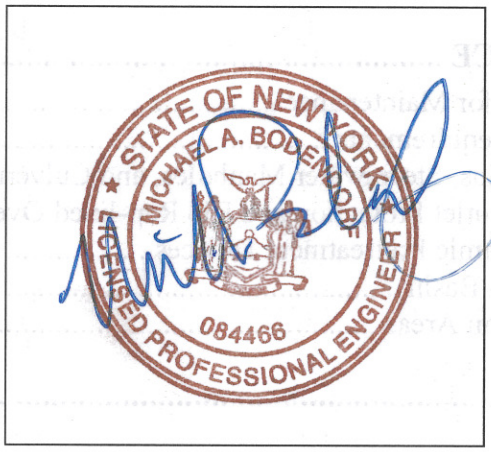
Stormwater Management System Operation and Maintenance Plan: for Edgewater Site Plan

Prepared for:
Scenic Beacon Developments, LLC
25 E. Main Street
Beacon, NY 12508

August 28, 2018



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1.0 INTRODUCTION

1.1 Summary of Stormwater Management System

The Edgewater project proposes construction of 246 apartments within seven buildings, along with an access road, parking areas, sidewalks, landscaping, and a central green space, among other amenities. As such, and in accordance with City and State standards, a stormwater management system is being incorporated into the plan. The calculations and details associated with the proposed stormwater management system are within the Stormwater Pollution Prevention Plan (SWPPP) dated January 31, 2017; Revised July 31, 2018, and the Site Plan Set dated January 31, 2017; Revised August 28, 2018. The latest version of both the SWPPP and Site Plan Set as approved by the City of Beacon Planning Board shall be referred to.

The stormwater management system consists of several series of structures and culvert pipes that convey the stormwater runoff to a pre-treatment hydrodynamic separator unit which then discharges into a bioretention area or an infiltration basin. The system mitigates the peak rates generated from the lot development prior to discharge offsite towards adjacent properties and the City stormwater collection system. The site map in Appendix A provides a general overview of the layout of the stormwater management system.

2.0 STORMWATER SYSTEM COMPONENTS

2.1 Catch Basins

Several catch basins are located throughout the site. Catch basins are pre-cast concrete structures located below grade that collect site runoff from the surface via a grate inlet, or from other portions of the site via pipe inlet. There are 24 catch basins located on the site identified as CB 102, 103, 104, 105, 203, 204, 205, 206, 207, 208, 301A, 302, 303, 304, 304A, 305, 305A, 306, 401, 402, 403, 404, 404A, and EX. CB 1. Catch basins are equipped with a sump to capture sediment. All catch basins have an outlet culvert pipe that conveys the runoff to its designed outlet. All culvert pipes on the site associated with the catch basins are 15”, 18” or 24” diameter corrugated high density polyethylene (HDPE). There are two discharge points from the site which are identified as EX. CB 1 in Branch Street and FES D in the northwest corner of the site. Both connects to the City owned and maintained stormwater management system.

2.2 Stormwater Manholes

Stormwater manholes are pre-cast concrete structures located below grade that act as changes in culvert pipe direction or as junctions for multiple culvert pipes being combined. There are 2 stormwater manholes located on the site identified as DMH 201 and DMH 209. Stormwater manholes are equipped with a sump to capture sediment. All stormwater manholes have an outlet culvert pipe that conveys the runoff to its designed outlet. Culvert pipes on the site associated with the stormwater manholes are 12”, 15” and 24” diameter corrugated HDPE.

2.3 Culvert Piping

Culvert piping consists of smooth interior corrugated HPDE pipe. The culvert pipes vary in size throughout the site, but are generally 15, 18” or 24” diameter.

2.4 Flared End Sections

Flared end sections are constructed out of HDPE material and are designed to spread out concentrated flow from a pipe back to a sheet flow condition; thereby decreasing the flow energy. Four flared end sections are located on the site and are identified as FES A, B, C, D and E.

