STORMWATER REPORT

THE OVERLOOK MULITFAMILY REDEVELOPMENT 44 WHARF STREET WEYMOUTH, MASSACHUSETTS

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APPENDICES

Appendix A – DEP Stormwater Checklist

- Appendix B Custom Soil Resource Report, Geotechnical Report
- Appendix C Supporting Calculations
 - HydroCAD Drainage Analysis
 - TSS Calculations
 - Water Quality Volume and Recharge Calculations
 - Manufacturer's O&M Procedures
 - Illicit Discharge Compliance Statement

Appendix D – Site Plans

1.0 PROJECT NARRATIVE

1.1 INTRODUCTION

On behalf of Francer Manufacturing & Supply Corporation (the "Owner") and Wharf Associates, LLC, c/o the Heritage Companies (the "Applicant"), Civil & Environmental Consultants, Inc. (CEC) has prepared this stormwater report and analysis to demonstrate compliance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the Town of Weymouth Stormwater Requirements.

The Applicant is proposing to redevelop an existing 3.5-acre parcel of land located at 44 Wharf Street in Weymouth, Massachusetts (the "Site") in order to redevelop an existing mill building and construct one (1) new building with 84 residential apartment units along with 146 associated parking spaces and drive aisles, landscape, stormwater management and utility improvements (the "Project")

1.2 EXISTING CONDITIONS

The 3.5-acre parcel of land includes one (1) existing historic mill building with an attached metal frame building, along with paved parking areas and a vegetated area in the rear of the Site. The Site is bound to the northwest by residential properties, to the west by an industrial property, to the southwest by an MBTA Commuter Rail Tracks, to the southeast by Wharf Street, and to the northeast by Osprey Overlook Park. See Figure 1 for a Site Locus Map and Figure 2 for an Aerial Map.

Under existing conditions, approximately 40% of the Site is covered by impervious areas consisting of the paved driveways, parking areas, sidewalks, and building roof areas. The remainder of the Site consists of a vegetated areas along the northerly and westerly portions of the Site. Existing topography in the Site ranges from elevation 14 feet (Town of Weymouth Datum) at the depressed loading dock at the eastern corner of the mill building, up to elevation 44 feet along the western wooded edge of the parcel. The Site contains steep slopes at approximately 18% pitching down from the residential properties to the west towards the central portion of the site. The remainder of the Site contains mild slopes directing runoff towards Wharf Street, and a localized catch basin in the rear of the property. A depressed area is located along the front of the building between Wharf Street and the existing building, with a localized low point where stormwater will pond and eventually overflow to Wharf Street. There is also a small yard drain which captures a negligible amount of stormwater runoff which is assumed to be a dry well.

A small diameter drain is located along the southerly edge of the property that appears to convey flows from beneath the MBTA tracks into an existing drainage swale and stone culvert behind the existing mill building. The catch basin and stone culvert are presumed to convey flows toward the existing municipal system in Wharf Street. A drainage culvert conveys flows from catch basins in Sumner Road through the Site to the municipal system in Wharf Street. Catch basins are located in the layout of Wharf Street to the north of the Site, which capture the runoff in Wharf Street and convey flow through a 24-inch culvert to an outlet along Herring Brook. Refer to the Existing Conditions Plan included in the Site Plans located within Appendix D.

The Site is located within a Zone AE regulatory floodplain, at Elevation 11 feet (NAVD88) as shown on the Federal Emergency Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Norfolk County, Massachusetts, Map # 25021C0231E, Town of Weymouth #250257, effective July 17, 2012. The Flood Insurance Study (FIS) for Norfolk County as revised July 16, 2015 identifies the Based Flood Elevation for Herring Brook along the Site frontage to be elevation 11.2 (NAVD88). The Zone AE denotes areas that are subject to flooding by the 1% annual chance flood. Refer to Figure 3 for the FEMA Flood Map.

The project is also located within buffer zones to resource areas protected under the Massachusetts Wetlands Protection Act including Inland Bank and Salt Marshes. The Site is also located within the 100-year Zone AE flood zone which is regulated as Coastal Land Subject to Flooding under the Wetlands Protection Act. The outer limit of the 200 foot Riverfront Area associated with Herring Brook extends onto the Site. Although the Site is not located within an Area of Critical Environmental Concern (ACEC), the existing municipal drainage system in Wharf Street discharges to the Weymouth Back River ACEC which is identified as an Outstanding Resource Water.

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the Site is classified primarily urban land (#602), with Hinkley loamy sand (#245C) along the west and Udorthents, refuse substratum (#652) along the easterly edge of the Site. Urban land refers to land that has been excavated and filled. Hinkley loamy sand is described as sandy and gravelly glaciofluvial deposits derives from gneiss and/or granite and/or schist. Udorthents, refuse substratum is described as excavated and filled loamy land over placed refuse. This is due to the presence of the existing landfill to the north which has been closed. Based on historical and asbuilt documentation of the limits of waste for the landfill, it is not expected that any refuse will be encountered at the Site.

Preliminary geotechnical investigations were performed by Charles H Gross, PE, LLC. in July, 2020. Nine (9) test borings were performed at the Site in July, 2020. Based on the test boring information, the soil at the Site generally consists of silty sand of 9 to 30 feet, underlain by approximately 2 feet of fill. The fill material was classified as silty sand with <5% fine gravel, 12-20% npf, root fibers, light brown to brown and dry. Some soil samples such as in borehole B-1 also had Sand from depth 13 feet to 20 feet. Gravelly Sand was found in smaller amounts such as in borehole B-2 from 0 feet to 2 feet depth and from 29 to 32 feet depth. Detailed soil descriptions are presented on the geotechnical report included in Appendix B. The groundwater levels observed in the various wells varying from depths of approximately 9-feet below ground surface to depths of 20 feet below ground surface. Based on these measurements, the groundwater elevations appear

to be lower on the northern portion of the Site and higher as you move south and east.

Based on the review of the NRCS Web Soil Survey Report and information contained in the geotechnical report, Hydrologic Soil Group (HSG) A was conservatively utilized in the hydrologic analysis as the project will result in an increase in impervious areas. Soil collected from geotechnical boring B-1 at varying depths was analyzed and the soils classified as fine to coarse sand and fine gravel, little silt (SM) per the Unified Soil Classification System (USCS). Accordingly, a Loamy Sand soil classification per the USDA Soil Textural Classification Methodology was utilized for infiltration calculations. An infiltration rate of 2.41 in/hr. was utilized based on the Rawl's rate for Loamy Sand in accordance with the Massachusetts Stormwater Handbook. Refer to Appendix B for the NRCS soil information and geotechnical engineering report.

1.3 PROPOSED PROJECT

The Applicant is proposing to redevelop the Site by performing a historic mill rehabilitation converting the existing underutilized and degraded mill building into residential apartment units. An existing metal frame building that was constructed after the original mill building will be razed and a new building with a similar footprint will be constructed in the northerly portion of the Site. Overall, the project includes the construction of 84 residential apartment units along with 146 associated parking spaces and drive aisles, landscape, stormwater management and utility improvements.

The Project will include new water quality and quantity controls designed to protect surface and groundwater resources and adjacent properties from potential impacts resulting from the proposed Project. The proposed improvements will be designed in accordance with the MassDEP Stormwater Management Standards and the Town of Weymouth Stormwater Requirements.

In the proposed condition, approximately 56% of the Site will be impervious consisting of paved driveway areas, sidewalks, and building roof areas. The remainder of the Site will consist of landscaped areas and existing wooded areas to remain undeveloped. The overall drainage patterns on the Site will be maintained in the proposed condition, and runoff from paved areas will be routed through water quality control structures and stormwater infiltration chambers before discharging into the existing municipal drainage system on Wharf Street. Clean runoff from building roof areas will be directed to subsurface infiltration chambers where stormwater will be recharged into the ground.

The stormwater runoff from paved areas within the central portions of the Site will be conveyed into a proprietary water quality units (Stormceptor[®] STC 450i) prior to being directed to infiltration chambers (StormTech[®] MC-3500 and StormTech[®] SC-740) that will provide stormwater recharge. The runoff from the proposed buildings will be captured by roof drains and conveyed through roof drain systems as clean runoff to infiltration chambers. Stormwater flows in excess of the

infiltration capacity will overflow into the existing municipal system in Wharf Street after providing detention of the stormwater flows. Stormwater runoff collected in a depressed courtyard along Wharf Street will be collected and routed through a water quality unit prior to discharging to the existing municipal system in Wharf Street.

Additionally, the project has been designed to grade the entrance and surrounding area to provide additional protection from flooding. The Site has been graded such that a minimum of 12-inches of freeboard is provided above the 100-year Based Flood Elevation along the Site frontage and proposed driveway preventing coastal flood waters from encroaching significantly onto the Site.

The drainage culvert conveying offsite flows from Sumner Road will be intercepted and directed through the Site stormwater network and reconnected to the existing municipal system in Wharf Street. The off-site stormwater runoff from the abutting properties to the northwest will be collected in a swale and conveyed to two landscape drains. This drainage will connect to the on-site drainage system and will be conveyed to the existing municipal system in Wharf Street.

2.0 STORMWATER MANAGEMENT SYSTEM

2.1 DESCRIPTION OF RUNOFF CONTROLS

The stormwater management improvements consist of components designed to manage runoff from the Site. These components attenuate runoff discharge peaks, minimize erosion, minimize the transport of sediments, improve water quality, and prevent impacts to the municipal drainage system and any downstream resource areas.

The stormwater management system will implement a treatment train of the Best Management Practices designed to provide 80% TSS (Total Suspended Solids) removal for stormwater runoff from the proposed drive aisles and parking areas. The proposed stormwater management system will use the following specific control measures:

• <u>Deep Sump Catch Basin</u>: Deep Sump Catch Basins provide efficient removal of free oils, debris and total suspended solids (TSS). Catch Basins allow for safe and easy removal of collected material and should be inspected and cleaned in accordance with the Operations and Maintenance (O&M) Plan and per manufacturer's recommendations. See the Long Term Pollution Prevention and O&M Plan included in Section 6 and Appendix C for supporting information.

The use of this unit for treatment of stormwater is accepted as a good practice and is in accordance with sound professional standards. The Massachusetts Stormwater Handbook lists the Deep Sump Catch Basin as an acceptable pre-treatment method for achieving the pollutant removal efficiencies noted¹.

- <u>Stormceptor STC 450i:</u> The proposed water quality units provide efficient removal of free oils, debris and total suspended solids (TSS). Although not the main objective of the water quality unit, some removal of heavy metals and other nutrients is also achieved. Water quality units allow for safe and easy removal of collected material and should be inspected and cleaned in accordance with the Operations and Maintenance (O&M) Plan and per manufacturer's recommendations. See the O&M Plan included in Section 6 and Appendix C for supporting information. The use of these units for treatment of stormwater is accepted as a good practice and is in accordance with sound professional standards. See Appendix C for supporting information.
- <u>Stormwater Infiltration Chambers (StormTech® MC-3500 Chambers & StormTech® SC-740) Isolator Row:</u> Although all runoff directed to the infiltration chambers is considered clean runoff from roof areas, the Isolator Row will provide efficient removal of free oils, debris and total suspended solids (TSS) as an added level of pretreatment of the stormwater runoff. The Isolator Rows allow for safe and easy removal of collected material and should

Massachusetts Stormwater Handbook

https://www.mass.gov/files/documents/2016/08/qi/v2c2.pdf (accessed December 2018)

be inspected and cleaned in accordance with the O&M Plan and per manufacturer's recommendations.

Stormwater recharge for the proposed redevelopment is also provided through the infiltration of runoff from the building roof areas via the StormTech® chambers which are located beneath the paved drive aisles between the existing historic mill building and the proposed building as well as under the paved parking area.

The use of Isolator Rows for treatment of stormwater is accepted as a good practice and is in accordance with sound professional standards. Calculations for the provided recharge volume and system drawdown time are provided in Appendix C.

These proposed runoff controls are detailed on the Site Plans included under separate cover.

2.2 CONSTRUCTION SEQUENCE PLAN

The purpose of the Construction Sequence Plan is to develop a working schedule for the implementation of the proposed stormwater improvements.

Prior to initiating any work, siltation control barriers will be installed along the limit of work. Once the appropriate permits are obtained, the construction project will commence in the following sequence:

- 1. Install all necessary siltation barriers as shown on the design drawings.
- 2. Perform tree clearing and grubbing.
- 3. Perform demolition of existing pavement, building and landscape areas and cut, cap, and remove existing utility services as shown on the design drawings.
- 4. Perform excavation for building foundation areas and subsurface utilities.
- 5. Install proposed utilities and stormwater infrastructure and construct building foundations.
- 6. Place clean fill/pavement base materials and install pavement base, sidewalk and curbing.
- 7. Construct buildings.
- 8. Install signage, striping and symbols on paved surfaces as shown on the design drawings.
- 9. Install proposed final landscaping.
- 10. Remove existing erosion control measures.

All construction water will be collected and treated in accordance with the Erosion and Sediment Control Plan included in Section 5.0 as well as a Stormwater Pollution Prevention Plan (SWPPP) and associated Notice of Intent (NOI) to be filed with the Environmental Protection Agency prior to construction.

3.0 STORMWATER ANALYSIS

3.1 METHOD OF ANALYSIS

A hydrologic analysis has been performed for the Site comparing existing conditions and postdevelopment conditions using a software program developed by HydroCAD. This program analyzes site hydrology by the graphic peak discharge method documented in Technical Release No. 20 and Technical Release No. 55 published by the United States Department of Agriculture (USDA) Soil Conservation Service.

The following variables were developed for the contributing watersheds (drainage areas) in order to complete the analysis:

- **Rainfall Depth:** A hydrologic analysis was performed for the 24-hour 2-year, 10-year, 25-year, and 100-year, Type III storm events (3.20, 4.70, 5.50, and 6.70 inches respectively) for each drainage area. The rainfall depths for the study area were obtained from available charts published in Technical Paper No. 40.
- **Runoff Curve Number (RCN):** The RCN is a hydrologic characteristic that contributes to the peak rate of runoff and volume from a given storm event. It is dependent upon soil conditions and land use. Generally, higher curve numbers are associated with less pervious soils and, hence, greater amounts of runoff. As previously noted, based on the NRCS Web Soil Survey Report, Hydrologic Soil Group (HSG) A was used in determining RCNs.
- **Time of Concentration:** The time of concentration is defined as the time it takes runoff to travel from the hydraulically most distant part of the watershed to the downstream point of interest. This parameter is dependent on the characteristics of the ground surface and condition of the travel path. Times of concentration were calculated for the various sub catchments using the HydroCAD program, with a minimum time of concentration of six (6.0) minutes used in accordance with the protocol outlined in Technical Release No. 55.

3.2 DRAINAGE AREAS

In order to perform the analysis, the contributing drainage areas for pre-development and post-development conditions for the Site were determined. The delineation of the drainage areas were determined using the topography depicted on the Existing Conditions plan based on the topographic field survey performed for the Site. Brief descriptions of the existing conditions and proposed conditions drainage areas are as follows:

• **Existing Conditions**: The Site is represented by three (3) on-site subcatchments (A2-EX, A3-EX, A5-EX) and two (2) off-site subcatchments (A1-OFF, A4-

OFF). All of the drainage areas drain to the existing municipal system in Wharf Street, represented as link A, which is identified as the existing municipal drainage system in Wharf Street. Refer to Figure HYD-EX for the existing conditions drainage areas. Descriptions of the existing conditions drainage areas are listed below:

- A1-OFF is the 2.941 acre off-site subcatchment upslope of the Site. The area flows overland and untreated downslope until it eventually crosses the Site and enters the existing municipal drainage system on Wharf Street. This area is comprised of pavement, gravel, roof, grass and wooded areas.
- A2-EX is the 0.337 acre subcatchment area that receives some roof area and flows overland and untreated onto Wharf Street, and into the existing municipal drainage system. There is a localized low point, which has been modeled as a detention pond in the analysis which overflows into the municipal drainage system in Wharf Street. This area is comprised of grass area, gravel loading area, walkways, and roof area of the existing structures.
- A3-EX is the 0.312 acre subcatchment area that receives some roof area and flows overland and untreated to Wharf Street, and into the existing municipal drainage system. This area is comprised of paved driveways, gravel driveways and walkways, and roof of the existing structures.
- A4-OFF is the 0.203 acre subcatchment area that flows overland and untreated into the Site from the MBTA property to the south. The runoff flows overland into the Site and is conveyed in drainage swale and stone culvert (along with a portion of the runoff from subcatchment A5-EX) that is presumed to drain to the municipal system in Wharf Street. This area is comprised of wooded and gravel areas.
- A5-EX is the 2.870 acre subcatchment area that flows untreated to the municipal system in Wharf Street. The stone culvert located to the west of the existing mill building collects stormwater runoff in the wooded area and is believed to direct this flow to the municipal system in Wharf Street. The catch basin located in the paved parking area in the rear of the mill building is also believed to run beneath the mill building and into the municipal drainage system on Wharf Street. The remainder of this subcatchment flows overland to Wharf Street where the runoff is collected in the existing catch basins. This subcatchment area is comprised of paved driveways, gravel driveways, grass, woods, and roofs of the existing structures.

| TABLE 3.1 EXISTING CONDITIONS | | | | | | | | |
|----------------------------------|---|-----------------|-----------------|-----------------|---------------------------------------|--|--|--|
| Drainage Area | Discharge Location | Design Point | Area (Acres) | Curve Number | Time of Concentration (minutes) | | | |
| A1-OFF | | | 2.941 | 66 | 17.3 | | | |
| A2-EX | Wharf Street – Existing Municipal | A | 0.337 | 71 | 6.0 | | | |
| A3-EX | | | 0.312 | 84 | 16.3 | | | |
| A4-OFF | System | | 0.203 | 64 | 12.0 | | | |
| A5-EX | | | 2.870 | 61 | 20.3 | | | |

Existing Conditions of drainage area are tabulated on Table 3.1 below.

- **Proposed Conditions:** The Site is represented by twelve (12) drainage subcatchments in the proposed condition. The subcatchments are delineated based on the proposed grading and drainage system design as depicted on the proposed Site Plans. Stormwater runoff will be collected by deep-sump hooded catch basins, routed through water quality units and stormwater infiltration chambers and will discharge to the existing municipal system in Wharf Street, maintaining the original drainage patterns. Clean stormwater runoff from building roof areas will be routed directly to subsurface infiltration chambers where stormwater will be recharged, with excess flows discharging to the municipal system in Wharf Street. Refer to Figure HYD-PR for the proposed conditions drainage areas. Descriptions of the proposed drainage areas are listed below:
 - A1-OFF is the 2.941 acre off-site subcatchment upslope of the Site. The area flows overland and untreated downslope until it eventually enters the Site. The runoff will be collected in two drainage inlets along the westerly limit of disturbance. The runoff will be routed through the site to the municipal system in Wharf Street. This area is comprised of pavement, gravel, roof, grass and wooded areas and will remain unchanged from the existing conditions.
 - A2-PR is the 0.403 acre subcatchment area which contains paved and landscaped areas to the west of the existing mill building. Stormwater runoff within this area

will be collected by a water quality inlet (Stormceptor 450-i) west of the existing mill building and will be routed to subsurface infiltration chambers. Stormwater in excess of the designed infiltrative capacity of the chambers will overflow through an outlet control structure and enter the proposed drainage system ultimately discharging the municipal drainage system in Wharf Street.

- A3-PR is the 0.556 acre subcatchment area which contains paved parking area and some landscaped islands. Stormwater runoff within this area will be conveyed overland to two deep-sump hooded catch basins, north of the existing mill building and south of the new building. This stormwater will run through a water quality unit, to subsurface infiltration chambers. Stormwater in excess of the designed infiltrative capacity of the chambers will overflow through an outlet control structure and enter the proposed drainage system ultimately discharging the municipal drainage system in Wharf Street.
- A4-OFF is the 0.203 acre subcatchment area that flows overland and untreated into the Site from the MBTA property to the south. The runoff flows overland into the Site and will be collected at the end of the existing drainage swale in a culvert with a headwall. The runoff will be routed through the Site to the municipal system in Wharf Street. This area is comprised of wooded and gravel areas and will remain unchanged from existing conditions.
- A5-PR s the 0.777 acre subcatchment area which contains largely undisturbed wooded areas along the southerly portion of the Site. The stormwater runoff will travel overland and untreated into the drainage system at the proposed headwall confluencing with the off-site flows from the MBTA tracks to the south. The flows will be routed through the Site to the municipal system in Wharf Street.
- A6-PR s the 0.280 acre subcatchment area which contains the southerly half of the existing mill building's roof area. The clean stormwater from the mill building's roof area will be conveyed via roof drains to the stormwater infiltration chambers located to the west of the existing mill building, confluencing with the flows from subcatchment A2-PR. The runoff will be recharged into the ground via the infiltration chambers, and will overflow through an outlet control structure and enter the proposed drainage system. This stormwater will merge with the flows from the south and will drain to the municipal drainage system in Wharf Street.
- A7-PR is the 0.285 acre subcatchment area that contains the courtyard area on the east side of the existing mill building, as well as the northeasterly portion of the mill building's roof area. The stormwater runoff from the courtyard area will be collected by landscape drains and stormwater runoff from roof areas will be collected by downspouts and a roof drain system. These flows will be conveyed

through a Stormceptor 450 water quality unit discharging to the existing municipal drainage system in Wharf Street.

- A8-PR is the 0.167 acre subcatchment area which contains the proposed new building's roof area. The clean stormwater captured within the roof area will be conveyed via roof drains to the stormwater infiltration chambers located to the west of the existing mill building. Stormwater in excess of the designed infiltrative capacity of the chambers will overflow through an outlet control structure and enter the proposed drainage system ultimately discharging the municipal drainage system in Wharf Street.
- A9-PR s the 0.304 acre subcatchment area which contains wooded and grass areas. The stormwater runoff will travel overland and untreated towards Wharf Street and into the existing municipal drainage system as it did under existing conditions.
- A10-PR is the 0.453 acre subcatchment area in the central portion of the Site which contains paved parking area, some landscaped islands and the northwesterly portion of the existing mill building roof areas. Stormwater runoff within this area will be collected by a water quality inlet (Stormceptor 450-i) west of the existing mill building and will be routed to subsurface infiltration chambers (StormTech[®] MC-3500). Stormwater in excess of the designed infiltrative capacity of the chambers will overflow through an outlet control structure and enter the proposed drainage system ultimately discharging the municipal drainage system in Wharf Street.
- A11-PR is the 0.149 acre subcatchment area which contains some wooded and grass areas, including a reinforced vegetated emergency access drive in the southerly portion of the Site. The stormwater runoff will travel overland and untreated towards Wharf Street and into the existing municipal drainage system as it did under existing conditions.
- A12-PR is the 0.145 acre subcatchment area in the northeasterly portion of the Site which contains paved area, some grass area, and rooftop runoff from a small wooden patio. Stormwater runoff within this area will be conveyed overland a deep-sump hooded catch basin and a trench drain located at the low point of the loading areas. This stormwater will run through a water quality units, to subsurface infiltration chambers. Stormwater in excess of the designed infiltrative capacity of the chambers will overflow through an outlet control structure and enter the proposed drainage system ultimately discharging the municipal drainage system in Wharf Street.

| TABLE 3.2 POST-DEVELOPMENT CONDITIONS | | | | | | | | | |
|--|-----------------------|--------------|------------------------------------|-----------------|---------------------------------------|------|--|--|--|
| Drainage Area | Discharge Location | Design Point | Area (Acres) | Curve Number | Time of Concentration (minutes) | | | | |
| A1-OFF | | | 2.941 | 66 | 17.3 | | | | |
| A2-PR | | | 0.403 | 88 | 6.0 | | | | |
| A3-PR | | | 0.556 | 91 | 6.0 | | | | |
| A4-OFF | - Wharf Street | | 0.203 | 64 | 12.0 | | | | |
| A5-PR | | Wharf Street | A 0.696 0.712 0.167 0.304 | 1.030 | 42 | 17.2 | | | |
| A6-PR | | | | 0.696 | 98 | 6.0 | | | |
| A7-PR | | | | 0.712 | 76 | 6.0 | | | |
| A8-PR | | | | 0.167 | 98 | 6.0 | | | |
| A9-PR | | | | 0.304 | 43 | 20.6 | | | |
| A10-PR | | | 0.149 | 90 | 6.0 | | | | |
| A11-PR | | | 0.453 | 48 | 6.0 | | | | |
| A12-PR | | | 0.145 | 84 | 6.0 | | | | |

Post development conditions are summarized on Table 3.2 below.

3.3 **RESULTS OF ANALYSIS**

A stormwater analysis was performed for the 2-year, 10-year, 25-year, and 100-year storm events in order to determine that there will be no increase in stormwater runoff once the proposed construction is complete and the stormwater control structures are in place. Detailed calculations are attached in Appendix C. A summary of the peak stormwater runoff is provided below.

| TABLE 3.3 PROJECT STORMWATER RUNOFF RATES | | | | | | | | | |
|---|-------------------|---------------------|--------------------|----------------------|--------------------|----------------------|---------------------|-----------------------|--|
| Peak Runoff Rate (cfs*) | | | | | | | | | |
| Design Point | 2- Year Ex. | 2- Year Prop. | 10- Year Ex. | 10- Year Prop. | 25- Year Ex. | 25- Year Prop. | 100- Year Ex. | 100- Year Prop. | |
| A (Wharf Street) | 2.15 | 1.40 | 6.51 | 4.20 | 9.30 | 6.95 | 13.83 | 12.49 | |

*cfs = cubic feet per second

As shown in Table 3.3 above, post-development runoff rates for the 2-year to 100-year storm events do not exceed existing runoff rates. Supporting calculations are provided in Appendix C.

3.3.1 Hydraulic Analysis

The calculations, provided in Appendix C, demonstrate that the proposed drainage infrastructure is capable of conveying all storm events up to the 25-year storm event.

