Stormwater Management Report

12 Farnsworth Street Repositioning

12 Farnsworth Street
Boston, MA 02210
16 February 2022
(Revised 18 February 2022)

SGH Project 210659

COMMONWEALTH OF MASSACHUSETTS
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Table of Contents

Contents

Page

1. INTRODUCTION 1

2. OBJECTIVE 2

3. BACKGROUND 3

4. REVIEW OF DOCUMENTS 4

5. EXISTING SITE CONDITIONS 5

6. PROPOSED SITE CONDITIONS 7

7. EROSION AND SEDIMENTATION CONTROL 10

8. CLIMATE CHANGE AND ADAPTATION PLANNING CONSIDERATIONS 11

9. ANALYSIS 12
   - 9.1 Method of Calculation 12
   - 9.2 Sources of Data 12
   - 9.3 Rainfall Depths 12
   - 9.4 Ground Cover 13
   - 9.5 Soil Conditions 13
   - 9.6 Recharge Volume Calculations 14
   - 9.7 Existing Site Conditions Runoff Calculations 15
   - 9.8 Proposed Site Conditions Runoff Calculations 15
   - 9.9 Water Quality Volume 16

10. MASSDEP STORMWATER MANAGEMENT STANDARDS 18
   - 10.1 Standard #1 – No New Untreated Discharges 18
   - 10.2 Standard #2 – Peak Rate Attenuation 18
   - 10.3 Standard #3 – Recharge 19
   - 10.4 Standard #4 – Water Quality 19
   - 10.5 Standard #5 – Land Uses with Higher Potential Pollutant Loads (LUHPPLs) 19
   - 10.6 Standard #6 – Stormwater Discharges within Zone II or Interim Wellhead Protection Area and Stormwater Discharges Near/to Critical Areas 19
   - 10.7 Standard #7 – Redevelopment 19
   - 10.8 Standard #8 – Stormwater Pollution Prevention and Erosion and Sedimentation Control 19
   - 10.9 Standard #9 – Operation and Maintenance Plan and Long-Term Pollution Prevention Plan 20
   - 10.10 Standard #10 – Prohibition of ILLICIT Discharges 20

FIGURES

Figure 1 – USGS Site Location Map
Figure 2 – Hydrologic Soil Group Plan
Figure 3 – Pre-Development Catchment Areas Plan
Figure 4 – Post Development Catchment Areas Plan

APPENDICES

Appendix A Checklist for Stormwater Report
Appendix B Geotechnical Report / NRCS Data/ USGS Surficial Geology Map
Appendix C Northeast Regional Climate Center Extreme Precipitation Table
Appendix D HydroCAD Input/Output Data
Appendix E Recharge Calculations
Appendix F Operation and Maintenance Plan & Long-Term Pollution Prevention Plan

1. INTRODUCTION

Simpson Gumpertz & Heger Inc. (SGH) prepared this Stormwater Management Report on behalf of Phase 3 Real Estate Partners (P3RE) for its proposed building renovation (Project) located at 12 Farnsworth Street, Boston, Massachusetts (Site) and the related proposed exterior utility upgrades at the adjacent parcel, 11 Sleeper Street, Boston, Massachusetts. This report summarizes the proposed stormwater management plan and relevant analyses for the Project. Refer to the drawing set (attached under separate cover) titled "12 Farnsworth Street/11 Sleeper Street Notice of Intent Drawings," prepared by SGH and dated 16 February 2022 for the proposed scope of improvements.

2. OBJECTIVE

The objective of the proposed stormwater management improvements is to provide long-term protection of natural resources downstream of the Site from degradation as a result of stormwater discharges from the Site and to comply with the Massachusetts Stormwater Standards. The following sections describe the specific improvements to be implemented at the Site.

3. BACKGROUND

The existing building at 12 Farnsworth Street in South Boston is six stories and is currently being utilized as office space. The building encompasses much of the parcel, and the remaining parcel area consists of a concrete patio adjacent to Farnsworth Street. A private alleyway (Westerly Passageway) runs along the northwestern side of the property line. The Westerly Passageway is currently used for pedestrian access to the neighboring parcels and contains subsurface utilities that serve the building. The westerly passageway contains a narrow gravel curbed area that houses certain mechanical equipment that serve the building, as well as the loading and receiving dock. The building is currently served by a transformer that is located on 11 Sleeper Street, the adjacent property to the north of the site, and the westerly passageway.

