Stormwater Management Report

Mount Holyoke College
Community Center with Dining

Prepared for

Mount Holyoke College

February 25, 2016

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EXECUTIVE SUMMARY

On behalf of the Mount Holyoke College, Green International Affiliates, Inc. (Green), working as the civil engineering subconsultant to Bergmeyer Associates, Inc. (Bergmeyer) is submitting this Stormwater Management Report to accompany the Notice of Intent Application to the Conservation Commission for new additions to the Mount Holyoke College located 50 College Street in South Hadley, MA.

Mount Holyoke College plans to build a new building for the Centralized Dining & Community Center that is adjacent to the Blanchard Hall, consolidating all food service operations within the new building and allowing the ground floor of Blanchard Hall to be reprogrammed with new community center space as needed. The new building is about 35,100 sf.

The project is categorized as a "New Development" project under the Massachusetts Stormwater Management Standards and thus needs to meet the Stormwater Standards to the full extent.

This project will effect an increase in impervious area of approximately 0.57 acres as associated with the proposed development, including the new building/building addition, associated walkways, and generator and transformer pads. As a result, a portion of the stormwater generated will need to be retained prior to discharge into Lower Pond to fully comply with the Wetland Protection Act (WPA) and MassDEP's Stormwater Standards. Flow from the new building will be mitigated through the installation of a subsurface detention vault to achieve the required peak rate attenuation.

The goal of the proposed stormwater improvements is to achieve, at minimum, predevelopment rates and quality of discharged stormwater to the extent that it is practical to do so. The following report was created in accordance with the "Massachusetts Stormwater Handbook" last revised in January 2008. The report is organized into sections that correspond to the categories listed in the Checklist for Stormwater Report. The checklist is included in *Appendix A – Checklist for Stormwater Report* of this report. The following is a more detailed description of the existing and proposed drainage areas and the design methodology for this project.

1.0 PROJECT DESCRIPTION

Mount Holyoke College plans to build a new building adjacent to the existing Blanchard Hall. In addition, the college plans to modify the associated walkways, loading dock driveway, and generator and transformer pads. In conjunction with these additions and changes, new stormwater structures will be installed to incorporate the increase in impervious area and modify the existing stormwater conveyance system. *Figure 1 – Locus Map* shows the project location.

1.1 Topography, Geology and Soils

The project limits include the area bordered by Lower Lake Road, the existing Blanchard Hall building, the existing Wilder Hall building, and the existing Ciruti Center building in South Hadley, MA. This area includes grass areas, landscaped areas and walkways. The Stony Brook and Lower Pond are located to the east of Lower Lake Road, located at the eastern edge of the Mount Holyoke Campus. An orthophoto of the site is shown in *Figure 2 – Aerial Map.*

The topography of the site, which has been modified by development, slopes gently up from Lower Lake Road toward the existing Blanchard Hall building. Trees are located intermittently around the site and along Lower Lake Road.

The existing site drainage consists of three separate hydrologic areas, each of which includes catch basin and drain manhole systems which collect stormwater from the project area and discharge to Lower Pond and/or Stony Brook.

The Natural Resources Conservation Service (NRCS) Soil Survey of Hampshire County, Massachusetts defines the soils within the limit of work as Hydrologic Soil Group (HSG) "A" soils. *Table 1.1 – NRCS Soil Classification* lists the soil designations, soil names and the hydrological soil groups present on the site.

Table 1.1 – NRCS Soil Classification

MAP DESIGNATION STATE/PUBL. SYM.	SOIL NAME	HYDROLOGIC SOIL GROUP
745C	Hinckley-Merrimac-Urban Land Complex	A

A detailed subsurface exploration program was conducted as part of the design on Tuesday, October 27, 2015. Three test pits in the triangular grass area north of Pratt Hall were conducted to determine the suitability of this area to accommodate a proposed stormwater best management practice (BMP). The test pit locations and logs are shown in *Appendix E – Soil Information*. Review of the test pits revealed similar conditions for all three test pits. Based on soil mottles, depth to seasonal high groundwater was estimated at between 3.0 and 3.8 feet below existing grade. Underlying parent material soil was observed to be silty with a HSG "D", indicating that the soil has low capacity for infiltration. The depth to seasonal high groundwater and the HSG both lead to the conclusion that this location is not suitable for infiltration.

Based on these test pits and previously conducted test pits/borings elsewhere on-site, as described in the Preliminary Geotechnical Study prepared by Clarence Welti Associates, Inc., dated October 2015, it appears that the majority of on-site parent material soil below the fill soil are also silty and HSG "D". Refer to *Appendix E – Soil Information* for test pit locations and logs from this testing program.

As a result of the on-site investigation described above, the stormwater design is based on the entire site being comprised of HSG “D” soils.

2.0 LOW IMPACT DEVELOPMENT MEASURES CONSIDERED

To the extent practicable, the MA Stormwater Management Regulations require that the project implement environmentally sensitive site design and Low Impact Development (LID) techniques to manage stormwater.

Key features of LID stormwater management systems include:

- Implementing practices that maintain existing hydrology
- Using decentralized practices to manage stormwater close to the source of generation

The following LID techniques/best management practices will be implemented to mitigate the increase in stormwater runoff from the Site:

- The development plan proposes to minimize disturbance to existing trees and shrubs and disturbance to adjacent wetland resource areas will be avoided.
- Existing drainage structures will be maintained for the areas of the project that will remain unchanged.

3.0 STANDARD 1: NO NEW UNTREATED DISCHARGES

The MA Stormwater Handbook requires that the project demonstrate that there are no new untreated discharges and that new discharges will not cause erosion or scour to downstream wetlands.

The Project will be designed so that no new untreated stormwater conveyances (outfalls/discharges) will be constructed. The Project will not discharge untreated stormwater into surface water, cause erosion to surface water or wetland resource areas.

4.0 STANDARD 2: PEAK RATE ATTENUATION

4.1 Existing Conditions

The existing site consists of the following surface types: impervious areas (i.e. pavement, concrete, and roof area), gravel, and grass areas.

The existing site discharges runoff to the following distinct design points: Lower Pond – South of Blanchard Hall through an existing 30" pipe (Design Point 1), Lower Pond - South of Blanchard Hall through an existing 18" pipe (Design Point 2), and a closed drainage system in Lower Lake Road (Design Point 3), which presumably discharges to Lower Pond or Stony Brook.

Existing drainage areas are delineated in *Figure 4 – Existing Conditions Watershed Plan*. For the purpose of this hydrologic analysis, the following assumption was made:

- The total watershed area for the existing conditions was used as the comparison base for the watershed area in the proposed conditions.

4.1.1 Existing Tributary Areas

Brief descriptions of each tributary area are below (see *Table 4.1 – Existing Conditions Drainage Area Characteristics* for drainage characteristics for each drainage area):

Drainage Area EDA-1

This area consists of the Blanchard Hall building along with the walkways and surrounding grass areas leading up to two nearby buildings on site – Ciruti Center and Wilder Hall. It also includes Lower Lake Road between Blanchard Circle and the Ciruti Center. This system is conveyed through a 30" pipe that discharges to Lower Pond. Prior to discharge, stormwater in this system is treated using an existing offline water quality structure near the discharge to Lower Pond. EDA-1 does not include additional inlets outside the project limits, as these areas remain unchanged during the entire project.

Drainage Area EDA-2

This area consists of the grass area southwest of Blanchard Hall, as well as the Blanchard Circle roadway, which is collected through a closed drainage system. This system is conveyed through an 18" pipe that discharges to Lower Pond. EDA-2 does not include additional inlets outside the project limits, as these areas remain unchanged during the entire project.

Drainage Area EDA-3

This area consists of a small portion of Lower Lake Road that sheet flows off the project limits and is collected by an existing closed drainage system within Lower Lake Road. This system presumably discharges to Lower Pond or Stony Brook.

4.1.2 Existing Drainage Area Summary

The following table summarizes the existing conditions drainage areas:

Table 4.1 – Existing Conditions Drainage Area Characteristics

DRAINAGE AREA	AREA (ACRES)	CURVE NUMBER
EDA-1	3.99	89
EDA-2	0.44	84
EDA-3	0.07	98

4.1.3 Peak Discharge Runoff Rates & Volume

The existing peak flow rates, tributary to the design points, were calculated for the 2-, 10-, and 100-year storm events. Results are presented in *Table 4.3 – Peak Rates of Runoff*.

4.2 Proposed Conditions

4.2.1 Proposed Tributary Areas

Mount Holyoke College plans to add a new building for the Centralized Dining and Community Center adjacent to the existing Blanchard Hall. The project will result in an overall increase of 0.57 acres of impervious area.

The stormwater management system has been designed to meet or reduce peak runoff rates from the project site for the 2-, 10-, and 100-year storm events. Although the project will result in an increase in impervious area on-site, the stormwater management system has been designed to mitigate any increase in the peak rate of stormwater runoff by capturing and temporarily storing runoff during these events. The site is considered new development and will meet this standard to the full extent.

Figure 4 – Proposed Conditions Watershed Plan shows the proposed drainage areas. The proposed stormwater management analysis divides the site into three watershed areas that discharge to three design points. The points of analysis are the same in the proposed condition as in the existing condition.

The following briefly describes the proposed changes to the drainage area.

Drainage Area PDA-1

This area consists of the Blanchard Hall building along with the walkways and surrounding grass areas leading up to two nearby buildings on site – Ciruti Center and Wilder Hall. It also includes Lower Lake Road between Blanchard Circle and the Ciruti Center. It also includes the new building and portions of the impervious adjacent surfaces as shown on *Figure 4 – Proposed Conditions Watershed Plan.* This system is conveyed through a 30” pipe that discharges to Lower Pond.

At the revised loading dock driveway, Deep Sump Catch Basins with Hoods are proposed to capture and treat runoff from the area. Pretreatment for runoff from these areas will be achieved through these deep sump inlet structures. This proposed system will run through a proposed inline water quality structure prior to being directed to the existing offline water quality structure near the discharge to Lower Pond.

The new roof area will flow through roof drains from multiple locations around the new building. The majority of these roof drains will be directed to a proposed subsurface detention vault located in the lawn area south of the new building, then to the existing offline water quality structure near the discharge to Lower Pond. The remaining portion of the roof not tributary to the subsurface detention vault will tie into

the proposed system and will be directed to the existing offline water quality structure near the discharge to Lower Pond without peak rate attenuation.

Existing drainage structures will be maintained for areas of the project that will remain unchanged and will be directed to the existing offline water quality structure near the discharge to Lower Pond without peak rate attenuation.

Drainage Area PDA-2

This area consists of the grass area southwest of Blanchard Hall, as well as the Blanchard Circle roadway, which is collected through a closed drainage system. This system is conveyed through an 18" pipe that discharges to Lower Pond.

The proposed work will result in a reduction in impervious and pervious area in PDA-2.

Drainage Area PDA-3

This area consists of a small portion of Lower Lake Road that sheet flows off the project limits and is collected by an existing closed drainage system within Lower Lake Road. This system presumably discharges to Lower Pond or Stony Brook.

PDA-3 will remain unchanged by the proposed development, as the work will not result in an increase in area (impervious or pervious) and the area will continue to drain using the existing drainage system.

The following table summarizes the proposed conditions drainage areas including the pertinent information used for the hydrologic analysis:

Table 4.2 – Proposed Conditions Drainage Area Characteristics

DRAINAGE AREA	AREA (ACRES)	CURVE NUMBER
PDA-1	4.18	91
PDA-2	0.25	86
PDA-3	0.07	98

4.2.2 Peak Discharge Runoff Rates & Volume

The peak flow rates were calculated for the 2-, 10-, and 100-year storm events under existing and proposed conditions. Although the project will increase impervious area on-site, the stormwater management system has been designed to mitigate any increase in the peak rate of stormwater runoff. Since the impervious area in DA-1 increased, the curve number for this area also increased; however, the proposed subsurface detention vault will result in a decrease in peak rates for this area. The following table represents a comparison between existing and proposed conditions peak rates of runoff from the proposed development tributary to each discharge point.

Table 4.3 – Peak Rates of Runoff (cfs)

DESIGN POINT		2-YEAR STORM	10-YEAR STORM	100-YEAR STORM
DA-1	Existing	6.53	11.14	16.98
	Proposed	6.27	10.43	15.84
DA-2	Existing	0.77	1.42	2.27
	Proposed	0.48	0.86	1.34
DA-3	Existing	0.20	0.31	0.44
	Proposed	0.20	0.30	0.43

4.3 Methodology and Design Criteria

4.3.1 Hydrologic Model Description

The drainage analysis was performed using the Natural Resources Conservation Service (NRCS) TR-55 and TR-20 methodologies and the computer program HydroCAD 10.0 by HydroCAD Software Solutions, LLC.

4.3.2 Design Storms and Rainfall Depth

The analysis was performed on the 2-, 10-, and 100-year frequency rainfall events. Rainfall depths were taken from the Natural Resources Conservation Service. The events were based on the 24-hour duration, Type-III distribution storm for South Hadley, MA.

The following rainfall depths were used in the calculations:

Storm Event	Rainfall Depth
2-Year	3.0 inches
10-Year	4.5 inches
100-Year	6.4 inches

4.3.3 Time of Concentration

The time of concentration (t_c) for each watershed was determined by finding the time necessary for runoff to travel from the hydraulically most distant point in the watershed to the point of concentration. The travel path was drawn based on the topography and the time was calculated using the NRCS Method and HydroCAD. A minimum t_c of 6.0 minutes was used.

4.3.4 Curve Numbers

Curve numbers were developed for each of the different use categories and hydrologic soil group types within each watershed area. The curve numbers were based on the NRCS methodology and are included in the HydroCAD input and output.

4.3.5 Drainage Collection System Design

The proposed drainage collection system is composed of catch basins, manholes, trench drains, proprietary water quality structures, and piping, that will collect runoff from the project area and convey it to various treatment areas and eventually to points of discharge.

5.0 STANDARD 3: STORMWATER RECHARGE

This site qualifies as "New Development"; however, as indicated in Section 1.1 of this report, the soils on-site can be classified as HSG "D", based on the results of three test pits that were performed. The results of this investigation are included in *Appendix E – Soil Information*.

Per Volume 3, Chapter 1 of MADEP's Massachusetts Stormwater Handbook, "No stormwater recharge systems shall be sited in soils that infiltrate lower than 0.17 inches/hour due to the potential for failure." Soils classified as HSG "D" have infiltration rates below 0.17 inches/hour and are thereby considered by MADEP as unsuitable for infiltration. While stormwater recharge (Standard 3) is still required for sites comprised entirely of HSG "D", there is a provision that allows best management practices to infiltrate the required recharge volume only to the maximum extent practicable due to the site being comprised solely of HSG "C" and "D" soils.

The required recharge calculations have been completed for the project based on the post-development impervious coverage and soil type. These calculations have been included in *Appendix C –Recharge/Water Quality Calculations* of this report. Due to on-site soil conditions, including shallow depth to seasonal high groundwater and poor capacity for infiltration, infiltration has not been proposed as part of this project, as it would result in drawdown times in excess of the required maximum 72 hours.

6.0 STANDARD 4: WATER QUALITY

Standard 4 requires that all stormwater management systems be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The MA Stormwater Handbook states that this standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and therefore are implemented and maintained;
- Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and
- Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

6.1 Long Term Pollution Prevention Plan

The long term pollution prevention measures are combined with the Operation and Maintenance Plan which include the removal of sediment and pollutants using both structural and non-structural controls. See Section 11 of this report for additional information on Operation and Maintenance requirements for the site.

6.2 Water Quality Treatment Volume

The project is not within an Outstanding Resource Waters area (Public Water Supply Contributor), a NHESP Priority Habitats of Rare Species Area, or a FEMA Flood Zone. As a result, the site is not subject to a "Water Quality Depth" of one (1) inch when computing the required water quality treatment volume. Calculations showing the required volume are included in *Appendix C - Recharge /Water Quality Calculations* of this report.

6.3 TSS Removal Computations

Standard 4 requires that a minimum of 80% Total Suspended Solids (TSS) removal rate be achieved under proposed conditions. This requirement is achieved for the watershed with the installation of deep sump inlet structures and water quality structures.

