the ensuing rain event. Direct access shall be provided to the sediment and floatable contaminant storage chambers to facilitate maintenance.

2.03 FRAMES AND COVERS:

A. Material: Cast iron, ASTM A48 Class 30.

B. Frames and Covers: Weight of 425 pounds, labeled with "DRAIN" in 3-inch high raised letters on cover, or equal. Standard frames and covers in accordance with City of Portland standards.

2.04 MISCELLANEOUS:

A. Joint Sealants:
   1. Butyl Rubber Sealant: One (1) inch diameter strips similar to Kent Seal or Ram-Nek.
   2. Butyl Rubber Caulking: Conform to AASHTO M-198, Type B.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. Stormwater Treatment System shall be constructed according to manufacturer's specifications. Install at elevations and locations shown on the Drawings or as otherwise directed by the RESIDENT.

B. Backfill in a careful manner, bringing the fill up in 6-inch lifts on all sides. Precast sections shall be set in a manner that will result in a watertight joint consistent with specification section 02720. In all instances, installation of Stormwater Treatment Systems shall conform to ASTM specification C 891 "Standard Practice for Installation of Underground Precast Utility Structures".

C. Holes made in the concrete sections for handling or other purposes shall be plugged with a non-shrink grout or by using grout in combination with concrete plugs.

D. Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The CONTRACTOR shall make all pipe connections.

3.02 LEAKAGE TESTING – PRECAST STRUCTURES:

A. General: Tests must be observed by the RESIDENT. Structures must be complete, including backfill, for final test acceptance. Plug all pipes and other openings in the structure walls prior to test.

B. Exfiltration Test:
1. Plug pipes into and out of structure and secure plugs.
2. Lower groundwater table (GWT) to below structure. Maintain GWT at this level throughout test. Provide means of determining GWT level at any time throughout test.
3. Fill structure with water to top of cone.
4. Allow a period of time for absorption (determined by CONTRACTOR).
5. Refill to top of cone.
6. Determine volume of leakage in an 8 hour (min) test period and calculate rate.
7. Acceptable leakage rate: Not more than 1 gallon per vertical foot per 24 hours.
8. RESIDENT reserves the right to require an infiltration test if he is not satisfied with the exfiltration test.

C. Vacuum Test:
1. Structures may be vacuum tested in lieu of the exfiltration test. The vacuum tests must be performed prior to backfilling the structure and filling joints. All pipe connections shall be made prior to the test.
2. Plug pipe openings and securely brace the plugs and pipe.
3. Set the tester onto the top section of the structure and inflate the compression band to affect a seal between the structure and the vacuum base.
4. Connect the vacuum pump to the outlet port, open the valve, start the motor and draw a vacuum of 10-inch mercury.
5. Close the valve and monitor the vacuum gauge.
6. The test shall pass if the vacuum holds at 10-inch mercury or drops no lower than 9 inches within the following times:

Depth of Structure (feet)	Time (min.)
0 - 10	3.0
10 - 15	3.5
15 - 20	4.0
20 - 25	4.5
>25	5.0

7. If the vacuum drops in excess of the prescribed rate, the CONTRACTOR shall locate the leak, make proper repairs, and retest the manhole.
8. If the unit fails the test after repair, the unit shall be water exfiltration tested.

3.03 REPAIRS:

A. Determine causes of all leaks and repair them. Perform earthwork required if structure has been backfilled.

B. Perform repairs using methods and materials approved by the RESIDENT. Remove and replace structure if necessary. Remove and replace defective sections if required by RESIDENT.

*** END OF SECTION ***