The Project includes interior renovations to convert the all-office space to a mixed-use research and development and office space. In addition, the Project requires several utility upgrades to support the change of use, including new domestic water, fire protection water, sanitary sewer, storm drain, gas, and electric services. The Project also includes an upgraded transformer and concrete pad on the 11 Sleeper Street lot. Trenching within Farnsworth Street, the adjacent private alleyway, and the westerly passageway is required to construct the new services.

The Boston Water and Sewer Commission (BWSC) and Groundwater Conservation Overlay District (GCOD) require the first inch of Runoff from the 12 Farnsworth building area is captured and infiltrated within 72 hours. To fulfill this requirement, the Project includes a sub-surface recharge system within the building, below the existing building slab.

The site, including the 11 Sleeper Street parcel, is mapped within the 100-year floodplain, a regulated wetland resource, and is therefore under the jurisdiction of the City of Boston Conservation Commission. The Project does not include drainage improvements or additional scope of work outside of the project site and 11 Sleeper Street. The scope of this Stormwater Management Report is limited to drainage improvements within the proposed limits of construction for the Project as indicated on the NOI Drawings.

4. REVIEW OF DOCUMENTS

We reviewed the following record documents.

- Plan titled "ALTA/ACSM Land Title Survey, #22 Boston Wharf Road, #12, #17 & #29 Farnsworth Street & #11 Sleeper Street, Boston, Mass" prepared by Feldman Land Surveyors and dated 25 August 2015.
- Plan titled "Existing Conditions Plan, 11 Sleeper Steet, 12 Farnsworth Street, Boston, (South Boston) Mass" prepared by Feldman Geospatial and dated 17 October 2021.
- Plans titled "As-Built Plan (Z123-25 and Z123-26)" prepared by the Boston Water and Sewer Commission and dated 02 February 2010.
- Geotechnical report titled "Geotechnical Design Recommendations, Soil Quality Data for Disposal, and Construction Considerations, Proposed 12 Farnsworth Street Renovation, Boston, Massachusetts" prepared by Haley & Aldrich, Inc. and dated 18 January 2022.

5. EXISTING SITE CONDITIONS

We base our current understanding of the existing (current) site conditions on visual field observations, topography from a formal field survey, and review of available record drawings.

We delineated the existing site into three (3) watershed subcatchment areas designated as "Existing Watershed Area – 12 Farns" (EWA-12F), "Existing Watershed Area – 11 Sleeper" (EWA-11S), and "Existing Watershed Area – Westerly Passageway" (EWA-WP), as indicated on Figure 3. The existing subcatchments discharge to Design Point 1 (DP-1), an existing 18 in. PVC BWSC storm drain in Farnsworth Street, as indicated on Figure 3, and eventually discharge to the Fort Point Channel through the BWSC drainage infrastructure within Congress Street.

EWA-12F encompasses the entire 12 Farnsworth Street parcel. EWA-12F consists of impervious roof area, an impervious concrete patio area, and impervious brick sidewalk area. The Site is relatively flat around the building. Runoff from the roof area is conveyed via internal roof drains and other plumbing appurtenances and discharges directly to the existing 18 in, PVC main in Farnsworth Street via an existing storm drain service lateral. The remaining concrete patio and sidewalk area Runoff is conveyed via surface flow to Farnsworth Street, where it enters the storm drain system via existing BWSC catch basins.

EWA-11S consists of the northeastern portion of the 11 Sleeper Street parcel, where the existing transformer and appurtenances are located. This area consists of an impervious concrete transformer pad and a pervious mulched area. Runoff from EWA-11S is conveyed via surface flow from the Westerly Passageway to an existing catch basin located within the adjacent unnamed alleyway. Runoff is then conveyed through the BWSC storm drainage system.

EWA-WP consists of the partial area between EWA-12F and EWA-11S, located within the Westerly Passageway between both the 11 Sleeper and 12 Farnsworth parcels. EWA-WP

includes a curbed area directly adjacent to the building and generally consists of gravel, loose dirt, and existing mechanical equipment servicing the building. Runoff is conveyed via surface flow from the Westerly Passageway to an existing catch basin located with the adjacent unnamed alleyway. Runoff is then conveyed through the BWSC storm drainage system.

6. PROPOSED SITE CONDITIONS

The project includes interior renovations to convert the existing office use to a mixed-use facility and the accompanying exterior utility work required to support the proposed use. Existing subsurface utilities within Farnsworth Street and the Westerly Passageway will be cut and capped, and new utilities (e.g., gas, electric, storm drain, sewer, domestic/fire protection water) will be constructed to service the building. The Project includes trenching and the replacement of all surface materials in kind to install the proposed utilities.