2.5 Rip Rap Outlet Protection and Overflow Weirs

Rip rap outlet protection is a thick section of angular rock placed at each FES. Rip rap is also placed within an overflow weir at Bioretention Area 2 (BIO 2) to further dissipate energy generated from concentrated flow through pipes. The stone sizes generally range from 4" to 9" in size.

2.6 Hydrodynamic Pretreatment Device

Hydrodynamic devices are pre-cast concrete structures that have internal components built into them to screen, separate and trap trash, debris, sediment, and hydrocarbons from stormwater runoff. There are 3 hydrodynamic pretreatment treatment devices located on the site identified as WQI 101, WQI 202, and WQI 301. WQI 101 has one 15" HDPE inlet pipe and one 18" HDPE outlet pipe, WQI 202 one 24" HDPE inlet pipe and one 24" HDPE outlet pipe, and WQI 301 has two inlet pipes (15" HDPE) and one 15" HDPE outlet pipe.

2.7 Infiltration Basin

Stormwater infiltration practices capture and temporarily store the water quality volume before allowing it to infiltrate through the floor of each practice into the soil over a two-day period. In areas where the subsurface soils exhibit high infiltration rates, the channel protection volume may also be infiltrated. Infiltration facilities are not typically capable of infiltrating the overbank flood or extreme flood volumes. Adequate outflows are required for these larger storm events. Soil testing to obtain infiltration rates are required as part of the design of infiltration facilities. Varying degrees of pre-treatment of the water quality are required based on the field determined infiltration rate of the subsurface soils. 100% of the water quality volume is required where the infiltration rate exceeds 5 inches per hour, 50% for infiltration rates between 2 and 5 inches per hour, and 25% for infiltration rates less than 2 inches per hour. Pre-treatment is typically accomplished through installation of plunge pools and other filtering methods. Infiltration practices must be isolated and protected from stormwater run-off during construction. The contributory drainage area shall be completely constructed and stabilized before connection of the stormwater conveyance system to the infiltration practice. Infiltration basins are typically landscaped by providing a hardy, drought tolerant grass species that is capable of tolerating periodic inundation. The established grass requires mowing twice annually (or as needed). Proper maintenance of the contributing conveyance system and pre-treatment practice are important in maintaining infiltration rates. One infiltration basin is located on-site and identified as IB 3.

2.8 Bioretention Areas

A bioretention device is stormwater management facility used to remove sediment and other stormwater pollutants from runoff and to infiltrate runoff into soil. A bioretention device consists of an excavated area that is backfilled with an engineered soil, covered with a mulch layer and planted with a diversity of woody and herbaceous vegetation. Bioretention devices are designed to pond runoff after rainfall events and gradually allow water to infiltrate into the engineered soil.

The engineered soil is a mixture of sand, compost and topsoil designed to allow sufficient infiltration of runoff as well as provide an appropriate planting medium. Bioretention devices have an overflow pipe to discharge water that cannot be adequately stored and treated in the facility. Bioretention devices generally have a perforated underdrain pipe beneath the engineered soil to remove water from the facility after treatment. Bioretention devices generally have a pretreatment area to capture and remove larger sediment particles. The pretreatment area can consist of grass filter strips, grass channels, sumps, hydrodynamic devices or forebays. In this case, pretreatment is handled by hydrodynamic devices. Two bioretention areas are located on site and identified as BIO 1 and BIO 2.

3.0 MAINTENANCE

3.1 Responsibility for Maintenance

The owner will be responsible for maintaining the private drainage system as identified in this Operation and Maintenance Plan. Any major maintenance (such as re-grading, drain replacement, or similar effort) should only be conducted by a competent professional, such as a licensed contractor. The owner itself, and contractors retained by the owner must familiarize themselves with the purposes, design specifications, features, and operation of the stormwater management system. Site maintenance service providers (e.g., landscape maintenance and other maintenance companies), need to be informed of the specific maintenance requirements for the stormwater management system and should review the Site Plan Set, SWPPP and the Stormwater Management System Operation and Maintenance Plan (this document). Any earth disturbing activities must implement erosion and sediment control measures to prevent transport of sediment to the stormwater management system.