For the purposes of this analysis it is assumed that the stormwater conveyed by the existing 8-inch stormwater pipe from beneath the MBTA tracks to the south is limited to the full flow capacity of the pipe, assumed to have a slope of two (2) percent. It is also assumed that the flow from the 12-inch drainage culvert conveying flows from Sumner Street that will be intercepted and routed through the Site, is also limited to the full flow capacity of that pipe at the limiting segment which contains a slope of approximately 1.7%.

4.0 STORMWATER CONTROL SYSTEM DESIGN CRITERIA

4.1 MASSDEP STORMWATER MANAGEMENT POLICY

Stormwater discharges from the proposed Project have been reviewed for conformance with the Massachusetts DEP Stormwater Management Policy (the Policy). The Policy is designed "to protect the wetlands and waters of the Commonwealth from adverse impacts of storm water runoff." To accomplish this goal, the Policy establishes ten (10) performance standards to control stormwater quantity and quality. These standards establish the level of required controls that can be achieved with site planning, structural and non-structural controls, and other best management practices (BMPs). The Stormwater Checklist is provided in Appendix A. Stormwater modeling methodology is discussed in detail in section 3.0. Results of the stormwater modeling of the existing and proposed conditions are provided as Appendix C.

4.1.1 Stormwater Management Standards

The following section documents compliance with the MassDEP Stormwater Management Standards.

Standard 1

No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The project is designed so that there are no new stormwater conveyances that could discharge untreated stormwater into, or cause erosion to, wetlands or waters of the Commonwealth. The proposed project maintains the overall drainage patterns of the pre-development conditions.

Standard 2

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

The total post-development peak discharge rates do not exceed pre-development rates. Stormwater modeling methodology is discussed in detail in Section 3.0. The model output is provided as Appendix C. The results are provided above in Table 3.3.

Standard 3

Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.

The project as proposed results in a net increase of impervious area. Per Standard 3 of the Stormwater Management Standards, infiltration measures should be introduced to minimize loss of annual recharge to groundwater from the increase of net impervious area. The project will result in the reduction of approximately 21,962 square feet (sf) of pervious area. In accordance with the stormwater standards, 0.60-inches of recharge must be provided for the increase in impervious areas on the Site for HSG A soils. Approximately 4,167 cubic feet (cf) of groundwater recharge is required for the overall increase in impervious area in the proposed condition. When applying the capture area adjustment for the 0.120 acre courtyard and building roof area that do not drain to the recharge facilities, approximately 4,296 cf of groundwater recharge is required. 9,853 cf of storage is provided between the three infiltration chamber systems, below the overflow outlets, providing significantly more recharge than the requirement.

Proposed infiltration chambers have been incorporated into the project design in order to provide additional stormwater recharge. Supporting calculations are provided in Appendix C.

Standard 4

For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when:

- A. Suitable nonstructural practices for source control and pollution prevention are implemented;
- B. Stormwater management best practices (BMPs) are sized to capture the prescribed runoff volume; and
- C. Stormwater management BMPs are maintained as designed.

The proposed development utilizes methods of storm water management to reduce TSS generation including the use of water quality units as is consistent with the Policy. The estimated TSS removal rate from the proposed BMPs is calculated to meet the requirement. Supporting calculations can be found in Appendix C.

The proposed development was designed to provide treatment of the 1" Water Quality Volume from impervious Site areas. The total Water Quality Volume for the Site was calculated to be 4,296 cf, which equates to an equivalent water quality flow rate of 1.43 cfs. Water Quality Volumes and the corresponding equivalent water quality flow rates for each treatment train were calculated as well. The proposed water quality units provide 80% TSS removal for flows up to 0.40 cfs, and 50% pre-treatment for larger flows. Supporting calculations can be found in Appendix C.

A comprehensive Operations and Maintenance Plan (O&M) has also been developed and is included in Section 6.0 of this report.

Standard 5

Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pre-treatment is prohibited.

The Site does not discharge from areas with higher potential pollutant loads.

Standard 6

Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resources Waters (ORWs), shellfish beds, bathing beaches, cold water fisheries, and recharge areas for public water supplies.

Although the Site is not located within an Area of Critical Environmental Concern (ACEC), the existing municipal drainage system in Wharf Street discharges to the Weymouth Back River ACEC which is identified as an Outstanding Resource Water. Accordingly, the stormwater management system has been designed with Best Management Practices (BMPs) in accordance with the MA Stormwater Handbook, and pre-treatment BMPs have been included that provide more than 44% pre-treatment for stormwater runoff before infiltration.

Standard 7

Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. Where it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

The project has been designed to comply fully with the Stormwater Management Standards.

Standard 8

Erosion and sediment controls must be implemented to prevent impacts during construction, or land disturbance activities.

Erosion and sediment controls are integral to the project improvements. The plan includes compost filter socks, which will be installed down-gradient of the proposed work area and silt sacks will be installed in existing catch basins adjacent to the Site. A temporary stabilized construction exit will be constructed as well. Prior to, and during construction, the Site's Erosion and Sediment Control Plan, included in Section 5.0 of this report will be followed. These measures will be utilized throughout construction to prevent erosion, control sediments, and stabilize exposed soils as discussed in Section 5.0.

Standard 9

All stormwater management systems must have an operations and maintenance plan to ensure that systems function as designed.

A comprehensive Operations and Maintenance Plan (O&M) has been developed and is included in Section 6.0 of this report.

Standard 10

All illicit discharges to the stormwater management system are prohibited.

There are no known illicit discharges at the Site and all construction will be performed without illicit discharges.

5.0 CONSTRUCTION PERIOD POLLUTION PREVENTION AND SEDIMENTATION AND EROSION CONTROL PLAN

5.1 INTRODUCTION

The greatest potential for sediment generation will occur during construction. An extensive erosion and sedimentation program is proposed and will be diligently implemented during construction of the project. The erosion control program will minimize erosion and sedimentation that could potentially impact resources areas. Water quality will be maintained by minimizing erosion of exposed soils and siltation. Erosion control barriers will be installed and exposed soil areas re-vegetated as soon as possible after work in an area is completed.

Responsible Party for Plan Compliance:

Wharf Associates, LLC c/o the Heritage Companies 70 Quincy Avenue Quincy, MA 02169 Contact: (617) 221-1033

Emergency Contact Information:

Civil & Environmental Consultants, Inc. – (774) 501-2176

5.2 CONSTRUCTION PHASE EROSION CONTROL MEASURES

The adjacent properties will be protected during construction by implementing siltation control measures, including the placement of compost silt socks as close as feasible to the down gradient limit of construction activity. Silt sacks will be installed in down gradient catch basins and a temporary stabilized construction exit will be constructed. The project may also implement other stabilization methods such as erosion netting and hydro seeding.

5.2.1 Short and Long Term Goals and Criteria

Short and long-term goals will include a variety of stabilizing sediment and erosion controls around the limit of work. All construction-phase erosion and sediment controls have been designed to retain sediment on-site to the extent practicable and limit runoff and the discharge of pollutants (sediment) from exposed areas of the Site.

All control measures will be installed and maintained in accordance with the manufacturer's specifications and good engineering practices. Weekly inspections and routine monitoring will be used to determine the effectiveness of controls in use.

Litter and solid construction debris potentially exposed to the stormwater will be prevented from becoming a pollution source through routine monitoring and the use of laborers to "pick" as necessary.

5.2.2 Stabilization Practices

The construction site activities will include numerous stabilizing practices. Sediment and erosion controls such as erosion netting, mulching and hydro-seeding may act as interim practices. Erosion netting material may include single net straw blankets or coconut blankets. Permanent stabilization practices will include the use of a hydro-seeding over vegetative support soil where additional exposure threatens stormwater quality. Seeding will be carried out with a seed mixture equal to the "Roadside Slope Mix" included below. All siltation barriers will remain in place until all exposed areas are re-vegetated.

PLANTING SCHEDULE FOR EXPOSED AREAS

- 1. All exposed areas landward of coastal beach will receive 6 inches of topsoil or compost material.
- 2. Seed will be equal to "Roadside Slope Mix" as specified by the Mass. Highway Department. Please refer to chart below for specifications. This mixture will be spread at a rate of 5 pounds per 1,000 square feet.

| TABLE 5.1 ROADSIDE SLOPE MIX | | | | | | | | | |
|---|-----|-----|-----|--|--|--|--|--|--|
| GerminationPurityCommon NameProportionMinimum | | | | | | | | | |
| Creeping Red Fescue | 50% | 85% | 95% | | | | | | |
| Kentucky 3 | 30% | 85% | 95% | | | | | | |
| Domestic Rye | 10% | 90% | 98% | | | | | | |
| Red Top | 5% | 85% | 92% | | | | | | |
| Ladino Clover | 5% | 85% | 96% | | | | | | |

5.2.3 Structural Practices

Perimeter controls will consist of compost silt socks. In order to ensure effective performance, proper installation is required. Wooden stakes, measuring 2" x 2", will be positioned on the downhill side (away from the job Site) of the silt socks. The posts will be driven at least one foot into the ground.

A temporary stabilized construction exit will be constructed. A cross slope will be placed at the entrance to direct runoff to the settling area. If deemed necessary after construction begins, a wash pad may be included to wash off vehicle wheels before leaving the Site. Silt sacks will be installed in down gradient catch basins in order to capture sediment prior to stormwater entering the municipal drainage systems.

5.3 NON-STRUCTURAL CONTROLS

5.3.1 Good Housekeeping

Non-structural controls are as effective as structural controls in sediment control. Non-structural controls to be used at the construction Site include:

- Regular sweeping of paved surfaces; and
- Prompt cleanup of any waste or spilled waste materials.

5.3.2 Exposure Minimization

Exposure will be minimized by providing both permanent and temporary soil stabilization (see Section 5.2.2) over areas that have been completely constructed, or areas that will not be revisited within a 30-day period.

Where practicable, industrial materials and activities will be protected from exposure to rain, snow, snowmelt, or runoff.

5.3.3 Preventative Maintenance

A preventative maintenance program includes the timely inspection and maintenance of stormwater management devices. Examples of preventative maintenance include:

- Removal of obstructions, if any, from inlets and outlets.
- Removal of accumulated sediment and vacuuming water from sumps.
- Repairing and re-planting slope areas that experience erosion.

5.3.4 Inspections

An experienced Construction Monitor will conduct inspections of construction areas once every 7 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater, or the occurrence of runoff from snowmelt sufficient to cause a discharge. Storm event information from a weather station representative of the Site's location may be used to determine if a storm event of 0.25 inches or greater has occurred on the Site. Total rainfall will be measured for any day of rainfall during normal business hours that measures 0.25 inches or greater. Construction areas an experienced Construction Monitor will inspect include:

- Disturbed areas of the construction Site that have not been finally stabilized,
- Areas used for storage of materials that are exposed to precipitation,
- Structural control measures,
- Locations where vehicles enter or exit the Site, and
- The stormwater management system and discharge outlets.

Disturbed areas and areas used for storage of materials that are exposed to precipitation will be inspected for evidence of, or the potential for, pollutants entering the drainage system.

Sediment and erosion control measures identified will be observed to ensure that they are operating correctly. The discharge locations or points will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the Site will be inspected for evidence of offsite sediment tracking.

Based on the results of these routine inspections, the Contractor will correct any deficiencies found as soon as practicable. Results of the inspections, corrective actions taken in response to any deficiencies, and any opportunities for improvement that are identified will be documented in an inspection report.

5.4 **RECORDKEEPING**

The following records will be maintained on the Site:

- 1. Dates when major grading activities occur,
- 2. Dates when construction activities temporarily or permanently cease on a portion of the Site,
- 3. Dates when stabilization measures are initiated, and
- 4. In addition, the following records will also be kept:
 - Any permit conditions/approvals,
 - All inspection reports, and
 - Any spill reports.



Table 5.1 - Construction BMPs Maintenance Log

Project Name:Wharf Street RedevelopmentProject Location:44 Wharf Street, Weymouth, MAProject Number:193-187

Approved By: KPS

| Best Management Practice | Inspection Frequency | Date Inspected | Inspector | Minimum Maintenance and Key Items to Check | Cleaning or Repair Needed (List Items if Required) | Date of Cleaning or Repair | Performed by |
|--|--|-------------------|-----------|--|---|----------------------------------|--------------|
| Pavement Sweeping | To be monitored as needed | | | Paved areas within the active construction site can be swept on a regular basis to remove larger sediment particles from construction activities. Pavement areas adjacent to the Site will be swept if dirt and debris is tracked from the active construction site. | | | |
| Catch Basin Inlet Protection (Silt Sack Sediment Trap) | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | Inspect for proper operation. If clogged, remove accumulated sediment and properly dispose of to maintain the capacity of the catch basin. | | | |
| Erosion Control Barrier (Straw Bales and Silt Fence) | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | Inspect for deterioration or failure. Remove sediment when buildup exceeds 6 inches or half the barrier height. The underside of straw bales should be kept in close contact with the earth and reset as necessary. | | | |
| Stabilized Construction Exit | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | The exit shall be maintained in a condition that will prevent tracking of sediment onto public rights-of-way. The contractor shall sweep or wash pavement at exits which have experienced mud-tracking onto the pavement or traveled way. When wheel washing is required, it shall be done on an area stabilized with aggregate that drains into an approved sediment trapping device. When the construction exit becomes ineffective, the stone shall be removed along with the collected soil material and redistributed on-site in a stable manner. The exit should then be reconstructed. All sediment shall be prevented from entering storm drains, ditches, or waterways. | | | |
| Vegetated Slope Stabilization | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | Inspect for erosion. Re-grade and re-seed as necessary. | | | |

6.0 OPERATIONS AND MAINTENANCE (O&M) PLAN

6.1 GENERAL

Stormwater management systems with multiple components, such as the one proposed for the project, assures the cleanest possible discharges of stormwater to the environment. However, these systems must be routinely maintained to keep them in good working order. Additionally, this plan identifies potential sources of pollution that may affect the quality of stormwater discharges and describes the implementation of Long-Term Pollution Prevention practices to reduce potential pollutants in stormwater discharge. The party identified below will be responsible for the operation and maintenance of the stormwater management system and Site. Schedules and procedures for inspection and maintenance of the existing and proposed stormwater management system components are provided in the following sections.

Responsible Party for Plan Compliance:

Wharf Associates, LLC c/o the Heritage Companies 70 Quincy Avenue Quincy, MA 02169 Contact: (617) 221-1033

If the property is ever sold, upon a transfer of ownership, the future owner shall assume the responsibilities for compliance with this O&M Plan.

Emergency Contact Information:

Civil & Environmental Consultants, Inc. - (774) 501-2176

Estimated O&M Budget:

It is estimated that an annual budget of \$2,000-\$4,000 should be allocated to performing routine inspections and maintenance identified in this O&M Plan.

6.2 ROUTINE INSPECTIONS

Inspections of the stormwater management system as a whole, and of the individual components of the system, will be carried out on a routine basis in accordance with the schedule identified in Section 6.3. Components to be inspected include the water quality unit, trench drain, infiltration chambers and roof drain outlet level spreader. Each will be inspected for sediment buildup, presence of oil, color, and structural damage. The results of each inspection will be entered into an inspection log. Refer to Table 6.1 for the inspection log form.

6.3 MAINTENANCE PLAN

The Responsible Party will incorporate a routine maintenance program to assure proper operation of the stormwater management system. Maintenance will be performed based on the results of inspections in accordance with the schedules identified in Table 6.1. The program will include the following maintenance activities:

Deep Sump Hooded Catch Basins

- All catch basins shall be inspected a minimum of at least four times per year.
- Sediment, if more than two (2) feet deep, and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary.
- During cleanings, confirm the oil/debris trap (hood) is installed properly, is free of clogs, and is functional. Reinstall or replace as needed.
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Water Quality Structure

- See the attached Manufacturer's instructions on operation and maintenance requirements and methodology.
- Inspect and clean twice per year or as required by manufacturer.
- Remove sediment and other trapped pollutants at the frequency or level specified by the manufacturer.

Roof Drain Outlet

- Perform routine roof inspections twice per year, typically in the spring and fall.
- Inspect for blockage and remove debris if required.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.

Subsurface Infiltration System

- See the attached Manufacturer's instructions on operation and maintenance requirements and methodology.
- Perform routine inspections on a monthly basis for the first three months after installation. Then, at a minimum, the treatment structure is to be inspected twice annually and the infiltrating structure is to be inspected annually.

- The subsurface infiltration system will be inspected twice during for the first year and annually thereafter by removing the manhole/access port covers and determining the thickness of sediment that has accumulated.
- If sediment is more than two inches deep, it must be suspended via flushing with clean water and removed using a vactor truck.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.

6.4 LONG TERM POLLUTION PREVENTION MAINTENANCE

The Responsible Party will incorporate a routine maintenance program to ensure the continued effectiveness of the structural water quality controls. Maintenance will be performed based on the results of inspections in accordance with the schedules identified below. The program will include the following maintenance activities:

Maintenance of Pavement Systems

Regular maintenance of pavement surfaces will prevent pollutants such as oil and grease, trash, and sediments from entering the stormwater management system. The following practices should be performed:

- Sweep or vacuum asphalt pavement areas annually with a commercial cleaning unit and dispose of removed material.
- Routinely pick up and remove litter from the parking areas, islands, and perimeter landscaping.

Maintenance of Vegetated Areas

Proper maintenance of vegetated areas can prevent the pollution of stormwater runoff by controlling the source of pollutants such as suspended sediments, excess nutrients, and chemicals from landscape care products. Practices that should be followed under the regular maintenance of the vegetated landscape include:

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- Grass vegetation should not be cut to a height less than four inches.

- Pesticide/Herbicide Usage No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary.

Management of Snow and Ice

Should significant snow fall events occur, which result in stockpiled snow impacting the operation of the Project Site, through the temporary loss of parking or limiting access in any way, the property manager may choose to have snow removed from the site. All snow removal operations will be done in accordance with Massachusetts DEP guidelines BRPG01-01, effective date March 8, 2001.

Salt and Deicing Chemicals

The amount of salt and deicing chemicals to be used on the site shall be reduced to the minimum amount needed to provide safe pedestrian and vehicle travel. The following practices should be followed to control the amount of salt and deicing materials that come into contact with stormwater runoff:

- Devices used for spreading salt and deicing chemicals should be capable of varying the rate of application based on the site specific conditions.
- Sand and salt should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials.

6.5 EMPLOYEE TRAINING

Training of personnel is essential to achieving proper operation and maintenance of the stormwater management system. Therefore, those Facility personnel who are responsible for operation and maintenance will be trained on the following subjects:

- Environmental laws and regulations relating to stormwater,
- The components and goals of the current Erosion and Sediment Control Plan,
- Site specific permit conditions and requirements,
- General Facility spill response procedures,
- General good housekeeping procedures, and
- General material management procedures.

Refresher training sessions will be held once a year following the completion of the Site Compliance Evaluation.

6.6 **RECORDKEEPING**

Records of inspections and maintenance shall be up to date and available for review and inspection, if requested by the City's official.



Table 5.1 - Construction BMPs Maintenance Log

Project Name:Wharf Street RedevelopmentProject Location:44 Wharf Street, Weymouth, MAProject Number:193-187

Approved By: KPS

| Best Management Practice | Inspection Frequency | Date Inspected | Inspector | Minimum Maintenance and Key Items to Check | Cleaning or Repair Needed (List Items if Required) | Date of Cleaning or Repair | Performed by |
|--|--|-------------------|-----------|--|---|----------------------------------|--------------|
| Pavement Sweeping | To be monitored as needed | | | Paved areas within the active construction site can be swept on a regular basis to remove larger sediment particles from construction activities. Pavement areas adjacent to the Site will be swept if dirt and debris is tracked from the active construction site. | | | |
| Catch Basin Inlet Protection (Silt Sack Sediment Trap) | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | Inspect for proper operation. If clogged, remove accumulated sediment and properly dispose of to maintain the capacity of the catch basin. | | | |
| Erosion Control Barrier (Straw Bales and Silt Fence) | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | Inspect for deterioration or failure. Remove sediment when buildup exceeds 6 inches or half the barrier height. The underside of straw bales should be kept in close contact with the earth and reset as necessary. | | | |
| Stabilized Construction Exit | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | The exit shall be maintained in a condition that will prevent tracking of sediment onto public rights-of-way. The contractor shall sweep or wash pavement at exits which have experienced mud-tracking onto the pavement or traveled way. When wheel washing is required, it shall be done on an area stabilized with aggregate that drains into an approved sediment trapping device. When the construction exit becomes ineffective, the stone shall be removed along with the collected soil material and redistributed on-site in a stable manner. The exit should then be reconstructed. All sediment shall be prevented from entering storm drains, ditches, or waterways. | | | |
| Vegetated Slope Stabilization | Inspect at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of storm event of 0.25 inches or greater. | | | Inspect for erosion. Re-grade and re-seed as necessary. | | | |

FIGURES

Figure 1 – Site Locus Map Figure 2 – Aerial Exhibit Figure 3 – FEMA Firmette Figure HYD-EX – Existing Conditions Drainage Area Map Figure HYD-PR – Proposed Conditions Drainage Area Map



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DATE:

JULY 2020 DWG SCALE:

1"=200' PROJECT NO:

193-187

2
NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <u>http://www.ngs.noaa.gov</u> or contact the National Geodetic Survey at the following address:

NGS Information Services NOAA, N/NGS12 National Geodetic Survey SSMC-3, #9202 1315 East-West Highway Silver Spring, Maryland 20910-3282 (301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713- 3242, or visit its website at <u>http://www.ngs.noaa.gov.</u>

Base map information shown on this FIRM was derived from digital orthophotography. Base map files were provided in digital format by Massachusetts Geographic Information Systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000. Aerial photography is dated April 2005.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center** (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



42° 13' 07.5" 70° 56' 15"

247000 M

41^{000m}[

JOINS PANEL 0233

342^{000m}E







APPENDIX A

DEP STORMWATER CHECKLIST



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 8²
- 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 Longterm 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



7/21/2020

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



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) | | | | |
| \boxtimes | 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 | | | | |
| \square | Other (describe): Subsurface Stormwater Chambers, Proprietary Water Quality Units | | | | |
| | | | | | |
| Sta | ndard 1: No New Untreated Discharges | | | | |
| \boxtimes | 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.



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 predevelopment 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 24hour storm.

Standard 3: Recharge

| \boxtimes | Soil | Anal | ysis | 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 |
|----------|
|----------|

Dynamic Field¹

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

Simple Dynamic

- 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.
- \boxtimes 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.

¹80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10year 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
 - \boxtimes 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 (| (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.



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.