BWSC and GCOD require a recharge system, which we are proposing to be constructed below the slab of the project site. The system is sized to store and infiltrate the first inch of rainfall over the building area within 72 hours per BWSC requirements and will overflow to the existing main in Farnsworth Street via a new service lateral for flows exceeding the required volume. A larger 8 ft by 8 ft concrete transformer pad will replace the existing 7-1/2 ft by 6-1/2 ft pad on the 11 Sleeper Street parcel.

The Boston Historical Commission requested new granite pavers surrounding the proposed transformer pad within the existing mulched area. A portion of the existing curbed area within the Westerly Passageway will also be modified to remove existing mechanical equipment and replace the surface material with granite pavers to match the area surrounding the transformer by request of the historical commission. The existing asphalt in the Westerly Passageway and adjacent parking spaces will be repaired as necessary after construction. The proposed granite pavers surrounding the transformer will extend approximately 2 ft into the existing parking area. Proposed pavers will be permeable with a reservoir course capable of storing and recharging the first inch of rainfall.

Other proposed stormwater management improvements for the Project include the groundwater recharge system, which will store and infiltrate the required recharge volume generated from approximately 10,700 sq ft of impervious roof area. The remaining site area will

continue to utilize the existing drainage patterns and infrastructure consisting of catch basins and subsurface piping. No additional impervious area will be added associated with the Project.

The proposed site consists of four (4) subcatchments designated as “Proposed Watershed Area – 12 Farns Roof” (PWA-12FR), “Proposed Watershed Area – 12 Farns Patio” (PWA-12FP), “Proposed Watershed Area – 11 Sleeper (PWA-11S), and “Proposed Watershed Area – Westerly Passageway” (PWA-WP), as indicated on Figure 4. All four proposed subcatchments ultimately discharge to Design Point 1 (DP-1), the existing 18 in. PVC storm drain in Farnsworth Street, as indicated on Figure 4, and eventually downstream to the Fort Point Channel.

PWA-12FR contains most of the site area and consists of the entire roof area of the 12 Farnsworth Street parcel. The roof area is conveyed via internal plumbing to the proposed recharge system, which is sized to store the first inch of rainfall over the roof area and infiltrate the volume within 72 hours. Flows in excess of the capacity of the recharge system will be conveyed to the storm drain main in Farnsworth Street via a proposed 10 in. storm drain service lateral.

PWA-12FP contains the existing concrete patio and sidewalk area adjacent to Farnsworth Street. No additional impervious area for this subcatchment is proposed; all surface materials removed during trenching operations will be replaced in kind. Runoff is conveyed via surface flow to the exiting BWSC storm drain infrastructure in Farnsworth Street.

PWA-11S contains the proposed transformer pad and granite paver system. Some existing paving and mulch areas are being replaced with pervious pavers, as requested by the historical commission, to facilitate the required utility construction within this subcatchment. Runoff from PWA-11S is conveyed via surface flow to the existing BWSC storm drain infrastructure.

PWA-WP contains the curbed area in the Westerly Passageway that is being modified to remove existing mechanical equipment. The existing gravel and dirt surface will be replaced with permeable pavers. Runoff from PWA-WP is conveyed via surface flow to an existing catch basin in the alleyway and into the existing BWSC storm drain piping infrastructure.

7. EROSION AND SEDIMENTATION CONTROL

The proposed utility upgrades will require excavations of varying depths within Farnsworth Street, the Westerly Passageway and the Alleyway adjacent to the site in order to install the new service laterals and connect to their respective mains. We expect the Contractor will use hydraulic excavators and hand methods as required to perform the excavation. Excavated soils will be reused to the maximum extent practicable and all surface materials will be replaced in kind to their original condition or better. Soils not suitable for reuse will be handled in accordance with recommendations from the Geotechnical Engineer of Record and will comply with all City, State, and Federal disposal requirements. Soils excavated within the building for the proposed recharge system will be handled similarly to the soil excavated for the proposed exterior utilities.

The contractor is responsible for preparing a Stormwater Pollution Prevention Plan (SWPPP) prior to construction (see section 9.8 – Standard #8). Silt Sack, or an approved equal, will be utilized in the catch basins immediately downstream of the proposed work as indicated on the NOI plans. Silt Sock, or an approved equal, will surround the affected 11 Sleeper Street area and the Westerly Passageway as indicated on the NOI plans to minimize the transportation of sediment during construction. Use of silt sock within Farnsworth Street is impracticable as the thoroughfare will remain operational to the maximum extent practicable during construction. The contractor will be responsible for providing additional erosion control measures and for ensuring proposer housekeeping is provided as required during construction. Maintenance of the erosion control measures will be described in the SWPPP and will, at a minimum, follow all manufacturers' recommendations.