3.2 Maintenance Requirements

The owner shall provide for the periodic inspection of the stormwater facilities in accordance with the SWPPP and shall have the facilities inspected on a yearly basis by a Professional Engineer licensed by the State of New York, to determine the condition and integrity of the stormwater control measures. The inspecting professional shall prepare and submit to the City of Beacon within 30 days of the inspection but not later than June 1 of each year, a written report of the findings including recommendations for those actions necessary for the continuation of the stormwater control measures.

3.2.1 Catch Basins, Stormwater Manholes, and Culvert Piping

In addition to standard periodic inspection following larger storm events, the following is a mandatory inspection schedule.

Frequency	Observation	Maintenance Activity
Spring and Fall	Inspect the storm drain outfall at EX. CB1 near Bank Street. Look for obstructions, vegetation, debris, litter, sediment, etc.	Contact the City of Beacon Highway Department to remove obstructions, sediment, etc.

Spring and Fall	Inspect all catch basins, stormwater manholes and their associated piping. Look for obstructions, vegetation, debris, litter, sediment, etc. blocking the structures or pipes. Utilize vacuum truck if necessary. Observe the flow of water after a rainfall event. Any evidence of ponding in the structure indicates a potential blockage.	Remove obstructions, remove sediment accumulations, etc. via vacuum truck or other acceptable method

3.2.2 Rip Rap Outlet Protection and Rip Rap-lined Overflow Weirs

Rip rap shall be inspected quarterly for sediment build-up, vegetation, debris, litter and obstructions. If sediment builds up enough to fill in the void space between the stones, then the rip rap shall be replaced.

Frequency	Observation	Maintenance Activity
Spring and Fall	Inspect the storm drain outfall rip rap protection at all Flared End Sections. Look for obstructions, vegetation, debris, litter, sediment, etc.	Remove obstructions, sediment, etc.
Spring and Fall	Inspect the rip rap overflow weir at BIO 2. Look for obstructions, vegetation, debris, litter, sediment, etc.	Remove obstructions, sediment, etc.

3.2.3 Hydrodynamic Pretreatment Devices

The hydrodynamic pretreatment device (HPD) requires regular inspection and maintenance to ensure optimal performance. Maintenance frequency will be driven by upstream conditions (contributing drainage area stabilization) and proper maintenance of upstream structures and culvert pipes. The manufacturer recommends that the HPD units be inspected quarterly (at each change of season). The structure shall be visually inspected for blockages or obstructions in the inlet or separation screen. The inspection should also quantify accumulation of hydrocarbons, sediment and trash within the system. Inspections and maintenance shall be performed by qualified personnel with adequate training in these types of units. The units shall be cleaned by vacuum truck once a year (except for the first year where more frequent cleanings may be required).

Frequency	Observation	Maintenance Activity
Quarterly (at each change of season)	The structures shall be visually inspected for blockages or obstructions in the inlet or separation screen. The inspection should also quantify accumulation of hydrocarbons, sediment and trash within the system.	Remove obstructions, sediment, etc. via vacuum truck or other acceptable method

3.2.4 Infiltration Basin

Infiltration basins shall be inspected monthly for sediment and debris accumulation. Inflow pipes, outlet structures and spillways should also be inspected for sediment and debris monthly. Any accumulated sediment or debris should be removed as necessary. After storm events, the infiltration basin's dewatering duration should also be monitored. The basin floor shall be mowed when the grass reaches a height of 18". Sediment shall be cleaned out of the basin annually.