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

GEOTECHNICAL INFORMATION

NRCS Soil Resource Report Geotechnical Report



United States Department of Agriculture

NRCS

Natural Resources Conservation Service A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/? cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



| MAP LEGEND | | | | MAP INFORMATION | |
|----------------|--|---|--|---|--|
| Area of In | terest (AOI) Area of Interest (AOI) | 8 | Spoil Area Stony Spot | The soil surveys that comprise your AOI were mapped at 1:25,000. | |
| Soils | Soil Map Unit Polygons | 00 V | Very Stony Spot Wet Spot | Warning: Soil Map may not be valid at this scale. | |
| | Soil Map Unit Lines | | Other Special Line Features | 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 | |
| Special (2) | Blowout | Water Features contrasting soils that could have b scale. Streams and Canals scale. | contrasting soils that could have been shown at a more detailed scale. | | |
| × | Clay Spot | Transport | ation Rails | Please rely on the bar scale on each map sheet for map measurements. | |
| × | Gravel Pit | ~ | Interstate Highways US Routes | Source of Map: Natural Resources Conservation Service Web Soil Survey URL: Coordinate System: Web Mercator (EPSG:3857) | |
| 0 | Landfill Lava Flow | ~ | Major Roads Local Roads | Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts | |
| | Marsh or swamp | Background | nd Aerial Photography | 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. | |
| 0 | Miscellaneous Water | | | This product is generated from the USDA-NRCS certified data as of the version date(s) listed below. | |
| × | Rock Outcrop | | | Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts Survey Area Data: Version 16, Jun 11, 2020 | |
| + ** | Sandy Spot | | | Soil map units are labeled (as space allows) for map scales | |
| \$ | Sinkhole | | | Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014 | |
| ې لار | Sodic Spot | | | 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. | |

| | | 1 | |
|-----------------------------|--|--------------|----------------|
| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
| 1 | Water | 1.1 | 5.0% |
| 65 | Ipswich mucky peat, 0 to 2 percent slopes, very frequently flooded | 2.2 | 10.3% |
| 104C | Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes | 2.7 | 12.5% |
| 245C | Hinckley loamy sand, 8 to 15 percent slopes | 7.0 | 32.7% |
| 253D | Hinckley loamy sand, 15 to 35 percent slopes | 0.0 | 0.1% |
| 602 | Urban land, 0 to 15 percent slopes | 2.8 | 13.4% |
| 652 | Udorthents, refuse substratum | 5.5 | 26.0% |
| Totals for Area of Interest | · | 21.3 | 100.0% |

Map Unit Legend

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit

descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Norfolk and Suffolk Counties, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: vkyp Mean annual precipitation: 32 to 50 inches Mean annual air temperature: 45 to 50 degrees F Frost-free period: 120 to 200 days Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

65—Ipswich mucky peat, 0 to 2 percent slopes, very frequently flooded

Map Unit Setting

National map unit symbol: 2tyqj Elevation: 0 to 10 feet Mean annual precipitation: 36 to 71 inches Mean annual air temperature: 39 to 55 degrees F Frost-free period: 140 to 250 days Farmland classification: Not prime farmland

Map Unit Composition

Ipswich and similar soils: 90 percent Minor components: 10 percent Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ipswich

Setting

Landform: Tidal marshes Landform position (three-dimensional): Dip Down-slope shape: Linear Across-slope shape: Linear Parent material: Partially- decomposed herbaceous organic material

Typical profile

Oe - 0 to 42 inches: mucky peat *Oa - 42 to 59 inches:* muck

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.14 to 99.90 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Very frequent

Frequency of ponding: None *Calcium carbonate, maximum in profile:* 5 percent *Salinity, maximum in profile:* Nonsaline to strongly saline (0.7 to 111.6 mmhos/cm) *Sodium adsorption ratio, maximum in profile:* 20.0 *Available water storage in profile:* Very high (about 26.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 8w Hydrologic Soil Group: A/D Ecological site: Tidal Salt High Marsh mesic very frequently flooded (R144AY002CT), Tidal Salt Low Marsh mesic very frequently flooded (R144AY001CT) Hydric soil rating: Yes

Minor Components

Westbrook

Percent of map unit: 5 percent Landform: Tidal marshes Landform position (three-dimensional): Dip Down-slope shape: Linear Across-slope shape: Linear Ecological site: Tidal Salt High Marsh mesic very frequently flooded (R144AY002CT), Tidal Salt Low Marsh mesic very frequently flooded (R144AY001CT) Hydric soil rating: Yes

Pawcatuck

Percent of map unit: 5 percent Landform: Tidal marshes Landform position (three-dimensional): Dip Down-slope shape: Linear Across-slope shape: Linear Ecological site: Tidal Salt High Marsh mesic very frequently flooded (R144AY002CT), Tidal Salt Low Marsh mesic very frequently flooded (R144AY001CT) Hydric soil rating: Yes

104C—Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w69p Elevation: 0 to 1,270 feet Mean annual precipitation: 36 to 71 inches Mean annual air temperature: 39 to 55 degrees F Frost-free period: 140 to 240 days Farmland classification: Not prime farmland

Map Unit Composition

Hollis, extremely stony, and similar soils: 35 percent Charlton, extremely stony, and similar soils: 25 percent Rock outcrop: 25 percent Minor components: 15 percent Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Extremely Stony

Setting

Landform: Hills, ridges Landform position (two-dimensional): Backslope, shoulder, summit Landform position (three-dimensional): Crest, side slope, nose slope Down-slope shape: Convex Across-slope shape: Linear, convex Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material *A - 2 to 7 inches:* gravelly fine sandy loam *Bw - 7 to 16 inches:* gravelly fine sandy loam *2R - 16 to 26 inches:* bedrock

Properties and qualities

Slope: 0 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 7s Hydrologic Soil Group: D Ecological site: Shallow Dry Till Uplands (F144AY033MA) Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills Landform position (two-dimensional): Summit, backslope, shoulder Landform position (three-dimensional): Crest, side slope Down-slope shape: Linear, convex Across-slope shape: Convex Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material *A - 2 to 4 inches:* fine sandy loam

Bw - 4 to 27 inches: gravelly fine sandy loam

C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 7s Hydrologic Soil Group: B Ecological site: Well Drained Till Uplands (F144AY034CT) Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges *Parent material:* Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 8 Hydrologic Soil Group: D Hydric soil rating: No

Minor Components

Canton, extremely stony

Percent of map unit: 7 percent Landform: Ridges, hills, moraines Landform position (two-dimensional): Summit, shoulder, backslope Landform position (three-dimensional): Side slope, crest *Down-slope shape:* Convex, linear *Across-slope shape:* Convex *Hydric soil rating:* No

Chatfield, extremely stony

Percent of map unit: 6 percent Landform: Hills, ridges Landform position (two-dimensional): Backslope, shoulder, summit Landform position (three-dimensional): Crest, side slope, nose slope Down-slope shape: Convex Across-slope shape: Linear, convex Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 1 percent Landform: Drumlins, ground moraines, recessionial moraines, hills Landform position (two-dimensional): Backslope, shoulder, summit Landform position (three-dimensional): Side slope, crest Down-slope shape: Linear, convex Across-slope shape: Convex Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 1 percent Landform: Ground moraines, drumlins, hills Landform position (two-dimensional): Footslope, backslope, summit Landform position (three-dimensional): Side slope, crest Down-slope shape: Linear, convex Across-slope shape: Convex Hydric soil rating: No

245C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9 Elevation: 0 to 1,480 feet Mean annual precipitation: 36 to 71 inches Mean annual air temperature: 39 to 55 degrees F Frost-free period: 140 to 240 days Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent *Minor components:* 15 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Hinckley

Setting

Landform: Outwash deltas, kame terraces, outwash plains, kames, eskers, moraines, outwash terraces

Landform position (two-dimensional): Shoulder, toeslope, footslope, backslope Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser

Down-slope shape: Convex, concave, linear

Across-slope shape: Concave, linear, convex

Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 8 inches: loamy sand

Bw1 - 8 to 11 inches: gravelly loamy sand

Bw2 - 11 to 16 inches: gravelly loamy sand

BC - 16 to 19 inches: very gravelly loamy sand

C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 4e Hydrologic Soil Group: A Ecological site: Dry Outwash (F144AY022MA) Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent Landform: Eskers, moraines, outwash terraces, outwash plains, kames Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope Landform position (three-dimensional): Side slope, head slope, nose slope, crest, riser Down-slope shape: Convex

Across-slope shape: Convex Hydric soil rating: No

Windsor

Percent of map unit: 5 percent

Landform: Moraines, kame terraces, outwash plains, outwash terraces, outwash deltas, kames, eskers

Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser

Down-slope shape: Convex, linear, concave *Across-slope shape:* Linear, convex, concave *Hydric soil rating:* No

Sudbury

Percent of map unit: 5 percent
Landform: Outwash terraces, kame terraces, outwash plains, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

253D—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2svmd Elevation: 0 to 860 feet Mean annual precipitation: 36 to 71 inches Mean annual air temperature: 39 to 55 degrees F Frost-free period: 140 to 240 days Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent *Minor components:* 15 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Hinckley

Setting

Landform: Outwash plains, kames, eskers, moraines, outwash terraces, outwash deltas, kame terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Crest, nose slope, side slope, head slope, riser

Down-slope shape: Concave, convex, linear

Across-slope shape: Linear, convex, concave

Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 8 inches: loamy sand

Bw1 - 8 to 11 inches: gravelly loamy sand *Bw2 - 11 to 16 inches:* gravelly loamy sand *BC - 16 to 19 inches:* very gravelly loamy sand *C - 19 to 65 inches:* very gravelly sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 6e Hydrologic Soil Group: A Ecological site: Dry Outwash (F144AY022MA) Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 10 percent
Landform: Moraines, kame terraces, outwash plains, outwash terraces, outwash deltas, kames, eskers
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, crest, side slope, head slope, riser
Down-slope shape: Convex, linear, concave
Across-slope shape: No

Merrimac

Percent of map unit: 3 percent

Landform: Kames, eskers, moraines, outwash terraces, outwash plains, kame terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser

Down-slope shape: Convex, concave, linear *Across-slope shape:* Concave, convex, linear

Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Moraines, outwash terraces, kame terraces, outwash plains, outwash deltas
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear

Hydric soil rating: No

602—Urban land, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: vkyj Mean annual precipitation: 32 to 50 inches Mean annual air temperature: 45 to 50 degrees F Frost-free period: 120 to 200 days Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 99 percent *Minor components:* 1 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Rock outcrops

Percent of map unit: 1 percent *Hydric soil rating:* Unranked

652—Udorthents, refuse substratum

Map Unit Setting

National map unit symbol: vkyg Elevation: 0 to 3,000 feet Mean annual precipitation: 45 to 54 inches Mean annual air temperature: 43 to 54 degrees F Frost-free period: 145 to 240 days Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 95 percent Minor components: 5 percent Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform position (two-dimensional): Shoulder, summit, backslope Landform position (three-dimensional): Riser, tread Down-slope shape: Linear, convex Across-slope shape: Convex, linear Parent material: Excavated and filled loamy land over made land, refuse

Typical profile

H1 - 0 to 6 inches: variable H2 - 6 to 60 inches: variable

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 6s Hydrologic Soil Group: A Hydric soil rating: Unranked

Minor Components

Udorthents

Percent of map unit: 5 percent Hydric soil rating: Unranked

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.




Table—Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---------------------------|--|--------|--------------|----------------|
| 1 | Water | | 1.1 | 5.0% |
| 65 | Ipswich mucky peat, 0 to 2 percent slopes, very frequently flooded | A/D | 2.2 | 10.3% |
| 104C | Hollis-Rock outcrop- Charlton complex, 0 to 15 percent slopes | D | 2.7 | 12.5% |
| 245C | Hinckley loamy sand, 8 to 15 percent slopes | A | 7.0 | 32.7% |
| 253D | Hinckley loamy sand, 15 to 35 percent slopes | A | 0.0 | 0.1% |
| 602 | Urban land, 0 to 15 percent slopes | | 2.8 | 13.4% |
| 652 | Udorthents, refuse substratum | A | 5.5 | 26.0% |
| Totals for Area of Intere | est | | 21.3 | 100.0% |

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition Component Percent Cutoff: None Specified Tie-break Rule: Higher

Water Features

Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.



| | MAP LI | EGEND | | MAP INFORMATION |
|-------------------|---|-----------|---|--|
| Area of In | Area of Interest (AOI) Area of Interest (AOI) | | Not rated or not available tures | The soil surveys that comprise your AOI were mapped at 1:25,000. |
| Soils Soil Rat | ing Polygons 0 - 25 25 - 50 50 - 100 100 - 150 150 - 200 > 200 Not rated or not available ing Lines 0 - 25 25 - 50 50 - 100 100 - 150 150 - 200 > 200 Not rated or not available ing Points 0 - 25 25 - 50 50 - 100 100 - 150 150 - 200 > 25 25 - 50 50 - 100 100 - 150 150 - 200 > 200 | Water Fea | tures Streams and Canals ation Rails Interstate Highways US Routes Major Roads Local Roads nd Aerial Photography | 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: 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: Norfolk and Suffolk Counties, Massachusetts Survey Area Data: Version 16, Jun 11, 2020 Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014 |
| • | . 200 | | | 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. |

Table—Depth to Water Table

| | - | | | |
|----------------------------|--|----------------------|--------------|----------------|
| Map unit symbol | Map unit name | Rating (centimeters) | Acres in AOI | Percent of AOI |
| 1 | Water | >200 | 1.1 | 5.0% |
| 65 | Ipswich mucky peat, 0 to 2 percent slopes, very frequently flooded | 0 | 2.2 | 10.3% |
| 104C | Hollis-Rock outcrop- Charlton complex, 0 to 15 percent slopes | >200 | 2.7 | 12.5% |
| 245C | Hinckley loamy sand, 8 to 15 percent slopes | >200 | 7.0 | 32.7% |
| 253D | Hinckley loamy sand, 15 to 35 percent slopes | >200 | 0.0 | 0.1% |
| 602 | Urban land, 0 to 15 percent slopes | >200 | 2.8 | 13.4% |
| 652 | Udorthents, refuse substratum | >200 | 5.5 | 26.0% |
| Totals for Area of Interes | st | | 21.3 | 100.0% |

Rating Options—Depth to Water Table

Units of Measure: centimeters Aggregation Method: Dominant Component Component Percent Cutoff: None Specified Tie-break Rule: Lower Interpret Nulls as Zero: No Beginning Month: January Ending Month: December

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| | 1-25 | | Projec | ct Name: 4 | 4 Wharf Street | Boring No. B-1 |
|---|--|-----------------------|----------------------------------|------------------------|---|---|
| (| CT | IC | Projec | ct Location: N | /eymouth, MA | Sheet 1 of 1 |
| | 5 | | Projec | ct Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineerit | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Groundwater Observations <u>Date Time Depth</u> Type 7/7/20 Completion 20' Size I.I Hamm Hamm | | | | | Casing Sampler Core Auger Split Spoon 4-1⁄4" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: R. Bonetti Log Prepared by C. Gross Rig Type: Acker AD2 ATV |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Desci | ription |
| | S-1 | 24/6 | 0 - 2 | 5-6-7-5 | Silty Sand (SM): c/f sand, <5% fine light brown to brown, dry. | e gravel, 12-20% npf, root fibers, 2' |
| | S-2 | 24/12 | 2 - 4 | 10-15-17-18 | Silty Sand (SM): c/f sand, 10-20% fi brown, dry. | ne gravel, 12-20% npf, light |
| 5' | S-3 | 17/10 | 5 - 6.4 | 11-37-50/5" | Silty Sand (SM): c/f sand, 10-20% f brown, dry. | ine gravel, 12-20% npf, light |
| | | | | | | 9' |
| 10' | S-4 | 24/14 | 10 - 12 | 24-13-16-22 | Silty Sand (SP-SM): c/f sand, <10% brown, dry. | fine gravel, 12-20% npf, |
| | | | | | | 13' |
| 15' | S-5 | 24/10 | 15 - 17 | 10-8-7-8 | Sand (SP-SM): c/f sand, 5-10% fine | gravel, 5-12% npf, brown, dry. |
| | | | | | | 20, |
| 20' | S-6 | 24/10 | 20 - 22 | 12-10-14-10 | Silty Sand (SM): fine sand, 20-30% | npf, brown, wet. |
| | | | | | | |
| 05, | | | | | End of Borir | ng @ 22' |
| 25 | | | | | | |
| | | | | | | |
| 30' | | | | | | |
| | S-8 | | | | | |
| | | | | | | r i |
| Samp S - sp ST - s AF - a RC - r c/f means n/f means | Ie Types lit spoon helby tube uger flight ock core coarse to fil medium to a nonplastic | ne fine fine | tomatic ha | mmer used for | driving & split-spoon sampler and | Granular SoilsCohesive SoilsN-Value DensityN-Value Consistency<4 |

| | 1-25 | | Projec | ct Name: 4 | 4 Wharf Street | Boring No. B-2 |
|---|--|-----------------------|----------------------------------|---|---|---|
| (| CT | IC | Projec | ct Location: W | /eymouth, MA | Sheet 1 of 1 |
| | | | Projec | ct Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineerint | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Groundwater Observations <u>Date Time Depth</u> 7/7/20 Completion 18' | | | tions <u>Depth</u> 18' | Type Size I.D. Hammer Wt. Hammer Fal | Casing Sampler Core Auger Split Spoon 4-1⁄4" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: R. Bonetti Log Prepared by C. Gross Rig Type: Acker AD2 ATV |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Desc | ription |
| | S-1 | 24/3 | 0 - 2 | 3-4-5-5 | Gravelly Sand (SP-SM): c/f sand, 1 | 0-15% m/f gravel, 5-12% npf, |
| | S-2 | 24/10 | 2 - 4 | 5-6-11-20 | Silty Sand (SM): c/f sand, 5-15% fir brown, dry. | e gravel, 12-20% npf, light |
| 5 | S-3 | 24/12 | 5 - 7 | 19-30-26-31 | Silty Sand (SM): c/f sand, 5-15% fir brown, dry. | e gravel, 12-20% npf, light |
| | | | | | | 9' |
| 10' | S-4 | 24/16 | 10 - 12 | 14-18-17-19 | Silty Sand (SM): c/f sand, 5-10% fir dry. | e gravel, 12-20% npf, brown, |
| 15' | S-5 | 24/20 | 15 - 17 | 16-24-19-17 | Silty Sand (SM): c/f sand, 5-10% fir dry. | e gravel, 12-20% npf, brown, 19' |
| 20' | S-6 | 24/22 | 20 - 22 | 5-4-4-8 | Silty Sand (SM): c/f sand, <5% fine wet. | gravel, 15-25% npf, brown, |
| 25' | S-7 | 24/18 | 25 - 27 | 8-9-7-8 | Silty Sand (SM): c/f sand, <5% fine wet. | gravel, 12-20% npf, brown, |
| 30' | S-8 | 24/24 | 30 - 32 | 9-7-12-12 | Gravelly Sand (SP-SM): c/f sand, 1 brown, wet. | 29' 0-15% m/f gravel, 5-12% npf, |
| | | | | | End of Borin | g @ 32' |
| Samp S - sp ST - s AF - a RC - r c/f means m/f means npf means | Ie Types lit spoon helby tube uger flight ock core coarse to fin medium to a nonplastic | ne fine fine | tomatic ha sing. | mmer used for | driving & split-spoon sampler and | Granular SoilsCohesive SoilsN-Value DensityN-Value Consistency<4 |

| | 1-25 | | Projec | ct Name: 4 | 4 Wharf Street | Boring No. B-3 |
|---|--|-----------------------|----------------------------------|---|--|---|
| (| C T | IC | Projec | ct Location: W | /eymouth, MA | Sheet 1 of 1 |
| | | | Projec | ct Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineerin | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Gr <u>Date</u> 7/7/2 | Groundwater Observations <u>Date Time Depth</u> 7/7/20 Completion 15' | | | Type Size I.D. Hammer Wt. Hammer Fal | <u>Casing Sampler Core</u> Auger Split Spoon 4-¼" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: R. Bonetti Log Prepared by C. Gross Rig Type: Acker AD2 ATV |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Desc | ription |
| | S-1 | 24/8 | 0 - 2 | 2-3-3-3 | Silty Sand (SM): fine sand, 20-30% | npf, brown, dry. |
| | S-2 | 24/12 | 2 - 4 | 5-6-6-6 | Silty Sand (SM): c/f sand, 5-15% fir brown, dry. | e gravel, 12-20% npf, medium 4' |
| 5' | S-3 | 24/12 | 5 - 7 | 12-22-25-50/4" | Silty Sand (SM): c/f sand, 10-20% f brown, dry. | ine gravel, 12-20% npf, light |
| | | | | | | 9' |
| 10' | S-4 | 24/16 | 10 - 12 | 6-8-15-21 | Sand (SP-SM): fine sand, 5-12% np | f, brown, dry. |
| | | | | | | 13' |
| 15' | S-5 | 24/12 | 15 - 17 | 17-10-7-4 | Sand (SP-SM): c/f sand, 5-15% fine | gravel, 5-12% npf, brown, wet. |
| | | | | | | 19 |
| 20' | S-6 | 24/22 | 20 - 22 | 4-7-12-23 | Silty Sand (SM): fine sand, 15-25% | npf, brown, wet. |
| 25' | S-7 | 24/24 | 25 - 27 | 5-5-8-9 | Silty Sand (SM): fine sand, 15-25% | npf, brown, wet. |
| 30' | S-8 | 8/2 | 30 - 30.7 | 7-50/2" | Silty Sand (SM): c/f sand, 5-10% fin wet. | e gravel, 12-20% npf, brown, |
| | | | | | Refusal @ 3 End of Boring (| 0.7' @ 30.7' |
| Samp S - sp ST - s AF - a RC - r c/f means m/f means npf means | le Types lit spoon helby tube uger flight ock core coarse to fin e medium to a nonplastic | ne fine fines | tomatic ha sing. | mmer used for | driving & split-spoon sampler and | Granular Soils N-Value DensityCohesive Soils N-Value Consistency<4 |

| | 125 | | Projec | t Name: 4 | 4 Wharf Street | Boring No. B-4 |
|--|-------------|-----------------------|----------------------------------|-----------------|---|--|
| 1 | CT | | Projec | t Location: W | /eymouth, MA | Sheet 1 of 1 |
| | | | Projec | t Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineerine | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Groundwater Observations <u>Date Time Depth</u> 7/7/20 Completion Not Encountered Hammer | | | | | Casing Sampler Core Auger Split Spoon 4-¼" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: G. Guinto Log Prepared by C. Gross Rig Type: Mobile B-57 |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Desc | ription |
| | S-1 | 24/15 | 0 - 2 | 17-15-15-12 | Fill: Silty Sand (SM): c/f sand, 5-15 | % fine gravel, 12-20% npf, |
| | S-2 | 24/15 | 2 - 4 | 5-6-6-5 | Fill: Silty Sand (SM): c/f sand, 5-15 brown, moist. | % fine gravel, 12-20% npf, |
| 5' | S-3 | 24/10 | 5 - 7 | 5-5-5-5 | Fill: Sandy Gravel (GP-GM): m/f gr npf, brick fragments, brown & gray, i | avel, 25-35% c/f sand, 5-12% moist. |
| | | | | | | |
| 10' | S-4 | 1/0 | 10 - 10.1 | 60/1" | No Recovery | |
| | | | | | Refusal @ | 2 10.1' |
| | | | | | End of Davia | - @ 10.12 |
| 15' | | | | | End of Borin | g @ 10.1* |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 20' | | | | | | |
| | | | | | | |
| | | | | | | |
| 25' | | | | | | |
| 25 | | | | | | |
| | | | | | | |
| | | | | | | |
| 30' | | | | | | |
| | | | | | | |
| | | | | | | |
| Sample Types Notes: S - split spoon 1. Automatic hammer used for casing. AF - auger flight C - rock core c/f means coarse to fine n/f means medium to fine npf means nonplastic fines Image: Complete the system | | | | | driving & split-spoon sampler and | Granular Soils N-Value 5-10 11-30 >50Cohesive Soils N-Value 2 |

| | | | | | | |
|---|-----------------------------|---|-------------------------------------|---|--|--|
| | 1-25 | | Projec | ct Name: 4 | 4 Wharf Street | Boring No. B-5 |
| | | IC | Projec | ct Location: N | Veymouth, MA | Sheet 1 of 1 |
| | E. | inthe | Projec | ct Number: 2 | 013 | Location: See Figure 2 |
| | otechnical | Engineel | Borine | g Contractor: S | oil X Corp | Approx. Elev. |
| Gr <u>Date</u> 7/7/20 | oundwa <u>3</u>) Com | ter Observa <u>Time</u> pletion Not E | tions <u>Depth</u> ncountered | Type Size I.D. Hammer Wt. Hammer Fal | Casing Sampler Core Auger Split Spoon 4-1⁄4" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: G. Guinto Log Prepared by C. Gross Rig Type: Mobile B-57 |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Descripti | on |
| | S-1 | 24/11 | 0 - 2 | 6-8-8-9 | Fill: Silty Sand (SM): c/f sand, <5% fine | gravel, 12-20% npf, black, |
| | S-2 | 24/12 | 2 - 4 | 8-13-13-15 | dry. Silty Sand (SM): fine sand, <10% fine g dry. | 2'2'2' |
| 5' | S-3 | 24/17 | 5 - 7 | 8-8-9-10 | Silty Sand (SM): c/f sand, mostly fine sa 12-20% npf, brown, dry. | and, <10% fine gravel, |
| | | | | | | 9' |
| 10' | S-4 | 24/15 | 10 - 12 | 6-6-6-5 | Sand (SP-SM): m/f sand, 5-12% npf, bro | own, dry. |
| 15' | | | | | End of Boring @ | 12' |
| 20' | | | | | | |
| 25' | | | | | | |
| 30' | | | | | | |
| Sample Types Notes: S - split spoon 1. Automatic hammer used ST - shelby tube AF - auger flight RC - rock core c/f means coarse to fine m/f means medium to fine fine npf means nonplastic fines 1. | | | | I mmer used for | driving & split-spoon sampler and split-spoon sampler and split-split-spoon sampler and split-split | ranular Soils /alue DensityCohesive Soils N-Value Consistency4very loose-210loose2-41-30medium5-81-50dense9-1550very dense16-3020very stiff>30hard |

| | 1-25 | 2.5 | Projec | t Name: 4 | 4 Wharf Street | Boring No. B-6 |
|---|----------------------|--|----------------------------------|---|---|--|
| (| CT | IC | Projec | t Location: N | /eymouth, MA | Sheet 1 of 1 |
| | | | Projec | t Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineering | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Gr <u>Date</u> 7/7/20 | oundwa 2) Con | ter Observa <u>Time</u> npletion | tions <u>Depth</u> 10' | Type Size I.D. Hammer Wt. Hammer Fal | Casing Sampler Core Auger Split Spoon 4-1⁄4" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: G. Guinto Log Prepared by C. Gross Rig Type: Mobile B-57 |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Desc | ription |
| | S-1 | 24/12 | 0 - 2 | 8-7-6-6 | Silty Sand (SM): c/f sand, <10% fir | ie gravel, 12-20% npf, brown, dry. |
| | S-2 | 24/10 | 2 - 4 | 8-7-7-7 | Silty Sand (SM): c/f sand, <10% fir | ie gravel, 12-20% npf, brown, dry. |
| 5' | S-3 | 24/17 | 5 - 7 | 9-10-10-10 | Silty Sand (SM): c/f sand, <10% fin | e gravel, 12-20% npf, brown, dry. |
| 10' | S-4 | 24/17 | 10 - 12 | 8-9-10-10 | Silty Sand (SM): fine sand, 20-30% | npf, brown, wet. |
| 15' | | | | | End of Bori | ng @ 12' |
| 20' | | | | | | |
| 25' | | | | | | |
| 30' | | | | | | |
| Sample Types S - split spoon ST - shelby tube AF - auger flight RC - rock core c/f means coarse to fine m/f means medium to fine npf means nonplastic fines | | | | | driving & split-spoon sampler and | Granular SoilsCohesive SoilsN-Value DensityN-Value Consistency<4 |