8. CLIMATE CHANGE AND ADAPTATION PLANNING CONSIDERATIONS

The site is subject to the impacts of climate change, which heighten the importance of future resiliency considerations. The scope of exterior work for this project is limited to primarily utility upgrades to support a change in building use, and accordingly, comprehensive exterior flood resiliency measures are not included in the scope of work at this time. The impervious area existing building will not significantly change as part of the limited exterior work and, thereby, will not increase the associated urban heat effect. Additionally, the existing building is considered historic and is thereby exempt from flood requirements for the building, as they are very difficult to implement successfully on historic structures. The owner understands the associated flood risk and will evaluate deploying temporary flood barriers to protect vulnerable locations in the future from increased flood elevations.

9. ANALYSIS

9.1 Method of Calculation

We utilized the Soil Conservation Service (SCS) Technical Release No. 20 (SCS Unit Hydrograph runoff procedure), SCS Technical Release No. 55 (Runoff Curve Numbers and calculating Time of Concentration), and rainfall data obtained from the Northeast Regional Climate Center to perform the hydrologic analysis for the site. The hydrologic model was created and calculated with HydroCAD, Version 10.0 software, developed by Applied Microcomputer Systems. We used synthetic Type III 24-hr storm for the calculations. The reach routing calculations were modeled using the Storage-Indication plus Translation Method, and the pond routing calculations were modeled using the Storage-Indication Method as applicable.

9.2 Sources of Data

- SCS Technical Release No. 20 (TR-20).
- SCS Technical Release No. 55 (TR-55).
- Northeast Regional Climate Center (NRCC); Extreme Precipitation in Massachusetts. (Appendix C).
- United States Geological Survey (USGS) Surficial Geology Maps. (Appendix B)
- Natural Resources Conservation Service (NRCS) Soil Survey of Suffolk County, Massachusetts. (Appendix B).
- January 2022 Site Specific Geotechnical Report (Performed by Haley & Aldrich). (Appendix B).

9.3 Rainfall Depths

In accordance with the DEP Stormwater Management Guidelines, we analyzed the 2, 10, 25, and 100-Year storm events. The following are the rainfall depths used for each storm event.

Table 1 - Rainfall Depths

Storm Event	24 Hour Rainfall
2-Year	3.26 in.
10-Year	4.90 in.
25-Year	6.19 in.
100-Year	8.81 in.

9.4 Ground Cover

The overall hydrologic study area for the proposed redevelopment is 21,500 square feet (0.49 acres). Table 2 below summarizes the ground cover distribution for the hydrologic study area for existing and proposed conditions.

Table 2 - Ground Cover Distribution - Hydrologic Area

Area	CN	Existing (sf)	Proposed (sf)
Hydrologic Soils Group B			
Concrete/Isolated Impervious	98	1,505	1,505
Gravel	96	202	73
Mulch	79	260	57
Roof	98	10,700	10,700
Permeable Paver	68[1]	0	358
Westerly Passageway Asphalt[2]	98	26	0
Total		**12,693**	**12,693**

9.5 Soil Conditions

Based on USGS publication "Surficial Materials Map of the Boston South Quadrangle, Massachusetts," compiled by Byron D. Stone and Mary L. DiGiacomo-Cohen, and dated 2018, the surficial soils at the Site are likely artificial fill deposits typically used in urban-development area. The artificial fill deposits are likely underlain by glacial deposits of coarse glaciofluvial and glaciodeltaic sediments that are graded to the glaciomarine sea level. Refer to Appendix B for more information.

[1] A composite curve number for the permeable pavers was calculated based on an assumed 12 in. stone base reservoir course with 40% voids.

[2] The proposed paver system extends into the existing parking area approximately 2 feet. Refer to the NOI drawings.

The subsurface soil investigation performed by Haley and Aldrich consisted of one soil boring and one test pit. The soil boring indicated marine deposits overlain with organic deposits overlain with fill. The fill soils generally consisted of very loose to loose silty sand with gravel and trace bricks and very soft organic soil and lean clay. The soil boring indicated that the fill layer is approximately 19 ft thick, underlain by 20 ft of organic deposits, which are underlain by marine deposits. Haley and Aldrich classified the existing fill materials on site as NRCS Hydrologic Soil Group (HSG) B for design purposes. Groundwater was found approximately 7.2 ft below the ground surface (El. 6.8 Boston City Base Datum [BCB]).