As the proposed BMPs will result in a reduction in peak rates and the project results in a net decrease in non-roof impervious area, greater TSS removal is anticipated from the existing water quality structure. In addition, the majority of new non-roof areas will be captured via the deep sump inlet structures and routed through in-line water quality structures, which have been sized to remove 80% TSS removal. At the revised loading dock driveway, Deep Sump Catch Basins with Hoods are proposed to capture and treat runoff from the area. Pretreatment for runoff from these areas will be achieved through these deep sump inlet structures. This proposed system will run through a proposed inline water quality structure prior to being directed to the existing offline water quality structure near the discharge to Lower Pond.

The TSS calculation for these watersheds is included in *Appendix C – Water Quality/Recharge Calculations*.

7.0 STANDARD 5: LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

Because the Project does not qualify as a Land Use with Higher Potential Pollutant Loads (LUHPPL), this standard is not applicable.

8.0 STANDARD 6: CRITICAL AREAS

Critical areas are shown in *Figure 5 – Protected Resource Areas Map*. Standard 6 requires that all stormwater management systems within a critical area be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS) prior to discharge. The treatment train to provide at least 44% TSS removal prior to discharge to the infiltration structure does not apply since no critical areas fall within the project limits.

The water quality standards for the proposed stormwater system have been addressed in Section 6 of this report.

9.0 STANDARD 7: REDEVELOPMENT

Because the Project does not qualify as a “redevelopment”, this standard is not applicable.

10.0 STANDARD 8: CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION & SEDIMENTATION CONTROL

A plan to control construction related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation and pollution prevention plan) shall be developed and implemented.

Construction period pollution prevention and erosion and sedimentation control measures will be implemented at the project site to control construction related impacts during construction and land disturbance activities. The General Contractor for the project will be responsible for implementation of the construction period controls.

The project will disturb more than one acre of land during the construction process and will require a NPDES Construction General Permit issued by the Environmental Protection Agency. As a result, a stormwater pollution prevention plan (SWPPP) will be required. The SWPPP document will satisfy the requirements of the Construction General Permit and the construction period erosion, sedimentation and pollution prevention plan requirements outlined in Standard 8 of the Massachusetts Stormwater Handbook. A SWPPP has not been prepared for inclusion with this Stormwater Management Report; however, one will be prepared prior to any construction activities at the site.

Without proper erosion and sedimentation control measures, grading, filling and installation of structures may cause erosion and sedimentation, resulting in temporarily increased turbidity and suspended solid loads. Runoff from construction sites may also transport sediment to downstream watercourses, where sediment deposition and accumulation will occur as flow velocities decrease. Erosion and sedimentation controls will be employed to prevent the erosion and transport of sediment into resource areas during the earthwork and construction phases of the project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

Below is a description of some of the erosion and sedimentation control measures that will be employed at the project and that will be included in the SWPPP.

10.1 Erosion and Sedimentation Control Measures

10.1.1 Minimize Disturbed Area and Protect Natural Features and Soil

The most important aspects of controlling erosion and sedimentation are limiting the extent of disturbance and limiting the size and length of the tributary drainage areas to the worksite and drainage structures. These fundamental principles will be the key factors in the Contractor's control of erosion on the project site. If appropriate, the Contractor will construct temporary diversion swales and settling basins or use a settling tank. If additional drainage or erosion control measures are needed, they will be located up-gradient from the straw wattles and silt fences when possible.

The Contractor is responsible for the maintenance and repair of all erosion control devices on-site. All erosion control devices will be regularly inspected. At no time will silt-laden water be allowed to enter sensitive areas (wetlands, streams, and drainage systems). Any runoff from disturbed surfaces will be directed through a sedimentation process prior to being discharged to the existing on site drainage system.

The Contractor will establish a staging area(s) within the area to be disturbed for the overnight storage of equipment and stockpiling of materials.

In the staging area, the Contractor will have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials will include, but are not limited to, straw wattles, silt fence, erosion control matting, inlet sediment filter bags, and crushed stone. As mentioned previously, erosion and sedimentation controls will be employed to minimize the erosion and transport of sediment into resource areas during the earthwork and construction phases of the Project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

The Contractor is responsible for erosion control on the site and will utilize erosion control measures where needed, regardless of whether the measures are specified on the construction plans or in supplemental plans prepared for the Stormwater Pollution Prevention Plan (SWPPP).

Primary erosion control techniques proposed include straw wattle barriers, silt fence barriers, and a stabilized construction entrance. A detailed description of each technique is discussed below.

10.1.2 Best Management Practices (BMPs)

Silt Fence and Straw Wattles

Erosion control barriers (silt fences and/or straw wattles) will be installed where required prior to the start of construction. These barriers will remain in place until all tributary surfaces have been fully stabilized.

Straw wattle barriers will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. In areas where high runoff velocities or high sediment loads are expected, silt fencing may be installed adjacent to the straw wattle barriers. This semipermeable barrier made of a synthetic porous fabric will provide additional protection. The silt fences and straw wattle barrier will be replaced as determined by periodic field inspection. Straw wattle barriers and siltation fences will be maintained and cleaned until the area tributary to it is fully stabilized.

Drain System Protection

Inlet sediment filter bags will be installed at drainage structures and maintained and cleaned as required to maintain their effectiveness. Catch basins, drain manholes and storm drain pipes will be cleaned of sediment and debris after the completion of construction. Sediment collected in structures will be disposed of properly and covered, if stored on-site.

Utility Construction

The Contractor will construct utility trenches in a manner that will not direct runoff toward wetlands resources or to drainage system structures.

10.1.3 Stabilization Activities

All disturbed surfaces will be stabilized a minimum of 14 days after construction in any portion of the project site is completed or is temporarily halted, unless additional construction is intended to be initiated within 21 days. The Contractor will not disturb more area than can be stabilized within 14 days unless the area is to remain active. The Contractor will not disturb more area than can be stabilized within the same construction season.

Slope Stabilization

The smallest practicable area of land will be exposed at a time. Slopes greater than three-to-one (horizontal to vertical) will be stabilized with seed, organic mulch, jute fabric, erosion control matting, or rip-rap, as appropriate, to prevent erosion during construction. After disturbed areas have been stabilized, the temporary erosion control measures will be removed and accumulated sediment will be removed and disposed of in an appropriate location. Disturbed areas will be stabilized with appropriate ground cover as soon as possible. After the removal of temporary erosion control measures, disturbed areas will receive a layer of topsoil for stabilization.

Stabilized Construction Entrance

Temporary stabilized construction entrances may be installed at the project site. The purpose of the construction entrance is to remove sediment attached to vehicle tires and to minimize sediment transport and deposition onto public road surfaces. The construction entrances will be composed of beds of crushed stone which will be replenished as necessary to maintain their proper function.

10.1.4 Good Housekeeping BMPs

The following good housekeeping practices will be followed on-site during the construction project:

- An effort will be made to store only enough product required to do the job
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible under a roof or other enclosure
- Products will be kept in their original containers with the original manufacturer's label
- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of a product will be used up before disposing of the container
- Manufacturer's recommendations for proper use and disposal will be followed
- The site superintendent will inspect daily to ensure proper use and disposal of materials
- The Contractor will be required in the Contract documents to control dust.

10.1.5 Material Handling & Waste Management

Hazardous Products

These practices will be used to reduce the risks associated with hazardous materials. Material Safety Data Sheets (MSDSs) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction trailer office. Hazardous fuels or other potential contaminants shall not be stored within any resource areas on site. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product they are using, particularly regarding spill control techniques.

- Products will be kept in original containers unless they are not re-sealable
- Original labels and material safety data will be retained; they contain important product information
- If surplus product must be disposed of, manufacturer's or local and State recommended methods for proper disposal will be followed

Hazardous Waste

All hazardous waste material will be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed.

Solid and Construction Wastes

All waste materials will be collected and stored in accordance with state and federal law in an appropriately covered container and/or securely lidded metal dumpster.

All trash and construction debris from the site will be deposited in the dumpster. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers will be located in an area where the likelihood of the containers contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

Sanitary Wastes

All sanitary waste will be collected from the portable units as required to maintain proper operation and sanitary conditions of these units. All maintenance work on portable sanitation units shall be performed by a licensed portable facility provider in complete compliance with local and state regulations.

All sanitary waste units will be located in an area where the likelihood of the unit contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

10.1.6 Spill Prevention and Control Plan

The Contractor will train all personnel in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the job site superintendent to properly train all personnel in spill prevention and clean up procedures. In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An “infiltration area” is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials

3. The minimum practical quantity of all such materials will be kept on the job site.

4. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.

5. Manufacturers recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

In the event of a spill, the following procedures should be followed:

1. All spills will be cleaned up immediately after discovery.

2. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.

3. The Project Manager and the Engineer of Record will be notified immediately.

4. Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill.

5. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to prevent the recurrence of such releases and to respond to such releases.

The job site superintendent will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the office trailer on-site.

10.1.7 Allowable Non-Stormwater Discharge Management

Certain types of discharges are allowed under the NPDES General Permit for Construction Activity, and it is the intent of this SWPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come into contact with the water prior to or after its discharge. The control measures that have been outlined previously in this report will be strictly followed to ensure that no contamination of these non-stormwater discharges takes place. The following non-stormwater discharges that may occur from the job site include:

- Discharges from fire-fighting activities
- Fire Hydrant flushings
- Water used to control dust in accordance with off-site vehicle tracking
- Potable water including uncontaminated water line flushings
- Uncontaminated ground water or spring water
- Foundation or footing drains where flows are not contaminated with process materials such as solvents
- Uncontaminated excavation dewatering
- Landscape Irrigation

11.0 STANDARD 9: OPERATION AND MAINTENANCE/LONG-TERM POLLUTION PREVENTION PLAN

Standard 9 – A long-term operation and maintenance plan shall be developed and implemented to ensure that the stormwater management system functions as designed.

The goal of the Operation and Maintenance (O&M)/Long-Term Pollution Prevention Plan (LTPPP) is not only to protect resources on-site or nearby, but also to protect resources in the region that may be affected by the activities at the site. Water quality treatment measures and the implementation of Best Management Practices (BMP's) for structural controls will result in the treatment of site stormwater and the removal of a minimum of 80 percent of the total suspended solids (TSS) load from the majority of the site in runoff prior to discharge from the site, consistent with Massachusetts DEP's TSS removal standard.

The Owner will be responsible for the operation and maintenance of the stormwater management system.

Non-structural pollutant controls include encouraging the use of salt substitutes for maintenance of paved areas; sweeping of pavement areas on a regular basis; use of slow-release organic fertilizers on landscaped areas to limit the amount of nutrients that could enter downstream resource areas, and employment of integrated pest management practices using biological controls and minimizing use of chemical alternatives. Structural pollutant controls include catch basins equipped with deep sumps and hoods and a subsurface detention vault. Below is a description of the minimum requirements of the O&M Plan.

11.1 Non-Structural Pollutant Controls

The proposed stormwater management system is designed to protect the runoff water quality through the removal of sediment and pollutants. Non-structural pollutant controls used to separate and capture stormwater pollutants are described below.

11.1.1 Pavement Maintenance

Long-term management practices will include regular sweeping of pavement areas within the lease area. The sweeping program will remove contaminants directly from paved surfaces to prevent their release into the drainage system. Street sweeping has been shown to be an effective initial treatment for reducing pollutant loadings in stormwater.

Standard Asphalt Pavement Maintenance

Sweep standard asphalt pavement areas at least four times per year with a commercial cleaning unit and properly dispose of removed material. Recommended sweeping schedule:

- Feb/Mar
- Aug/Sep
- Apr/May
- Oct/Nov

More frequent sweeping of paved surfaces will result in less accumulation in catch basins, less cleaning of subsurface structures, and less disposal costs.

11.1.2 Deicing Chemicals

Use of road salt (sodium chloride) for maintenance of paved areas will be limited, and use of salt substitutes, such as calcium magnesium acetate (CMA), will be encouraged. These practices will limit the amount of dissolved pollutants in runoff and minimize potential impacts of deicing chemicals on downstream resource areas.

11.2 Structural Pollutant Controls

The proposed stormwater management system is designed to protect runoff water quality through the removal of sediment and pollutants. Minimum operation and maintenance requirements for the structural pollutant controls used to separate and capture stormwater pollutants are described below.

11.2.1 Drain Inlets

Drain inlets at the project site will be equipped with deep sumps (minimum 4-feet) and hooded outlets to trap debris, sediments, and floating contaminants, which are the largest constituents of urban runoff. The cleaning of drain inlets in coordination with minimal use of sand and street sweeping comprises a multi-level source control approach that prevents sand, sediment, and litter from entering the drain inlets. Regular maintenance and cleaning of drain inlets will assure adequate performance of these structures.

The proper removal of sediments and associated pollutants and trash occurs only when drain inlets and sumps are cleaned out regularly. The more frequent the cleaning, the less likely sediments will be re-suspended and subsequently discharged. In addition, frequent cleaning also results in more volume available for future deposition and enhances the overall performance. More frequent sweeping of paved surfaces will result in less accumulation in drain inlets, less cleaning of subsurface structures, and less disposal costs.

Drain Inlets - Inspections and Cleaning

- All drain inlets shall be inspected at least twice per year including at the end of the foliage and snow-removal seasons.
- All drain inlets shall be cleaned annually or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the drain inlet grates must be kept free of snow and ice.
- During warmer periods, the drain inlet grates must be kept free of leaves, litter, sand, and debris.

11.2.2 Stormwater Outfalls

The stormwater drainage systems share one existing outfall location where treated stormwater is discharged upgradient of surface wetlands.

- Inspect outfall location monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- Inspect outfalls annually after initial three month period.
- Annual inspections should be supplemented after large storms, when washouts may occur.
- Maintain vegetation around outfalls to prevent blockages at the outfall.
- Remove and dispose of any trash or debris at the outfall.

11.2.3 Subsurface Detention Vault

The subsurface detention vault is used to detain rooftop runoff. To maintain functionality, the subsurface detention vault requires regular inspection and occasional cleaning.

Subsurface Detention Vault - Inspections and Cleaning

- The subsurface detention vault will be inspected at least once each year by removing the manhole/access port covers and determining the thickness of sediment that has accumulated in the vault.
- If sediment is more than two inches deep, the inlets to the downstream manhole shall be temporarily plugged and the sediment shall be suspended via flushing with clean water and removed using a vacuum truck. Following removal of the sediment, the inlets to the downstream manhole shall be unplugged.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.

11.2.4 Water Quality Structures

The proposed water quality structures are inline structures used to treat surface runoff collected from catch basins and/or trench drains. To maintain functionality, the proposed inline water quality structures require regular inspection and cleaning. Regulating the sediment and petroleum product input to the proposed subsurface water quality structure is the priority maintenance activity.

Water Quality Structures - Inspections and Cleaning

- Water quality structure maintenance shall be performed on a regular basis as recommended by the manufacturer (described in the Stormceptor Owner's Manual obtained from the Stormceptor website http://www.stormceptor.com) and as summarized herein.
- Sediment removal will be performed at least annually, but is likely to vary widely based on site conditions and loadings. Typical maintenance cleaning can be done with a vacuum truck.
- Inspection for each of the water quality structures will include a quantification of the sediment load and oil and grease volumes. This is easily made from the surface with a tube dipstick with ball valve inserted through the cleanout pipe or other access port.
- Depths of sediment of 15" shall indicate required maintenance. Inspection of the internal structure will be part of the routine inspection plan. The units are designed to accept 15% of their capacity in solids annually based on maximum drainage area loading. Removal of sediment, oils and grease from the system will depend on rates of accumulation.
- All sediment and oil waste materials shall be disposed of in accordance with all Federal, State and Local regulations.

12.0 STANDARD 10: PROHIBITION OF ILLICIT DISCHARGES

Standard 10 of the Massachusetts Stormwater Handbook prohibits illicit discharges to stormwater management systems. As stated in the handbook, "The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater."

Proponents of projects within Wetlands jurisdiction must demonstrate compliance with this requirement by submitting to the issuing authority an Illicit Discharge Compliance Statement verifying that no illicit discharges exist on the site and by including in the pollution prevention plan measures to prevent illicit discharges to the stormwater management system.

Section 9 of this report discusses how the project will prevent illicit discharges to the stormwater management system during construction.