| | 1-25 | . 5 | Projec | t Name: 4 | 4 Wharf Street | Boring No. B-7 |
|---|---------------------|---|----------------------------------|---|---|--|
| (| CT | IC | Projec | t Location: N | /eymouth, MA | Sheet 1 of 1 |
| | | | Projec | t Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineering | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Gr <u>Date</u> 7/7/20 | oundwa 2) Ca | ter Observa <u>Time</u> ompletion | tions <u>Depth</u> 9' | Type Size I.D. Hammer Wt. Hammer Fal | Casing Sampler Core Auger Split Spoon 4-¼" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: G. Guinto Log Prepared by C. Gross Rig Type: Mobile B-57 |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Des | cription |
| | S-1 | 24/6 | 0 - 2 | 5-6-8-12 | Fill: Silty Sand (SM): c/f sand, <10 | 0% fine gravel, 12-20% npf, trace |
| | S-2 | 24/4 | 2 - 4 | 8-9-11-11 | Fill: Silty Sand (SM): c/f sand, 5-1 brick fragments, dark brown, dry. | 5% fine gravel, 12-20% npf, trace |
| 5' | S-3 | 24/6 | 5 - 7 | 12-17-17-20 | Sandy Gravel (GP-GM): m/f grave dark brown & gray, dry. | el, 20-30% c/f sand, 5-12% npf, 7' |
| 10' | S-4 | 24/16 | 10 - 12 | 8-10-12-14 | Silty Sand (SM): c/f sand, <5% fin wet. | e gravel, 15-25% npf, brown, |
| 15' | | | | | End of Bor | ing @ 12' |
| 20' | | | | | | |
| 25' | | | | | | |
| 30' | | | | | | |
| Sample Types Notes: S - split spoon 1. Automatic hammer used for construction of the casing. AF - auger flight RC - rock core c/f means coarse to fine m/f means medium to fine npf means nonplastic fines Image: Comparison of the comparison of the comparison of the casing. | | | | | driving & split-spoon sampler and | Granular Soils N-Value Density <4 very looseCohesive Soils N-Value Consistency <2 very soft5-10loose2-4soft11-30medium5-8medium31-50dense9-15stiff>50very dense16-30very stiff>30hard-30hard |

| | 1-25 | | Projec | t Name: 4 | 4 Wharf Street | Boring No. B-8 |
|---|-------------|-----------------------|----------------------------------|--|--|--|
| (| CT | IC | Projec | t Location: V | /eymouth, MA | Sheet 1 of 1 |
| | | | Projec | t Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineerine | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Groundwater Observations <u>Date Time Depth</u> Typ 7/7/20 Completion Not Encountered Har Har | | | | Type Size I.D. Hammer Wt Hammer Fal | Casing Sampler Con Auger Split Spoon 4-1⁄4" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: G. Guinto Log Prepared by C. Gross Rig Type: Mobile B-57 |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample De | escription |
| | S-1 | 24/12 | 0 - 2 | 6-8-8-7 | Silty Sand (SM): c/f sand, most | y fine sand, <10% fine gravel, |
| | S-2 | 24/13 | 2 - 4 | 7-8-9-10 | Silty Sand (SM): fine sand, 15-2 | 5% npf, light brown, dry. |
| 5' | S-3 | 24/15 | 5 - 7 | 8-12-14-14 | Silty Sand (SM): fine sand, 15-2 | 25% npf, light brown, dry. |
| | | | | | | 9' |
| 10' | S-4 | 24/17 | 10 - 12 | 8-8-9-9 | Sand (SP-SM): m/f sand, 5-12% | npf, brown, dry. |
| 15' | | | | | End of B | oring @ 12' |
| 20' | | | | | | |
| 25' | | | | | | |
| 30' | | | | | | |
| Sample Types Notes: S - split spoon I. Automatic hammer used for a casing. ST - shelby tube AF - auger flight RC - rock core c/f means coarse to fine m/f means medium to fine fine npf means nonplastic fines I. Automatic hammer used for a casing. | | | | | driving & split-spoon sampler and | Granular SoilsCohesive SoilsN-Value DensityN-Value Consistency<4 |

| | 125 | | Projec | t Name: 4 | 4 Wharf Street | Boring No. B-9 |
|--|-------------|-----------------------|----------------------------------|-----------------|--|--|
| 1 | CT | | Projec | t Location: W | /eymouth, MA | Sheet 1 of 1 |
| | | | Projec | t Number: 2 | 013 | Location: See Figure 2 |
| | eotechnical | Engineerine | Boring | g Contractor: S | oil X Corp | Approx. Elev. |
| Groundwater Observations <u>Date Time Depth</u> Type 7/7/20 Completion Not Encountered Hammer M | | | | | <u>Casing Sampler Core</u> Auger Split Spoon 4-1⁄4" 1-3/8" Automatic Hammer | Date Start: 7/7/20 Date Finish: 7/7/20 Driller: G. Guinto Log Prepared by C. Gross Rig Type: Mobile B-57 |
| Depth | No. | Pen./Rec. (inches) | <u>Sample</u> Depth (feet) | Blows/6" | Sample Descr | iption |
| | S-1 | 24/17 | 0 - 2 | 10-12-9-8 | Fill: Silty Sand (SM): c/f sand, <5% fragments, dark brown & black, dry. | fine gravel, 12-25% npf, brick 2' |
| | S-2 | 24/13 | 2 - 4 | 8-12-15-17 | Silty Sand (SM): c/f sand, 5-15% m/ dry. | f gravel,12-20% npf, brown, |
| 5' | S-3 | 24/17 | 5 - 7 | 12-28-45-42 | Silty Sand (SM): c/f sand, 5-15% m/ dry. | f gravel,12-20% npf, brown, |
| | | | | | | 9' |
| 10' | S-4 | 24/17 | 10 - 12 | 6-7-7-8 | Sand (SP-SM): c/f sand, <10% fine g | gravel, 5-12% npf, brown, dry. |
| 15' | | | | | End of Borin | g @ 12' |
| 20' | | | | | | |
| 25' | | | | | | |
| 30' | | | | | | |
| | | | | | | |
| Sample Types Notes: S - split spoon I. Automatic hammer used for construction ST - shelby tube AF - auger flight RC - rock core c/f means coarse to fine m/f means medium to fine npf means nonplastic fines | | | | | driving & split-spoon sampler and | Granular SoilsCohesive SoilsN-Value DensityN-Value Consistency<4 |

APPENDIX C

SUPPORTING CALCULATIONS

HydroCAD Drainage Analysis TSS Calculations Water Quality Volume and Recharge Calculations Hydraulic Analysis Manufacturer's O&M Procedures HydroCAD Drainage Analysis



193187-CV01-HYD-EX

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Area Listing (all nodes)

| A | Area CN | Description |
|-----|---------|---|
| (s | q-ft) | (subcatchment-numbers) |
| 62, | 085 49 | 50-75% Grass cover, Fair, HSG A (A1-OFF, A2-EX, A3-EX, A5-EX) |
| 28, | 146 96 | Gravel surface, HSG A (A1-OFF, A2-EX, A3-EX, A4-OFF, A5-EX) |
| 45, | 553 98 | Paved parking, HSG A (A1-OFF, A3-EX, A5-EX) |
| 41, | 782 98 | Roofs, HSG A (A1-OFF, A2-EX, A3-EX, A5-EX) |
| 63, | 217 36 | Woods, Fair, HSG A (A3-EX, A4-OFF, A5-EX) |
| 49, | 447 43 | Woods/grass comb., Fair, HSG A (A1-OFF) |
| 290 | ,230 64 | TOTAL AREA |

193187-CV01-HYD-EX

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|------------------------------|--|
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Soil Listing (all nodes)

| Area | Soil | Subcatchment |
|---------|-------|-------------------------------------|
| (sq-ft) | Group | Numbers |
| 290,230 | HSG A | A1-OFF, A2-EX, A3-EX, A4-OFF, A5-EX |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| 290,230 | | TOTAL AREA |

193187-CV01-HYD-EX Prepared by CEC, Inc.

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| | ••• | | ••• | | | |
|--------------------------|-------------------------|--|---|---------------------------------|------------------------------------|--------------------|
| SubcatchmentA1-OFF: A1 | -OFF low Length=210' | Runoff Area=128 Slope=0.0500 '/' | ,117 sf 36.91% Tc=17.3 min 0 | Impervious CN=66 Runc | Runoff Deptha off=1.27 cfs 6, | >0.57" 084 cf |
| SubcatchmentA2-EX: A2- | EX | Runoff Area=14 | ,662 sf 40.21% Tc=6.0 min | o Impervious CN=71 Ru | Runoff Depthan noff=0.31 cfs | >0.79" 971 cf |
| SubcatchmentA3-EX: A3- | EX | Runoff Area=8 Flow Length=605 | ,446 sf 58.44% Tc=16.3 min (| Impervious CN=84 Runc | Runoff Depth off=0.28 cfs 1, | >1.56" 098 cf |
| SubcatchmentA4-OFF: A4 | -OFF Flow Length=50 | Runoff Area=)' Slope=0.0300 '/ | 8,837 sf 0.00% /' Tc=12.0 min | Impervious CN=64 Ru | Runoff Depthan noff=0.08 cfs | >0.49" 363 cf |
| SubcatchmentA5-EX: A5- | EX | Runoff Area=130 Flow Length=616' | ,168 sf 22.44% Tc=20.3 min 0 | Impervious CN=61 Runc | Runoff Depth off=0.68 cfs 4, | >0.38" 169 cf |
| Reach 1R: Routing | n=0.016 L= | Avg. Flow Depth: 542.0' S=0.0609 ' | =0.01' Max Vel /' Capacity=91 [:] | l=1.03 fps In 7.83 cfs Out | flow=0.08 cfs flow=0.06 cfs | 363 cf 359 cf |
| Reach 4R: Routing | n=0.016 L=61 | Avg. Flow Depth=0 8.0' S=0.0615 '/' | 0.04' Max Vel=2 Capacity=922.3 | 2.47 fps Inflo 36 cfs Outflo | ow=1.27 cfs 6, ow=1.22 cfs 6, | 084 cf 031 cf |
| Pond A1-P: A1-P | Discarde | Peak Ele d=0.04 cfs 966 cf | v=14.59' Storaç Primary=0.00 o | ge=354 cf In cfs 0 cf Outf | flow=0.31 cfs flow=0.04 cfs | 971 cf 966 cf |
| Link A: DESIGN POINT A - | EXISTING MUN | IICIPALDRAINA | GESYSTEM | Inflov Primar | w=2.15 cfs 11 y=2.15 cfs 11 | ,657 cf ,657 cf |

Total Runoff Area = 290,230 sf Runoff Volume = 12,686 cf Average Runoff Depth = 0.52" 69.91% Pervious = 202,895 sf 30.09% Impervious = 87,335 sf

Summary for Subcatchment A1-OFF: A1-OFF

Runoff 1.27 cfs @ 12.29 hrs, Volume= 6,084 cf, Depth> 0.57" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| A | rea (sf) | CN | Description | | |
|-------|----------|---------|--------------|--------------|---|
| | 13,269 | 98 | Roofs, HSC | θA | |
| | 34,025 | 98 | Paved park | ing, HSG A | N N N N N N N N N N N N N N N N N N N |
| | 28,415 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A |
| | 49,447 | 43 | Woods/gras | ss comb., F | air, HSG A |
| | 2,961 | 96 | Gravel surfa | ace, HSG A | A |
| 1 | 28,117 | 66 | Weighted A | verage | |
| | 80,823 | | 63.09% Pe | rvious Area | |
| | 47,294 | | 36.91% Imp | pervious Ar | ea |
| | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 2.4 | 160 | 0.0500 |) 1.12 | | Shallow Concentrated Flow, shallow conc. flow |
| | | | | | Woodland Kv= 5.0 fps |
| 17.3 | 210 | Total | | | |

Subcatchment A1-OFF: A1-OFF



Summary for Subcatchment A2-EX: A2-EX

Runoff 0.31 cfs @ 12.10 hrs, Volume= 971 cf, Depth> 0.79" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| Ar | rea (sf) | CN | Description | | | | | |
|-------|------------------------------|-------|-------------|--------------|---------------|--|--|--|
| | 5,895 | 98 | Roofs, HSC | θA | | | | |
| | 0 | 98 | Paved park | ing, HSG A | ١ | | | |
| | 8,201 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | | | |
| | 566 | 96 | Gravel surf | ace, HSG A | 4 | | | |
| | 14,662 | 71 | Weighted A | verage | | | | |
| | 8,767 | | 59.79% Pe | rvious Area | | | | |
| | 5,895 40.21% Impervious Area | | | | | | | |
| | | | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | | |
| 6.0 | | | | | Direct Entry, | | | |

Subcatchment A2-EX: A2-EX



Summary for Subcatchment A3-EX: A3-EX

Runoff 0.28 cfs @ 12.23 hrs, Volume= 1,098 cf, Depth> 1.56" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| A | rea (sf) | CN | Description | | |
|-------|----------|-------|--------------|--------------|--|
| | 3,745 | 98 | Roofs, HSC | βA | |
| | 1,191 | 98 | Paved park | ing, HSG A | N Contraction of the second |
| | 2,014 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A |
| | 252 | 36 | Woods, Fai | r, HSG A | |
| | 1,244 | 96 | Gravel surfa | ace, HSG A | Α |
| | 8,446 | 84 | Weighted A | verage | |
| | 3,510 | | 41.56% Pe | rvious Area | |
| | 4,936 | | 58.44% Imp | pervious Ar | ea |
| | | | - | | |
| Tc | Length | Slop | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | |
| 13.8 | 50 | 0.060 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 0.6 | 40 | 0.050 | 0 1.12 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| | | | | | Woodland Kv= 5.0 fps |
| 1.0 | 260 | 0.050 | 0 4.54 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| | | | | | Paved Kv= 20.3 fps |
| 0.9 | 255 | 0.060 | 0 4.97 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| | | | | | Paved Kv= 20.3 fps |
| 16.3 | 605 | Total | | | |

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Hydrograph Runoff 0.3 0.28 cfs 0.28 Type III 24-hr 0.26 2-Year 0.24 24-Hour Storm Rainfall=3.20" 0.22 Runoff Area=8,446 sf 0.2 Runoff Volume=1,098 cf 0.18 (**sj** 0.18⁻ 0.16⁻ 0.14⁻ Runoff Depth>1.56" Flow Length=605' Tc=16.3 min 0.12 CN=84 0.1 0.08 0.06 0.04 0.02 0-5 6 7 8 9 10 11 12 14 15 16 17 18 19 13 20 Time (hours)

Subcatchment A3-EX: A3-EX

Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.08 cfs @ 12.21 hrs, Volume= 363 cf, Depth> 0.49" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| A | rea (sf) | CN | Description | | |
|-------|----------|---------|--------------|--------------|--|
| | 0 | 98 | Roofs, HSC | θA | |
| | 0 | 98 | Paved park | ing, HSG A | N |
| | 0 | 49 | 50-75% Gra | ass cover, I | Fair, HSG A |
| | 4,743 | 36 | Woods, Fai | r, HSG A | |
| | 4,094 | 96 | Gravel surfa | ace, HSG A | A |
| | 8,837 | 64 | Weighted A | verage | |
| | 8,837 | | 100.00% P | ervious Are | a |
| | | | | | |
| Тс | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | |
| 3.2 | 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW |
| | | | | | Grass: Short n= 0.150 P2= 3.20" |
| 8.8 | 20 | 0.0300 | 0.04 | | Sheet Flow, |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 12.0 | 50 | Total | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-EX: A5-EX

Runoff 0.68 cfs @ 12.41 hrs, Volume= 4,169 cf, Depth> 0.38" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| _ | Ai | rea (sf) | CN | Description | | | | |
|---|------------------------|----------|--------|--------------|--------------|---|--|--|
| | 18,873 98 Roofs, HSG A | | | | | | | |
| | | 10,337 | 98 | Paved park | ing, HSG A | | | |
| | | 23,455 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | |
| | | 58,222 | 36 | Woods, Fai | r, HSG A | | | |
| _ | | 19,281 | 96 | Gravel surfa | ace, HSG A | Ν | | |
| | 1 | 30,168 | 61 | Weighted A | verage | | | |
| | 1 | 00,958 | | 77.56% Pei | rvious Area | | | |
| | | 29,210 | | 22.44% Imp | pervious Ar | ea | | |
| | | | | | | | | |
| | Tc | Length | Slope | e Velocity | Capacity | Description | | |
| _ | (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | | | |
| | 13.8 | 50 | 0.0600 | 0.06 | | Sheet Flow, SHEET FLOW | | |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | |
| | 1.8 | 100 | 0.1300 | 0.90 | | Shallow Concentrated Flow, SHALLOW CONC. | | |
| | | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | |
| | 4.4 | 200 | 0.0900 | 0.75 | | Shallow Concentrated Flow, SHALL CONC. FLOW 2 | | |
| | | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | |
| | 0.3 | 266 | 0.0300 |) 16.09 | 193.04 | Channel Flow, CHANNEL FLOW | | |
| | | | | | | Area= 12.0 sf Perim= 12.0' r= 1.00' | | |
| _ | | | | | | n= 0.016 Asphalt, rough | | |
| | 20.3 | 616 | Total | | | | | |

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Hydrograph Runoff 0.75 0.68 cfs 0.7 Type III 24-hr 0.65 2-Year 0.6 24-Hour Storm Rainfall=3.20" 0.55 Runoff Area=130,168 sf 0.5 Runoff Volume=4,169 cf 0.45 Flow (cfs) Runoff Depth>0.38" 0.4 Flow Length=616' 0.35 Tc=20.3 min 0.3 CN=61 0.25 0.2 0.15 0.1 0.05 0-5 6 7 8 9 10 11 13 14 15 16 17 18 19 12 20 Time (hours)

Subcatchment A5-EX: A5-EX

Summary for Reach 1R: Routing



Summary for Reach 4R: Routing



Summary for Pond A1-P: A1-P

| Inflow Area | a = | 14,662 sf, | 40.21% Ir | npervious, | Inflow Depth > | 0.79" | for 2-Year, 24-Hour Storm event | t |
|-------------|-----|------------|------------|------------|----------------|----------|---------------------------------|---|
| Inflow | = | 0.31 cfs @ | 12.10 hrs, | Volume= | 971 c | f | | |
| Outflow | = | 0.04 cfs @ | 12.97 hrs, | Volume= | 966 c | f, Atten | n= 86%, Lag= 52.3 min | |
| Discarded | = | 0.04 cfs @ | 12.97 hrs, | Volume= | 966 c | f | | |
| Primary | = | 0.00 cfs @ | 5.00 hrs, | Volume= | 0 c | f | | |

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Peak Elev= 14.59' @ 12.97 hrs Surf.Area= 776 sf Storage= 354 cf

Plug-Flow detention time= 91.0 min calculated for 966 cf (99% of inflow) Center-of-Mass det. time= 89.1 min (914.9 - 825.8)

| Volume | Inve | rt Ava | il.Storage | Stora | ge Description | |
|------------------|-----------|--------------------|------------------|-----------|-------------------------|------------------------------------|
| #1 | 16.0 | 0' | 709 cf | West | Depression (Pris | matic)Listed below (Recalc) |
| #2 | 14.0 | 0' | 6,091 cf | East | Depression (Prisi | matic)Listed below (Recalc) |
| | | | 6,800 cf | Total | Available Storage | |
| | | | | _ | | |
| Elevatio | n S | Surf.Area | In | c.Store | Cum.Store | |
| (fee | t) | (sq-ft) | (cub | ic-feet) | (cubic-feet) | |
| 16.0 | 0 | 59 | | 0 | 0 | |
| 17.0 | 0 | 673 | | 366 | 366 | |
| 17.5 | 60 | 700 | | 343 | 709 | |
| Flave tia | | D f A m a a | lu. | | Ourse Otherse | |
| Elevatio | n s | Surr.Area | IN (auto | C.Store | Cum.Store | |
| (tee | t) | (sq-π) | dub) | IC-TEET) | (cubic-teet) | |
| 14.0 | 0 | 425 | | 0 | 0 | |
| 15.0 | 0 | 1,019 | | 722 | 722 | |
| 16.0 | 0 | 1,799 | | 1,409 | 2,131 | |
| 17.0 | 0 | 3,060 | | 2,430 | 4,561 | |
| 17.5 | 50 | 3,060 | | 1,530 | 6,091 | |
| Device | Routing | In | vert Out | let Devi | ces | |
| #1 | Primary | 17 | 7.10' 10. | 0' long | x 5.0' breadth Br | oad-Crested Rectangular Weir |
| | • | | Hea | ad (feet) | 0.20 0.40 0.60 | 0.80 1.00 1.20 1.40 1.60 1.80 2.00 |
| | | | 2.5 | 03.00 | 3.50 4.00 4.50 5 | 5.00 5.50 |
| | | | Coe | ef. (Engl | ish) 2.34 2.50 2. | .70 2.68 2.68 2.66 2.65 2.65 2.65 |
| | | | 2.6 | 5 2.67 | 2.66 2.68 2.70 2 | 2.74 2.79 2.88 |
| #2 | Discardeo | d 14 | 1.00' 2.4 | 10 in/hr | Exfiltration over | Surface area |
| Discourt | | | 04 -6- 0 | | | |

Discarded OutFlow Max=0.04 cfs @ 12.97 hrs HW=14.59' (Free Discharge) **2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=14.00' (Free Discharge) 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

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Pond A1-P: A1-P



Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow A | \rea = | 290,230 sf, 30 |).09% Impervious, | Inflow Depth > 0.48" | for 2-Year, 24-Hour Storm event |
|----------|--------|-----------------|-------------------|----------------------|---------------------------------|
| Inflow | = | 2.15 cfs @ 12.4 | 41 hrs, Volume= | 11,657 cf | |
| Primary | / = | 2.15 cfs @ 12.4 | 41 hrs, Volume= | 11,657 cf, Atter | n= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM



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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| SubcatchmentA1-OFF: | A1-OFF | Runoff Area=12 | 8,117 sf 36.9 | 1% Impervious | Runoff Dept | h>1.39" |
|---|------------------|-----------------------------------|----------------------------------|---------------------------------|-----------------------------------|----------------------|
| | Flow Length=210' | Slope=0.0500 '/' | Tc=17.3 min | CN=66 Rund | off=3.53 cfs 14 | 1,791 cf |
| SubcatchmentA2-EX: A | 2-EX | Runoff Area=1 | 4,662 sf 40.2 Tc=6.0 mir | 1% Impervious า CN=71 Ruเ | Runoff Dept noff=0.72 cfs 2 | h>1.74" 2,128 cf |
| SubcatchmentA3-EX: A | 3-EX | Runoff Area= Flow Length=605 | 8,446 sf 58.4 5' Tc=16.3 mir | 4% Impervious ר CN=84 Rui | Runoff Dept | h>2.80" 1,972 cf |
| SubcatchmentA4-OFF: | A4-OFF | Runoff Area | =8,837 sf 0.0 | 0% Impervious | Runoff Dept | h>1.26" |
| | Flow Length=5 | 0' Slope=0.0300 |)'/' Tc=12.0 m | nin CN=64 R | unoff=0.25 cfs | 927 cf |
| SubcatchmentA5-EX: A | 5-EX | Runoff Area=13 | 0,168 sf 22.4 | 4% Impervious | Runoff Dept | h>1.07" |
| | F | low Length=616' | Tc=20.3 min | CN=61 Rund | off=2.47 cfs 1 | 1,586 cf |
| Reach 1R: Routing | n=0.016 L= | Avg. Flow Dept 542.0' S=0.0609 | h=0.01' Max ` 9 '/' Capacity= | Vel=1.38 fps I 917.83 cfs Ou | nflow=0.25 cfs itflow=0.21 cfs | 927 cf 919 cf |
| Reach 4R: Routing | م | vg. Flow Depth=0 | 0.07' Max Vel | =3.45 fps Inflo | ow=3.53 cfs 14 | 4,791 cf |
| | n=0.016 L=618 | 3.0' S=0.0615 '/' | Capacity=922 | 2.36 cfs Outflo | ow=3.45 cfs 14 | 4,701 cf |
| Pond A1-P: A1-P | Discarded=(| Peak Ele 0.07 cfs 1,774 cf | v=15.23' Stora Primary=0.00 | age=979 cf Inf cfs 0 cf Outf | low=0.72 cfs 2 ow=0.07 cfs 1 | 2,128 cf I,774 cf |
| Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGESYSTEM Inflow=6.51 cfs 29,178 | | | | | | 9,178 cf |
| Primary=6.51 cfs 29,178 | | | | | | 9,178 cf |

Total Runoff Area = 290,230 sf Runoff Volume = 31,404 cf Average Runoff Depth = 1.30" 69.91% Pervious = 202,895 sf 30.09% Impervious = 87,335 sf
Summary for Subcatchment A1-OFF: A1-OFF

Runoff 3.53 cfs @ 12.26 hrs, Volume= 14,791 cf, Depth> 1.39" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | |
|-------|----------|--------|-------------|--------------|--|
| | 13,269 | 98 | Roofs, HSC | βA | |
| | 34,025 | 98 | Paved park | ing, HSG A | N Contraction of the second seco |
| | 28,415 | 49 | 50-75% Gra | ass cover, I | Fair, HSG A |
| | 49,447 | 43 | Woods/gras | ss comb., F | Fair, HSG A |
| | 2,961 | 96 | Gravel surf | ace, HSG A | A |
| 1 | 28,117 | 66 | Weighted A | verage | |
| | 80,823 | | 63.09% Pe | rvious Area | L |
| | 47,294 | | 36.91% Im | pervious Ar | ea |
| | | | - | | |
| Тс | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 2.4 | 160 | 0.0500 |) 1.12 | | Shallow Concentrated Flow, shallow conc. flow |
| | | | | | Woodland Kv= 5.0 fps |
| 17.3 | 210 | Total | | | |

Subcatchment A1-OFF: A1-OFF



Summary for Subcatchment A2-EX: A2-EX

Runoff 0.72 cfs @ 12.10 hrs, Volume= 2,128 cf, Depth> 1.74" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | | | | |
|-------|----------|-------|-------------|-----------------------|--|--|--|--|
| | 5,895 | 98 | Roofs, HSC | θA | | | | |
| | 0 | 98 | Paved park | ing, HSG A | L Contraction of the second seco | | | |
| | 8,201 | 49 | 50-75% Gra | ass cover, F | ⁻ air, HSG A | | | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | | | |
| | 566 | 96 | Gravel surf | Gravel surface, HSG A | | | | |
| | 14,662 | 71 | Weighted A | verage | | | | |
| | 8,767 | | 59.79% Pe | rvious Area | | | | |
| | 5,895 | | 40.21% Im | pervious Are | ea | | | |
| | | | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | | |
| 6.0 | | | | | Direct Entry, | | | |