Frequency	Observation	Maintenance Activity
After several storm events or after an extreme storm event	Inspect outfalls and other areas for signs of erosion, signs of mulch movement out of the treatment area, signs of damaged plants or dead or diseased vegetation. Observe dewatering capability.	Repair areas of erosion and replace dead, diseased or damage plants. If it takes longer than 24 hours to dewater the Infiltration Basin, the valve on the underdrain shall be opened slightly to provide full dewatering in 24 hours.
Spring and Fall	Inspect inflow and outflow points for erosion or clogging. Inspect trees, shrubs and other vegetation to evaluate their health and replace any dead or diseased vegetation. Inspect surrounding drainage area for erosion or signs of sediment delivery to the Infiltration Basin.	Remove any invasive plant species. Remove clogs from the stormwater system inflow and outflow components.
Annually	Check for signs of vegetation overgrowth. Observe dewatering capability. Check fertilizer, and test soils for pH.	Harvest overgrown vegetation and remove from the Infiltration Basin. If it takes longer than 24 hours to dewater the Infiltration Basin, the valve on the underdrain shall be opened slightly to provide full dewatering in 24 hours. If the pH is below 5.2, lime should be applied. If the pH is above 7.0 to 8.0, iron sulfate plus sulfur can be applied to reduce the pH.
2 to 3 years		If dewatering is a problem, core aeration of cultivating un-vegetated areas may be required to ensure adequate filtration.

3.2.5 Bioretention Areas

Bioretention areas shall be inspected by a licensed professional acceptable to the City of Beacon.

Frequency	Observation	Maintenance Activity
After several storm events or after an extreme storm event	Inspect outfalls and other areas for signs of erosion, signs of mulch movement out of the treatment area, signs of damaged plants or dead or diseased vegetation. Observe dewatering capability.	Replace mulch as needed, repair areas of erosion and replace dead, diseased or damage plants. If it takes longer than 24 hours to dewater the bioretention area, the valve on the underdrain shall be opened slightly to provide full dewatering in 24 hours.
Spring and Fall	Inspect inflow and outflow points for erosion or clogging. Inspect trees, shrubs and other vegetation to evaluate their health and replace any dead or diseased vegetation. Inspect surrounding drainage area for erosion or signs of sediment delivery to the bioretention area.	Remove any invasive plant species. Remove clogs from the stormwater system inflow and outflow components.
Annually	Check for signs of vegetation overgrowth. Observe dewatering capability. Check fertilizer, and test soils for pH.	Harvest overgrown vegetation and remove from the bioretention area. If it takes longer than 24 hours to dewater the bioretention area, the valve on the underdrain shall be opened slightly to provide full dewatering in 24 hours. If the pH is below 5.2, lime should be applied. If the pH is above 7.0 to 8.0, iron sulfate plus sulfur can be applied to reduce the pH.
2 to 3 years		Replace mulch over entire area. If dewatering is a problem, core aeration of cultivating un-vegetated areas may be required to ensure adequate filtration.

3.2.5.1 Bioretention Areas Long Term Landscape Monitoring Plan

Installed plants within the stormwater facilities shall be evaluated for their physical condition, placement, species and quantity of plants. A report log describing the installation of the plantings as described above shall be issued to the City by the site Landscape Architect supervising construction. Following site stabilization, the Owner or Owner's Landscape Architect (LA) shall