Standard 10 also states that "The Illicit Discharge Compliance Statement must be accompanied by a site map that is drawn to scale and that identifies the location of any systems for conveying stormwater on the site and shows that these systems do not allow the entry of any illicit discharges into the stormwater management system. The site map shall identify the location of any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater management systems and the location of any measures taken to prevent the entry of illicit discharges into the stormwater management system." Included with the Notice of Intent Submission is a Utility Plan that displays the location of all of the stormwater management components as well as other utilities (existing and proposed) on the project site and conforms to requirements of a "site map" to accompany the Illicit Discharge Compliance Statement.

An Illicit Discharge Compliance Statement is included in Appendix F – Illicit Discharge Compliance Statement of this Report.

13.0 COMPLIANCE WITH TOTAL MAXIMUM DAILY LOADS (TMDL)

The site discharges to the Stony Brook (MA34-19), which is listed as a Category 5 (Impaired, TMDL required) on the Massachusetts Year 2012 Integrated List of Waters.

Therefore, this standard is not applicable. The Environmental Protection Agency's Map, *Waterbody Assessment and TMDL Status – South Hadley, MA*, is included in *Appendix D – TMDL Information*.

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FIGURES

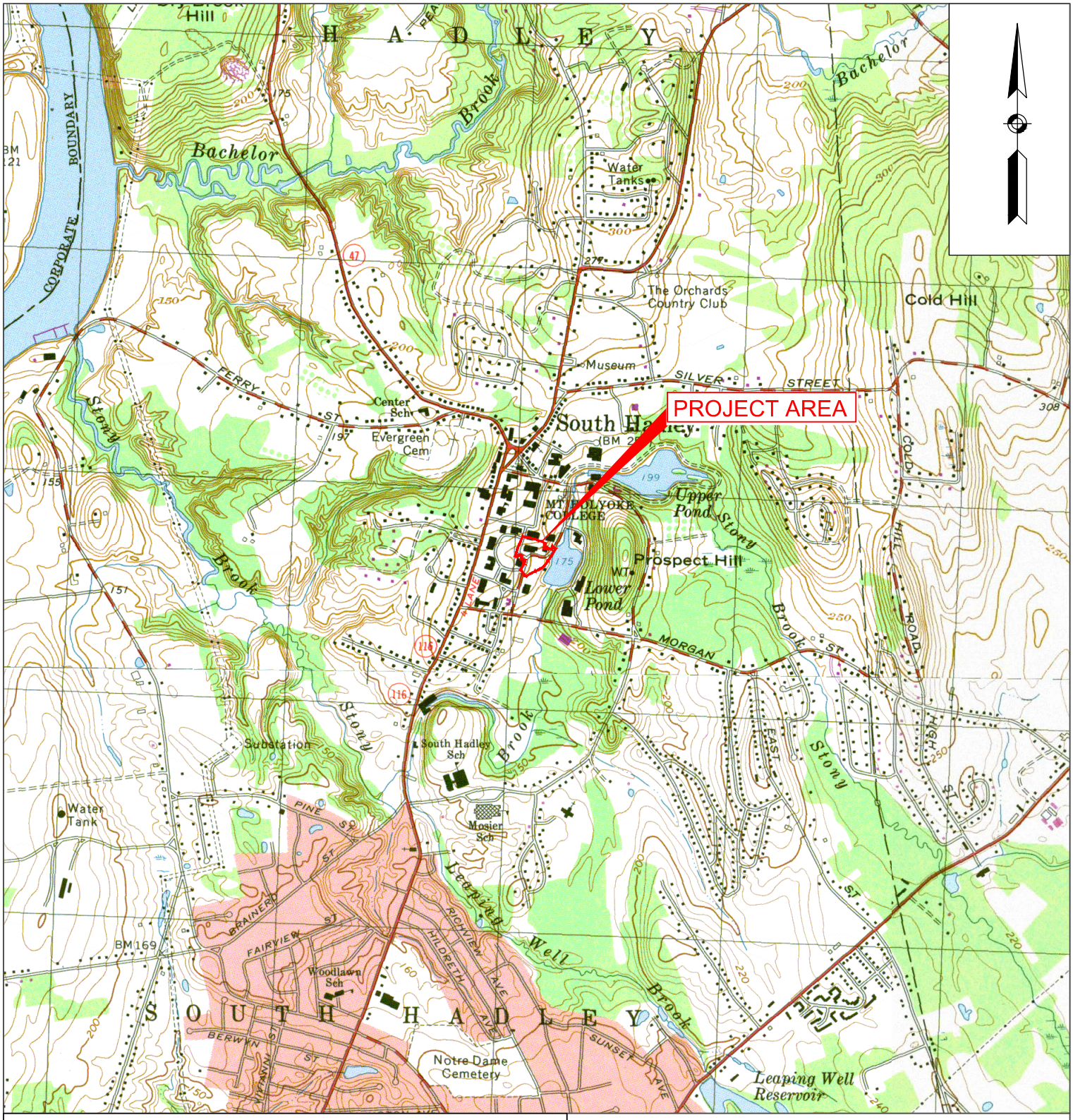
Figure 1 – Locus Map

Figure 2 – Aerial Map

Figure 3 – Existing Conditions Watershed Plan

Figure 4 – Proposed Conditions Watershed Plan

Figure 5 – Protected Resource Areas Map



LEGEND:

LIMIT OF WORK

HORIZONTAL GRAPHIC SCALE:

2000 0 1000 2000

1" = 2000'

NOTE: IMAGE TAKEN FROM MASSGIS

FIGURE 1 – LOCUS MAP

MOUNT HOLYOKE COLLEGE

SOUTH HADLEY, MASSACHUSETTS

GREEN INTERNATIONAL AFFILIATES, INC.

CIVIL & STRUCTURAL ENGINEERS WESTFORD, MASSACHUSETTS

SCALE: AS NOTED	DATE: 02/23/2016	PROJECT NO. 15040
APPROVED: _____	DESIGNED BY: KK DRAWN BY: JT CHECKED BY: LB	

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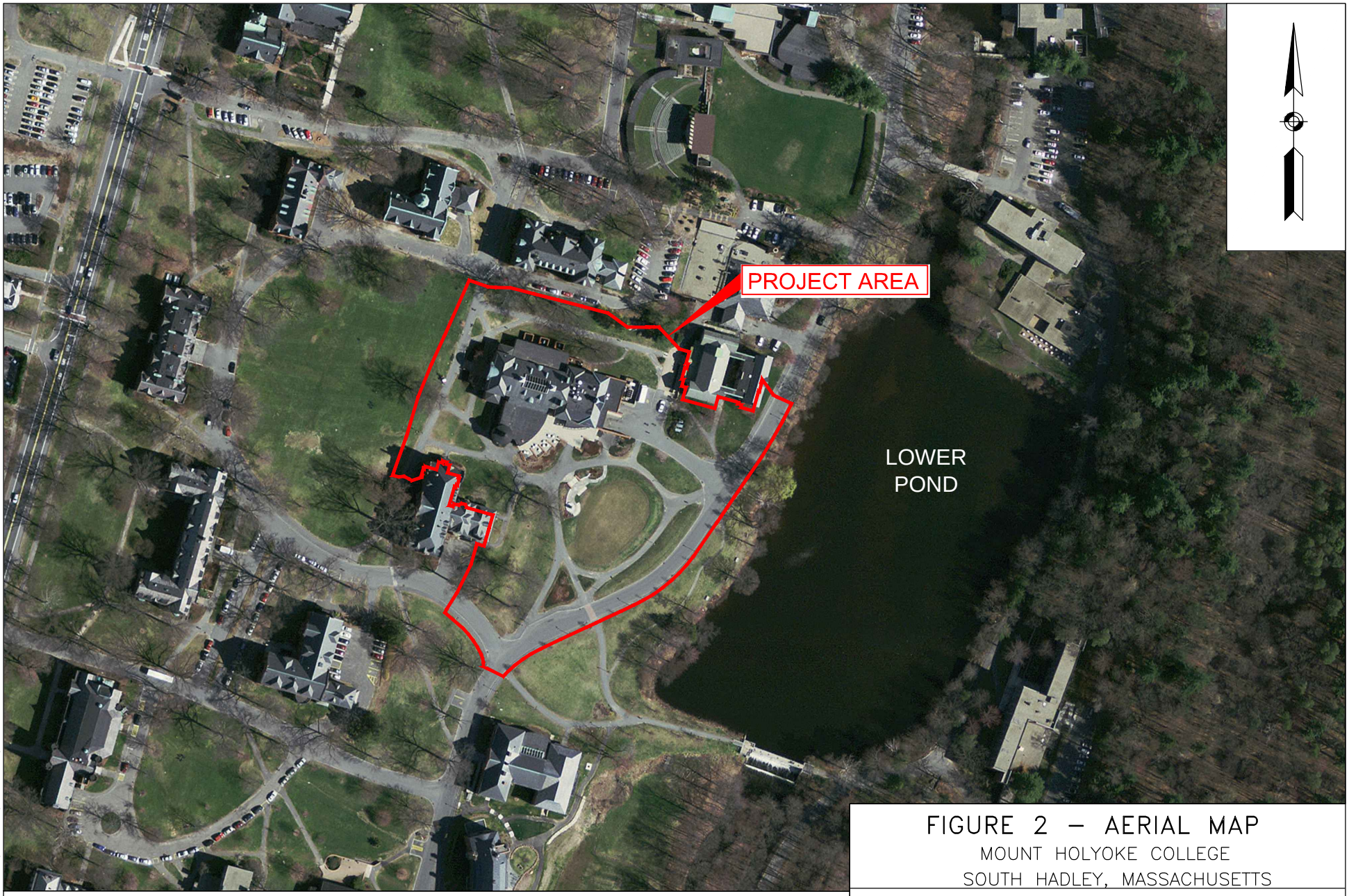

HORIZONTAL GRAPHIC SCALE:

200 0 100 200

1" = 200'

NOTE: IMAGE TAKEN FROM MASSGIS

LEGEND:

LIMIT OF WORK

FIGURE 2 – AERIAL MAP

MOUNT HOLYOKE COLLEGE

SOUTH HADLEY, MASSACHUSETTS

GREEN INTERNATIONAL AFFILIATES, INC.

CIVIL & STRUCTURAL ENGINEERS WESTFORD, MASSACHUSETTS

SCALE: AS NOTED	DATE: 02/22/2016	PROJECT NO. 15040
APPROVED: _____	DESIGNED BY: KK DRAWN BY: JT CHECKED BY: LB	

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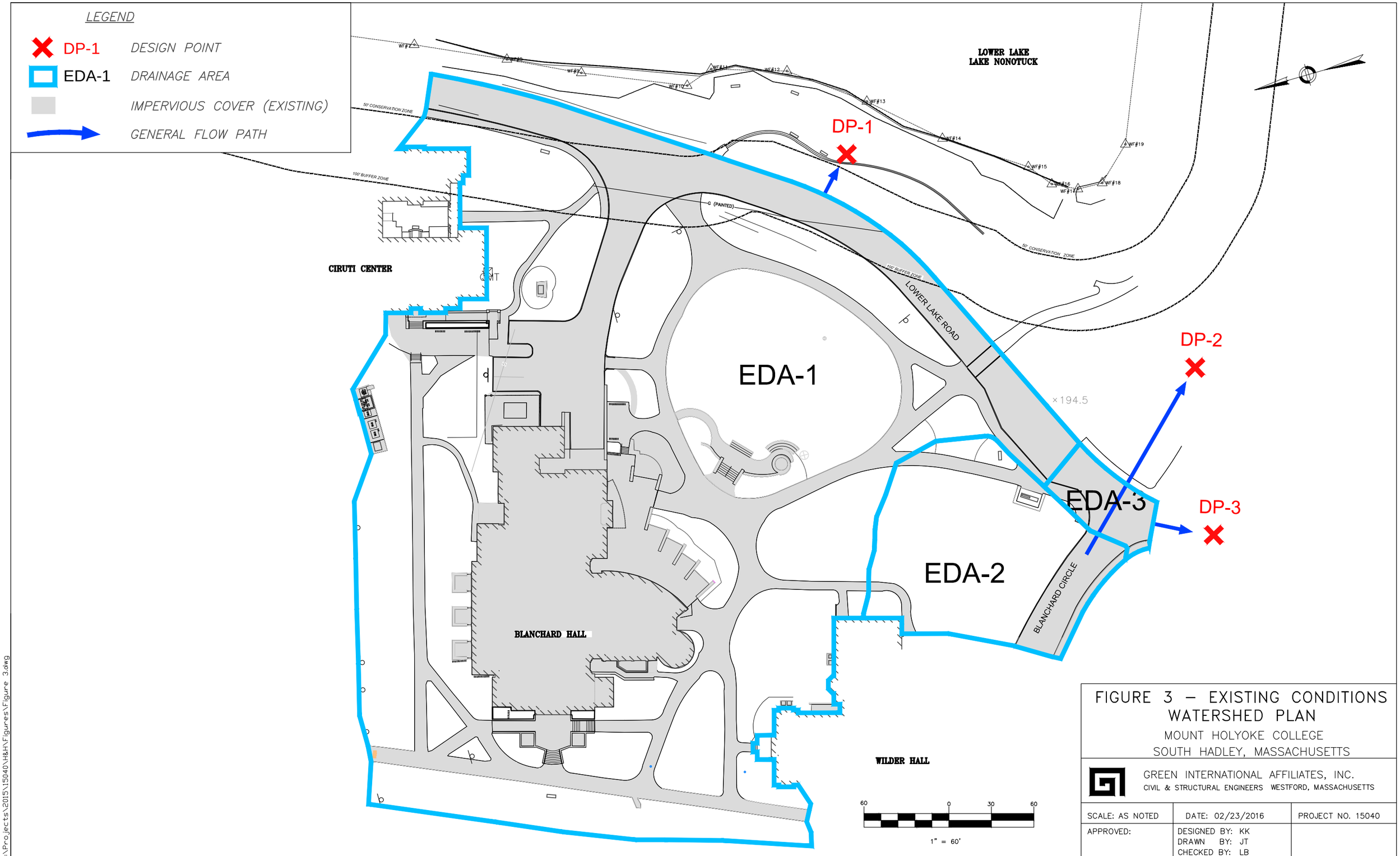

FIGURE 3 – EXISTING CONDITIONS WATERSHED PLAN

MOUNT HOLYOKE COLLEGE

SOUTH HADLEY, MASSACHUSETTS

GREEN INTERNATIONAL AFFILIATES, INC.