Subcatchment A2-EX: A2-EX



Summary for Subcatchment A3-EX: A3-EX

Runoff 0.50 cfs @ 12.22 hrs, Volume= 1,972 cf, Depth> 2.80" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | | | | |
|-------|----------|--------|--------------|--------------|---|--|--|--|
| | 3,745 | 98 | Roofs, HSG | Roofs, HSG A | | | | |
| | 1,191 | 98 | Paved park | ing, HSG A | N | | | |
| | 2,014 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A | | | |
| | 252 | 36 | Woods, Fai | r, HSG A | | | | |
| | 1,244 | 96 | Gravel surfa | ace, HSG A | Α | | | |
| | 8,446 | 84 | Weighted A | verage | | | | |
| | 3,510 | | 41.56% Pe | rvious Area | l de la constante d | | | |
| | 4,936 | | 58.44% Imp | pervious Ar | ea | | | |
| | | | | | | | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/ft | :) (ft/sec) | (cfs) | | | | |
| 13.8 | 50 | 0.060 | 0.06 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 0.6 | 40 | 0.050 | 0 1.12 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Woodland Kv= 5.0 fps | | | |
| 1.0 | 260 | 0.050 | 0 4.54 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Paved Kv= 20.3 fps | | | |
| 0.9 | 255 | 0.060 | 0 4.97 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Paved Kv= 20.3 fps | | | |
| 16.3 | 605 | Total | | | | | | |

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Subcatchment A3-EX: A3-EX

Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.25 cfs @ 12.19 hrs, Volume= 927 cf, Depth> 1.26" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| | Ai | rea (sf) | CN | Description | | |
|---|-------|----------|---------|--------------|--------------|--|
| | | 0 | 98 | Roofs, HSC | βA | |
| | | 0 | 98 | Paved park | ing, HSG A | |
| | | 0 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A |
| | | 4,743 | 36 | Woods, Fai | r, HSG A | |
| _ | | 4,094 | 96 | Gravel surfa | ace, HSG A | l |
| | | 8,837 | 64 | Weighted A | verage | |
| | | 8,837 | | 100.00% P | ervious Are | а |
| | | | | | | |
| | Тс | Length | Slope | e Velocity | Capacity | Description |
| _ | (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | |
| | 3.2 | 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW |
| | | | | | | Grass: Short n= 0.150 P2= 3.20" |
| | 8.8 | 20 | 0.0300 | 0.04 | | Sheet Flow, |
| _ | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| | 12.0 | 50 | Total | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-EX: A5-EX

Runoff 2.47 cfs @ 12.32 hrs, Volume= 11,586 cf, Depth> 1.07" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | | | |
|-------|----------|--------|--------------|--------------|--|--|--|
| | 18,873 | 98 | Roofs, HSG A | | | | |
| | 10,337 | 98 | Paved park | ing, HSG A | N Contraction of the second | | |
| | 23,455 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A | | |
| | 58,222 | 36 | Woods, Fai | r, HSG A | | | |
| | 19,281 | 96 | Gravel surfa | ace, HSG A | A Contraction of the second seco | | |
| 1 | 30,168 | 61 | Weighted A | verage | | | |
| 1 | 00,958 | | 77.56% Pe | rvious Area | | | |
| | 29,210 | | 22.44% Imp | pervious Ar | ea | | |
| | | | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description | | |
| (min) | (feet) | (ft/ft | (ft/sec) | (cfs) | · | | |
| 13.8 | 50 | 0.0600 | 0.06 | | Sheet Flow, SHEET FLOW | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | |
| 1.8 | 100 | 0.1300 | 0.90 | | Shallow Concentrated Flow, SHALLOW CONC. | | |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | |
| 4.4 | 200 | 0.0900 | 0.75 | | Shallow Concentrated Flow, SHALL CONC. FLOW 2 | | |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | |
| 0.3 | 266 | 0.0300 |) 16.09 | 193.04 | Channel Flow, CHANNEL FLOW | | |
| | | | | | Area= 12.0 sf Perim= 12.0' r= 1.00' | | |
| | | | | | n= 0.016 Asphalt, rough | | |
| 20.3 | 616 | Total | | | | | |

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Hydrograph Runoff 2.47 cfs Type III 24-hr 10-Year 24-Hour Storm Rainfall=4.70" 2-Runoff Area=130,168 sf Runoff Volume=11,586 cf Flow (cfs) Runoff Depth>1.07" Flow Length=616' Tc=20.3 min 1 CN=61 0-6 ź 8 9 10 11 12 13 14 15 16 17 18 19 5 20 Time (hours)

Subcatchment A5-EX: A5-EX

Summary for Reach 1R: Routing



Summary for Reach 4R: Routing



Summary for Pond A1-P: A1-P

| Inflow Area | a = | 14,662 sf, | 40.21% Impervious, | Inflow Depth > 1.74" | for 10-Year, 24-Hour Storm event |
|-------------|-----|------------|--------------------|----------------------|----------------------------------|
| Inflow | = | 0.72 cfs @ | 12.10 hrs, Volume= | 2,128 cf | |
| Outflow | = | 0.07 cfs @ | 13.45 hrs, Volume= | 1,774 cf, Atter | ר= 91%, Lag= 81.0 min |
| Discarded | = | 0.07 cfs @ | 13.45 hrs, Volume= | 1,774 cf | - |
| Primary | = | 0.00 cfs @ | 5.00 hrs, Volume= | 0 cf | |

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Peak Elev= 15.23' @ 13.45 hrs Surf.Area= 1,200 sf Storage= 979 cf

Plug-Flow detention time= 169.3 min calculated for 1,769 cf (83% of inflow) Center-of-Mass det. time= 122.1 min (930.2 - 808.0)

| Volume | Invert | Avail.S | torage S | Storag | ge Description | |
|------------|-----------|----------|-------------------|----------|-------------------|------------------------------------|
| #1 | 16.00' | | 709 cf | Nest | Depression (Pris | matic)Listed below (Recalc) |
| #2 | 14.00' | 6, | ,091 cf | East [| Depression (Prisi | matic)Listed below (Recalc) |
| | | 6, | ,800 cf 1 | Total / | Available Storage | |
| | | | | | - | |
| Elevatio | n S | urf.Area | Inc.S | Store | Cum.Store | |
| (fee | t) | (sq-ft) | (cubic- | feet) | (cubic-feet) | |
| 16.0 | 0 | 59 | | 0 | 0 | |
| 17.0 | 0 | 673 | | 366 | 366 | |
| 17.5 | 0 | 700 | | 343 | 709 | |
| | | | | | | |
| Elevatio | n Si | urf.Area | Inc.S | Store | Cum.Store | |
| (fee | t) | (sq-ft) | (cubic- | feet) | (cubic-feet) | |
| 14.0 | 0 | 425 | | 0 | 0 | |
| 15.0 | 0 | 1,019 | | 722 | 722 | |
| 16.0 | 0 | 1,799 | 1 | ,409 | 2,131 | |
| 17.0 | 0 | 3,060 | 2 | ,430 | 4,561 | |
| 17.5 | 0 | 3,060 | 1 | ,530 | 6,091 | |
| | Denting | | | D | | |
| Device | Routing | | | | | |
| #1 | Primary | 17.10 |)' 10.0' I | long | x 5.0' breadth Br | oad-Crested Rectangular Weir |
| | | | Head | (feet) | 0.20 0.40 0.60 | 0.80 1.00 1.20 1.40 1.60 1.80 2.00 |
| | | | 2.50 | 3.00 | 3.50 4.00 4.50 5 | |
| | | | Coer. | (Engl | ISN) 2.34 2.50 2. | 70 2.68 2.68 2.66 2.65 2.65 2.65 |
| щ о | | 14.00 | | 2.0/ / | 2.00 2.08 2.70 2 | 2.14 2.19 2.00 Curfood area |
| #Z | Discarded | 14.00 | 2.410 | in/nr | Exhitration over | Surrace area |
| | | | | | | |

Discarded OutFlow Max=0.07 cfs @ 13.45 hrs HW=15.23' (Free Discharge) **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=14.00' (Free Discharge) 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

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Pond A1-P: A1-P



Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow A | Area = | 290,230 sf, 30.09% | Impervious, | Inflow Depth > | 1.21" | for 10-Year, 24-Hour Storm event |
|----------|--------|--------------------|-------------|----------------|----------|----------------------------------|
| Inflow | = | 6.51 cfs @ 12.34 h | s, Volume= | 29,178 ct | f | |
| Primary | y = | 6.51 cfs @ 12.34 h | rs, Volume= | 29,178 ct | f, Atter | n= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM



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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| SubcatchmentA1-OFF: | A 1-OFF Flow Length=210' | Runoff Area=12 Slope=0.0500 '/' | 8,117 sf 36.9 Tc=17.3 min | 1% Impervic CN=66 Ri | ous Runoff De unoff=4.93 cfs | oth>1.90" 20,255 cf |
|----------------------|------------------------------------|--|--------------------------------|-----------------------------|-------------------------------------|------------------------|
| SubcatchmentA2-EX: A | A2-EX | Runoff Area=1 | 4,662 sf 40.2 Tc=6.0 mir | 1% Impervio n CN=71 F | ous Runoff De Runoff=0.96 cfs | oth>2.31" 2,827 cf |
| SubcatchmentA3-EX: A | \3-ЕХ | Runoff Area= Flow Length=605 | 8,446 sf 58.4 ' Tc=16.3 mir | 4% Impervic 1 CN=84 F | ous Runoff De Runoff=0.61 cfs | oth>3.50" 2,461 cf |
| SubcatchmentA4-OFF: | A4-OFF Flow Length=50 | Runoff Area / Slope=0.0300 '/ | =8,837 sf 0.0 ' Tc=12.0 mir | 0% Impervic 1 CN=64 F | ous Runoff De Runoff=0.35 cfs | oth>1.75" 1,286 cf |
| SubcatchmentA5-EX: A | \5-EX | Runoff Area=13 Flow Length=616' | 0,168 sf 22.4 Tc=20.3 min | 4% Impervic CN=61 R | ous Runoff De unoff=3.65 cfs | oth>1.52" 16,455 cf |
| Reach 1R: Routing | n=0.016 L=5 | Avg. Flow Depth= 42.0' S=0.0609 '/ | =0.02' Max Ve ' Capacity=91 | el=1.55 fps I7.83 cfs O | Inflow=0.35 cfs outflow=0.31 cfs | 1,286 cf 1,277 cf |
| Reach 4R: Routing | / n=0.016 L=61 | Avg. Flow Depth=0 8.0' S=0.0615 '/' |).09' Max Vel Capacity=922 | =3.82 fps li 2.36 cfs Ou | nflow=4.93 cfs itflow=4.82 cfs | 20,255 cf 20,152 cf |
| Pond A1-P: A1-P | Discarded= | Peak Elev= 0.08 cfs 2,193 cf | 15.54' Storage Primary=0.00 | e=1,379 cf cfs 0 cf O | Inflow=0.96 cfs utflow=0.08 cfs | 2,827 cf 2,193 cf |
| Link A: DESIGN POINT | A - EXISTING MU | NICIPALDRAIN | AGESYSTEN | f I Pri | nflow=9.30 cfs imary=9.30 cfs | 40,346 cf 40,346 cf |

Total Runoff Area = 290,230 sf Runoff Volume = 43,284 cf Average Runoff Depth = 1.79" 69.91% Pervious = 202,895 sf 30.09% Impervious = 87,335 sf

Summary for Subcatchment A1-OFF: A1-OFF

Runoff 4.93 cfs @ 12.25 hrs, Volume= 20,255 cf, Depth> 1.90" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description | | |
|-------|----------|--------|-------------|--------------|--|
| | 13,269 | 98 | Roofs, HSC | βA | |
| | 34,025 | 98 | Paved park | ing, HSG A | N Contraction of the second seco |
| | 28,415 | 49 | 50-75% Gra | ass cover, I | Fair, HSG A |
| | 49,447 | 43 | Woods/gras | ss comb., F | Fair, HSG A |
| | 2,961 | 96 | Gravel surf | ace, HSG A | A |
| 1 | 28,117 | 66 | Weighted A | verage | |
| | 80,823 | | 63.09% Pe | rvious Area | L |
| | 47,294 | | 36.91% Im | pervious Ar | ea |
| | | | - | | |
| Тс | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 2.4 | 160 | 0.0500 |) 1.12 | | Shallow Concentrated Flow, shallow conc. flow |
| | | | | | Woodland Kv= 5.0 fps |
| 17.3 | 210 | Total | | | |

Subcatchment A1-OFF: A1-OFF



Summary for Subcatchment A2-EX: A2-EX

Runoff 0.96 cfs @ 12.10 hrs, Volume= 2,827 cf, Depth> 2.31" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| Area (sf |) CN | Description | | | | |
|------------|---------|----------------------------------|--|--|--|--|
| 5,895 | 5 98 | Roofs, HSG A | | | | |
| C |) 98 | Paved parking, HSG A | | | | |
| 8,201 | 49 | 50-75% Grass cover, Fair, HSG A | | | | |
| C |) 36 | Woods, Fair, HSG A | | | | |
| 566 | 6 96 | Gravel surface, HSG A | | | | |
| 14,662 | 2 71 | 1 Weighted Average | | | | |
| 8,767 | 7 | 59.79% Pervious Area | | | | |
| 5,895 | 5 | 40.21% Impervious Area | | | | |
| | | | | | | |
| Tc Lengt | th Slop | pe Velocity Capacity Description | | | | |
| (min) (fee | t) (ft/ | ft) (ft/sec) (cfs) | | | | |
| 6.0 | | Direct Entry, | | | | |

Subcatchment A2-EX: A2-EX



Summary for Subcatchment A3-EX: A3-EX

Runoff 0.61 cfs @ 12.22 hrs, Volume= 2,461 cf, Depth> 3.50" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description | | | | | |
|-------|----------|-------|--------------|--------------|--|--|--|--|
| | 3,745 | 98 | Roofs, HSG | Roofs, HSG A | | | | |
| | 1,191 | 98 | Paved park | ing, HSG A | N | | | |
| | 2,014 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A | | | |
| | 252 | 36 | Woods, Fai | r, HSG A | | | | |
| | 1,244 | 96 | Gravel surfa | ace, HSG A | A | | | |
| | 8,446 | 84 | Weighted A | verage | | | | |
| | 3,510 | | 41.56% Per | vious Area | | | | |
| | 4,936 | | 58.44% Imp | pervious Ar | ea | | | |
| | | | | | | | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | | |
| 13.8 | 50 | 0.060 | 0.06 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 0.6 | 40 | 0.050 | 0 1.12 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Woodland Kv= 5.0 fps | | | |
| 1.0 | 260 | 0.050 | 0 4.54 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Paved Kv= 20.3 fps | | | |
| 0.9 | 255 | 0.060 | 0 4.97 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Paved Kv= 20.3 fps | | | |
| 16.3 | 605 | Total | | | | | | |

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Subcatchment A3-EX: A3-EX

Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.35 cfs @ 12.18 hrs, Volume= 1,286 cf, Depth> 1.75" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description | | | | | |
|-------|----------|---------|--------------|--------------|--|--|--|--|
| | 0 | 98 | Roofs, HSG A | | | | | |
| | 0 | 98 | Paved park | ing, HSG A | N | | | |
| | 0 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A | | | |
| | 4,743 | 36 | Woods, Fai | r, HSG A | | | | |
| | 4,094 | 96 | Gravel surfa | ace, HSG A | A | | | |
| | 8,837 | 64 | Weighted A | verage | | | | |
| | 8,837 | | 100.00% P | ervious Are | a | | | |
| | | | | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | | | | |
| 3.2 | 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Grass: Short n= 0.150 P2= 3.20" | | | |
| 8.8 | 20 | 0.0300 | 0.04 | | Sheet Flow, | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 12.0 | 50 | Total | | | | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-EX: A5-EX

Runoff 3.65 cfs @ 12.31 hrs, Volume= 16,455 cf, Depth> 1.52" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description | | | | |
|-------|----------|-------------------------------|--------------|--------------|---|--|--|
| | 18,873 | 98 | Roofs, HSC | βA | | | |
| | 10,337 | 0,337 98 Paved parking, HSG A | | | | | |
| | 23,455 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | |
| | 58,222 | 36 | Woods, Fai | ir, HSG A | | | |
| | 19,281 | 96 | Gravel surfa | ace, HSG A | Α | | |
| 1 | 30,168 | 61 | Weighted A | verage | | | |
| 1 | 00,958 | | 77.56% Pe | rvious Area | | | |
| | 29,210 | | 22.44% Imp | pervious Ar | ea | | |
| | | | | | | | |
| Тс | Length | Slope | e Velocity | Capacity | Description | | |
| (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | | | |
| 13.8 | 50 | 0.0600 | 0.06 | | Sheet Flow, SHEET FLOW | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | |
| 1.8 | 100 | 0.1300 | 0.90 | | Shallow Concentrated Flow, SHALLOW CONC. | | |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | |
| 4.4 | 200 | 0.0900 |) 0.75 | | Shallow Concentrated Flow, SHALL CONC. FLOW 2 | | |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | |
| 0.3 | 266 | 0.0300 |) 16.09 | 193.04 | Channel Flow, CHANNEL FLOW | | |
| | | | | | Area= 12.0 sf Perim= 12.0' r= 1.00' | | |
| | | | | | n= 0.016 Asphalt, rough | | |
| 20.3 | 616 | Total | | | | | |

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Subcatchment A5-EX: A5-EX

Summary for Reach 1R: Routing



Summary for Reach 4R: Routing



Summary for Pond A1-P: A1-P

| Inflow Area | a = | 14,662 sf, | 40.21% Impervious, | Inflow Depth > 2.31" | for 25-Year, 24-Hour Storm event |
|-------------|-----|------------|--------------------|----------------------|----------------------------------|
| Inflow | = | 0.96 cfs @ | 12.10 hrs, Volume= | 2,827 cf | |
| Outflow | = | 0.08 cfs @ | 13.61 hrs, Volume= | 2,193 cf, Atte | en= 92%, Lag= 91.2 min |
| Discarded | = | 0.08 cfs @ | 13.61 hrs, Volume= | 2,193 cf | - |
| Primary | = | 0.00 cfs @ | 5.00 hrs, Volume= | 0 cf | |

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Peak Elev= 15.54' @ 13.61 hrs Surf.Area= 1,436 sf Storage= 1,379 cf

Plug-Flow detention time= 183.4 min calculated for 2,186 cf (77% of inflow) Center-of-Mass det. time= 126.0 min (927.7 - 801.7)

| Volume | Inver | t Avail | .Storage | Storag | ge Description | |
|----------|-----------|-----------------------|------------------|----------|-------------------------|------------------------------------|
| #1 | 16.00 |)' | 709 cf | West | Depression (Pris | matic)Listed below (Recalc) |
| #2 | 14.00 |)' | 6,091 cf | East I | Depression (Prisi | matic)Listed below (Recalc) |
| | | | 6,800 cf | Total | Available Storage | |
| Flevatio | n c | Surf Area | Inc | Store | Cum Store | |
| (fee | t) | (sa-ft) | (cubi | c-feet) | (cubic-feet) | |
| 16.0 | 0 | <u> (59 </u> 59 | (00.01 | 0 | 0 | |
| 17.0 | 0 | 673 | | 366 | 366 | |
| 17.5 | 50 | 700 | | 343 | 709 | |
| Elevatio | n S | Surf Area | Inc | Store | Cum Store | |
| (fee | t) | (sq-ft) | (cubi | c-feet) | (cubic-feet) | |
| 14.0 | 0 | 425 | • | 0 | 0 | |
| 15.0 | 0 | 1,019 | | 722 | 722 | |
| 16.0 | 0 | 1,799 | | 1,409 | 2,131 | |
| 17.0 | 0 | 3,060 | | 2,430 | 4,561 | |
| 17.5 | 0 | 3,060 | | 1,530 | 6,091 | |
| Device | Routing | Inv | vert Outl | et Devi | ces | |
| #1 | Primary | 17. | .10' 10.0 | long | x 5.0' breadth Br | oad-Crested Rectangular Weir |
| | | | Hea | d (feet) | 0.20 0.40 0.60 | 0.80 1.00 1.20 1.40 1.60 1.80 2.00 |
| | | | 2.50 | 3.00 | 3.50 4.00 4.50 5 | 5.00 5.50 |
| | | | Coe | f. (Engl | ish) 2.34 2.50 2. | 70 2.68 2.68 2.66 2.65 2.65 2.65 |
| | | | 2.65 | 2.67 | 2.66 2.68 2.70 2 | 2.74 2.79 2.88 |
| #2 | Discarded | 14 | .00' 2.41 | 0 in/hr | Exfiltration over | Surface area |
| Discourt | | | | 0.04 h. | | |

Discarded OutFlow Max=0.08 cfs @ 13.61 hrs HW=15.54' (Free Discharge) **2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=14.00' (Free Discharge) 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

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Pond A1-P: A1-P

Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow A | Area = | 290,230 sf, 30.09% Imperviou | is, Inflow Depth > 1.67" | for 25-Year, 24-Hour Storm event |
|----------|--------|------------------------------|--------------------------|----------------------------------|
| Inflow | = | 9.30 cfs @ 12.32 hrs, Volume | = 40,346 cf | |
| Primar | y = | 9.30 cfs @ 12.32 hrs, Volume | = 40,346 cf, Atter | n= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM



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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| SubcatchmentA1-OFF: | A1-OFF Flow Length=210' | Runoff Area=12 Slope=0.0500 '/' | 8,117 sf 36.9 Tc=17.3 min | 1% Impervio CN=66 Rι | us Runoff Dep unoff=7.20 cfs | oth>2.73" 29,181 cf |
|----------------------|----------------------------|--|--------------------------------|------------------------------|------------------------------------|------------------------|
| SubcatchmentA2-EX: A | 2-EX | Runoff Area=1 | 4,662 sf 40.2 Tc=6.0 mir | 1% Impervio า CN=71 F | us Runoff Dej Runoff=1.34 cfs | oth>3.23" 3,946 cf |
| SubcatchmentA3-EX: A | 3-EX | Runoff Area= Flow Length=605 | 8,446 sf 58.4 ' Tc=16.3 mir | 4% Impervio า CN=84 F | us Runoff De Runoff=0.79 cfs | oth>4.56" 3,213 cf |
| SubcatchmentA4-OFF: | A4-OFF Flow Length=50 | Runoff Area /' Slope=0.0300 '/ | =8,837 sf 0.0 ' Tc=12.0 mir | 0% Impervio n CN=64 F | us Runoff De Runoff=0.53 cfs | oth>2.55" 1,879 cf |
| SubcatchmentA5-EX: A | \5-EX | Runoff Area=13 Flow Length=616' | 0,168 sf 22.4 Tc=20.3 min | 4% Impervio CN=61 Rι | us Runoff Dep unoff=5.62 cfs | oth>2.27" 24,604 cf |
| Reach 1R: Routing | n=0.016 L=5 | Avg. Flow Depth= 42.0' S=0.0609 '/ | =0.02' Max Ve ' Capacity=9´ | el=1.81 fps 17.83 cfs O | Inflow=0.53 cfs utflow=0.48 cfs | 1,879 cf 1,868 cf |
| Reach 4R: Routing | ہ n=0.016 L=61 | Avg. Flow Depth=0 8.0' S=0.0615 '/' |).11' Max Vel Capacity=922 | =4.26 fps Ir 2.36 cfs Out | nflow=7.20 cfs tflow=7.06 cfs | 29,181 cf 29,059 cf |
| Pond A1-P: A1-P | Discarded= | Peak Elev= 0.10 cfs 2,815 cf | 15.96' Storag Primary=0.00 | e=2,055 cf cfs 0 cf Oเ | Inflow=1.34 cfs utflow=0.10 cfs | 3,946 cf 2,815 cf |
| Link A: DESIGN POINT | A - EXISTING MU | NICIPALDRAIN | AGESYSTEN | / Inf Prim | flow=13.83 cfs nary=13.83 cfs | 58,744 cf 58,744 cf |

Total Runoff Area = 290,230 sf Runoff Volume = 62,822 cf Average Runoff Depth = 2.60" 69.91% Pervious = 202,895 sf 30.09% Impervious = 87,335 sf

Summary for Subcatchment A1-OFF: A1-OFF

Runoff 7.20 cfs @ 12.25 hrs, Volume= 29,181 cf, Depth> 2.73" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | rea (sf) | CN | Description | | |
|-------|----------|---------|--------------|--------------|---|
| | 13,269 | 98 | Roofs, HSC | θA | |
| | 34,025 | 98 | Paved park | ing, HSG A | N N N N N N N N N N N N N N N N N N N |
| | 28,415 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A |
| | 49,447 | 43 | Woods/gras | ss comb., F | air, HSG A |
| | 2,961 | 96 | Gravel surfa | ace, HSG A | A |
| 1 | 28,117 | 66 | Weighted A | verage | |
| | 80,823 | | 63.09% Pe | rvious Area | |
| | 47,294 | | 36.91% Imp | pervious Ar | ea |
| | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 2.4 | 160 | 0.0500 |) 1.12 | | Shallow Concentrated Flow, shallow conc. flow |
| | | | | | Woodland Kv= 5.0 fps |
| 17.3 | 210 | Total | | | |