The site is predominantly covered by a mix of paved areas, gravel surfaces, mulched areas, and roof area and as described above has varying HSG designations based on the USDA National Cooperative Soil Survey. We assigned the following Natural Resources Conservation Service (NRCS) Curve Numbers (CN) for the different ground covers as follows:

- Impervious (i.e., pavement, concrete, & roofs): CN=98
- Mulch over HSG B Soil: CN=79
- Gravel Surface CN=96
- Permeable Granite Pavers: CN=68

9.6 Recharge Volume Calculations

The required recharge volume represents a depth of runoff equivalent to 1.0 inch of rainfall over the roof area in accordance with Article 32 of the Boston Zoning Code. The required recharge volume is calculated using Equation 1 below. Impervious area coverage, corresponding cover type, and corresponding target depth factors for each HSG for the post-development site are reported in Table 3.

Equation 1: Recharge Volume

$$R_v = F\ x\ impervious\ area$$

$$where,$$
$$R_v = Required\ Recharge\ Volume\ [cubic\ feet]$$
$$F\ = Target\ Depth\ Factor\ with\ each\ HSG$$

Table 3 - Required Recharge Volume[3]

Impervious Area & Corresponding Cover Type			
NRCS Hydrologic Soil Type	**Total Proposed Impervious Area over Soil Type (SF)**	**Target Factor (F) (in)**	**Required Recharge Volume (cf)**
Roof Area	10,700	1.0	892
Total Required Recharge Volume:			**892**

Haley and Aldrich performed a falling head is-situ permeability test within the test boring. Haley and Aldrich recommended an infiltration rate of 0.3 in./hour for design of the recharge system. See Appendix E for the Recharge System Storage Table and Recharge Calculations.

9.7 Existing Site Conditions Runoff Calculations

Figure 3 indicates the existing drainage sub-catchments and parameters we used in the analysis. We generated runoff hydrographs using SCS TR-20 and TR-55 methodology to determine the peak rate of discharge for existing conditions. See Appendix D for HydroCAD Input/Output Data. Table 4 below summarizes the existing peak rates of Runoff.

Table 4 - Existing Peak Runoff Rates

Peak Runoff (cubic feet per second)[4]				
Design Point	**2-Year Storm**	**10-Year Storm**	**25-Year Storm**	**100-Year Storm**
DP-1	0.95	1.44	1.82	2.60

9.8 Proposed Site Conditions Runoff Calculations

Figure 4 indicates the proposed drainage sub-catchments and parameters we used in the analysis. We generated runoff hydrographs using SCS TR-20 and TR-55 methodology to

[3] Refer to Appendix E for recharge calculations.
[4] The peak runoff rates only include flows generated from within the limit of work as shown on the NOI drawings. The provided runoff rates do not represent the total flow rate in the BWSC system generated from flows outside the limit of work.

determine the peak rate of discharge for proposed conditions. See Appendix D for HydroCAD Input/Output Data. Table 5 below summarizes the proposed peak rates of Runoff.

Table 5 - Proposed Peak Runoff Rates

Peak Runoff (cubic feet per second)[3]				
Design Point	**2-Year Storm**	**10-Year Storm**	**25-Year Storm**	**100-Year Storm**
DP-1	0.91	1.40	1.79	2.56

9.9 Water Quality Volume

We calculated Water Quality Volume in accordance with the methodology described for Standard 4 in Chapter 1 of Volume 3 of the Massachusetts Stormwater Handbook, published in February 2008. The required water quality depth is 0.5 inches. We calculated the total water quality volume using Equation 2 and reported in Table 7 below using a water quality depth of 1.0 in. to be consistent with requirements of Article 32 of the Boston Zoning Code. The proposed runoff drainage patterns are consistent with the existing drainage patterns, and no added impervious area is proposed. The proposed permeable pavers do not require pretreatment because no impervious area is routed through the paver system.

Equation 2: Water Quality Treatment Volume

$$\boldsymbol{V_{WQ} = (D_{WQ}/inches/foot) * (A_{IMP} * 43,560\ square\ feet/acre)}$$

$where,$
$V_{WQ} = Required\ Water\ Quality\ Volume\ [cubic\ feet]$
$D_{WQ} = Water\ Quality\ Depth: 1\ inch$
$A_{IMP} = Impervious\ Area\ [acres]$

The proposed impervious area in PWA-11S and PWA-WP is routed into the permeable paver system, designed to capture and infiltrate the first inch of Runoff. The Runoff is treated via infiltration.