CIVIL & STRUCTURAL ENGINEERS WESTFORD, MASSACHUSETTS

SCALE: AS NOTED	DATE: 02/23/2016	PROJECT NO. 15040
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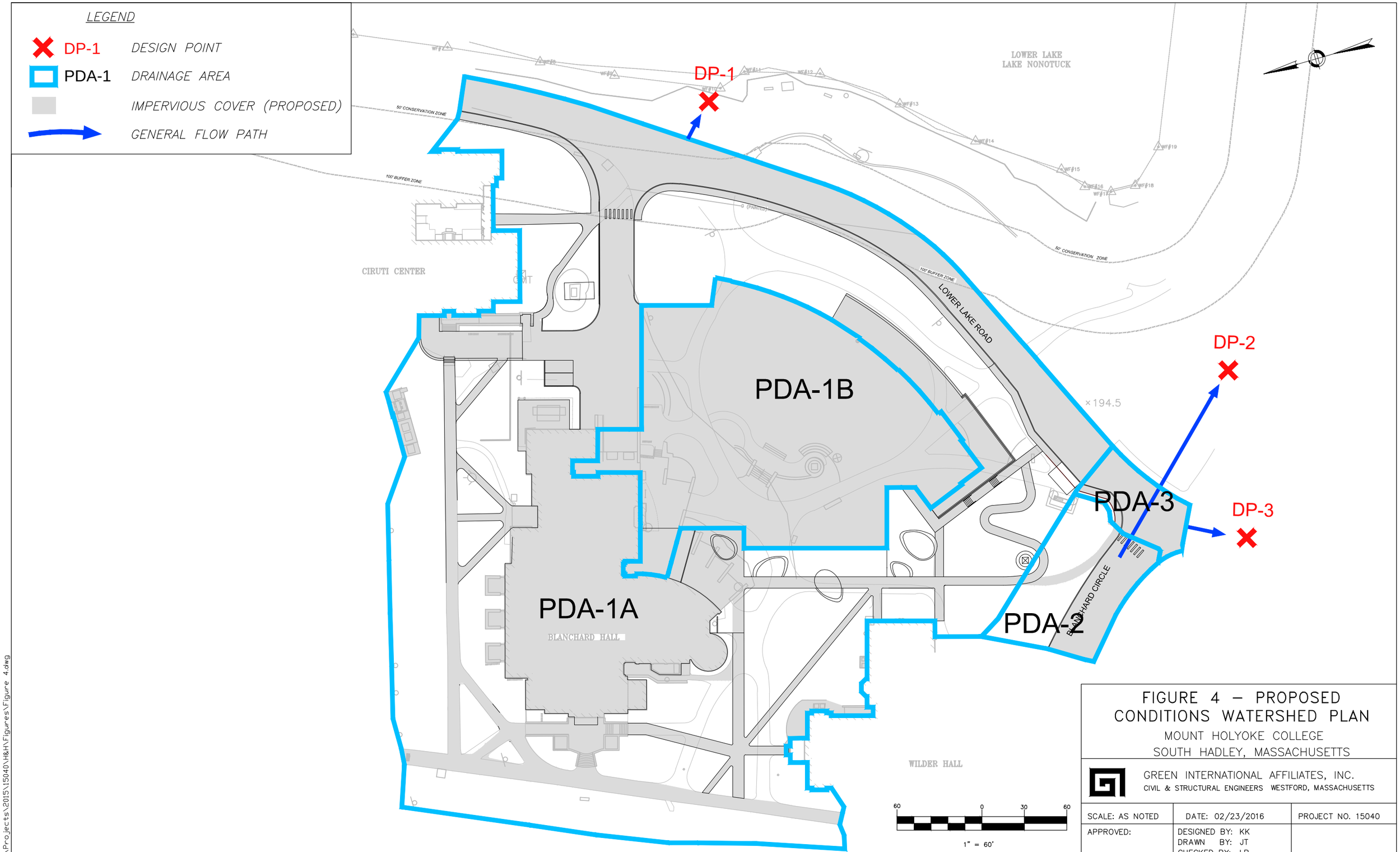

FIGURE 4 – PROPOSED CONDITIONS WATERSHED PLAN

MOUNT HOLYOKE COLLEGE

SOUTH HADLEY, MASSACHUSETTS

GREEN INTERNATIONAL AFFILIATES, INC.

CIVIL & STRUCTURAL ENGINEERS WESTFORD, MASSACHUSETTS

SCALE: AS NOTED	DATE: 02/23/2016	PROJECT NO. 15040
APPROVED:	DESIGNED BY: KK DRAWN BY: JT CHECKED BY: LB	

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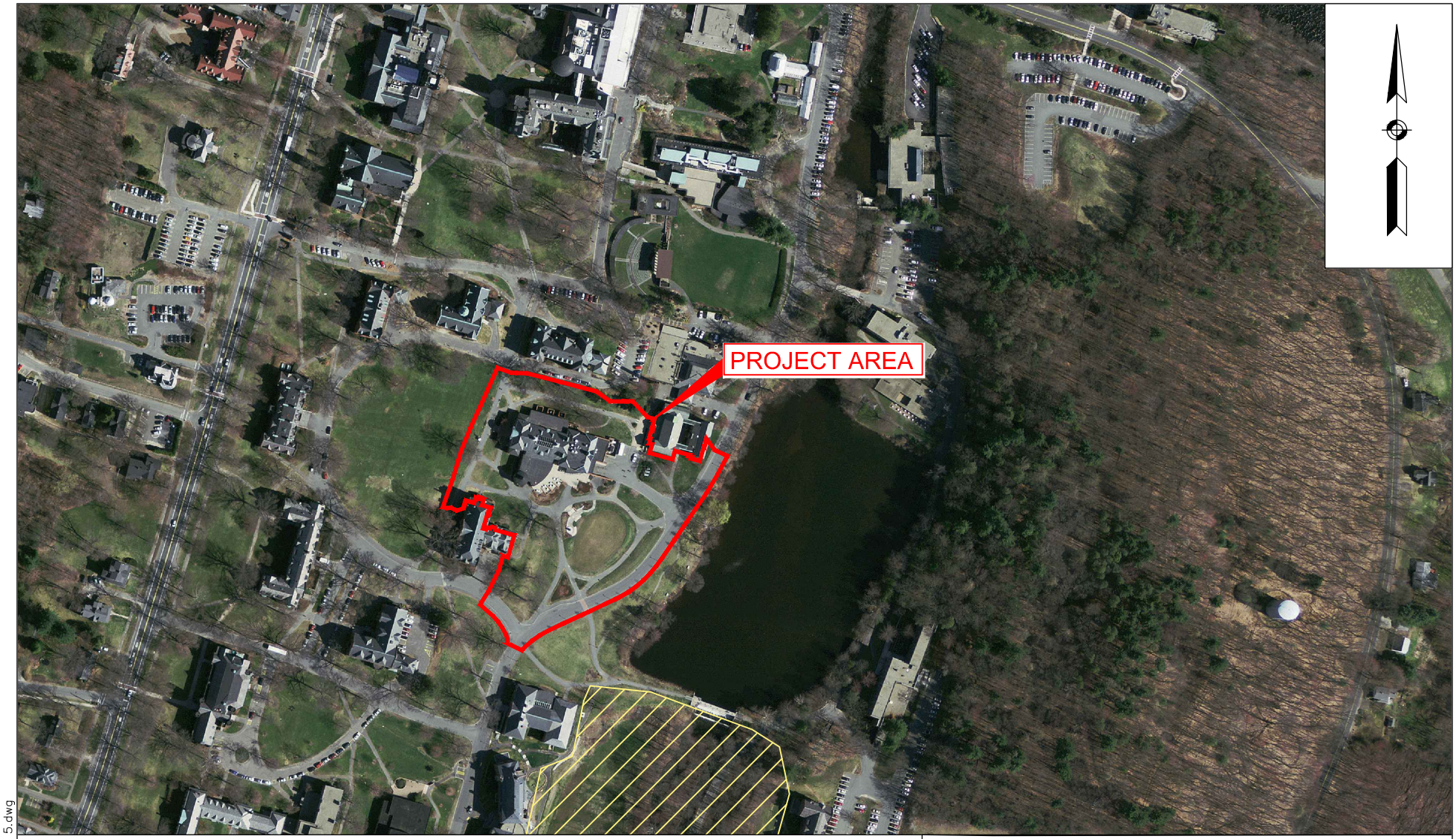

LEGEND:

LIMIT OF WORK LINE

NHESP, PRIORITY HABITATS OF RARE WILDLIFE

300 0 150 300

1" = 300'

NOTE: IMAGE AND DATA TAKEN FROM MASSGIS

FIGURE 5 – PROTECTED RESOURCE AREAS MAP

MOUNT HOLYOKE COLLEGE

SOUTH HADLEY, MASSACHUSETTS

GREEN INTERNATIONAL AFFILIATES, INC.

CIVIL & STRUCTURAL ENGINEERS WESTFORD, MASSACHUSETTS

SCALE: AS NOTED	DATE: 02/23/2016	PROJECT NO. 15040
APPROVED: _____	DESIGNED BY: KK DRAWN BY: JT CHECKED BY: LB	

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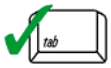
APPENDIX A - CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

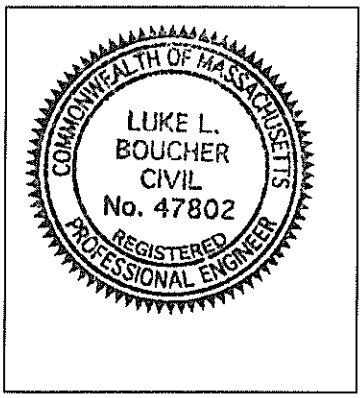
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



02/25/2016

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☒ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☒ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

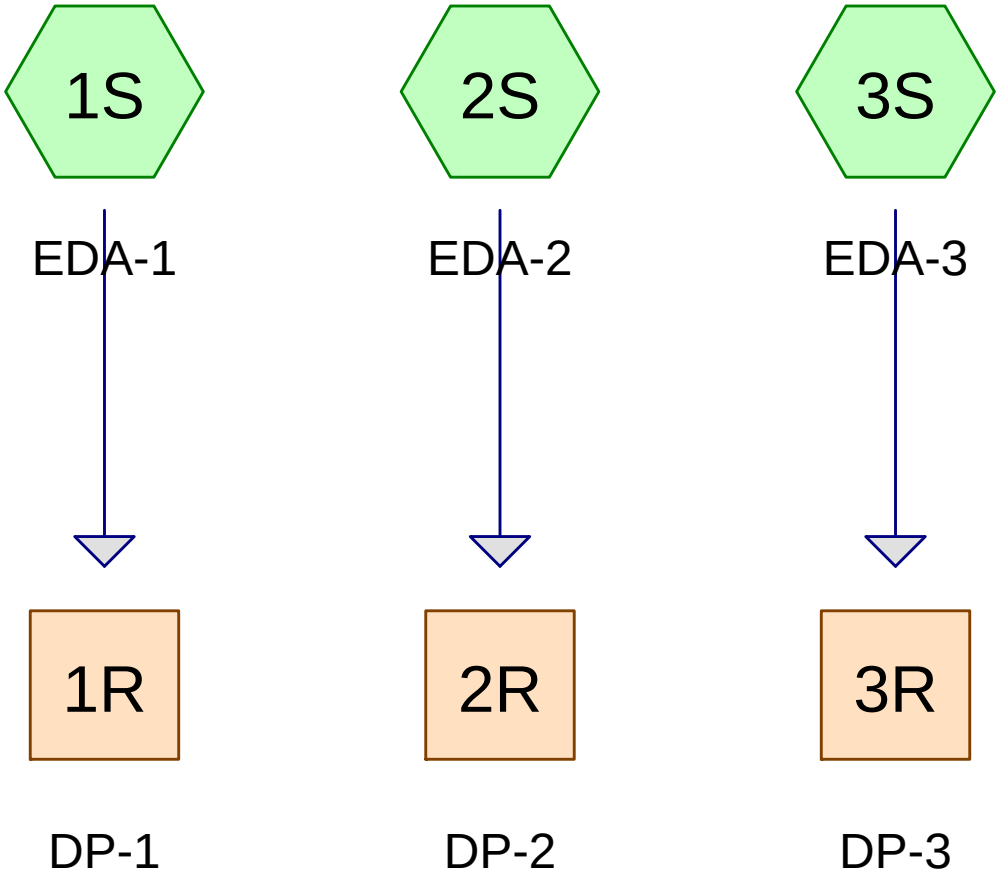
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

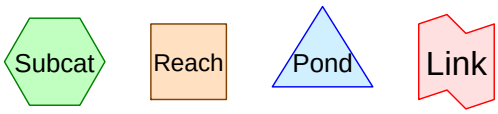
☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX B – HYDROLOGIC CALCULATIONS

- Existing Conditions Calculations
- Proposed Conditions Calculations





Routing Diagram for Existing_Conditions
Prepared by Microsoft, Printed 2/22/2016
HydroCAD® 10.00 s/n 06415 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.416	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S)
0.024	96	Gravel surface, HSG D (1S, 2S)
1.609	98	Paved parking, HSG D (1S, 2S, 3S)
0.447	98	Roofs, HSG D (1S)
4.496	**88**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EDA-1 Runoff Area=173,589 sf 47.30% Impervious Runoff Depth=1.90"
Flow Length=408' Tc=15.9 min CN=89 Runoff=6.53 cfs 0.631 af

Subcatchment 2S: EDA-2 Runoff Area=19,175 sf 23.07% Impervious Runoff Depth=1.52"
Tc=6.0 min CN=84 Runoff=0.77 cfs 0.056 af

Subcatchment 3S: EDA-3 Runoff Area=3,096 sf 98.39% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.20 cfs 0.016 af

Reach 1R: DP-1 Inflow=6.53 cfs 0.631 af
Outflow=6.53 cfs 0.631 af

Reach 2R: DP-2 Inflow=0.77 cfs 0.056 af
Outflow=0.77 cfs 0.056 af

Reach 3R: DP-3 Inflow=0.20 cfs 0.016 af
Outflow=0.20 cfs 0.016 af

Total Runoff Area = 4.496 ac Runoff Volume = 0.703 af Average Runoff Depth = 1.88"
54.27% Pervious = 2.440 ac 45.73% Impervious = 2.056 ac

Summary for Subcatchment 1S: EDA-1

Runoff = 6.53 cfs @ 12.22 hrs, Volume= 0.631 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
19,481	98	Roofs, HSG D
90,692	80	>75% Grass cover, Good, HSG D
62,626	98	Paved parking, HSG D
790	96	Gravel surface, HSG D
173,589	89	Weighted Average
91,482		52.70% Pervious Area
82,107		47.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0103	0.11		**Sheet Flow, GRASS** Grass: Short n= 0.150 P2= 3.00"
8.3	358	0.0106	0.72		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
15.9	408	Total			

Summary for Subcatchment 2S: EDA-2

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.056 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
14,512	80	>75% Grass cover, Good, HSG D
4,423	98	Paved parking, HSG D
240	96	Gravel surface, HSG D
19,175	84	Weighted Average
14,752		76.93% Pervious Area
4,423		23.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: EDA-3

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
50	80	>75% Grass cover, Good, HSG D
3,046	98	Paved parking, HSG D
3,096	98	Weighted Average
50		1.61% Pervious Area
3,046		98.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach 1R: DP-1

Inflow Area = 3.985 ac, 47.30% Impervious, Inflow Depth = 1.90" for 2-Year event
Inflow = 6.53 cfs @ 12.22 hrs, Volume= 0.631 af
Outflow = 6.53 cfs @ 12.22 hrs, Volume= 0.631 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: DP-2

Inflow Area = 0.440 ac, 23.07% Impervious, Inflow Depth = 1.52" for 2-Year event
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 0.056 af
Outflow = 0.77 cfs @ 12.09 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: DP-3

Inflow Area = 0.071 ac, 98.39% Impervious, Inflow Depth = 2.77" for 2-Year event
Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af
Outflow = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EDA-1 Runoff Area=173,589 sf 47.30% Impervious Runoff Depth=3.30"
Flow Length=408' Tc=15.9 min CN=89 Runoff=11.14 cfs 1.094 af

Subcatchment 2S: EDA-2 Runoff Area=19,175 sf 23.07% Impervious Runoff Depth=2.82"
Tc=6.0 min CN=84 Runoff=1.42 cfs 0.103 af

Subcatchment 3S: EDA-3 Runoff Area=3,096 sf 98.39% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.31 cfs 0.025 af

Reach 1R: DP-1 Inflow=11.14 cfs 1.094 af
Outflow=11.14 cfs 1.094 af

Reach 2R: DP-2 Inflow=1.42 cfs 0.103 af
Outflow=1.42 cfs 0.103 af

Reach 3R: DP-3 Inflow=0.31 cfs 0.025 af
Outflow=0.31 cfs 0.025 af

Total Runoff Area = 4.496 ac Runoff Volume = 1.223 af Average Runoff Depth = 3.26"
54.27% Pervious = 2.440 ac 45.73% Impervious = 2.056 ac

Summary for Subcatchment 1S: EDA-1

Runoff = 11.14 cfs @ 12.21 hrs, Volume= 1.094 af, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
19,481	98	Roofs, HSG D
90,692	80	>75% Grass cover, Good, HSG D
62,626	98	Paved parking, HSG D
790	96	Gravel surface, HSG D
173,589	89	Weighted Average
91,482		52.70% Pervious Area
82,107		47.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0103	0.11		**Sheet Flow, GRASS** Grass: Short n= 0.150 P2= 3.00"
8.3	358	0.0106	0.72		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
15.9	408	Total			

Summary for Subcatchment 2S: EDA-2

Runoff = 1.42 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
14,512	80	>75% Grass cover, Good, HSG D
4,423	98	Paved parking, HSG D
240	96	Gravel surface, HSG D
19,175	84	Weighted Average
14,752		76.93% Pervious Area
4,423		23.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: EDA-3

Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
50	80	>75% Grass cover, Good, HSG D
3,046	98	Paved parking, HSG D
3,096	98	Weighted Average
50		1.61% Pervious Area
3,046		98.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach 1R: DP-1

Inflow Area = 3.985 ac, 47.30% Impervious, Inflow Depth = 3.30" for 10-Year event
Inflow = 11.14 cfs @ 12.21 hrs, Volume= 1.094 af
Outflow = 11.14 cfs @ 12.21 hrs, Volume= 1.094 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: DP-2

Inflow Area = 0.440 ac, 23.07% Impervious, Inflow Depth = 2.82" for 10-Year event
Inflow = 1.42 cfs @ 12.09 hrs, Volume= 0.103 af
Outflow = 1.42 cfs @ 12.09 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: DP-3

Inflow Area = 0.071 ac, 98.39% Impervious, Inflow Depth = 4.26" for 10-Year event
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 0.025 af
Outflow = 0.31 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EDA-1 Runoff Area=173,589 sf 47.30% Impervious Runoff Depth=5.12"
Flow Length=408' Tc=15.9 min CN=89 Runoff=16.98 cfs 1.701 af

Subcatchment 2S: EDA-2 Runoff Area=19,175 sf 23.07% Impervious Runoff Depth=4.57"
Tc=6.0 min CN=84 Runoff=2.27 cfs 0.168 af

Subcatchment 3S: EDA-3 Runoff Area=3,096 sf 98.39% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=0.44 cfs 0.036 af

Reach 1R: DP-1 Inflow=16.98 cfs 1.701 af
Outflow=16.98 cfs 1.701 af

Reach 2R: DP-2 Inflow=2.27 cfs 0.168 af
Outflow=2.27 cfs 0.168 af

Reach 3R: DP-3 Inflow=0.44 cfs 0.036 af
Outflow=0.44 cfs 0.036 af

Total Runoff Area = 4.496 ac Runoff Volume = 1.906 af Average Runoff Depth = 5.09"
54.27% Pervious = 2.440 ac 45.73% Impervious = 2.056 ac

Summary for Subcatchment 1S: EDA-1

Runoff = 16.98 cfs @ 12.21 hrs, Volume= 1.701 af, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
19,481	98	Roofs, HSG D
90,692	80	>75% Grass cover, Good, HSG D
62,626	98	Paved parking, HSG D
790	96	Gravel surface, HSG D
173,589	89	Weighted Average
91,482		52.70% Pervious Area
82,107		47.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0103	0.11		**Sheet Flow, GRASS** Grass: Short n= 0.150 P2= 3.00"
8.3	358	0.0106	0.72		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
15.9	408	Total			

Summary for Subcatchment 2S: EDA-2

Runoff = 2.27 cfs @ 12.09 hrs, Volume= 0.168 af, Depth= 4.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
14,512	80	>75% Grass cover, Good, HSG D
4,423	98	Paved parking, HSG D
240	96	Gravel surface, HSG D
19,175	84	Weighted Average
14,752		76.93% Pervious Area
4,423		23.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: EDA-3

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
50	80	>75% Grass cover, Good, HSG D
3,046	98	Paved parking, HSG D
3,096	98	Weighted Average
50		1.61% Pervious Area
3,046		98.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach 1R: DP-1

Inflow Area = 3.985 ac, 47.30% Impervious, Inflow Depth = 5.12" for 100-Year event
Inflow = 16.98 cfs @ 12.21 hrs, Volume= 1.701 af
Outflow = 16.98 cfs @ 12.21 hrs, Volume= 1.701 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: DP-2

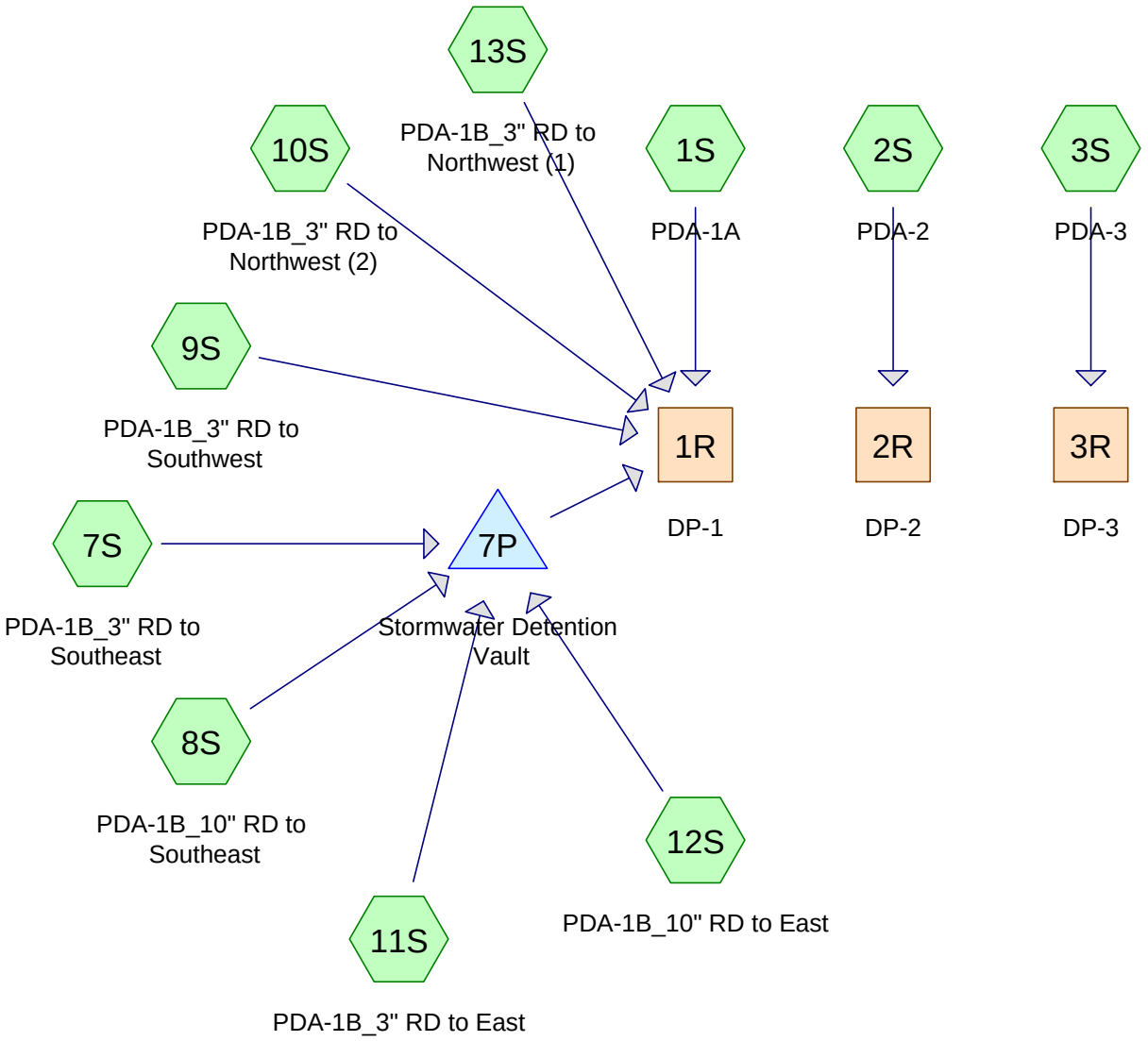
Inflow Area = 0.440 ac, 23.07% Impervious, Inflow Depth = 4.57" for 100-Year event
Inflow = 2.27 cfs @ 12.09 hrs, Volume= 0.168 af
Outflow = 2.27 cfs @ 12.09 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: DP-3

Inflow Area = 0.071 ac, 98.39% Impervious, Inflow Depth = 6.16" for 100-Year event
Inflow = 0.44 cfs @ 12.09 hrs, Volume= 0.036 af
Outflow = 0.44 cfs @ 12.09 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Subcat Reach Pond Link

Routing Diagram for Proposed_Conditions
Prepared by Microsoft, Printed 2/22/2016
HydroCAD® 10.00 s/n 06415 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.166	80	>75% Grass cover, Good, HSG D (2S)
1.689	80	>75% Grass cover, Good, HSG D (Actually 77,457 sf) (1S)
0.012	96	Gravel surface, HSG D (1S)
0.089	98	Contingency (5% Grass -> Impervious) (1S)
1.287	98	Paved parking, HSG D (1S, 2S, 3S)
1.252	98	Unconnected roofs, HSG D (1S, 7S, 8S, 9S, 10S, 11S, 12S, 13S)
4.496	**91**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PDA-1A Runoff Area=148,322 sf 50.03% Impervious Runoff Depth=1.90"
Flow Length=408' Tc=15.9 min CN=89 Runoff=5.58 cfs 0.539 af

Subcatchment 2S: PDA-2 Runoff Area=10,952 sf 33.98% Impervious Runoff Depth=1.66"
Tc=6.0 min CN=86 Runoff=0.48 cfs 0.035 af

Subcatchment 3S: PDA-3 Runoff Area=3,022 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.20 cfs 0.016 af

Subcatchment 7S: PDA-1B_3" RD to Runoff Area=650 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.04 cfs 0.003 af

Subcatchment 8S: PDA-1B_10" RD to Runoff Area=16,000 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=1.04 cfs 0.085 af

Subcatchment 9S: PDA-1B_3" RD to Runoff Area=650 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.04 cfs 0.003 af

Subcatchment 10S: PDA-1B_3" RD to Runoff Area=1,180 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment 11S: PDA-1B_3" RD to East Runoff Area=950 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment 12S: PDA-1B_10" RD to Runoff Area=12,950 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.84 cfs 0.069 af

Subcatchment 13S: PDA-1B_3" RD to Runoff Area=1,180 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.006 af

Reach 1R: DP-1 Inflow=6.27 cfs 0.717 af
Outflow=6.27 cfs 0.717 af

Reach 2R: DP-2 Inflow=0.48 cfs 0.035 af
Outflow=0.48 cfs 0.035 af

Reach 3R: DP-3 Inflow=0.20 cfs 0.016 af
Outflow=0.20 cfs 0.016 af

Pond 7P: Stormwater Detention Vault Peak Elev=184.49' Storage=1,916 cf Inflow=1.99 cfs 0.162 af
Outflow=0.61 cfs 0.162 af

Total Runoff Area = 4.496 ac Runoff Volume = 0.768 af Average Runoff Depth = 2.05"
41.54% Pervious = 1.868 ac 58.46% Impervious = 2.629 ac

Summary for Subcatchment 1S: PDA-1A

Runoff = 5.58 cfs @ 12.22 hrs, Volume= 0.539 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

	Area (sf)	CN	Description
*	73,584	80	>75% Grass cover, Good, HSG D (Actually 77,457 sf)
*	49,332	98	Paved parking, HSG D
	539	96	Gravel surface, HSG D
	20,994	98	Unconnected roofs, HSG D
*	3,873	98	Contingency (5% Grass -> Impervious)
	148,322	89	Weighted Average
	74,123		49.97% Pervious Area
	74,199		50.03% Impervious Area
	20,994		28.29% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0103	0.11		**Sheet Flow, GRASS** Grass: Short n= 0.150 P2= 3.00"
8.3	358	0.0106	0.72		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
15.9	408	Total			

Summary for Subcatchment 2S: PDA-2

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
7,230	80	>75% Grass cover, Good, HSG D
3,722	98	Paved parking, HSG D
10,952	86	Weighted Average
7,230		66.02% Pervious Area
3,722		33.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: PDA-3

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
3,022	98	Paved parking, HSG D
3,022		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 7S: PDA-1B_3" RD to Southeast

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
650	98	Unconnected roofs, HSG D
650		100.00% Impervious Area
650		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 8S: PDA-1B_10" RD to Southeast

Runoff = 1.04 cfs @ 12.09 hrs, Volume= 0.085 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
16,000	98	Unconnected roofs, HSG D
16,000		100.00% Impervious Area
16,000		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 9S: PDA-1B_3" RD to Southwest

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
650	98	Unconnected roofs, HSG D
650		100.00% Impervious Area
650		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 10S: PDA-1B_3" RD to Northwest (2)

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
1,180	98	Unconnected roofs, HSG D
1,180		100.00% Impervious Area
1,180		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 11S: PDA-1B_3" RD to East

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
950	98	Unconnected roofs, HSG D
950		100.00% Impervious Area
950		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 12S: PDA-1B_10" RD to East

Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.069 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
12,950	98	Unconnected roofs, HSG D
12,950		100.00% Impervious Area
12,950		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: PDA-1B_3" RD to Northwest (1)

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (sf)	CN	Description
1,180	98	Unconnected roofs, HSG D
1,180		100.00% Impervious Area
1,180		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach 1R: DP-1

Inflow Area = 4.175 ac, 59.25% Impervious, Inflow Depth = 2.06" for 2-Year event
Inflow = 6.27 cfs @ 12.22 hrs, Volume= 0.717 af
Outflow = 6.27 cfs @ 12.22 hrs, Volume= 0.717 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: DP-2

Inflow Area = 0.251 ac, 33.98% Impervious, Inflow Depth = 1.66" for 2-Year event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 0.035 af
Outflow = 0.48 cfs @ 12.09 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: DP-3

Inflow Area = 0.069 ac,100.00% Impervious, Inflow Depth = 2.77" for 2-Year event
Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af
Outflow = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: Stormwater Detention Vault

Inflow Area = 0.701 ac,100.00% Impervious, Inflow Depth = 2.77" for 2-Year event
Inflow = 1.99 cfs @ 12.09 hrs, Volume= 0.162 af
Outflow = 0.61 cfs @ 12.40 hrs, Volume= 0.162 af, Atten= 69%, Lag= 18.8 min
Primary = 0.61 cfs @ 12.40 hrs, Volume= 0.162 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 184.49' @ 12.40 hrs Surf.Area= 0 sf Storage= 1,916 cf

Plug-Flow detention time= 50.6 min calculated for 0.161 af (100% of inflow)
Center-of-Mass det. time= 50.4 min (808.2 - 757.8)

Volume	Invert	Avail.Storage	Storage Description
#1	182.22'	6,510 cf	**Stormwater Detention Vault**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.22	0	0
185.55	2,810	2,810
186.62	3,700	6,510

Device	Routing	Invert	Outlet Devices
#1	Primary	182.22'	**4.0" Round Outlet** L= 5.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 182.22' / 182.22' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#2	Primary	185.55'	**10.0" Round Outlet** L= 5.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 185.55' / 185.55' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf

Primary OutFlow Max=0.61 cfs @ 12.40 hrs HW=184.49' (Free Discharge)
└─**1=Outlet** (Inlet Controls 0.61 cfs @ 6.98 fps)
└─**2=Outlet** (Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PDA-1A Runoff Area=148,322 sf 50.03% Impervious Runoff Depth=3.30"
Flow Length=408' Tc=15.9 min CN=89 Runoff=9.52 cfs 0.935 af

Subcatchment 2S: PDA-2 Runoff Area=10,952 sf 33.98% Impervious Runoff Depth=3.00"
Tc=6.0 min CN=86 Runoff=0.86 cfs 0.063 af

Subcatchment 3S: PDA-3 Runoff Area=3,022 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.30 cfs 0.025 af

Subcatchment 7S: PDA-1B_3" RD to Runoff Area=650 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment 8S: PDA-1B_10" RD to Runoff Area=16,000 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.58 cfs 0.131 af

Subcatchment 9S: PDA-1B_3" RD to Runoff Area=650 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment 10S: PDA-1B_3" RD to Runoff Area=1,180 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.12 cfs 0.010 af

Subcatchment 11S: PDA-1B_3" RD to East Runoff Area=950 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.09 cfs 0.008 af

Subcatchment 12S: PDA-1B_10" RD to Runoff Area=12,950 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.28 cfs 0.106 af

Subcatchment 13S: PDA-1B_3" RD to Runoff Area=1,180 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.12 cfs 0.010 af

Reach 1R: DP-1 Inflow=10.43 cfs 1.209 af
Outflow=10.43 cfs 1.209 af

Reach 2R: DP-2 Inflow=0.86 cfs 0.063 af
Outflow=0.86 cfs 0.063 af

Reach 3R: DP-3 Inflow=0.30 cfs 0.025 af
Outflow=0.30 cfs 0.025 af

Pond 7P: Stormwater Detention Vault Peak Elev=185.64' Storage=3,128 cf Inflow=3.01 cfs 0.249 af
Outflow=0.77 cfs 0.249 af