Subcatchment A1-OFF: A1-OFF



Summary for Subcatchment A2-EX: A2-EX

Runoff 1.34 cfs @ 12.09 hrs, Volume= 3,946 cf, Depth> 3.23" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| Area (st | f) CN | <u> </u> D | escription | | | | | |
|---------------------------|--|------------|--------------|--------------|-------------|--|--|--|
| 5,89 | 5 98 | 3 R | oofs, HSG | βA | | | | |
| | 0 98 | 3 P | aved park | ing, HSG A | 4 | | | |
| 8,20 | 1 49 | 95 | 0-75% Gra | ass cover, F | Fair, HSG A | | | |
| | 0 36 | 5 W | loods, Fai | r, HSG A | | | | |
| 56 | 6 96 | 6 G | Fravel surfa | ace, HSG A | Α | | | |
| 14,66 | 14,662 71 Weighted Average | | | | | | | |
| 8,76 | 8,767 59.79% Pervious Area | | | | | | | |
| 5,89 | 5 | 4 | 0.21% Imp | pervious Ar | rea | | | |
| Tc Leng (min) (fee | Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) | | | | | | | |
| 6.0 | 6.0 Direct Entry, | | | | | | | |
| Subcatchment A2-EX: A2-EX | | | | | | | | |



Summary for Subcatchment A3-EX: A3-EX

Runoff 0.79 cfs @ 12.22 hrs, Volume= 3,213 cf, Depth> 4.56" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | rea (sf) | CN | Description | | | | | |
|-------|----------|-------|--------------|--------------|--|--|--|--|
| | 3,745 | 98 | Roofs, HSG A | | | | | |
| | 1,191 | 98 | Paved park | ing, HSG A | N Contraction of the second seco | | | |
| | 2,014 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A | | | |
| | 252 | 36 | Woods, Fai | r, HSG A | | | | |
| | 1,244 | 96 | Gravel surfa | ace, HSG A | Α | | | |
| | 8,446 | 84 | Weighted A | verage | | | | |
| | 3,510 | | 41.56% Pe | rvious Area | | | | |
| | 4,936 | | 58.44% Imp | pervious Ar | ea | | | |
| | | | - | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | | |
| 13.8 | 50 | 0.060 | 0.06 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 0.6 | 40 | 0.050 | 0 1.12 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Woodland Kv= 5.0 fps | | | |
| 1.0 | 260 | 0.050 | 0 4.54 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Paved Kv= 20.3 fps | | | |
| 0.9 | 255 | 0.060 | 0 4.97 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Paved Kv= 20.3 fps | | | |
| 16.3 | 605 | Total | | | | | | |

193187-CV01-HYD-EX

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Hydrograph Runoff 0.85 0.79 cfs 0.8 Type III 24-hr 0.75 100-Year 0.7 24-Hour Storm Rainfall=6.70" 0.65 Runoff Area=8,446 sf 0.6 0.55 Runoff Volume=3,213 cf 0.5 Flow (cfs) Runoff Depth>4.56" 0.45 Flow Length=605' 0.4 Tc=16.3 min 0.35 0.3 CN=84 0.25 0.2 0.15 0.1 0.05 0-5 6 ż 10 11 12 14 15 16 17 18 19 8 ģ 13 20

Time (hours)

Subcatchment A3-EX: A3-EX

Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.53 cfs @ 12.17 hrs, Volume= 1,879 cf, Depth> 2.55" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| Ai | rea (sf) | CN | Description | | | | | |
|-----------|----------|---------|--------------|--------------|---|--|--|--|
| | 0 | 98 | Roofs, HSG A | | | | | |
| | 0 | 98 | Paved park | ing, HSG A | N Contraction of the second | | | |
| | 0 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | |
| | 4,743 | 36 | Woods, Fai | r, HSG A | | | | |
| | 4,094 | 96 | Gravel surfa | ace, HSG A | A | | | |
| | 8,837 | 64 | Weighted A | verage | | | | |
| | 8,837 | | 100.00% P | ervious Are | а | | | |
| | | | | | | | | |
| Тс | Length | Slope | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/ft) | (ft/sec) | (cfs) | | | | |
| 3.2 | 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Grass: Short n= 0.150 P2= 3.20" | | | |
| 8.8 | 20 | 0.0300 | 0.04 | | Sheet Flow, | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 12.0 | 50 | Total | | | | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-EX: A5-EX

Runoff 5.62 cfs @ 12.30 hrs, Volume= 24,604 cf, Depth> 2.27" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | rea (sf) | CN | Description | | |
|-------|----------|--------|--------------|--------------|---|
| | 18,873 | 98 | Roofs, HSC | βA | |
| | 10,337 | 98 | Paved park | ing, HSG A | N N N N N N N N N N N N N N N N N N N |
| | 23,455 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A |
| | 58,222 | 36 | Woods, Fai | ir, HSG A | |
| | 19,281 | 96 | Gravel surfa | ace, HSG A | Α |
| 1 | 30,168 | 61 | Weighted A | verage | |
| 1 | 00,958 | | 77.56% Pe | rvious Area | |
| | 29,210 | | 22.44% Imp | pervious Are | ea |
| | | | | | |
| Тс | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | |
| 13.8 | 50 | 0.0600 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 1.8 | 100 | 0.1300 | 0.90 | | Shallow Concentrated Flow, SHALLOW CONC. |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps |
| 4.4 | 200 | 0.0900 |) 0.75 | | Shallow Concentrated Flow, SHALL CONC. FLOW 2 |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps |
| 0.3 | 266 | 0.0300 |) 16.09 | 193.04 | Channel Flow, CHANNEL FLOW |
| | | | | | Area= 12.0 sf Perim= 12.0' r= 1.00' |
| | | | | | n= 0.016 Asphalt, rough |
| 20.3 | 616 | Total | | | |

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Hydrograph Runoff 6-5.62 cfs Type III 24-hr 100-Year 5-24-Hour Storm Rainfall=6.70" Runoff Area=130,168 sf 4-Runoff Volume=24,604 cf Flow (cfs) Runoff Depth>2.27" 3-Flow Length=616' Tc=20.3 min CN=61 2-1-0-6 ź 8 9 10 11 12 14 15 16 17 18 19 5 13 20 Time (hours)

Subcatchment A5-EX: A5-EX

Summary for Reach 1R: Routing



Summary for Reach 4R: Routing



Summary for Pond A1-P: A1-P

| Inflow Area | a = | 14,662 sf, | 40.21% Impervious, | Inflow Depth > 3.23" | for 100-Year, 24-Hour Storm event |
|-------------|-----|------------|--------------------|----------------------|-----------------------------------|
| Inflow | = | 1.34 cfs @ | 12.09 hrs, Volume= | 3,946 cf | |
| Outflow | = | 0.10 cfs @ | 13.80 hrs, Volume= | 2,815 cf, Atter | n= 93%, Lag= 102.6 min |
| Discarded | = | 0.10 cfs @ | 13.80 hrs, Volume= | 2,815 cf | - |
| Primary | = | 0.00 cfs @ | 5.00 hrs, Volume= | 0 cf | |

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Peak Elev= 15.96' @ 13.80 hrs Surf.Area= 1,766 sf Storage= 2,055 cf

Plug-Flow detention time= 197.4 min calculated for 2,805 cf (71% of inflow) Center-of-Mass det. time= 131.9 min (926.1 - 794.2)

| Volume | Invert | Invert Avail.Storage | | Storage Description | | | |
|----------------------------------|-----------|--|---------|---|-------------------------|-----------------------------|--|
| #1 | 16.00' | 709 cf | | West | Depression (Pris | matic)Listed below (Recalc) | |
| #2 | 14.00' | 6,091 cf | | East | Depression (Prisi | matic)Listed below (Recalc) | |
| | | 6 | ,800 cf | Total | Available Storage | | |
| | | | | | | | |
| Elevatio | n S | Surf.Area | | Store | Cum.Store | | |
| (fee | t) | (sq-ft) | | c-feet) | (cubic-feet) | | |
| 16.0 | 0 | 59 | 59 | | 0 | | |
| 17.0 | 0 | 673 | 366 | | 366 | | |
| 17.5 | 0 | 700 | 343 | | 709 | | |
| | | | | | | | |
| Elevatio | n S | Surf.Area Inc | | Store | Cum.Store | | |
| (fee | t) | (sq-ft) (cubi | | c-feet) | (cubic-feet) | | |
| 14.0 | 0 | 425 | 1 | | 0 | | |
| 15.0 | 0 | 1,019 | | | 722 | | |
| 16.0 | 0 | 1,799 | ,799 | | 2,131 | | |
| 17.0 | 0 | 3,060 | | 2,430 | 4,561 | | |
| 17.5 | 0 | 3,060 | | 1,530 | 6,091 | | |
| | | | | | | | |
| Device | Routing | iting Invert Outle | | et Devi | ces | | |
| #1 | Primary | rimary 17.10' 10 . He 2.5 | | 10.0' long x 5.0' breadth Broad-Crested Rectangular Weir | | | |
| | | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 | | | |
| | | | | 0 3.00 3.50 4.00 4.50 5.00 5.50 | | | |
| Coef. (English) 2.34 2.50 2.70 2 | | 70 2.68 2.68 2.66 2.65 2.65 2.65 | | | | | |
| | | | 2.65 | 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 | | | |
| #2 | Discarded | carded 14.00' | | 2.410 in/hr Exfiltration over Surface area | | | |
| | | | | | | | |

Discarded OutFlow Max=0.10 cfs @ 13.80 hrs HW=15.96' (Free Discharge) **2=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=14.00' (Free Discharge) 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
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Pond A1-P: A1-P

Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow | Area = | 290,230 sf, | 30.09% Impervious, | Inflow Depth > 2.43" for 100-Year, 24-Hour Storm even | t |
|--------|--------|-------------|--------------------|---|---|
| Inflow | = | 13.83 cfs @ | 12.31 hrs, Volume= | 58,744 cf | |
| Primar | y = | 13.83 cfs @ | 12.31 hrs, Volume= | 58,744 cf, Atten= 0%, Lag= 0.0 min | |

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM





Project Notes

Rainfall events imported from "185868-Drainage-HydroCAD-EX.hcp"

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Rainfall Events Listing

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|-------------------------|----------------|-------|---------|---------------------|-----|-------------------|-----|
| 1 | 2-Year, 24-Hour Storm | Type III 24-hr | | Default | 24.00 | 1 | 3.20 | 2 |
| 2 | 10-Year, 24-Hour Storm | Type III 24-hr | | Default | 24.00 | 1 | 4.70 | 2 |
| 3 | 25-Year, 24-Hour Storm | Type III 24-hr | | Default | 24.00 | 1 | 5.50 | 2 |
| 4 | 100-Year, 24-Hour Storm | Type III 24-hr | | Default | 24.00 | 1 | 6.70 | 2 |

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Area Listing (all nodes)

| Area | CN | Description |
|---------|----|---|
| (sq-ft) | | (subcatchment-numbers) |
| 68,520 | 49 | 50-75% Grass cover, Fair, HSG A (A1-OFF, A10-PR, A11-PR, A12-PR, A2-PR, |
| | | A3-PR, A5-PR, A7-PR, A9-PR) |
| 7,055 | 96 | Gravel surface, HSG A (A1-OFF, A4-OFF) |
| 88,885 | 98 | Paved parking, HSG A (A1-OFF, A10-PR, A11-PR, A12-PR, A2-PR, A3-PR, |
| | | A5-PR, A7-PR) |
| 41,743 | 98 | Roofs, HSG A (A1-OFF, A10-PR, A12-PR, A6-PR, A7-PR, A8-PR) |
| 34,564 | 36 | Woods, Fair, HSG A (A11-PR, A4-OFF, A5-PR, A9-PR) |
| 49,447 | 43 | Woods/grass comb., Fair, HSG A (A1-OFF) |
| 290,214 | 70 | TOTAL AREA |

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|------------------------------|--|
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Soil Listing (all nodes)

| Area | Soil | Subcatchment |
|---------|-------|---|
| (sq-ft) | Group | Numbers |
| 290,214 | HSG A | A1-OFF, A10-PR, A11-PR, A12-PR, A2-PR, A3-PR, A4-OFF, A5-PR, A6-PR, |
| | | A7-PR, A8-PR, A9-PR |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| 290,214 | | TOTAL AREA |

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| HSG-A | HSG-B | HSG-C | HSG-D | Other | Total | Ground | S |
|-------------|---------|---------|---------|---------|---------|----------------|---|
| (sq-ft) | (sq-ft) | (sq-ft) | (sq-ft) | (sq-ft) | (sq-ft) | Cover | ١ |
| 68,520 | 0 | 0 | 0 | 0 | 68,520 | 50-75% Grass | |
| | | | | | | cover, Fair | |
| 7,055 | 0 | 0 | 0 | 0 | 7,055 | Gravel surface | |
| 88,885 | 0 | 0 | 0 | 0 | 88,885 | Paved parking | |
| 41,743 | 0 | 0 | 0 | 0 | 41,743 | Roofs | |
| 34,564 | 0 | 0 | 0 | 0 | 34,564 | Woods, Fair | |
| 49,447 | 0 | 0 | 0 | 0 | 49,447 | Woods/grass | |
| | | | | | | comb., Fair | |
| 290,214 | 0 | 0 | 0 | 0 | 290,214 | TOTAL AREA | |
| | | | | | | | |

Ground Covers (all nodes)

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| Line# | Node Number | In-Invert (feet) | Out-Invert (feet) | Length (feet) | Slope (ft/ft) | n | Diam/Width (inches) | Height (inches) | Inside-Fill (inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|------------------------|--------------------|-------------------------|
| 1 | 2R | 1.00 | -1.00 | 200.0 | 0.0100 | 0.012 | 18.0 | 0.0 | 0.0 |
| 2 | 5R | 10.00 | 0.00 | 200.0 | 0.0500 | 0.012 | 18.0 | 0.0 | 0.0 |
| 3 | 6R | 2.50 | 0.00 | 50.0 | 0.0500 | 0.012 | 18.0 | 0.0 | 0.0 |
| 4 | A1-P | 17.00 | 14.80 | 220.0 | 0.0100 | 0.012 | 12.0 | 0.0 | 0.0 |
| 5 | A2-P | 16.00 | 15.50 | 21.0 | 0.0238 | 0.012 | 12.0 | 0.0 | 0.0 |
| 6 | A3-P | 13.00 | 12.90 | 9.0 | 0.0111 | 0.012 | 12.0 | 0.0 | 0.0 |

Pipe Listing (all nodes)

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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| SubcatchmentA1-OFF: A1-OFF Flow Length=210' | Runoff Area=128,117 sf 36.91% Impervious Runoff Depth>0.64" Slope=0.0500 '/' Tc=17.3 min CN=66 Runoff=1.27 cfs 6,828 cf |
|--|--|
| SubcatchmentA10-PR: A10-PR | Runoff Area=19,711 sf 83.95% Impervious Runoff Depth>2.17" Tc=6.0 min CN=90 Runoff=1.13 cfs 3,559 cf |
| SubcatchmentA11-PR: A7-PR | Runoff Area=6,482 sf 3.70% Impervious Runoff Depth>0.09" Tc=6.0 min CN=48 Runoff=0.00 cfs 48 cf |
| SubcatchmentA12-PR: A12-PR | Runoff Area=6,309 sf 71.93% Impervious Runoff Depth>1.68" Tc=6.0 min CN=84 Runoff=0.28 cfs 884 cf |
| SubcatchmentA2-PR: A2-PR | Runoff Area=17,558 sf 79.08% Impervious Runoff Depth>2.00" Tc=6.0 min CN=88 Runoff=0.93 cfs 2,919 cf |
| SubcatchmentA3-PR: A3-PR | Runoff Area=24,198 sf 86.63% Impervious Runoff Depth>2.26" Tc=6.0 min CN=91 Runoff=1.43 cfs 4,550 cf |
| SubcatchmentA4-OFF: A4-OFF Flow Length=50 | Runoff Area=8,837 sf 0.00% Impervious Runoff Depth>0.56" V Slope=0.0300 '/' Tc=12.0 min CN=64 Runoff=0.08 cfs 410 cf |
| SubcatchmentA5-PR: A5-PR | Runoff Area=33,865 sf 2.70% Impervious Runoff Depth>0.01" Flow Length=295' Tc=17.2 min CN=42 Runoff=0.00 cfs 37 cf |
| SubcatchmentA6-PR: A6-PR | Runoff Area=12,206 sf 100.00% Impervious Runoff Depth>2.97" Tc=6.0 min CN=98 Runoff=0.86 cfs 3,016 cf |
| SubcatchmentA7-PR: A7-PR | Runoff Area=12,418 sf 54.38% Impervious Runoff Depth>1.15" Tc=6.0 min CN=76 Runoff=0.37 cfs 1,191 cf |
| SubcatchmentA8-PR: A8-PR | Runoff Area=7,290 sf 100.00% Impervious Runoff Depth>2.97" Tc=6.0 min CN=98 Runoff=0.52 cfs 1,802 cf |
| SubcatchmentA9-PR: A9-PR | Runoff Area=13,223 sf 0.00% Impervious Runoff Depth>0.02" Flow Length=295' Tc=20.6 min CN=43 Runoff=0.00 cfs 23 cf |
| Reach 1R: Routing n=0.016 L=5 | Avg. Flow Depth=0.01' Max Vel=1.03 fps Inflow=0.08 cfs 410 cf 542.0' S=0.0609 '/' Capacity=917.83 cfs Outflow=0.06 cfs 407 cf |
| Reach 2R: Routing 18.0" Round Pipe n=0.012 | Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf L=200.0' S=0.0100 '/' Capacity=11.38 cfs Outflow=0.00 cfs 0 cf |
| Reach 3R: Routing n=0.016 L= | Avg. Flow Depth=0.01' Max Vel=0.56 fps Inflow=0.00 cfs 48 cf 400.0' S=0.0500 '/' Capacity=102.34 cfs Outflow=0.00 cfs 47 cf |
| Reach 5R: Routing 18.0" Round Pipe n=0.012 L=20 | Avg. Flow Depth=0.23' Max Vel=7.51 fps Inflow=1.28 cfs 7,236 cf 00.0' S=0.0500 '/' Capacity=25.45 cfs Outflow=1.27 cfs 7,231 cf |

| 193187-CV01-HYD-PR Prepared by CEC. Inc. | Type III 24-hr 2-Year, 24-h | "Hour Storm Rainfall=3.20 Printed 7/20/2020 |
|--|--|---|
| HydroCAD® 10.10-3a s/n 10498 | © 2020 HydroCAD Software Solutions LLC | Page 9 |
| Reach 6R: Routing 18.0" Round Pipe | Avg. Flow Depth=0.23' Max Vel=7.64 t n=0.012 L=50.0' S=0.0500 '/' Capacity=25.45 cfs | fps Inflow=1.35 cfs 7,369 cf s Outflow=1.35 cfs 7,368 cf |
| Reach 7R: Routing | Avg. Flow Depth=0.04' Max Vel=2.47 f =0.016 L=618.0' S=0.0615 '/' Capacity=922.36 cfs | fps Inflow=1.27 cfs 6,828 cf s Outflow=1.22 cfs 6,792 cf |
| Pond A1-P: CHAMBERS | Peak Elev=18.37' Storage=2,704 Discarded=0.10 cfs 5,354 cf Primary=0.00 cfs 0 c | cf Inflow=1.79 cfs 5,936 cf f Outflow=0.10 cfs 5,354 cf |
| Pond A2-P: CHAMBERS | Peak Elev=17.14' Storage=4,544 Discarded=0.17 cfs 9,223 cf Primary=0.00 cfs 0 c | cf Inflow=3.08 cfs 9,911 cf f Outflow=0.17 cfs 9,223 cf |
| Pond A3-P: CHAMBERS | Peak Elev=14.41' Storage=28 Discarded=0.02 cfs 745 cf Primary=0.08 cfs 137 | 84 cf Inflow=0.28 cfs 884 cf cf Outflow=0.10 cfs 883 cf |
| Link 1L: Manhole | | Inflow=1.28 cfs 7,236 cf Primary=1.28 cfs 7,236 cf |
| Link 4L: Manhole | | Inflow=1.35 cfs 7,369 cf Primary=1.35 cfs 7,369 cf |
| Link A: DESIGN POINT A - EX | (ISTING MUNICIPAL DRAINAGESYSTEM | Inflow=1.48 cfs 8,629 cf Primary=1.48 cfs 8,629 cf |

Total Runoff Area = 290,214 sf Runoff Volume = 25,268 cf Average Runoff Depth = 1.04" 54.99% Pervious = 159,586 sf 45.01% Impervious = 130,628 sf

Summary for Subcatchment A1-OFF: A1-OFF

Runoff 1.27 cfs @ 12.29 hrs, Volume= 6,828 cf, Depth> 0.64" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| | Ai | rea (sf) | CN | Description | | | | | |
|---|------|----------|--------|------------------------|--------------|--|--|--|--|
| | | 13,269 | 98 | Roofs, HSC | θA | | | | |
| | | 34,025 | 98 | Paved park | ing, HSG A | N Contraction of the second seco | | | |
| | | 28,415 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A | | | |
| | | 49,447 | 43 | Woods/gras | ss comb., F | air, HSG A | | | |
| | | 2,961 | 96 | Gravel surf | ace, HSG A | A | | | |
| | 1 | 28,117 | 66 | Weighted A | verage | | | | |
| | | 80,823 | | 63.09% Pe | rvious Area | | | | |
| | | 47,294 | | 36.91% Impervious Area | | | | | |
| | | | | | | | | | |
| | Tc | Length | Slope | e Velocity | Capacity | Description | | | |
| (| min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | | | | |
| | 14.9 | 50 | 0.050 | 0.06 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| | 2.4 | 160 | 0.050 | 0 1.12 | | Shallow Concentrated Flow, shallow conc. flow | | | |
| | | | | | | Woodland Kv= 5.0 fps | | | |
| | 17.3 | 210 | Total | | | | | | |

Subcatchment A1-OFF: A1-OFF



Summary for Subcatchment A10-PR: A10-PR

Runoff 1.13 cfs @ 12.09 hrs, Volume= 3,559 cf, Depth> 2.17" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| Are | a (sf) | CN | Description | | | | |
|-------|----------------------------|-------|-------------|--------------|-------------------------|--|--|
| 4 | 4,128 | 98 | Roofs, HSC | ΞA | | | |
| 12 | 2,420 | 98 | Paved park | ing, HSG A | ١ | | |
| | 3,163 | 49 | 50-75% Gr | ass cover, F | ⁻ air, HSG A | | |
| | 0 | 36 | Woods, Fa | ir, HSG A | | | |
| | 0 | 96 | Gravel surf | ace, HSG A | A | | |
| 19 | 19,711 90 Weighted Average | | | | | | |
| | 3,163 16.05% Pervious Area | | | | | | |
| 16 | 6,548 | | 83.95% Im | | | | |
| | | | | | | | |
| Tc L | _ength | Slop | e Velocity | Capacity | Description | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | |
| 6.0 | | | | | Direct Entry, | | |

Subcatchment A10-PR: A10-PR



Summary for Subcatchment A11-PR: A7-PR

Runoff 0.00 cfs @ 14.55 hrs, Volume= 48 cf, Depth> 0.09" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| A | rea (sf) | CN | Description | | | | |
|-------|---------------------------|-------|-------------|--------------|-------------------------|--|--|
| | 0 | 98 | Roofs, HSC | θA | | | |
| | 240 | 98 | Paved park | ing, HSG A | ١ | | |
| | 5,070 | 49 | 50-75% Gra | ass cover, F | ⁻ air, HSG A | | |
| | 1,172 | 36 | Woods, Fai | ir, HSG A | | | |
| | 0 | 96 | Gravel surf | ace, HSG A | 4 | | |
| | 6.482 48 Weighted Average | | | | | | |
| | 6,242 | | 96.30% Pe | rvious Area | | | |
| | 240 3.70% Impervious Area | | | | | | |
| | | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | |
| 6.0 | | | | | Direct Entry, | | |

Subcatchment A11-PR: A7-PR



Summary for Subcatchment A12-PR: A12-PR

Runoff 0.28 cfs @ 12.09 hrs, Volume= 884 cf, Depth> 1.68" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| A | rea (sf) | CN | Description | | | |
|-------|----------|-------|-------------|--------------|--|--|
| | 260 | 98 | Roofs, HSC | θA | | |
| | 4,278 | 98 | Paved park | ing, HSG A | L Contraction of the second seco | |
| | 1,771 | 49 | 50-75% Gra | ass cover, F | ⁻ air, HSG A | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | |
| | 0 | 96 | Gravel surf | ace, HSG A | ١ | |
| | 6,309 | 84 | Weighted A | verage | | |
| | 1,771 | | 28.07% Pe | rvious Area | | |
| | 4,538 | | 71.93% Im | pervious Are | ea | |
| | | | | | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A12-PR: A12-PR



Summary for Subcatchment A2-PR: A2-PR

Runoff 0.93 cfs @ 12.09 hrs, Volume= 2,919 cf, Depth> 2.00" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"



Summary for Subcatchment A3-PR: A3-PR

Runoff 1.43 cfs @ 12.09 hrs, Volume= 4,550 cf, Depth> 2.26" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"



Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.08 cfs @ 12.21 hrs, Volume= 410 cf, Depth> 0.56" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| | A | rea (sf) | CN | Description | | | | | | | |
|---|-------|----------|--------|--------------|--------------|--|--|--|--|--|--|
| | | 0 | 98 | Roofs, HSC | Roofs, HSG A | | | | | | |
| | | 0 | 98 | Paved park | ing, HSG A | | | | | | |
| | | 0 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | | | |
| | | 4,743 | 36 | Woods, Fai | r, HSG A | | | | | | |
| _ | | 4,094 | 96 | Gravel surfa | ace, HSG A | Ν | | | | | |
| | | 8,837 | 64 | Weighted A | verage | | | | | | |
| | | 8,837 | | 100.00% Pe | ervious Are | а | | | | | |
| | | | | | | | | | | | |
| | Тс | Length | Slope | e Velocity | Capacity | Description | | | | | |
| | (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | | | | | | |
| | 3.2 | 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW | | | | | |
| | | | | | | Grass: Short n= 0.150 P2= 3.20" | | | | | |
| | 8.8 | 20 | 0.0300 | 0.04 | | Sheet Flow, | | | | | |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | | | |
| | 12.0 | 50 | Total | | | | | | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-PR: A5-PR