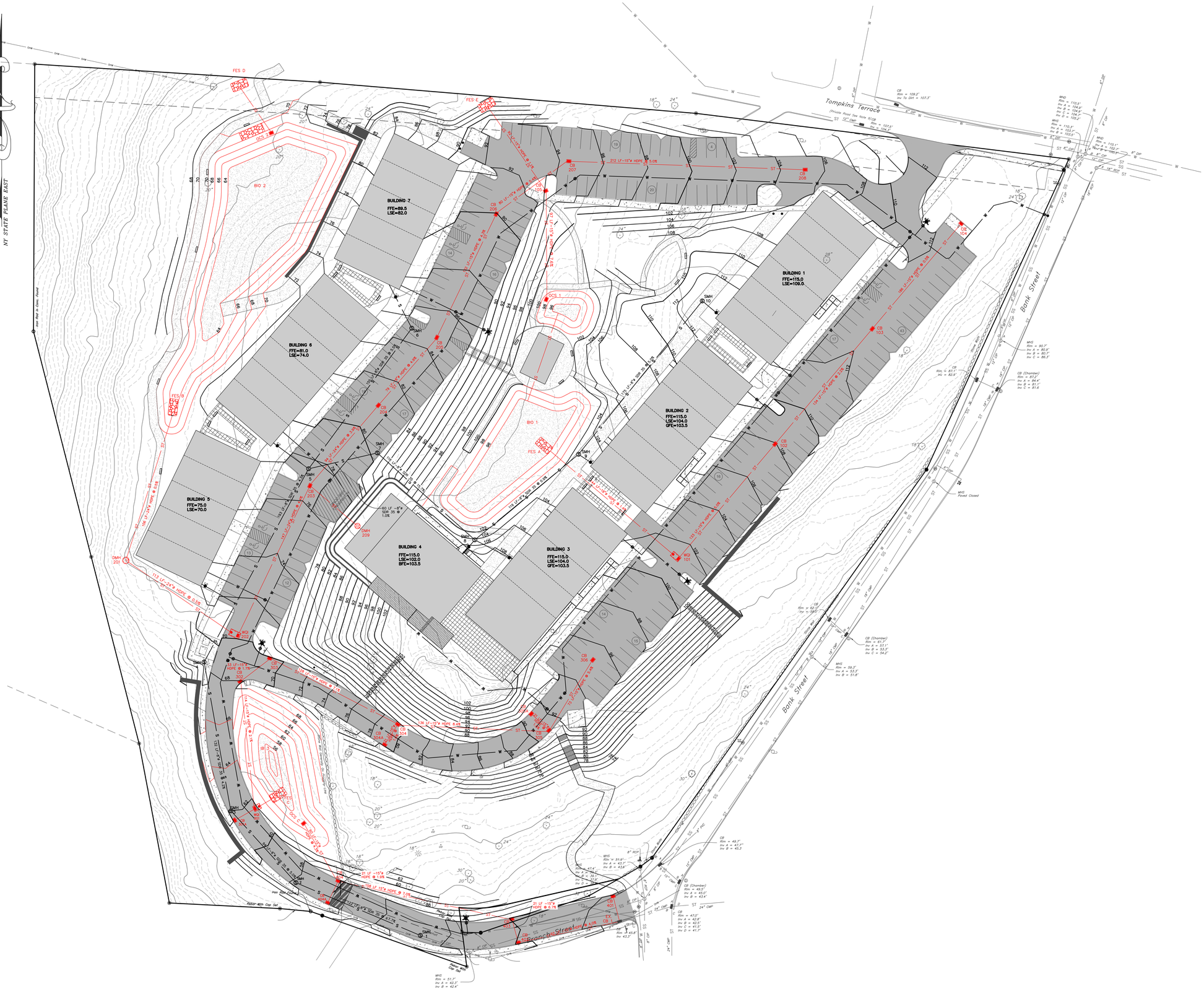
periodically inspect the installed landscaping within the stormwater practices. Each newly installed plant shall be inspected quarterly during the first year, and annually thereafter for a period of five (5) years, for invasive species, overall plant health, quantity of plants, evidence of erosion around roots and plant damage. Any damaged, diseased or dead plants shall be replaced in kind. Every year dating from the start of construction for each phase, the owner's LA shall submit an annual report to the City of Beacon. The reports shall include photographs, field logs and percentage of plant survival in all stormwater facilities.
The post monitoring plans shall be as follows:
(a) The first inspection of newly planted areas shall become the baseline standard for the quantity, diversity, size and aerial/ground coverage of new plantings. All subsequent monitoring shall see appreciable improvements in plant sizes according to specific growth habits of each species, no appreciable changes in plant quantity and diversity, and appreciable improvements in aerial and ground coverage.
(b) The monitoring plan shall include a description of typical maintenance practices and specify replacement for plants lost or those in poor health to maintain standards of size, diversity, quantity, and coverage. Minimum aerial/ground coverage shall be 80%. At minimum, species diversity shall remain as designed. Plant viability shall be a minimum of 80% of the post construction baseline. Invasive plants shall make up less than 15% of the total number of plants. Natural plant colonizers shall be counted provided they do not decrease the planned diversity and they are not considered invasive plants.
(c) Inspections, maintenance and reporting shall continue in perpetuity after the end of the season in which the plant installations are completed.
(d) Inspection and maintenance shall be performed by a qualified professional acceptable to the City.
(e) The plan shall include a description of the methodology used to assess conditions in the field and a sample field-inspection check list to be used during inspections. Field check lists and photographs of areas subject to monitoring shall be submitted with each annual report. Remediation, such as removal of invasive species or replacement of plants shall be required if the post-construction standards are not met.
(f) Maintenance shall include manual watering of newly installed plants during the growing-in period if an agreed-upon standard for natural rainfall is not met during the first growing season. Removal of invasive species shall also be part of mandatory maintenance during the growing-in period.