Table 6 - Ground Cover Distribution - Hydrologic Area to Permeable Paver

Area	Proposed (sf)
Permeable Pavers	358
Transformer Pad	64
Total	**422**

Table 7 - Water Quality Volume[5]

Water Quality Volume			
Area (sf)	Water Quality Runoff Depth (in.)	Water Quality Volume Required (cf)	Water Quality Volume Provided (cf)
422	1.0	35	143

[5] Refer to Appendix E.

10. MASSDEP STORMWATER MANAGEMENT STANDARDS

The ten standards contained in the DEP Stormwater Management policy relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control, and stormwater maintenance. The following summarizes the proposed Project's compliance with the Stormwater Management Standards.

10.1 Standard #1 – No New Untreated Discharges

The Project does not propose any new untreated discharges. The Project implements stormwater quality controls, including source controls, as part of the long-term pollution prevention plan, including groundwater recharge.

10.2 Standard #2 – Peak Rate Attenuation

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development discharge rates.

We generated runoff hydrographs for 2, 10, 25, and 100-Year, 24-hour storm events using the SCS TR-20 Method and Type III rainfall distribution.

Table 11 below summarizes the pre- and post-development peak runoff discharge rates determined in the hydrologic/hydraulic analyses and show no increase in peak rates under proposed conditions.

Table 11 - Comparison of Peak Runoff Rates

Peak Runoff (cubic feet per second)												
Pre-Development Conditions vs. Proposed Conditions												
Design Point	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	0.95	0.91	-0.04	1.44	1.40	-0.04	1.82	1.79	-0.03	2.60	2.56	-0.04

10.3 Standard #3 – Recharge

The sub-slab recharge system and exterior permeable pavers provide sufficient storage to accommodate the required recharge volume. This project complies with Standard #3.

10.4 Standard #4 – Water Quality

The proposed runoff drainage patterns are consistent with the existing drainage patterns on site. The proposed recharge system and the permeable pavers provide water quality treatment that improves the existing treatment of stormwater for the site.

10.5 Standard #5 – Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The site is not considered a land use with Higher Potential Pollutant Loads (LUHPPLs); therefore, the project complies with standard #5.

10.6 Standard #6 – Stormwater Discharges within Zone II or Interim Wellhead Protection Area and Stormwater Discharges Near/to Critical Areas

The proposed improvements are not located within a Zone II or an Interim Wellhead Protection Area.

10.7 Standard #7 – Redevelopment

Redevelopments include development, rehabilitation, expansion, and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area and improves existing conditions. The proposed project does not increase overall impervious area and improves existing conditions. The project is considered a redevelopment project and complies with standard #7.

10.8 Standard #8 – Stormwater Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention Plan has not been included in the Stormwater Report but will be prepared by the Contractor and submitted before land disturbance begins. The NOI drawings (attached under separate cover) include provisions for erosion and sedimentation control that will be incorporated into the SWPPP.

The SWPPP will be prepared by the contractor describing the specific practices, installation methods, and inspection requirements for temporary and permanent erosion prevention and sediment control practices. The SWPPP will follow the template developed by the U.S. EPA. At a minimum, the SWPPP will include the following measures:

- Minimize the extent and time of exposed soils;
- Provide perimeter sediment control, including silt fence and/or compost filter tubes;
- Provide catch basin inlet protection, including geotextile filter fabric and gravel drop;
- Minimize sediment track out with stabilized construction exits;
- Control discharges from soil stockpiles include temporary erosion control measures and perimeter sediment controls;
- Minimize dust;
- Temporary stormwater management practices including basins, traps, and swales;
- Dewatering requirements;
- Temporary and permanent stabilization requirements, including seeding, mulching, and matting;
- Good housekeeping pollution prevention measures;
- Maintenance requirements; and
- Inspection, recordkeeping, and reporting requirements.

10.9 Standard #9 – Operation and Maintenance Plan and Long-Term Pollution Prevention Plan

Maintenance of the stormwater management system will be the responsibility of the Owner. A site-specific Operations and Maintenance Plan and Long-Term Pollution Prevention Plan is included in Appendix F.

10.10 Standard #10 – Prohibition of ILLICIT Discharges

To the best of the Owners and Engineer's knowledge, no illicit discharges exist at the Site.