Total Runoff Area = 4.496 ac Runoff Volume = 1.296 af Average Runoff Depth = 3.46"
41.54% Pervious = 1.868 ac 58.46% Impervious = 2.629 ac

Summary for Subcatchment 1S: PDA-1A

Runoff = 9.52 cfs @ 12.21 hrs, Volume= 0.935 af, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	73,584	80	>75% Grass cover, Good, HSG D (Actually 77,457 sf)
*	49,332	98	Paved parking, HSG D
	539	96	Gravel surface, HSG D
	20,994	98	Unconnected roofs, HSG D
*	3,873	98	Contingency (5% Grass -> Impervious)
	148,322	89	Weighted Average
	74,123		49.97% Pervious Area
	74,199		50.03% Impervious Area
	20,994		28.29% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0103	0.11		**Sheet Flow, GRASS** Grass: Short n= 0.150 P2= 3.00"
8.3	358	0.0106	0.72		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
15.9	408	Total			

Summary for Subcatchment 2S: PDA-2

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
7,230	80	>75% Grass cover, Good, HSG D
3,722	98	Paved parking, HSG D
10,952	86	Weighted Average
7,230		66.02% Pervious Area
3,722		33.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: PDA-3

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
3,022	98	Paved parking, HSG D
3,022		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 7S: PDA-1B_3" RD to Southeast

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
650	98	Unconnected roofs, HSG D
650		100.00% Impervious Area
650		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 8S: PDA-1B_10" RD to Southeast

Runoff = 1.58 cfs @ 12.09 hrs, Volume= 0.131 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
16,000	98	Unconnected roofs, HSG D
16,000		100.00% Impervious Area
16,000		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 9S: PDA-1B_3" RD to Southwest

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
650	98	Unconnected roofs, HSG D
650		100.00% Impervious Area
650		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 10S: PDA-1B_3" RD to Northwest (2)

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
1,180	98	Unconnected roofs, HSG D
1,180		100.00% Impervious Area
1,180		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 11S: PDA-1B_3" RD to East

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.008 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
950	98	Unconnected roofs, HSG D
950		100.00% Impervious Area
950		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 12S: PDA-1B_10" RD to East

Runoff = 1.28 cfs @ 12.09 hrs, Volume= 0.106 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
12,950	98	Unconnected roofs, HSG D
12,950		100.00% Impervious Area
12,950		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: PDA-1B_3" RD to Northwest (1)

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
1,180	98	Unconnected roofs, HSG D
1,180		100.00% Impervious Area
1,180		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach 1R: DP-1

Inflow Area = 4.175 ac, 59.25% Impervious, Inflow Depth = 3.47" for 10-Year event
Inflow = 10.43 cfs @ 12.21 hrs, Volume= 1.209 af
Outflow = 10.43 cfs @ 12.21 hrs, Volume= 1.209 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: DP-2

Inflow Area = 0.251 ac, 33.98% Impervious, Inflow Depth = 3.00" for 10-Year event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: DP-3

Inflow Area = 0.069 ac,100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
Inflow = 0.30 cfs @ 12.09 hrs, Volume= 0.025 af
Outflow = 0.30 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: Stormwater Detention Vault

Inflow Area = 0.701 ac,100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
Inflow = 3.01 cfs @ 12.09 hrs, Volume= 0.249 af
Outflow = 0.77 cfs @ 12.45 hrs, Volume= 0.249 af, Atten= 74%, Lag= 21.9 min
Primary = 0.77 cfs @ 12.45 hrs, Volume= 0.249 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 185.64' @ 12.45 hrs Surf.Area= 0 sf Storage= 3,128 cf

Plug-Flow detention time= 51.6 min calculated for 0.249 af (100% of inflow)
Center-of-Mass det. time= 51.6 min (801.4 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1	182.22'	6,510 cf	**Stormwater Detention Vault**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.22	0	0
185.55	2,810	2,810
186.62	3,700	6,510

Device	Routing	Invert	Outlet Devices
#1	Primary	182.22'	**4.0" Round Outlet** L= 5.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 182.22' / 182.22' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#2	Primary	185.55'	**10.0" Round Outlet** L= 5.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 185.55' / 185.55' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf

Primary OutFlow Max=0.77 cfs @ 12.45 hrs HW=185.64' (Free Discharge)
└─**1=Outlet** (Inlet Controls 0.76 cfs @ 8.69 fps)
└─**2=Outlet** (Barrel Controls 0.01 cfs @ 0.69 fps)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PDA-1A Runoff Area=148,322 sf 50.03% Impervious Runoff Depth=5.12"
Flow Length=408' Tc=15.9 min CN=89 Runoff=14.51 cfs 1.454 af

Subcatchment 2S: PDA-2 Runoff Area=10,952 sf 33.98% Impervious Runoff Depth=4.79"
Tc=6.0 min CN=86 Runoff=1.34 cfs 0.100 af

Subcatchment 3S: PDA-3 Runoff Area=3,022 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=0.43 cfs 0.036 af

Subcatchment 7S: PDA-1B_3" RD to Runoff Area=650 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=0.09 cfs 0.008 af

Subcatchment 8S: PDA-1B_10" RD to Runoff Area=16,000 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=2.25 cfs 0.189 af

Subcatchment 9S: PDA-1B_3" RD to Runoff Area=650 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=0.09 cfs 0.008 af

Subcatchment 10S: PDA-1B_3" RD to Runoff Area=1,180 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=0.17 cfs 0.014 af

Subcatchment 11S: PDA-1B_3" RD to East Runoff Area=950 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af

Subcatchment 12S: PDA-1B_10" RD to Runoff Area=12,950 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=1.82 cfs 0.153 af

Subcatchment 13S: PDA-1B_3" RD to Runoff Area=1,180 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=0.17 cfs 0.014 af

Reach 1R: DP-1 Inflow=15.84 cfs 1.849 af
Outflow=15.84 cfs 1.849 af

Reach 2R: DP-2 Inflow=1.34 cfs 0.100 af
Outflow=1.34 cfs 0.100 af

Reach 3R: DP-3 Inflow=0.43 cfs 0.036 af
Outflow=0.43 cfs 0.036 af

Pond 7P: Stormwater Detention Vault Peak Elev=186.04' Storage=4,493 cf Inflow=4.30 cfs 0.360 af
Outflow=1.29 cfs 0.360 af

Total Runoff Area = 4.496 ac Runoff Volume = 1.985 af Average Runoff Depth = 5.30"
41.54% Pervious = 1.868 ac 58.46% Impervious = 2.629 ac

Summary for Subcatchment 1S: PDA-1A

Runoff = 14.51 cfs @ 12.21 hrs, Volume= 1.454 af, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

	Area (sf)	CN	Description
*	73,584	80	>75% Grass cover, Good, HSG D (Actually 77,457 sf)
*	49,332	98	Paved parking, HSG D
	539	96	Gravel surface, HSG D
	20,994	98	Unconnected roofs, HSG D
*	3,873	98	Contingency (5% Grass -> Impervious)
	148,322	89	Weighted Average
	74,123		49.97% Pervious Area
	74,199		50.03% Impervious Area
	20,994		28.29% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0103	0.11		**Sheet Flow, GRASS** Grass: Short n= 0.150 P2= 3.00"
8.3	358	0.0106	0.72		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
15.9	408	Total			

Summary for Subcatchment 2S: PDA-2

Runoff = 1.34 cfs @ 12.09 hrs, Volume= 0.100 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
7,230	80	>75% Grass cover, Good, HSG D
3,722	98	Paved parking, HSG D
10,952	86	Weighted Average
7,230		66.02% Pervious Area
3,722		33.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: PDA-3

Runoff = 0.43 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
3,022	98	Paved parking, HSG D
3,022		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 7S: PDA-1B_3" RD to Southeast

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.008 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
650	98	Unconnected roofs, HSG D
650		100.00% Impervious Area
650		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 8S: PDA-1B_10" RD to Southeast

Runoff = 2.25 cfs @ 12.09 hrs, Volume= 0.189 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
16,000	98	Unconnected roofs, HSG D
16,000		100.00% Impervious Area
16,000		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 9S: PDA-1B_3" RD to Southwest

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.008 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
650	98	Unconnected roofs, HSG D
650		100.00% Impervious Area
650		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 10S: PDA-1B_3" RD to Northwest (2)

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
1,180	98	Unconnected roofs, HSG D
1,180		100.00% Impervious Area
1,180		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 11S: PDA-1B_3" RD to East

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
950	98	Unconnected roofs, HSG D
950		100.00% Impervious Area
950		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 12S: PDA-1B_10" RD to East

Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.153 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
12,950	98	Unconnected roofs, HSG D
12,950		100.00% Impervious Area
12,950		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: PDA-1B_3" RD to Northwest (1)

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.40"

Area (sf)	CN	Description
1,180	98	Unconnected roofs, HSG D
1,180		100.00% Impervious Area
1,180		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach 1R: DP-1

Inflow Area = 4.175 ac, 59.25% Impervious, Inflow Depth = 5.31" for 100-Year event
Inflow = 15.84 cfs @ 12.21 hrs, Volume= 1.849 af
Outflow = 15.84 cfs @ 12.21 hrs, Volume= 1.849 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: DP-2

Inflow Area = 0.251 ac, 33.98% Impervious, Inflow Depth = 4.79" for 100-Year event
Inflow = 1.34 cfs @ 12.09 hrs, Volume= 0.100 af
Outflow = 1.34 cfs @ 12.09 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: DP-3

Inflow Area = 0.069 ac,100.00% Impervious, Inflow Depth = 6.16" for 100-Year event
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 0.036 af
Outflow = 0.43 cfs @ 12.09 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: Stormwater Detention Vault

Inflow Area = 0.701 ac,100.00% Impervious, Inflow Depth = 6.16" for 100-Year event
Inflow = 4.30 cfs @ 12.09 hrs, Volume= 0.360 af
Outflow = 1.29 cfs @ 12.40 hrs, Volume= 0.360 af, Atten= 70%, Lag= 19.1 min
Primary = 1.29 cfs @ 12.40 hrs, Volume= 0.360 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 186.04' @ 12.40 hrs Surf.Area= 0 sf Storage= 4,493 cf

Plug-Flow detention time= 51.7 min calculated for 0.359 af (100% of inflow)
Center-of-Mass det. time= 51.8 min (796.0 - 744.2)

Volume	Invert	Avail.Storage	Storage Description
#1	182.22'	6,510 cf	**Stormwater Detention Vault**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.22	0	0
185.55	2,810	2,810
186.62	3,700	6,510

Device	Routing	Invert	Outlet Devices
#1	Primary	182.22'	**4.0" Round Outlet** L= 5.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 182.22' / 182.22' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#2	Primary	185.55'	**10.0" Round Outlet** L= 5.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 185.55' / 185.55' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf

Primary OutFlow Max=1.29 cfs @ 12.40 hrs HW=186.04' (Free Discharge)
└─**1=Outlet** (Inlet Controls 0.80 cfs @ 9.20 fps)
└─**2=Outlet** (Barrel Controls 0.49 cfs @ 2.13 fps)

APPENDIX C – RECHARGE/WATER QUALITY CALCULATIONS

- Recharge Volume Calculations
- Water Quality Calculations
- TSS Calculations
- Subsurface Detention Vault Drawdown Table

GREEN INTERNATIONAL AFFILIATES, INC.
Civil and Structural Engineers

RECHARGE VOLUME CALCULATIONS

Date: February 22, 2016
Revised:
Project: Bergmeyer Associates, Inc./Mount Holyoke College
Project No: 15040
Location: South Hadley, MA

Prepared By: KK
Checked By: LB

Recharge Volume Design

Objective: Size BMP that will approximate the annual recharge from the existing conditions.

Methodology: MA Department of Environmental Protection (DEP) Massachusetts Stormwater Handbook (Vol.3, Ch.1)

Design Criteria: The required recharge volume equals a depth of runoff corresponding to the soil type times the increase in impervious areas covering that soil type at the post-development site.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)
A	Sand	0.60 inches
B	Loam	0.35 inches
C	Silty Loam	0.25 inches
D	Clay	0.10 inches

The soils are defined by the Natural Resources Conservation Service (NRCS) Soil Survey of Hampshire County of Massachusetts. The site is comprised of 'D' soils. Because of this soil type and soil conditions within the project, no recharge will occur. Instead, a BMP will be sized for storage of the required volume.

Calculation Results:

Designation	Volume Required (cf)	Volume Provided (cf)
DP-1	**263**	**-**
DP-2	**0**	**-**
DP-3	**0**	**-**

Required Recharge Volume: **DP-1**

Hydrologic Soil Group	Existing Impervious Area (SF)	Proposed Impervious Area (SF)	Increase in Impervious Area (SF)	Target Depth	Volume Required
A			0	0.60	0 cf
B			0	0.35	0 cf
C			0	0.25	0 cf
D	91,171	122,752	31,581	0.10	263 cf
Total			31,581		263 cf

Required Recharge Volume: **DP-2**

Hydrologic Soil Group	Existing Impervious Area (SF)	Proposed Impervious Area (SF)	Increase in Impervious Area (SF)	Target Depth	Volume Required
A			0	0.60	0 cf
B			0	0.35	0 cf
C			0	0.25	0 cf
D	4,424	3,721	-703	0.10	-6 cf
Total			-703		-6 cf

Required Recharge Volume: **DP-3**

Hydrologic Soil Group	Existing Impervious Area (SF)	Proposed Impervious Area (SF)	Increase in Impervious Area (SF)	Target Depth	Volume Required
A			0	0.60	0 cf
B			0	0.35	0 cf
C			0	0.25	0 cf
D	3,046	3,022	-24	0.10	0 cf
Total			-24		0 cf

GREEN INTERNATIONAL AFFILIATES, INC.
Civil and Structural Engineers

WATER QUALITY CALCULATIONS

Date: February 19, 2016
Revised:
Project: Bergmeyer Associates, Inc./Mount Holyoke College
Project No: 15040
Location: South Hadley, MA

Prepared By: KK
Checked By: LB

Objective: To determine the required Water Quality Volume (WQV) for adequate stormwater treatment.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: Volume to be treated = 0.5" x Post Development Impervious Area

The project is not within an Outstanding Resource Waters area (Public Water Supply Contributor), a NHESP Priority Habitats of Rare Species Area, or a FEMA Flood Zone. As a result, the site is required to provide a volume to treat 0.5" of runoff over the increase in impervious area when computing the required water quality treatment volume.