4.0 LOG BOOK

All inspection reports shall include the date, weather conditions on the day of the inspection and leading up to the inspection, a list of the stormwater management system components that were inspected, the results of the inspection, and the maintenance performed. The inspection reports shall be kept within a log book for long term monitoring. Additional notes and significant repairs should be noted with applicable dates and also kept within the log book. In addition to the required reporting noted in Section 3.1, a copy of all inspection reports shall be made available to the City of Beacon Building Department upon request.

APPENDIX A

Operation & Maintenance Plan



LEGEND:

- RL● EXISTING ROOF LEADER LOCATION
- SEWER MANHOLE
- UNKNOWN MANHOLE
- GUY WIRE ANCHOR
- UTILITY POLE
- ELECTRIC BOX
- HYDRANT
- WATER VALVE
- ROUND DROP INLET
- ELECTRIC METER
- UTILITY POLE WITH LIGHT
- COMMUNICATION BOX
- OVERHEAD WIRES
- FENCE
- DROP INLET
- GAS METER
- LAMP
- UNKNOWN VALVE
- EXISTING WATER EDGE
- PROPOSED EASEMENT LINE
- CB 3 PROPOSED CATCH BASIN WITH INLET PROTECTION
- PROPOSED CLEANOUT
- PROPOSED HYDRANT
- PROPOSED WATER VALVE
- PROPOSED SANITARY MANHOLE
- PROPOSED RETAINING WALL
- ST PROPOSED CULVERT
- PROPOSED UNDERDRAIN
- PROPOSED ROOF LEADER PIPE
- 121 PROPOSED MINOR CONTOUR
- 120 PROPOSED MAJOR CONTOUR
- PROPOSED SPOT ELEVATION
- EXISTING CATCH BASIN
- EXISTING UTILITY POLE
- CO PROPOSED CLEANOUT
- S PROPOSED SEWER SERVICE LINE
- W PROPOSED WATER SUPPLY LINE
- PROPOSED FENCE
- IMPERVIOUS SURFACE
- PROPOSED RIP RAP
- UTILITY CROSSING LOCATION
- RL● PROPOSED ROOF LEADER LOCATION
- WS PROPOSED WATER SERVICE LINE
- PROPOSED WATER SHUT-OFF VALVE

INSPECTION SCHEDULE & LONG TERM MAINTENANCE OF STORMWATER STRUCTURES

CATCH BASINS AND PIPING:

ALL CATCH BASINS SHALL BE INSPECTED AFTER EACH STORM EVENT FOR SEDIMENT ACCUMULATION, AND DEBRIS, AND REMOVE AS NECESSARY. WHEN SEDIMENT ACCUMULATION WITHIN THE CATCH BASIN SUMP REACHES 1/2 OF THE SUMP DEPTH, IT SHALL BE REMOVED. ASSOCIATED PIPING SHALL BE INSPECTED ANNUALLY AND ACCUMULATED SEDIMENT SHALL BE REMOVED AS NEEDED.