Runoff 0.00 cfs @ 21.68 hrs, Volume= 37 cf, Depth> 0.01" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| A | rea (sf) | CN | Description | | | | | | |
|-------|----------|---------|------------------------|--------------|--|--|--|--|--|
| | 0 | 98 | 98 Roofs, HSG A | | | | | | |
| | 913 | 98 | 8 Paved parking, HSG A | | | | | | |
| | 10,323 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | | |
| | 22,629 | 36 | Woods, Fai | r, HSG A | | | | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | Ι | | | | |
| | 33,865 | 42 | Weighted A | verage | | | | | |
| | 32,952 | | 97.30% Pei | rvious Area | | | | | |
| | 913 | | 2.70% Impe | ervious Area | а | | | | |
| | | | | | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description | | | | |
| (min) | (feet) | (ft/ft) | (ft/sec) | (cfs) | | | | | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW | | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | | |
| 1.7 | 100 | 0.1600 |) 1.00 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | | |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | | | |
| 0.6 | 145 | 0.0700 | 4.26 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | | |
| | | | | | Unpaved Kv= 16.1 fps | | | | |
| 17.2 | 295 | Total | | | | | | | |

Subcatchment A5-PR: A5-PR



Summary for Subcatchment A6-PR: A6-PR

Runoff 0.86 cfs @ 12.08 hrs, Volume= 3,016 cf, Depth> 2.97" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| Area (sf) | CN | Description | | |
|--------------|--------|--------------|--------------|-----------------------------|
| 0 | 98 | Paved park | ing, HSG A | 4 |
| 12,206 | 98 | Roofs, HSC | βĂ | |
| 0 | 96 | Gravel surfa | ace, HSG A | Α. |
| 0 | 36 | Woods, Fai | r, HSG A | |
| 0 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A |
| 12,206 | 98 | Weighted A | verage | |
| 12,206 | | 100.00% Im | npervious A | Area |
| | | | | |
| Tc Length | n Slop | be Velocity | Capacity | Description |
| (min) (feet) |) (ft/ | ft) (ft/sec) | (cfs) | |
| 6.0 | | | | Direct Entry, DIRECT 18 MIN |

Subcatchment A6-PR: A6-PR



Summary for Subcatchment A7-PR: A7-PR

Runoff 0.37 cfs @ 12.10 hrs, Volume= 1,191 cf, Depth> 1.15" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| Ar | rea (sf) | CN | Description | | | | | |
|-------|----------|-------|-----------------------|--------------|---------------|--|--|--|
| | 4,590 | 98 | Roofs, HSC | ΞA | | | | |
| | 2,163 | 98 | Paved park | ing, HSG A | ١ | | | |
| | 5,665 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | | | |
| | 0 | 96 | Gravel surf | ace, HSG A | A | | | |
| | 12,418 | 76 | 76 Weighted Average | | | | | |
| | 5,665 | | 45.62% Pe | rvious Area | | | | |
| | 6,753 | | 54.38% Im | pervious Ar | ea | | | |
| _ | | | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/f | ft/ft) (ft/sec) (cfs) | | | | | |
| 6.0 | | | | | Direct Entry, | | | |

Subcatchment A7-PR: A7-PR



Summary for Subcatchment A8-PR: A8-PR

Runoff 0.52 cfs @ 12.08 hrs, Volume= 1,802 cf, Depth> 2.97" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| Are | ea (sf) | CN | Description | | | |
|-------|---------|-------|---------------|------------|---------------|--|
| | 7,290 | 98 | Roofs, HSG A | 4 | | |
| | 0 | 98 | Paved parkin | g, HSG A | | |
| | 0 | 49 | 50-75% Gras | s cover, F | air, HSG A | |
| | 0 | 36 | Woods, Fair, | HSG A | | |
| | 0 | 96 | Gravel surfac | e, HSG A | ١ | |
| | 7,290 | 98 | Weighted Ave | erage | | |
| | 7,290 | | 100.00% Imp | ervious A | rea | |
| | | | | | | |
| Тс | Length | Slop | e Velocity (| Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A8-PR: A8-PR



Summary for Subcatchment A9-PR: A9-PR

Runoff 0.00 cfs @ 17.39 hrs, Volume= 23 cf, Depth> 0.02" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 2-Year, 24-Hour Storm Rainfall=3.20"

| _ | A | rea (sf) | CN L | Description | | | | | |
|---|--------------------|----------------------------|---------------------------------------|----------------------------------|--------------|---|--|--|--|
| | | 0 | 98 F | Roofs, HSG A | | | | | |
| | | 0 | 98 F | Paved park | ing, HSG A | | | | |
| | | 7,203 | 49 5 | 50-75% Gra | ass cover, F | Fair, HSG A | | | |
| | | 6,020 | 36 V | Voods, Fai | r, HSG A | | | | |
| _ | | 0 | 96 (| Gravel surfa | ace, HSG A | 1 | | | |
| | | 13,223 | 43 V | Veighted A | verage | | | | |
| | | 13,223 | 1 | 00.00% Pe | ervious Are | а | | | |
| | | | | | | | | | |
| | Тс | Length | Slope | Velocity | Capacity | Description | | | |
| | (min) | <i>(= </i> | | | | | | | |
| _ | | (feet) | (ft/ft) | (ft/sec) | (cfs) | | | | |
| _ | 18.3 | (feet) 50 | (ft/ft) 0.0300 | (ft/sec) 0.05 | (cfs) | Sheet Flow, SHEET FLOW | | | |
| _ | 18.3 | (feet) 50 | (ft/ft) 0.0300 | (ft/sec) 0.05 | (cfs) | Sheet Flow, SHEET FLOW Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| | 18.3 | (feet) 50 100 | (ft/ft) 0.0300 0.1600 | (ft/sec) 0.05 1.00 | (cfs) | Sheet Flow, SHEET FLOW Woods: Dense underbrush n= 0.800 P2= 3.20" Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | 18.3 1.7 | (feet) 50 100 | (ft/ft) 0.0300 0.1600 | (ft/sec) 0.05 1.00 | (cfs) | Sheet Flow, SHEET FLOW Woods: Dense underbrush n= 0.800 P2= 3.20" Shallow Concentrated Flow, SHALLOW CONC FLOW Forest w/Heavy Litter Kv= 2.5 fps | | | |
| | 18.3 1.7 0.6 | (feet) 50 100 145 | (ft/ft) 0.0300 0.1600 0.0700 | (ft/sec) 0.05 1.00 4.26 | (cfs) | Sheet Flow, SHEET FLOW Woods: Dense underbrush n= 0.800 P2= 3.20" Shallow Concentrated Flow, SHALLOW CONC FLOW Forest w/Heavy Litter Kv= 2.5 fps Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| _ | 18.3 1.7 0.6 | (feet) 50 100 145 | (ft/ft) 0.0300 0.1600 0.0700 | (ft/sec) 0.05 1.00 4.26 | (cfs) | Sheet Flow, SHEET FLOW Woods: Dense underbrush n= 0.800 P2= 3.20" Shallow Concentrated Flow, SHALLOW CONC FLOW Forest w/Heavy Litter Kv= 2.5 fps Shallow Concentrated Flow, SHALLOW CONC FLOW Unpaved Kv= 16.1 fps | | | |

20.6 295 Total

Subcatchment A9-PR: A9-PR



Summary for Reach 1R: Routing



Summary for Reach 2R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 29,764 sf, 87.66% Impervious, Inflow Depth =
 0.00" for 2-Year, 24-Hour Storm event

 Inflow =
 0.00 cfs @
 0.00 hrs, Volume=
 0 cf

 Outflow =
 0.00 cfs @
 0.00 hrs, Volume=
 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0100 '/' Inlet Invert= 1.00', Outlet Invert= -1.00'





Reach 2R: Routing

Summary for Reach 3R: Routing

Inflow Area = 6,482 sf, 3.70% Impervious, Inflow Depth > 0.09" for 2-Year, 24-Hour Storm event Inflow 0.00 cfs @ 14.55 hrs, Volume= 48 cf = Outflow 0.00 cfs @ 14.90 hrs, Volume= 47 cf, Atten= 0%, Lag= 20.5 min =

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 0.56 fps, Min. Travel Time= 11.9 min Avg. Velocity = 0.50 fps, Avg. Travel Time= 13.3 min

Peak Storage= 1 cf @ 14.70 hrs Average Depth at Peak Storage= 0.01', Surface Width= 0.76' Bank-Full Depth= 0.50' Flow Area= 12.5 sf, Capacity= 102.34 cfs

0.00' x 0.50' deep channel, n= 0.016 Side Slope Z-value= 0.0 100.0 '/' Top Width= 50.00' Length= 400.0' Slope= 0.0500 '/' Inlet Invert= 20.00', Outlet Invert= 0.00'





Reach 3R: Routing

Summary for Reach 5R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 251,782 sf, 47.30% Impervious, Inflow Depth > 0.34" for 2-Year, 24-Hour Storm event

 Inflow =
 1.28 cfs @ 12.43 hrs, Volume=
 7,236 cf

 Outflow =
 1.27 cfs @ 12.44 hrs, Volume=
 7,231 cf, Atten= 0%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 7.51 fps, Min. Travel Time= 0.4 min Avg. Velocity = 3.69 fps, Avg. Travel Time= 0.9 min

Peak Storage= 34 cf @ 12.43 hrs Average Depth at Peak Storage= 0.23', Surface Width= 1.08' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0500 '/' Inlet Invert= 10.00', Outlet Invert= 0.00'





Reach 5R: Routing

Summary for Reach 6R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 258,091 sf, 47.90% Impervious, Inflow Depth > 0.34" for 2-Year, 24-Hour Storm event

 Inflow =
 1.35 cfs @ 12.44 hrs, Volume=
 7,369 cf

 Outflow =
 1.35 cfs @ 12.44 hrs, Volume=
 7,368 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 7.64 fps, Min. Travel Time= 0.1 min Avg. Velocity = 3.70 fps, Avg. Travel Time= 0.2 min

Peak Storage= 9 cf @ 12.44 hrs Average Depth at Peak Storage= 0.23', Surface Width= 1.09' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 50.0' Slope= 0.0500 '/' Inlet Invert= 2.50', Outlet Invert= 0.00'





Reach 6R: Routing

Summary for Reach 7R: Routing



Summary for Pond A1-P: CHAMBERS

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| Inflow Area | ı = | 29,764 sf, | 87.66% In | npervious, | Inflow Depth > | 2.39" | for 2-Y | ear, 24-Hour Storm event |
|-------------|-----|------------|------------|------------|----------------|----------|---------|--------------------------|
| Inflow | = | 1.79 cfs @ | 12.09 hrs, | Volume= | 5,936 c | f | | |
| Outflow | = | 0.10 cfs @ | 11.00 hrs, | Volume= | 5,354 c | f, Atter | n= 95%, | Lag= 0.0 min |
| Discarded | = | 0.10 cfs @ | 11.00 hrs, | Volume= | 5,354 c | f | | |
| Primary | = | 0.00 cfs @ | 0.00 hrs, | Volume= | 0 c | f | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 18.37' @ 14.14 hrs Surf.Area= 1,761 sf Storage= 2,704 cf

Plug-Flow detention time= 241.5 min calculated for 5,354 cf (90% of inflow) Center-of-Mass det. time= 193.1 min (977.8 - 784.7)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 16.10' | 2,519 cf | 22.75'W x 77.40'L x 5.50'H Field A |
| | | | 9,685 cf Overall - 3,388 cf Embedded = 6,297 cf x 40.0% Voids |
| #2A | 16.85' | 3,388 cf | ADS_StormTech MC-3500 d +Capx 30 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 30 Chambers in 3 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf |
| | | 5,907 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 17.00' | 12.0" Round Culvert |
| | | | L= 220.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 17.00' / 14.80' S= 0.0100 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 21.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 20.00' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 16.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.10 cfs @ 11.00 hrs HW=16.16' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.10' (Free Discharge) -1=Culvert (Controls 0.00 cfs) -2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Controls 0.00 cfs)

Pond A1-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

10 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 75.40' Row Length +12.0" End Stone x 2 = 77.40' Base Length 3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

30 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,388.0 cf Chamber Storage

9,684.7 cf Field - 3,388.0 cf Chambers = 6,296.7 cf Stone x 40.0% Voids = 2,518.7 cf Stone Storage

Chamber Storage + Stone Storage = 5,906.6 cf = 0.136 afOverall Storage Efficiency = 61.0%Overall System Size = $77.40' \times 22.75' \times 5.50'$

30 Chambers 358.7 cy Field 233.2 cy Stone





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Summary for Pond A2-P: CHAMBERS

| Inflow Area | ı = | 51,199 sf, | 87.50% In | npervious, | Inflow Depth > | 2.32" | for 2-Y | 'ear, 24-Hour Storm event |
|-------------|-----|------------|------------|------------|----------------|----------|---------|---------------------------|
| Inflow | = | 3.08 cfs @ | 12.09 hrs, | Volume= | 9,911 c | f | | |
| Outflow | = | 0.17 cfs @ | 11.16 hrs, | Volume= | 9,223 c | f, Atter | า= 94%, | Lag= 0.0 min |
| Discarded | = | 0.17 cfs @ | 11.16 hrs, | Volume= | 9,223 c | f | | - |
| Primary | = | 0.00 cfs @ | 0.00 hrs, | Volume= | 0 c | f | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 17.14' @ 14.05 hrs Surf.Area= 3,136 sf Storage= 4,544 cf

Plug-Flow detention time= 237.5 min calculated for 9,223 cf (93% of inflow) Center-of-Mass det. time= 200.8 min (996.0 - 795.2)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 15.00' | 4,421 cf | 37.08'W x 84.57'L x 5.50'H Field A |
| | | | 17,249 cf Overall - 6,196 cf Embedded = 11,052 cf x 40.0% Voids |
| #2A | 15.75' | 6,196 cf | ADS_StormTech MC-3500 d +Cap x 55 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 55 Chambers in 5 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf |
| | | 10,617 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 16.00' | 12.0" Round Culvert |
| | - | | L= 21.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 16.00' / 15.50' S= 0.0238 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 20.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Discarded | 15.00' | 2.410 in/hr Exfiltration over Surface area |
| #4 | Device 1 | 17.90' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.17 cfs @ 11.16 hrs HW=15.06' (Free Discharge) **3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.00' (Free Discharge) -1=Culvert (Controls 0.00 cfs) -2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-4=Orifice/Grate (Controls 0.00 cfs)

Pond A2-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Effective Size= $70.4^{\circ}W \times 45.0^{\circ}H \Rightarrow 15.33$ sf $\times 7.17L = 110.0$ cf Overall Size= $77.0^{\circ}W \times 45.0^{\circ}H \times 7.50^{\circ}L$ with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

11 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 82.57' Row Length +12.0" End Stone x 2 = 84.57' Base Length 5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

55 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 6,196.4 cf Chamber Storage

17,248.8 cf Field - 6,196.4 cf Chambers = 11,052.4 cf Stone x 40.0% Voids = 4,421.0 cf Stone Storage

Chamber Storage + Stone Storage = 10,617.3 cf = 0.244 af Overall Storage Efficiency = 61.6% Overall System Size = 84.57' x 37.08' x 5.50'

55 Chambers 638.8 cy Field 409.3 cy Stone





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Pond A2-P: CHAMBERS

Summary for Pond A3-P: CHAMBERS

| Inflow Area | ı = | 6,309 sf, | 71.93% In | npervious, | Inflow Depth > | 1.68" | for 2-Year, | 24-Hour Storm event |
|-------------|-----|------------|------------|------------|----------------|----------|-------------|---------------------|
| Inflow | = | 0.28 cfs @ | 12.09 hrs, | Volume= | 884 c | f | | |
| Outflow | = | 0.10 cfs @ | 12.41 hrs, | Volume= | 883 c | f, Atten | = 66%, Lag | = 19.2 min |
| Discarded | = | 0.02 cfs @ | 11.56 hrs, | Volume= | 745 c | f | | |
| Primary | = | 0.08 cfs @ | 12.41 hrs, | Volume= | 137 c | f | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 14.41' @ 12.41 hrs Surf.Area= 353 sf Storage= 284 cf

Plug-Flow detention time= 101.1 min calculated for 881 cf (100% of inflow) Center-of-Mass det. time= 100.3 min (929.3 - 828.9)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 13.10' | 347 cf | 11.00'W x 32.10'L x 3.50'H Field A |
| | | | 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids |
| #2A | 13.60' | 368 cf | ADS_StormTech SC-740 +Cap x 8 Inside #1 |
| | | | Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf |
| | | | Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap |
| | | | 8 Chambers in 2 Rows |
| | | 715 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 13.00' | 12.0" Round Culvert |
| | - | | L= 9.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 13.00' / 12.90' S= 0.0111 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 15.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 14.25' | 6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 13.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.02 cfs @ 11.56 hrs HW=13.14' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.08 cfs @ 12.41 hrs HW=14.41' (Free Discharge)

1=Culvert (Passes 0.08 cfs of 3.42 cfs potential flow)

-2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 0.08 cfs @ 1.37 fps)
Pond A3-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10'Base Length 2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af Overall Storage Efficiency = 57.8% Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers 45.8 cy Field 32.2 cy Stone





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Summary for Link 1L: Manhole

[62] Hint: Exceeded Reach 2R OUTLET depth by 1.00' @ 0.00 hrs

| Inflow <i>J</i> | Area = | 251,782 sf, 47.30 | % Impervious, | Inflow Depth > | 0.34" fc | or 2-Year, 24-H | lour Storm event |
|-----------------|--------|--------------------|---------------|----------------|----------|-----------------|------------------|
| Inflow | = | 1.28 cfs @ 12.43 l | rs, Volume= | 7,236 cf | | | |
| Primar | y = | 1.28 cfs @ 12.43 ł | rs, Volume= | 7,236 cf | , Atten= | 0%, Lag= 0.0 r | nin |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs





Summary for Link 4L: Manhole

| Inflow Are | ea = | 258,091 sf, | 47.90% In | npervious, | Inflow Depth > | 0.34" | for 2-Y | ∕ear, 24-Hour S | Storm event |
|------------|------|-------------|------------|------------|----------------|----------|---------|-----------------|-------------|
| Inflow | = | 1.35 cfs @ | 12.44 hrs, | Volume= | 7,369 c | f | | | |
| Primary | = | 1.35 cfs @ | 12.44 hrs, | Volume= | 7,369 c | f, Atten | = 0%, l | _ag= 0.0 min | |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs



Link 4L: Manhole

Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow Are | ea = | 290,214 sf, | 45.01% In | npervious, | Inflow Depth > | 0.36" | for 2-Year, 24-Hour Storm event |
|------------|------|-------------|------------|------------|----------------|----------|---------------------------------|
| Inflow | = | 1.48 cfs @ | 12.43 hrs, | Volume= | 8,629 c | f | |
| Primary | = | 1.48 cfs @ | 12.43 hrs, | Volume= | 8,629 c | f, Atten | = 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM



193187-CV01-HYD-PR Prepared by CEC, Inc.

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| SubcatchmentA1-OFF: A1-OFF Flow Length=210' | Runoff Area=128,117 sf 36.91% Impervious Runoff Depth>1.52" Slope=0.0500 '/' Tc=17.3 min CN=66 Runoff=3.54 cfs 16,228 cf |
|---|--|
| SubcatchmentA10-PR: A10-PR | Runoff Area=19,711 sf 83.95% Impervious Runoff Depth>3.58" Tc=6.0 min CN=90 Runoff=1.83 cfs 5,888 cf |
| SubcatchmentA11-PR: A7-PR | Runoff Area=6,482 sf 3.70% Impervious Runoff Depth>0.48" Tc=6.0 min CN=48 Runoff=0.04 cfs 259 cf |
| SubcatchmentA12-PR: A12-PR | Runoff Area=6,309 sf 71.93% Impervious Runoff Depth>2.99" Tc=6.0 min CN=84 Runoff=0.50 cfs 1,574 cf |
| SubcatchmentA2-PR: A2-PR | Runoff Area=17,558 sf 79.08% Impervious Runoff Depth>3.38" Tc=6.0 min CN=88 Runoff=1.55 cfs 4,948 cf |
| SubcatchmentA3-PR: A3-PR | Runoff Area=24,198 sf 86.63% Impervious Runoff Depth>3.69" Tc=6.0 min CN=91 Runoff=2.29 cfs 7,438 cf |
| SubcatchmentA4-OFF: A4-OFF Flow Length=50 | Runoff Area=8,837 sf 0.00% Impervious Runoff Depth>1.39" ' Slope=0.0300 '/' Tc=12.0 min CN=64 Runoff=0.25 cfs 1,020 cf |
| SubcatchmentA5-PR: A5-PR | Runoff Area=33,865 sf 2.70% Impervious Runoff Depth>0.24" Flow Length=295' Tc=17.2 min CN=42 Runoff=0.04 cfs 667 cf |
| SubcatchmentA6-PR: A6-PR | Runoff Area=12,206 sf 100.00% Impervious Runoff Depth>4.46" Tc=6.0 min CN=98 Runoff=1.28 cfs 4,537 cf |
| SubcatchmentA7-PR: A7-PR | Runoff Area=12,418 sf 54.38% Impervious Runoff Depth>2.29" Tc=6.0 min CN=76 Runoff=0.76 cfs 2,368 cf |
| SubcatchmentA8-PR: A8-PR | Runoff Area=7,290 sf 100.00% Impervious Runoff Depth>4.46" Tc=6.0 min CN=98 Runoff=0.76 cfs 2,710 cf |
| SubcatchmentA9-PR: A9-PR | Runoff Area=13,223 sf 0.00% Impervious Runoff Depth>0.27" Flow Length=295' Tc=20.6 min CN=43 Runoff=0.02 cfs 299 cf |
| Reach 1R: Routing n=0.016 L=5 | Avg. Flow Depth=0.01' Max Vel=1.38 fps Inflow=0.25 cfs 1,020 cf 42.0' S=0.0609 '/' Capacity=917.83 cfs Outflow=0.22 cfs 1,015 cf |
| Reach 2R: Routing 18.0" Round Pipe n=0.012 L | Avg. Flow Depth=0.09' Max Vel=1.84 fps Inflow=0.08 cfs 432 cf =200.0' S=0.0100 '/' Capacity=11.38 cfs Outflow=0.08 cfs 432 cf |
| Reach 3R: Routing n=0.016 L= | Avg. Flow Depth=0.02' Max Vel=1.10 fps Inflow=0.04 cfs 259 cf =400.0' S=0.0500 '/' Capacity=102.34 cfs Outflow=0.03 cfs 257 cf |
| Reach 5R: Routing A 18.0" Round Pipe n=0.012 L=2 | vg. Flow Depth=0.39' Max Vel=10.26 fps Inflow=3.69 cfs 20,503 cf 00.0' S=0.0500 '/' Capacity=25.45 cfs Outflow=3.69 cfs 20,495 cf |

| 193187-CV01-HYD-PR | Type III 24-hr 10-Year, 24-Hour Storm Rain | fall=4.70" |
|----------------------------|---|------------|
| Prepared by CEC, Inc. | Printed 7 | 7/20/2020 |
| HydroCAD® 10.10-3a s/n 104 | 498 © 2020 HydroCAD Software Solutions LLC | Page 41 |
| | | - |
| Reach 6R: Routing | Avg. Flow Depth=0.40' Max Vel=10.40 fps Inflow=3.88 cfs | 21,106 cf |
| 18.0" Round Pip | e n=0.012 L=50.0' S=0.0500 '/' Capacity=25.45 cfs Outflow=3.88 cfs | 21,105 cf |
| | | |
| Reach 7R: Routing | Avg. Flow Depth=0.07' Max Vel=3.45 fps Inflow=3.54 cfs | 16,228 cf |
| | n=0.016 L=618.0' S=0.0615 '/' Capacity=922.36 cfs Outflow=3.44 cfs | 16,164 cf |
| | | |
| Pond A1-P: CHAMBERS | Peak Elev=20.15' Storage=4,845 cf Inflow=2.83 cfs | 9,486 cf |
| | Discarded=0.10 cfs 5,853 cf Primary=0.08 cfs 432 cf Outflow=0.18 cfs | 6,285 cf |
| | | |
| Pond A2-P: CHAMBERS | Peak Elev=18.27' Storage=7,210 cf Inflow=4.88 cfs | 16,036 cf |
| Dis | scarded=0.17 cfs 10,099 cf Primary=0.42 cfs 2,225 cf Outflow=0.59 cfs | 12,324 cf |
| | | |
| Pond A3-P: CHAMBERS | Peak Elev=14.66' Storage=345 cf Inflow=0.50 cfs | s 1,574 cf |
| | Discarded=0.02 cfs 962 cf Primary=0.37 cfs 611 cf Outflow=0.39 cfs | 1,573 cf |
| | | |
| Link 1L: Manhole | Inflow=3.69 cfs | 20,503 cf |
| | Primary=3.69 cfs | 20,503 cf |
| | | o |
| Link 4L: Manhole | Inflow=3.88 cfs | 21,106 cf |
| | Primary=3.88 cfs | 21,106 cf |
| | | 04 000 -f |
| LINK A: DESIGN POINTA - | EXISTING MUNICIPAL DRAINAGESYSTEM INTIOW=4.21 CTS | 24,028 CT |
| | Primary=4.21 cts | 24,028 CT |
| | | |

Total Runoff Area = 290,214 sf Runoff Volume = 47,936 cf Average Runoff Depth = 1.98" 54.99% Pervious = 159,586 sf 45.01% Impervious = 130,628 sf