Calculation results:

Designation	Volume Required (cf)	Volume Provided (cf)
DP-1	0	-
DP-2	0	-
DP-3	0	-

Volume to be Treated:

DP-1

Total Increase in Impervious Area (excluding roofs): **0 sf** (Roof Area > Increase)
Total Volume to be Treated: **0 cf**

DP-2

Total Increase in Impervious Area (excluding roofs): **0 sf**
Total Volume to be Treated: **0 cf**

DP-3

Total Increase in Impervious Area (excluding roofs): **0 sf**
Total Volume to be Treated: **0 cf**

Volume Provided:

DP-1 - Subsurface Detention Vault

WQ_v = storage below lowest outlet (orifice) = **-** **cf**

DP-2

WQ_v = storage below lowest outlet (orifice) = **-** **cf**

DP-3

WQ_v = storage below lowest outlet (orifice) = **-** **cf**

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: DP-1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = 0.85

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Mount Holyoke College+C17: 15040**
Prepared By: **Luke Boucher**
Date: **2/19/2016**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: DP-2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**

Total TSS Removal = 25%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Mount Holyoke College+C17: 15040**
Prepared By: **Luke Boucher**
Date: **2/19/2016**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: DP-3

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**

Total TSS Removal = 25%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Mount Holyoke College+C17: 15040**
Prepared By: **Luke Boucher**
Date: **2/19/2016**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

SUBSURFACE DETENTION VAULT
DRAWDOWN TABLE

Proposed_Conditions *Type III 24-hr 2-Year Rainfall=3.00"*
Prepared by Microsoft Printed 2/23/2016
HydroCAD® 10.00 s/n 06415 © 2011 HydroCAD Software Solutions LLC

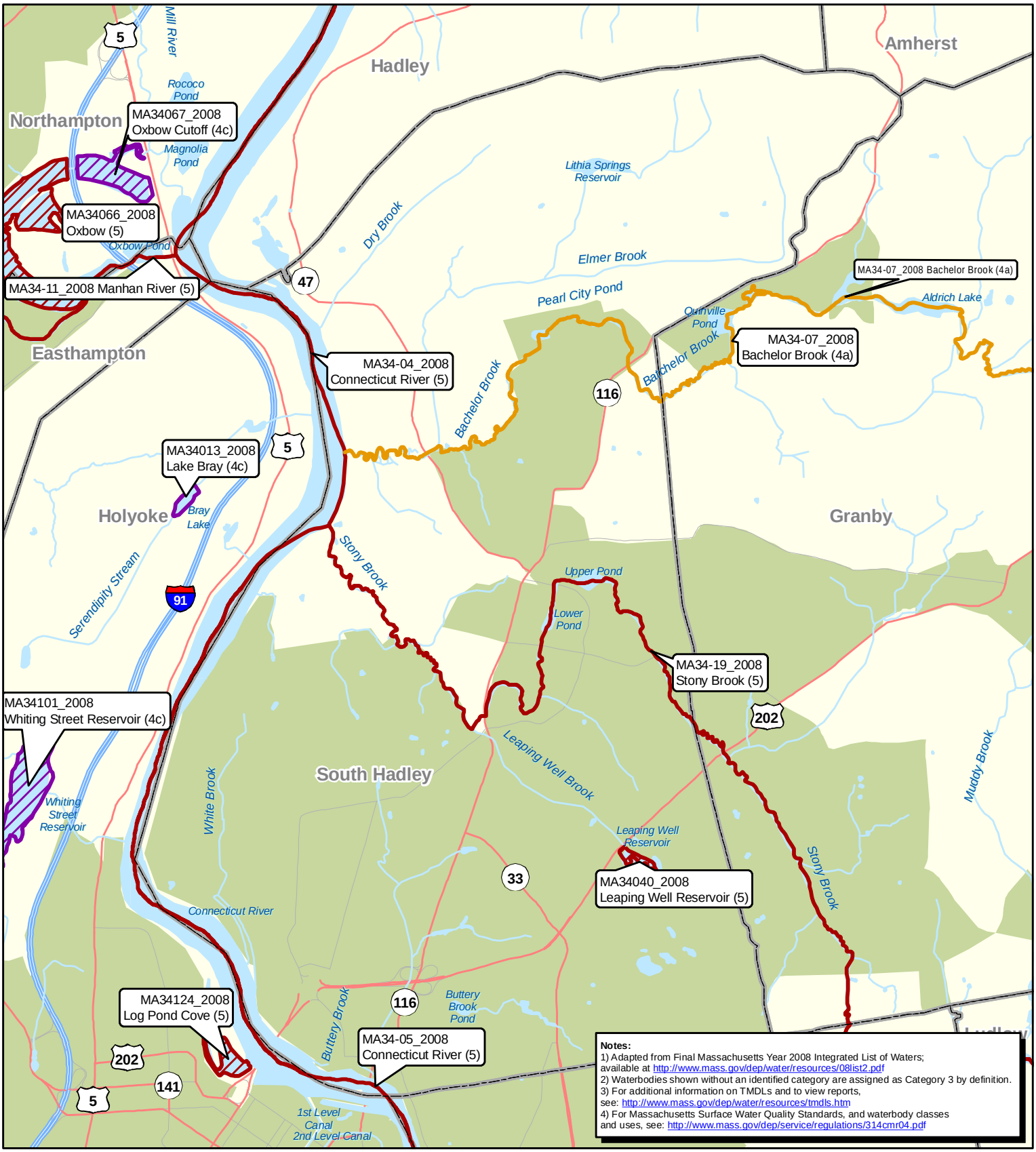
Hydrograph for Pond 8P: Stormwater Detention Vault

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	**2,810**	**185.55**	**0.75**
1.00	0.00	798	183.17	0.37
2.00	0.00	178	182.43	0.05
3.00	0.00	88	182.32	0.01
4.00	0.00	59	182.29	0.01
5.00	0.00	45	182.27	0.00
6.00	0.00	37	182.26	0.00
7.00	0.00	32	182.26	0.00
8.00	0.00	27	182.25	0.00
9.00	0.00	23	182.25	0.00
10.00	0.00	20	182.24	0.00
11.00	0.00	17	182.24	0.00
12.00	0.00	15	182.24	0.00
13.00	0.00	13	182.24	0.00
14.00	0.00	11	182.23	0.00
15.00	0.00	9	182.23	0.00
16.00	0.00	8	182.23	0.00
17.00	0.00	7	182.23	0.00
18.00	0.00	6	182.23	0.00
19.00	0.00	5	182.23	0.00
20.00	0.00	4	182.23	0.00
21.00	0.00	4	182.22	0.00
22.00	0.00	3	182.22	0.00
23.00	0.00	3	182.22	0.00
24.00	0.00	2	182.22	0.00
25.00	0.00	2	182.22	0.00
26.00	0.00	2	182.22	0.00
27.00	0.00	2	182.22	0.00
28.00	0.00	1	182.22	0.00
29.00	0.00	1	182.22	0.00
30.00	0.00	1	182.22	0.00
31.00	0.00	1	182.22	0.00
32.00	0.00	1	182.22	0.00
33.00	0.00	1	182.22	0.00
34.00	0.00	1	182.22	0.00
35.00	0.00	0	182.22	0.00
36.00	0.00	0	182.22	0.00

DRAWDOWN TIME = 35 HOURS
< 72 HOURS (OK)

APPENDIX D – TMDL INFORMATION

- Environmental Protection Agency's Map, Waterbody Assessment and TMDL Status - South Hadley, MA



Notes:
1) Adapted from Final Massachusetts Year 2008 Integrated List of Waters; available at http://www.mass.gov/dep/water/resources/08list2.pdf
2) Waterbodies shown without an identified category are assigned as Category 3 by definition.
3) For additional information on TMDLs and to view reports, see: http://www.mass.gov/dep/water/resources/tmdls.htm
4) For Massachusetts Surface Water Quality Standards, and waterbody classes and uses, see: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

Waterbody Assessment and TMDL Status
South Hadley, MA

N

0 0.5 Miles

EPA

Map produced by EPA Region I GIS Center
Map Tracker ID 6678, February 25, 2010
Data Sources: TeleAtlas, Census Bureau, USGS, MassDEP

Waterbody Label

State ID,
Waterbody Name (Category)
(TMDL(s) approved for this waterbody)

See companion table for a listing of pollutants, non-pollutants, and TMDLs for each waterbody

Assessment of Waterbody Segment

- **Category 2:** Attaining some uses; other uses not assessed
- **Category 3:** Insufficient information to make assessments for any use.
- **Category 4a:** TMDL is completed and approved for one or more pollutants
- **Category 4c:** Impairment not caused by a pollutant.
- **Category 5:** Impaired or threatened for one or more uses and requiring a TMDL.

- Waterbodies
- Swamp/Marsh
- MS4 Urbanized Areas (2000 Census)
- Municipal Boundaries

APPENDIX E – SOIL INFORMATION

- NRCS Soils Report (from NRCS Web Soil Survey)
- Boring Logs

Hydrologic Soil Group—Hampshire County, Massachusetts, Central Part

Map Scale: 1:6,920 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hampshire County, Massachusetts, Central Part
Survey Area Data: Version 10, Sep 28, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 28, 2011—Apr 18, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Hampshire County, Massachusetts, Central Part (MA609)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Water		16.6	7.4%
4A	Rippowam fine sandy loam, 0 to 3 percent slopes	A/D	5.2	2.3%
14A	Scitico silt loam, 0 to 3 percent slopes	D	1.0	0.4%
30A	Raynham silt loam, 0 to 3 percent slopes	C/D	1.9	0.8%
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	0.0	0.0%
220B	Boxford silt loam, 3 to 8 percent slopes	D	1.8	0.8%
255A	Windsor loamy sand, 0 to 3 percent slopes	A	4.9	2.2%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	0.6	0.3%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	B	0.0	0.0%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	B	0.9	0.4%
275B	Agawam fine sandy loam, 3 to 8 percent slopes	B	2.9	1.3%
397B	Wethersfield fine sandy loam, 3 to 8 percent slopes	C	15.0	6.7%
397C	Wethersfield fine sandy loam, 8 to 15 percent slopes	C	12.9	5.8%
536C	Wethersfield fine sandy loam, 8 to 15 percent slopes, stony	C	51.8	23.1%
741A	Amostown-Windsor silty substratum-Urban land complex, 0 to 3 percent slopes		16.2	7.2%
745C	Hinckley-Merrimac-Urban land complex, 3 to 15 percent slopes	A	86.2	38.4%
750C	Windsor-Scitico-Amostown complex, 0 to 15 percent slopes	A	6.4	2.8%
Totals for Area of Interest			**224.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

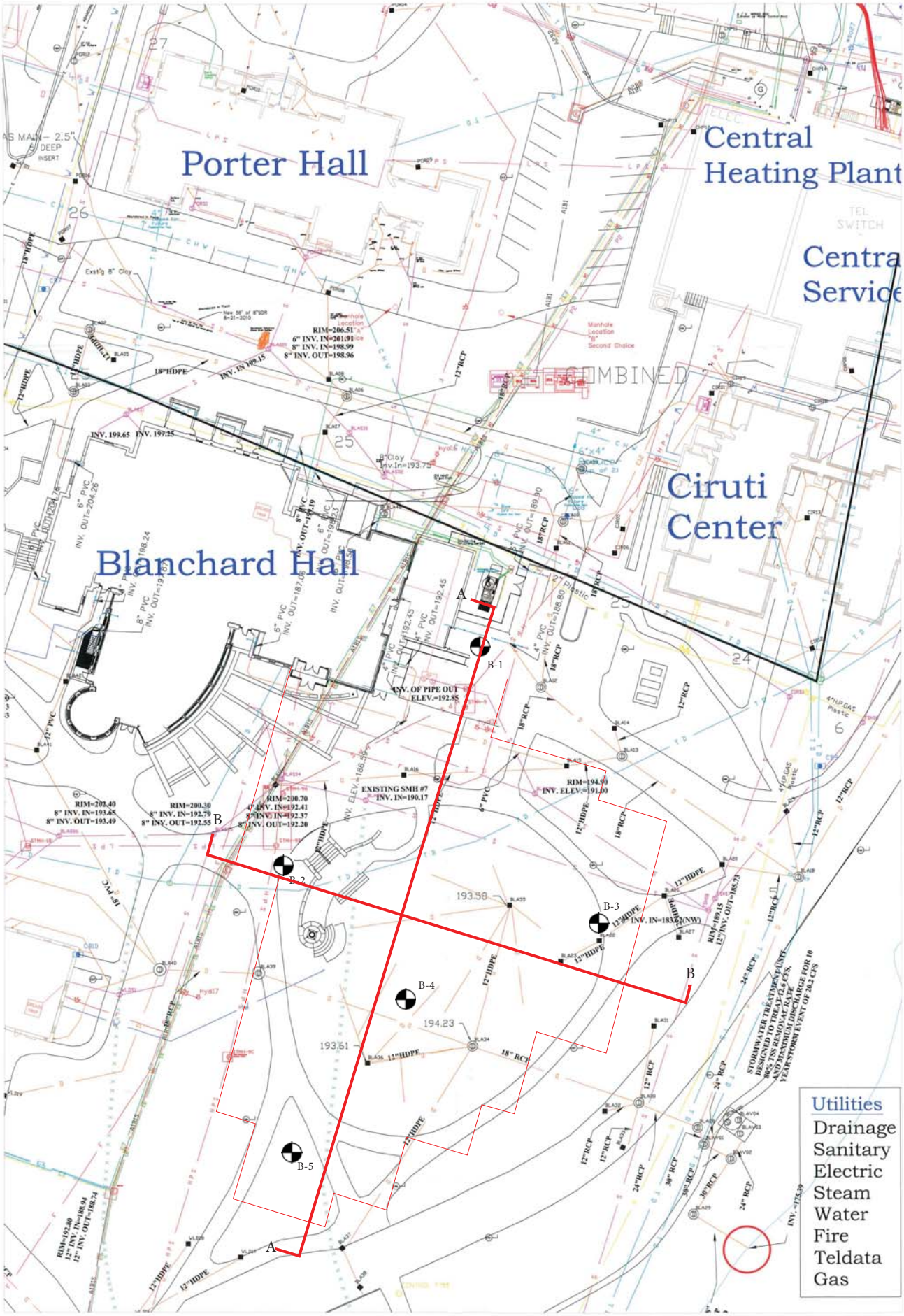
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher



TEST BORING & CROSS SECTION LOCATIONS ADDITON TO BLANCHARD HALL MOUNT HOLOYKE COLLEGE NTS SEPTEMBER , 2015 DR. CLARENCE WELTI, P.E., P.C.	SITE UTILITIES MOUNT HOLYOKE COLLEGE	MOUNT HOLYOKE. FACILITIES MANAGEMENT OTTO C KOHLER BUILDING 47 MORGAN STREET SOUTH HADLEY, MASSACHUSETTS 01075 (413) 538-2012

DRAWN BY: psz/rb/lwm
CHECKED BY:
SCALE: 1" = 20'
DATE: 3.19.2015
FILE: mhc_fm_base.dwg
1 of 1

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
BERGMEYER ASSOCIATES, INC.

PROJECT NAME
ADDITION TO BLANCHARD HALL, MT.HOLYOKE COLLEGE

LOCATION
MOUNT HOYOKE COLLEGE
50 COLLEGE STREET, SOUTH HADLEY, MA.

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	NQ
SIZE I.D.	3.75"		1.375"	2.0"
HAMMER WT.			140 lbs	
HAMMER FALL			30"	

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV. 197
HOLE NO. **B-1**

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 9/15/15
FINISH DATE 9/15/15

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS		ELEV.
0					ASPHALT	0.25	
	1	16-14-18-11	1.00'-3.00'		GREY FINE-CRS. SAND AND GRAVEL, TRACE SILT	0.50	
					DARK BR. FINE-CRS. SAND, SOME GRAVEL, LITTLE SILT, TRACE BRICK & CINDERS - FILL	2.5	195
	2	8-7-6-8	3.00'-5.00'		GREY/BR. FINE-CRS.SAND, SOME SILT, LITTLE BRICK, TRACE GRAVEL - FILL		
5	3	7-8-6-4	5.00'-7.00'				
	4	2-2-20-11	7.00'-9.00'				190
					BR. FINE-CRS. SAND, LITTLE SILT & GRAVEL	8.0	
	5	4-4-8-16	9.00'-11.00'				
10					GREY/BR.SILT, TRACE CLAY	10.5	
							185
					CORED BEDROCK - GREY SHALE AND SILTSTONE	13.5	
15					RUN #1 13.5' - 18.5' RECOVERED 60" RQD=7%		
							180
					BOTTOM OF BORING @ 18.5'	18.5	
20							
							175
25							
							170
30							
							165
35							

LEGEND: COL. A:
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER
INSPECTOR:

SHEET 1 OF 1 HOLE NO. **B-1**

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT BERGMEYER ASSOCIATES, INC.	PROJECT NAME ADDITION TO BLANCHARD HALL, MT.HOLYOKE COLLEGE LOCATION MOUNT HOYOKE COLLEGE 50 COLLEGE STREET, SOUTH HADLEY, MA.