HYDRODYNAMIC DEVICES:

THE VORTEX UNITS SHALL BE INSPECTED QUARTERLY DURING THE FIRST YEAR OF OPERATION. THE MANUFACTURER RECOMMENDS THAT THE CDS UNITS BE INSPECTED BI-ANNUALLY (ONCE IN THE SPRING AND ONCE IN THE FALL). THE STRUCTURE SHALL BE VISUALLY INSPECTED FOR BLOCKAGES OR OBSTRUCTIONS IN THE INLET OR SEPARATION SCREEN. THE INSPECTION SHOULD ALSO QUANTIFY ACCUMULATION OF HYDROCARBONS, SEDIMENT AND TRASH WITHIN THE SYSTEM. INSPECTIONS AND MAINTENANCE SHALL BE PERFORMED BY QUALIFIED PERSONNEL WITH ADEQUATE TRAINING IN THESE TYPES OF UNITS. THE UNITS SHALL BE CLEANED BY VACUUM TRUCK ONCE A YEAR (EXCEPT FOR THE FIRST YEAR WHERE MORE FREQUENT CLEANINGS MAY BE REQUIRED).

INFILTRATION BASIN:

THE INFILTRATION BASIN SHALL BE INSPECTED MONTHLY FOR SEDIMENT AND DEBRIS ACCUMULATION. INFLOW PIPES, OUTLET STRUCTURES AND SPILLWAYS SHOULD ALSO BE INSPECTED FOR SEDIMENT AND DEBRIS MONTHLY. ANY ACCUMULATED SEDIMENT OR DEBRIS SHOULD BE REMOVED AS NECESSARY. PLANTINGS SHALL BE INSPECTED MONTHLY FOR HEIGHT, FERTILIZER, QUANTITY AND UNAUTHORIZED INVASIVE OR INAPPROPRIATE SPECIES. AFTER STORM EVENTS, THE INFILTRATION BASIN DEWATERING DURATION SHOULD ALSO BE MONITORED. THE BASIN FLOOR SHALL BE MOWED AS REQUIRED; HOWEVER, THE GRASS HEIGHT SHALL NOT EXCEED 18". SEDIMENT SHALL BE CLEANED OUT OF THE INFILTRATION BASIN ANNUALLY.

POST CONSTRUCTION NOTES:

1. UPON COMPLETION OF CONSTRUCTION OF THE STORMWATER FACILITIES, AS-BUILT DRAWINGS OF ALL STORMWATER PRACTICES AND AN OPERATION AND MAINTENANCE PLAN MANUAL SHALL BE PROVIDED TO THE CITY OF BEACON.

SNOW STORAGE NOTES:

1. THE SITE OWNER WILL UTILIZE A LOADER TO MOVE SNOW TO THE AREAS DESIGNATED FOR SNOW STORAGE.

SITE CLEARING NOTES:

1. SITE SHALL OCCUR BETWEEN OCTOBER 1ST THROUGH MARCH 31ST IN ACCORDANCE WITH NYSDEC REGULATIONS.

REVISIONS:

NO.	DATE	DESCRIPTION	BY

Operation & Maintenance Plan
Scale: 1" = 30'

Operation & Maintenance Plan
Sheet 1 of 1

Owner:
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Edgewater
Beacon, New York
Scale: 1" = 30'
January 31, 2017