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	
SIZE I.D.	3.75"		1.375"	NQ
HAMMER WT.			140 lbs	2.0"
HAMMER FALL			30"	

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV. 198.5 | HOLE NO. **B-2**

GROUND WATER OBSERVATIONS
AT 13.2 FT. AFTER 1 HOURS
AT FT. AFTER HOURS

START DATE 9/17/15
FINISH DATE 9/17/15

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS		ELEV.
0	1	10-13-27-30	0.00'-2.00'		TOPSOIL	0.40	
					BR. FINE-CRS.SAND, LITTLE SILT, TRACE CONCRETE & BRICK - FILL	1.50	
	2	23-19-20-19	2.00'-4.00'		GREY FINE-MED. SAND AND SILT, TRACE FINE GRAVEL - FILL		195
5	3	10-11-13-15	5.00'-7.00'				
	4	8-6-5-5	7.00'-9.00'			8.0	190
					BR. FINE-MED. SAND, LITTLE SILT & GRAVEL, TRACE ASPHALT - FILL		
	5	3-5-11-13	9.00'-11.00'				
10						13.0	185
					GREY SILT, LITTLE TO SOME CLAY		
15	6	2-3-4	15.00'-16.50'			18.5	180
					RED/BR. FINE-CRS. SAND AND SILT, LITTLE GRAVEL		
20	7	12-13-60	20.00'-21.25'			21.0	
					CORED BEDROCK - RED/BR.SHALE & SILTSTONE		
					RUN #1 21.0' - 26.0' RECOVERED 60" RQD=60%		175
25						26.0	
					BOTTOM OF BORING @ 26.0'		
					2" DIA. WELL @ 24.0'		
					10' OF SCREEN (.010 SLOT)		170
30					14' OF RISER		
					0' OF STICKUP		
					SAND FROM 24.0' TO 12.0'		
					BENTONITE SEAL FROM 12.0' TO 11.0'		165
35							

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER
INSPECTOR:

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT BERGMEYER ASSOCIATES, INC.	PROJECT NAME ADDITION TO BLANCHARD HALL, MT.HOLYOKE COLLEGE LOCATION MOUNT HOYOKE COLLEGE 50 COLLEGE STREET, SOUTH HADLEY, MA.

DEPTH	SAMPLE NO.	SAMPLE BLOWS/6"	SAMPLE DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
					BACKFILL FROM 11.0' TO 0.5'	
					CONCRETE FROM 0.5' TO SURFACE	
					7" DIA. ROADWAY BOX COVER	
						160
40						
						155
45						
						150
50						
						145
55						
						140
60						
						135
65						
						130
70						
						125
75						

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER

INSPECTOR:

SHEET 2 OF 2

HOLE NO. **B-2**

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
BERGMEYER ASSOCIATES, INC.

PROJECT NAME
ADDITION TO BLANCHARD HALL, MT.HOLYOKE COLLEGE

LOCATION
MOUNT HOYOKE COLLEGE
50 COLLEGE STREET, SOUTH HADLEY, MA.

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	NQ
SIZE I.D.	3.75"		1.375"	2.0"
HAMMER WT.			140 lbs	
HAMMER FALL			30"	

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV. 191.5
HOLE NO. **B-3**

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 9/15/15
FINISH DATE 9/15/15

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
0	1	2-2-3-4	0.00'-2.00'		TOPSOIL 0.20	
					GREY/BR. FINE-CRS. SAND, SOME SILT, LITTLE GRAVEL & BRICK, TRACE ASPHALT - FILL	190
	2	2-2-2-2	2.00'-4.00'			
	3	2-1-1-1	4.00'-6.00'			
5						
	4	1-2-2-5	6.00'-8.00'			185
					7.5	
	5	7-8-8-14	8.00'-10.00'		BR. FINE SAND AND SILT	
					9.5	
10	6	7-8-7	10.00'-11.50'		BR. FINE-MED.SAND AND SILT, LITTLE GRAVEL	
						180
					12.5	
					CORED BEDROCK - RED/GREY SHALE AND SANDSTONE	
					RUN #1 12.5' - 17.5' RECOVERED 60" RQD=0%	
15						
						175
					17.5	
					BOTTOM OF BORING @ 17.5'	
20						
						170
25						
						165
30						
						160
35						

LEGEND: COL. A:
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER
INSPECTOR:

SHEET 1 OF 1 HOLE NO. **B-3**

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT BERGMEYER ASSOCIATES, INC.	PROJECT NAME ADDITION TO BLANCHARD HALL, MT.HOLYOKE COLLEGE LOCATION MOUNT HOYOKE COLLEGE 50 COLLEGE STREET, SOUTH HADLEY, MA.

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	
SIZE I.D.	3.75"		1.375"	
HAMMER WT.			140 lbs	
HAMMER FALL			30"	

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV. 195.0 | HOLE NO. **B-4**

GROUND WATER OBSERVATIONS
AT 13.65 FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 9/16/15
FINISH DATE 9/16/15

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS		ELEV.
0	1	1-2-5-8	0.00'-2.00'		TOPSOIL	0.40	195
					GREY/BR. FINE-MED. SAND, SOME SILT, LITTLE GRAVEL, TRACE ASPHALT - FILL	2.0	
	2	7-8-7-11	2.00'-4.00'		GERY/BR.SILT, TRACE CLAY	3.5	
	3	12-21-19-10	4.00'-6.00'		GREY/BR.FINE-CRS.SAND, LITTLE SILT & GRAVEL - FILL		
5						6.0	190
	4	4-4-3-2	6.00'-8.00'		GREY/BR.FINE-CRS.SAND, LITTLE TO SOME SILT		
	5	7-7-9-9	8.00'-10.00'				
10	6	8-9-2-12	10.00'-12.00'				185
					GREY SILT, LITTLE CLAY	11.5	
15	7	6-8-14	15.00'-16.50'				180
					GREY/BR. FINE-CRS. SAND, SOME SILT, LITTLE GRAVEL	16.0	
					CORED BEDROCK - RED/GREY SILTSTONE AND SHALE	17.5	
					RUN #1 17.5' - 22.5' RECOVERED 60" RQD=45%		
20							175
					BOTTOM OF BORING @ 22.5'	22.5	
25							170
30							165
35							160

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER
INSPECTOR:

SHEET 1 OF 1 | HOLE NO. **B-4**

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT BERGMEYER ASSOCIATES, INC.	PROJECT NAME ADDITION TO BLANCHARD HALL, MT.HOLYOKE COLLEGE LOCATION MOUNT HOYOKE COLLEGE 50 COLLEGE STREET, SOUTH HADLEY, MA.

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	NQ
SIZE I.D.	3.75"		1.375"	2.0"
HAMMER WT.			140 lbs	
HAMMER FALL			30"	

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV. 195.0 | HOLE NO. **B-5**

GROUND WATER OBSERVATIONS
AT FT. AFTER HOURS
AT FT. AFTER HOURS

START DATE 9/16/15
FINISH DATE 9/16/15

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS		ELEV.
0	1	2-7-8-10	0.00'-2.00'		CEDAR CHIPS	0.20	195
					TOPSOIL	0.50	
					BR. FINE-CRS. SAND, SOME SILT, LITTLE GRAVEL - FILL	2.0	
	2	11-12-13-12	2.00'-4.00'		BR. FINE-MED. SAND, LITTLE SILT, LITTLE SILT/CLAY LAYERS - FILL	3.0	
					GREY FINE SAND AND SILT - FILL		
5	3	13-10-7-5	5.00'-7.00'				190
					BR. FINE-MED. SAND, LITTLE SILT & ASPHALT - FILL	6.0	
	4	5-5-5-6	7.00'-9.00'				
					GREY FINE-MED. SAND AND SILT, TRACE CLAY & GRAVEL	9.0	
10	5	9-8-7-10	10.00'-12.00'				185
15	6	4-8-10	15.00'-16.50'				180
					RED/GREY/BR. FINE SAND AND SILT, LITTLE GRAVEL, TRACE CLAY	16.0	
					CORED BEDROCK - GREY SHALE	17.0	
					RUN #1 17.0' - 22.0' RECOVERED 60" RQD=		
20							175
					BOTTOM OF BORING @ 22.0'	22.0	
25							170
30							165
35							160

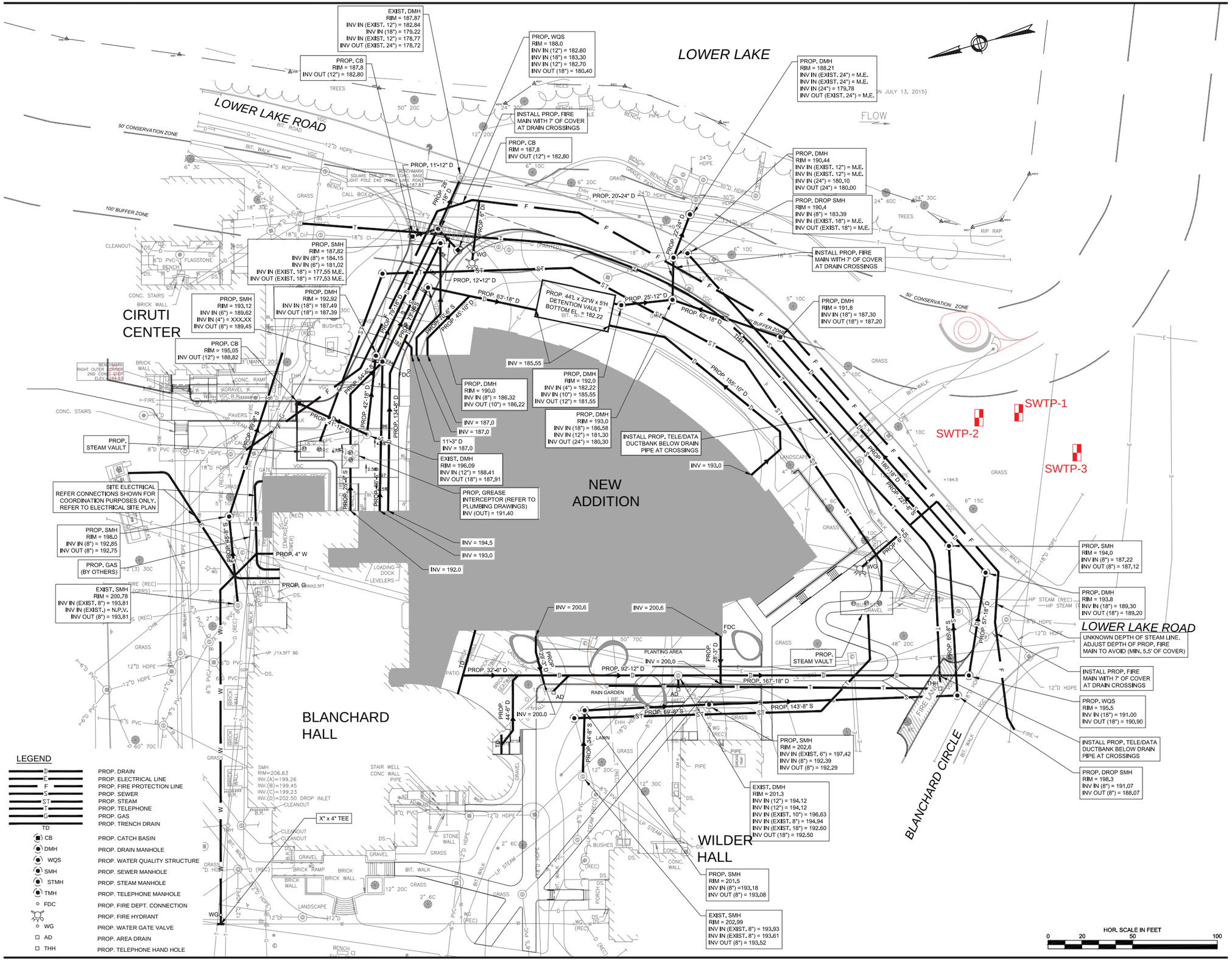
LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER
INSPECTOR:

SHEET 1 OF 1 | HOLE NO. **B-5**



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NO.	BY	DATE	DESCRIPTION
	KK	02.26.2016	PERMIT PLANS

MOUNT HOLYOKE COLLEGE
COMMUNITY CENTER WITH DINING

50 College St, South Hadley, MA 01075

TEST PIT LOCATION PLAN

OCTOBER 27, 2015

DRAWN BY:	KK
REVIEWED BY:	LB
JOB NO:	15040.002

C105

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT BERGMEYER	PROJECT NAME ADDITION TO BLANCHARD HALL LOCATION MOUNT HOLYOKE COLLEGE SOUTH HADLEY, MA

	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV.	HOLE NO. SWTP-1
TYPE					LINE & STA.	GROUND WATER OBSERVATIONS	START DATE 10/27/15
SIZE I.D.					N. COORDINATE	AT 9.2 FT. AFTER 0 HOURS	
HAMMER WT.					E. COORDINATE	AT FT. AFTER HOURS	FINISH DATE 10/27/15
HAMMER FALL							

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS		ELEV.
0					Topsoil		
					Light brown fine to medium SAND, trace Silt	1.0	
					Rust Stained fine to medium SAND, trace Silt	3.0	
					Grey/brown fine to medium SAND, some Silt	3.25	
5							
					Red/brown fine to medium SAND and Silt, little Gravel	7.0	
10					Bottom of Test Pit @ 10.0'	10.0	
					Note: Groundwater was at 9.2 feet below the existing grade at the completion of the test pit. The soils to about 2 feet above that level had water contents close saturation.		
15							
20							
25							
30							
35							

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER:

INSPECTOR: M.WELTI

SHEET 1 OF 1 HOLE NO. **SWTP-1**

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT BERGMEYER	PROJECT NAME ADDITION TO BLANCHARD HALL LOCATION MOUNT HOLYOKE COLLEGE SOUTH HADLEY, MA

	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV.	HOLE NO. SWTP-2
TYPE					LINE & STA.	GROUND WATER OBSERVATIONS	START DATE 10/27/15
SIZE I.D.					N. COORDINATE	AT 8.9 FT. AFTER 0 HOURS	
HAMMER WT.					E. COORDINATE	AT FT. AFTER HOURS	FINISH DATE 10/27/15
HAMMER FALL							

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS		ELEV.
0					Topsoil	0.83	
					Light brown fine to medium SAND, trace Silt	3.75	
					Rust Stained fine to medium SAND, trace Silt	4.75	
5					Grey/brown fine to medium SAND, some Silt to SILT and fine SAND	8.9	
					Red/brown fine to medium SAND and Silt, little Gravel	9.5	
10					Bottom of test pit @ 9.5 feet		
					Note: Groundwater was at 8.9 feet below the existing grade at the completion of the test pit. The soils to about 2 feet above that level had water contents close to saturation.		
15							
20							
25							
30							
35							

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER:

INSPECTOR: M.WELTI

SHEET 1 OF 1 HOLE NO. **SWTP-2**

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT BERGMEYER	PROJECT NAME ADDITION TO BLANCHARD HALL LOCATION MOUNT HOLYOKE COLLEGE SOUTH HADLEY, MA

	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV.	HOLE NO. SWTP-3
TYPE					LINE & STA.	GROUND WATER OBSERVATIONS	START DATE 10/27/15
SIZE I.D.					N. COORDINATE	AT none FT. AFTER 0 HOURS	
HAMMER WT.					E. COORDINATE	AT FT. AFTER HOURS	FINISH DATE 10/27/15
HAMMER FALL							

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS		ELEV.
0					Topsoil	0.83	
					Light grey/white/brown Ashes and Cinders - FILL	2.5	
					Light brown fine to medium SAND, trace Silt	3.83	
					Rust brown fine to medium SAND, trace Silt	4.20	
5					Grey/brown fine to medium SAND, some Silt to SILT and fine SAND	7.0	
					grey/brown SILT and CLAY	9.0	
10					Bottom of test pit @ 9.0 feet Note: There was groundwater seepage into the test pit at about 7 feet below the existing grades. The soils below that level were saturated.		
15							
20							
25							
30							
35							

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER:

INSPECTOR: M.WELTI

SHEET 1 OF 1 HOLE NO. **SWTP-3**

APPENDIX F – ILLICIT DISCHARGE COMPLIANCE STATEMENT

Illicit Discharge Compliance Statement

Per Standard 10 of the Massachusetts Stormwater Handbook, the following is an Illicit Discharge Compliance Statement:

The design plans submitted for the Notice of Intent have been designed in full compliance with current standards.

The Long-Term Pollution Prevention Plan is part of the Operation and Maintenance Plan and includes measures to prevent illicit discharges. There are no known combined sewer outfalls and to the best of our knowledge all closed stormwater systems discharge per MA DEP requirements. Based on observations during site visits performed by the design team, the site does not contain any known existing illicit discharges.

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
LUKE L.
BOUCHER
CIVIL
No. 47802
REGISTERED
PROFESSIONAL ENGINEER

02/25/2016

Signature and Date

APPENDIX G – STORMWATER MANAGEMENT PLANS (BOUND SEPARATELY)