Summary for Subcatchment A1-OFF: A1-OFF

Runoff 3.54 cfs @ 12.26 hrs, Volume= 16,228 cf, Depth> 1.52" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| Ar | rea (sf) | CN | Description | | | | | |
|-------|----------|---------|----------------------|--------------|--|--|--|--|
| | 13,269 | 98 | Roofs, HSC | θA | | | | |
| | 34,025 | 98 | Paved park | ing, HSG A | N Contraction of the second seco | | | |
| | 28,415 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A | | | |
| | 49,447 | 43 | Woods/gras | ss comb., F | air, HSG A | | | |
| | 2,961 | 96 | Gravel surfa | ace, HSG A | A | | | |
| 1 | 28,117 | 66 | Weighted A | verage | | | | |
| | 80,823 | | 63.09% Pervious Area | | | | | |
| | 47,294 | | 36.91% Imp | pervious Ar | ea | | | |
| | | | - | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/ft) | (ft/sec) | (cfs) | | | | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 2.4 | 160 | 0.0500 |) 1.12 | | Shallow Concentrated Flow, shallow conc. flow | | | |
| | | | | | Woodland Kv= 5.0 fps | | | |
| 17.3 | 210 | Total | | | | | | |

Subcatchment A1-OFF: A1-OFF



Summary for Subcatchment A10-PR: A10-PR

Runoff 1.83 cfs @ 12.09 hrs, Volume= 5,888 cf, Depth> 3.58" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| Ar | rea (sf) | CN | Description | | | | |
|-------|----------|-------|---------------------|--------------|--|--|--|
| | 4,128 | 98 | Roofs, HSC | ΞA | | | |
| | 12,420 | 98 | Paved park | ing, HSG A | L Contraction of the second seco | | |
| | 3,163 | 49 | 50-75% Gr | ass cover, F | ⁻ air, HSG A | | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | | |
| | 0 | 96 | Gravel surf | ace, HSG A | ١ | | |
| | 19,711 | 90 | 90 Weighted Average | | | | |
| | 3,163 | | 16.05% Pe | rvious Area | | | |
| | 16,548 | | 83.95% Im | pervious Are | ea | | |
| _ | | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | |
| 6.0 | | | | | Direct Entry, | | |

Subcatchment A10-PR: A10-PR



Summary for Subcatchment A11-PR: A7-PR

Runoff 0.04 cfs @ 12.17 hrs, Volume= 259 cf, Depth> 0.48" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| AI | rea (sf) | CN | Description | | | | |
|-------------|------------------|---------------|---------------------------|-------------------|--|--|--|
| | 0 | 98 | Roofs, HSC | θA | | | |
| | 240 | 98 | Paved park | ing, HSG A | L Contraction of the second seco | | |
| | 5,070 | 49 | 50-75% Gra | ass cover, F | ⁻ air, HSG A | | |
| | 1,172 | 36 | Woods, Fai | r, HSG A | | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | ١ | | |
| | 6,482 | 48 | Weighted Average | | | | |
| | 6,242 | | 96.30% Per | rvious Area | | | |
| | 240 | | 3.70% Impe | ervious Area | а | | |
| Tc (min) | Length (feet) | Slop (ft/f | e Velocity t) (ft/sec) | Capacity (cfs) | Description | | |
| 6.0 | | | | | Direct Entry, | | |

Subcatchment A11-PR: A7-PR



Summary for Subcatchment A12-PR: A12-PR

Runoff 0.50 cfs @ 12.09 hrs, Volume= 1,574 cf, Depth> 2.99" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | | | |
|-------|----------|-------|--------------------|--------------|---------------|--|--|
| | 260 | 98 | Roofs, HSC | ΞA | | | |
| | 4,278 | 98 | Paved park | ing, HSG A | ١ | | |
| | 1,771 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | | |
| | 0 | 96 | Gravel surf | ace, HSG A | 4 | | |
| | 6,309 | 84 | 4 Weighted Average | | | | |
| | 1,771 | | 28.07% Pe | rvious Area | l | | |
| | 4,538 | | 71.93% Im | pervious Ar | ea | | |
| | | | | | | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | | |
| 6.0 | | | | | Direct Entry, | | |

Subcatchment A12-PR: A12-PR



Summary for Subcatchment A2-PR: A2-PR

Runoff 1.55 cfs @ 12.09 hrs, Volume= 4,948 cf, Depth> 3.38" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"



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Summary for Subcatchment A3-PR: A3-PR

Runoff 2.29 cfs @ 12.09 hrs, Volume= 7,438 cf, Depth> 3.69" =

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Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"



11 12 13 14 15 16 17 18 19

Time (hours)

20 21 22 23

24

Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.25 cfs @ 12.18 hrs, Volume= 1,020 cf, Depth> 1.39" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | | | | | |
|-------|----------|---------|--------------|--------------|--|--|--|--|--|
| | 0 | 98 | Roofs, HSC | Roofs, HSG A | | | | | |
| | 0 | 98 | Paved park | ing, HSG A | N | | | | |
| | 0 | 49 | 50-75% Gra | ass cover, I | Fair, HSG A | | | | |
| | 4,743 | 36 | Woods, Fai | r, HSG A | | | | | |
| | 4,094 | 96 | Gravel surfa | ace, HSG A | A | | | | |
| | 8,837 | 64 | Weighted A | verage | | | | | |
| | 8,837 | | 100.00% P | ervious Are | a | | | | |
| | | | | | | | | | |
| Тс | Length | Slope | e Velocity | Capacity | Description | | | | |
| (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | | | | | |
| 3.2 | 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW | | | | |
| | | | | | Grass: Short n= 0.150 P2= 3.20" | | | | |
| 8.8 | 20 | 0.0300 | 0.04 | | Sheet Flow, | | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | | |
| 12.0 | 50 | Total | | | | | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-PR: A5-PR

Runoff 0.04 cfs @ 12.60 hrs, Volume= 667 cf, Depth> 0.24" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | | | | |
|-------|----------|---------|------------------------|--------------|--|--|--|--|
| | 0 | 98 | Roofs, HSC | βA | | | | |
| | 913 | 98 | 8 Paved parking, HSG A | | | | | |
| | 10,323 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | |
| | 22,629 | 36 | Woods, Fai | r, HSG A | | | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | Ν | | | |
| | 33,865 | 42 | Weighted A | verage | | | | |
| | 32,952 | | 97.30% Pei | rvious Area | | | | |
| | 913 | | 2.70% Impe | ervious Area | а | | | |
| | | | | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | | | | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 1.7 | 100 | 0.1600 |) 1.00 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | | |
| 0.6 | 145 | 0.0700 |) 4.26 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Unpaved Kv= 16.1 fps | | | |
| 17.2 | 295 | Total | | | | | | |

Subcatchment A5-PR: A5-PR



Summary for Subcatchment A6-PR: A6-PR

Runoff 1.28 cfs @ 12.08 hrs, Volume= 4,537 cf, Depth> 4.46" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| Area (sf) | CN | Description | |
|--------------|-------|--------------------|-----------------------------|
| 0 | 98 | Paved parking, HS | G A |
| 12,206 | 98 | Roofs, HSG A | |
| 0 | 96 | Gravel surface, HS | G A |
| 0 | 36 | Woods, Fair, HSG | A |
| 0 | 49 | 50-75% Grass cov | er, Fair, HSG A |
| 12,206 | 98 | Weighted Average | |
| 12,206 | | 100.00% Imperviou | s Area |
| | | | |
| Tc Length | Slop | be Velocity Capad | ity Description |
| (min) (feet) | (ft/f | ft) (ft/sec) (c | s) |
| 6.0 | | | Direct Entry, DIRECT 18 MIN |
| | | | - |

Subcatchment A6-PR: A6-PR



Summary for Subcatchment A7-PR: A7-PR

Runoff 0.76 cfs @ 12.09 hrs, Volume= 2,368 cf, Depth> 2.29" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| Ar | rea (sf) | CN Description | | | | | | |
|-------|----------|---------------------|--------------|--------------|---------------|--|--|--|
| | 4,590 | 98 | Roofs, HSC | θA | | | | |
| | 2,163 | 98 | Paved park | ing, HSG A | ١ | | | |
| | 5,665 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | A | | | |
| | 12,418 | 76 Weighted Average | | | | | | |
| | 5,665 | | 45.62% Per | rvious Area | | | | |
| | 6,753 | | 54.38% Imp | pervious Ar | ea | | | |
| Та | Longth | Clar | o Volocity | Canaaitu | Description | | | |
| | Length | Siop | | Capacity | Description | | | |
| (min) | (teet) | (11/1 | t) (π/sec) | (CTS) | | | | |
| 6.0 | | | | | Direct Entry. | | | |

Subcatchment A7-PR: A7-PR



Summary for Subcatchment A8-PR: A8-PR

Runoff 0.76 cfs @ 12.08 hrs, Volume= 2,710 cf, Depth> 4.46" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| A | rea (sf) | CN | Description | | | |
|-------|----------|-------|--------------|--------------|---------------|--|
| | 7,290 | 98 | Roofs, HSG | βA | | |
| | 0 | 98 | Paved park | ing, HSG A | ١ | |
| | 0 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | |
| | 0 | 36 | Woods, Fai | r, HSG A | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | 4 | |
| | 7,290 | 98 | Weighted A | verage | | |
| | 7,290 | | 100.00% Im | npervious A | rea | |
| | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A8-PR: A8-PR



Summary for Subcatchment A9-PR: A9-PR

Runoff 0.02 cfs @ 12.61 hrs, Volume= 299 cf, Depth> 0.27" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 10-Year, 24-Hour Storm Rainfall=4.70"

| | Ai | rea (sf) | CN [| Description | | |
|---|-------|----------|---------|--------------|--------------|---|
| | | 0 | 98 F | Roofs, HSC | βA | |
| | | 0 | 98 F | Paved park | ing, HSG A | N Contraction of the second |
| | | 7,203 | 49 5 | 50-75% Gra | ass cover, F | Fair, HSG A |
| | | 6,020 | 36 V | Voods, Fai | r, HSG A | |
| _ | | 0 | 96 (| Gravel surfa | ace, HSG A | A |
| | | 13,223 | 43 V | Veighted A | verage | |
| | | 13,223 | 1 | 100.00% P | ervious Are | а |
| | | | | | | |
| | Тс | Length | Slope | Velocity | Capacity | Description |
| | (min) | (feet) | (ft/ft) | (ft/sec) | (cfs) | |
| | 18.3 | 50 | 0.0300 | 0.05 | | Sheet Flow, SHEET FLOW |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| | 1.7 | 100 | 0.1600 | 1.00 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| | | | | | | Forest w/Heavy Litter Kv= 2.5 fps |
| | 0.6 | 145 | 0.0700 | 4.26 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| _ | | | | | | Unpaved Kv= 16.1 fps |
| | | | | | | |

20.6 295 Total

Subcatchment A9-PR: A9-PR



Summary for Reach 1R: Routing



Summary for Reach 2R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 29,764 sf, 87.66% Impervious, Inflow Depth = 0.17" for 10-Year, 24-Hour Storm event

 Inflow =
 0.08 cfs @ 13.77 hrs, Volume=
 432 cf

 Outflow =
 0.08 cfs @ 13.82 hrs, Volume=
 432 cf, Atten= 0%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 1.84 fps, Min. Travel Time= 1.8 min Avg. Velocity = 1.31 fps, Avg. Travel Time= 2.5 min

Peak Storage= 8 cf @ 13.79 hrs Average Depth at Peak Storage= 0.09', Surface Width= 0.70' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0100 '/' Inlet Invert= 1.00', Outlet Invert= -1.00'





Reach 2R: Routing

Summary for Reach 3R: Routing

Inflow Area = 6,482 sf, 3.70% Impervious, Inflow Depth > 0.48" for 10-Year, 24-Hour Storm event Inflow 0.04 cfs @ 12.17 hrs, Volume= 259 cf = Outflow 0.03 cfs @ 12.46 hrs, Volume= 257 cf, Atten= 8%, Lag= 17.3 min =

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 1.10 fps, Min. Travel Time= 6.1 min Avg. Velocity = 0.69 fps, Avg. Travel Time= 9.7 min

Peak Storage= 12 cf @ 12.36 hrs Average Depth at Peak Storage= 0.02', Surface Width= 2.45' Bank-Full Depth= 0.50' Flow Area= 12.5 sf, Capacity= 102.34 cfs

0.00' x 0.50' deep channel, n= 0.016 Side Slope Z-value= 0.0 100.0 '/' Top Width= 50.00' Length= 400.0' Slope= 0.0500 '/' Inlet Invert= 20.00', Outlet Invert= 0.00'





Summary for Reach 5R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 251,782 sf, 47.30% Impervious, Inflow Depth > 0.98" for 10-Year, 24-Hour Storm event

 Inflow =
 3.69 cfs @
 12.37 hrs, Volume=
 20,503 cf

 Outflow =
 3.69 cfs @
 12.38 hrs, Volume=
 20,495 cf, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 10.26 fps, Min. Travel Time= 0.3 min Avg. Velocity = 4.71 fps, Avg. Travel Time= 0.7 min

Peak Storage= 72 cf @ 12.37 hrs Average Depth at Peak Storage= 0.39', Surface Width= 1.31' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0500 '/' Inlet Invert= 10.00', Outlet Invert= 0.00'





Reach 5R: Routing

Summary for Reach 6R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 258,091 sf, 47.90% Impervious, Inflow Depth > 0.98" for 10-Year, 24-Hour Storm event

 Inflow =
 3.88 cfs @
 12.37 hrs, Volume=
 21,106 cf

 Outflow =
 3.88 cfs @
 12.37 hrs, Volume=
 21,105 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 10.40 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.72 fps, Avg. Travel Time= 0.2 min

Peak Storage= 19 cf @ 12.37 hrs Average Depth at Peak Storage= 0.40', Surface Width= 1.32' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 50.0' Slope= 0.0500 '/' Inlet Invert= 2.50', Outlet Invert= 0.00'





Reach 6R: Routing

Summary for Reach 7R: Routing



Summary for Pond A1-P: CHAMBERS

| Inflow Area | a = | 29,764 sf, | 87.66% In | npervious, | Inflow Depth > | 3.82" | for | 10-Year, 24-Hour | Storm event |
|-------------|-----|------------|------------|------------|----------------|----------|------|------------------|-------------|
| Inflow | = | 2.83 cfs @ | 12.09 hrs, | Volume= | 9,486 c | f | | | |
| Outflow | = | 0.18 cfs @ | 13.77 hrs, | Volume= | 6,285 c | f, Atten | = 94 | %, Lag= 101.0 mi | n |
| Discarded | = | 0.10 cfs @ | 9.84 hrs, | Volume= | 5,853 c | f | | • | |
| Primary | = | 0.08 cfs @ | 13.77 hrs, | Volume= | 432 c | f | | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 20.15' @ 13.77 hrs Surf.Area= 1,761 sf Storage= 4,845 cf

Plug-Flow detention time= 253.2 min calculated for 6,275 cf (66% of inflow) Center-of-Mass det. time= 154.9 min (930.1 - 775.2)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 16.10' | 2,519 cf | 22.75'W x 77.40'L x 5.50'H Field A |
| | | | 9,685 cf Overall - 3,388 cf Embedded = 6,297 cf x 40.0% Voids |
| #2A | 16.85' | 3,388 cf | ADS_StormTech MC-3500 d +Capx 30 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 30 Chambers in 3 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf |
| | | 5.907 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 17.00' | 12.0" Round Culvert |
| | | | L= 220.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 17.00' / 14.80' S= 0.0100 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 21.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 20.00' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 16.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.10 cfs @ 9.84 hrs HW=16.16' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.07 cfs @ 13.77 hrs HW=20.15' (Free Discharge) -**1=Culvert** (Passes 0.07 cfs of 4.84 cfs potential flow) -2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 0.07 cfs @ 1.31 fps)

Pond A1-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= $77.0^{\circ}W \times 45.0^{\circ}H \times 7.50^{\circ}L$ with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

10 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 75.40' Row Length +12.0" End Stone x 2 = 77.40' Base Length 3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

30 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,388.0 cf Chamber Storage

9,684.7 cf Field - 3,388.0 cf Chambers = 6,296.7 cf Stone x 40.0% Voids = 2,518.7 cf Stone Storage

Chamber Storage + Stone Storage = 5,906.6 cf = 0.136 afOverall Storage Efficiency = 61.0%Overall System Size = $77.40' \times 22.75' \times 5.50'$

30 Chambers 358.7 cy Field 233.2 cy Stone





193187-CV01-HYD-PR

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Summary for Pond A2-P: CHAMBERS

| Inflow Area | a = | 51,199 sf, | 87.50% Impervious, | Inflow Depth > 3.76" | for 10-Year, 24-Hour Storm event |
|-------------|-----|------------|--------------------|----------------------|----------------------------------|
| Inflow | = | 4.88 cfs @ | 12.09 hrs, Volume= | 16,036 cf | |
| Outflow | = | 0.59 cfs @ | 12.68 hrs, Volume= | 12,324 cf, Atte | en= 88%, Lag= 35.9 min |
| Discarded | = | 0.17 cfs @ | 10.08 hrs, Volume= | 10,099 cf | - |
| Primary | = | 0.42 cfs @ | 12.68 hrs, Volume= | 2,225 cf | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 18.27' @ 12.68 hrs Surf.Area= 3,136 sf Storage= 7,210 cf

Plug-Flow detention time= 226.1 min calculated for 12,304 cf (77% of inflow) Center-of-Mass det. time= 145.1 min (928.2 - 783.1)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 15.00' | 4,421 cf | 37.08'W x 84.57'L x 5.50'H Field A |
| | | | 17,249 cf Overall - 6,196 cf Embedded = 11,052 cf x 40.0% Voids |
| #2A | 15.75' | 6,196 cf | ADS_StormTech MC-3500 d +Cap x 55 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 55 Chambers in 5 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf |
| | | 10.617 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 16.00' | 12.0" Round Culvert |
| | - | | L= 21.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 16.00' / 15.50' S= 0.0238 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 20.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Discarded | 15.00' | 2.410 in/hr Exfiltration over Surface area |
| #4 | Device 1 | 17.90' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.17 cfs @ 10.08 hrs HW=15.06' (Free Discharge) **3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.42 cfs @ 12.68 hrs HW=18.27' (Free Discharge) -1=Culvert (Passes 0.42 cfs of 5.04 cfs potential flow) -2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-4=Orifice/Grate (Orifice Controls 0.42 cfs @ 2.08 fps)

Pond A2-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Effective Size= $70.4^{\circ}W \times 45.0^{\circ}H \Rightarrow 15.33$ sf $\times 7.17L = 110.0$ cf Overall Size= $77.0^{\circ}W \times 45.0^{\circ}H \times 7.50^{\circ}L$ with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

11 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 82.57' Row Length +12.0" End Stone x 2 = 84.57' Base Length 5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

55 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 6,196.4 cf Chamber Storage

17,248.8 cf Field - 6,196.4 cf Chambers = 11,052.4 cf Stone x 40.0% Voids = 4,421.0 cf Stone Storage

Chamber Storage + Stone Storage = 10,617.3 cf = 0.244 af Overall Storage Efficiency = 61.6% Overall System Size = 84.57' x 37.08' x 5.50'

55 Chambers 638.8 cy Field 409.3 cy Stone





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Summary for Pond A3-P: CHAMBERS

| Inflow Area | a = | 6,309 sf, | 71.93% Imper | vious, I | Inflow Depth > | 2.99" | for 10- | Year, 24 | -Hour Stor | rm event |
|-------------|-----|------------|-----------------|----------|----------------|----------|---------|----------|------------|----------|
| Inflow | = | 0.50 cfs @ | 12.09 hrs, Volu | ıme= | 1,574 c | f | | | | |
| Outflow | = | 0.39 cfs @ | 12.16 hrs, Volu | ıme= | 1,573 c | f, Atten | = 22%, | Lag= 4.4 | 4 min | |
| Discarded | = | 0.02 cfs @ | 10.80 hrs, Volu | ıme= | 962 c | f | | - | | |
| Primary | = | 0.37 cfs @ | 12.16 hrs, Volu | ıme= | 611 c | f | | | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 14.66' @ 12.16 hrs Surf.Area= 353 sf Storage= 345 cf

Plug-Flow detention time= 78.5 min calculated for 1,573 cf (100% of inflow) Center-of-Mass det. time= 77.9 min (890.4 - 812.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 13.10' | 347 cf | 11.00'W x 32.10'L x 3.50'H Field A |
| | | | 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids |
| #2A | 13.60' | 368 cf | ADS_StormTech SC-740 +Cap x 8 Inside #1 |
| | | | Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf |
| | | | Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap |
| | | | 8 Chambers in 2 Rows |
| | | 715 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 13.00' | 12.0" Round Culvert |
| | 2 | | L= 9.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 13.00' / 12.90' S= 0.0111 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 15.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 14.25' | 6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 13.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.02 cfs @ 10.80 hrs HW=13.14' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.37 cfs @ 12.16 hrs HW=14.66' (Free Discharge)

1=Culvert (Passes 0.37 cfs of 4.07 cfs potential flow)

-2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 0.37 cfs @ 2.17 fps)

Pond A3-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10'Base Length 2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af Overall Storage Efficiency = 57.8% Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers 45.8 cy Field 32.2 cy Stone





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Summary for Link 1L: Manhole

[62] Hint: Exceeded Reach 2R OUTLET depth by 1.00' @ 0.00 hrs

| Inflow | Area = | = | 251,782 sf, | 47.30% Impervious, | Inflow Depth > 0.98" | for 10-Year, 24-Hour Storm event |
|--------|--------|---|-------------|--------------------|----------------------|----------------------------------|
| Inflow | = | | 3.69 cfs @ | 12.37 hrs, Volume= | 20,503 cf | |
| Primar | ту = | | 3.69 cfs @ | 12.37 hrs, Volume= | 20,503 cf, Atter | n= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs



Link 1L: Manhole

Summary for Link 4L: Manhole

| Inflow A | \rea = | 258,091 sf, 47.90% Impervious, | Inflow Depth > 0.98" | for 10-Year, 24-Hour Storm event |
|----------|--------|--------------------------------|----------------------|----------------------------------|
| Inflow | = | 3.88 cfs @ 12.37 hrs, Volume= | 21,106 cf | |
| Primary | / = | 3.88 cfs @ 12.37 hrs, Volume= | 21,106 cf, Atter | n= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs



Link 4L: Manhole
Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow A | Area = | 290,214 sf, 45.01% Impervious | s, Inflow Depth > 0.99" | for 10-Year, 24-Hour Storm event |
|----------|--------|-------------------------------|-------------------------|----------------------------------|
| Inflow | = | 4.21 cfs @ 12.37 hrs, Volume= | = 24,028 cf | |
| Primar | y = | 4.21 cfs @ 12.37 hrs, Volume= | = 24,028 cf, Atter | n= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM



193187-CV01-HYD-PR Prepared by CEC, Inc.

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| SubcatchmentA1-OFF: A1-OFF Flow Length=210 | Runoff Area=128,117 sf 36.91% Impervious Runoff Depth>2.07" Slope=0.0500 '/' Tc=17.3 min CN=66 Runoff=4.94 cfs 22,079 cf |
|---|--|
| SubcatchmentA10-PR: A10-PR | Runoff Area=19,711 sf 83.95% Impervious Runoff Depth>4.36" Tc=6.0 min CN=90 Runoff=2.20 cfs 7,156 cf |
| SubcatchmentA11-PR: A7-PR | Runoff Area=6,482 sf 3.70% Impervious Runoff Depth>0.78" Tc=6.0 min CN=48 Runoff=0.09 cfs 423 cf |
| SubcatchmentA12-PR: A12-PR | Runoff Area=6,309 sf 71.93% Impervious Runoff Depth>3.73" Tc=6.0 min CN=84 Runoff=0.62 cfs 1,960 cf |
| SubcatchmentA2-PR: A2-PR | Runoff Area=17,558 sf 79.08% Impervious Runoff Depth>4.14" Tc=6.0 min CN=88 Runoff=1.89 cfs 6,061 cf |
| SubcatchmentA3-PR: A3-PR | Runoff Area=24,198 sf 86.63% Impervious Runoff Depth>4.47" Tc=6.0 min CN=91 Runoff=2.74 cfs 9,004 cf |
| SubcatchmentA4-OFF: A4-OFF Flow Length=50 | Runoff Area=8,837 sf 0.00% Impervious Runoff Depth>1.91" D' Slope=0.0300 '/' Tc=12.0 min CN=64 Runoff=0.36 cfs 1,406 cf |
| SubcatchmentA5-PR: A5-PR | Runoff Area=33,865 sf 2.70% Impervious Runoff Depth>0.45" Flow Length=295' Tc=17.2 min CN=42 Runoff=0.13 cfs 1,269 cf |
| SubcatchmentA6-PR: A6-PR | Runoff Area=12,206 sf 100.00% Impervious Runoff Depth>5.26" Tc=6.0 min CN=98 Runoff=1.50 cfs 5,349 cf |
| SubcatchmentA7-PR: A7-PR | Runoff Area=12,418 sf 54.38% Impervious Runoff Depth>2.95" Tc=6.0 min CN=76 Runoff=0.98 cfs 3,053 cf |
| SubcatchmentA8-PR: A8-PR | Runoff Area=7,290 sf 100.00% Impervious Runoff Depth>5.26" Tc=6.0 min CN=98 Runoff=0.89 cfs 3,195 cf |
| SubcatchmentA9-PR: A9-PR | Runoff Area=13,223 sf 0.00% Impervious Runoff Depth>0.50" Flow Length=295' Tc=20.6 min CN=43 Runoff=0.06 cfs 550 cf |
| Reach 1R: Routing n=0.016 L=3 | Avg. Flow Depth=0.02' Max Vel=1.55 fps Inflow=0.36 cfs 1,406 cf 542.0' S=0.0609 '/' Capacity=917.83 cfs Outflow=0.31 cfs 1,400 cf |
| Reach 2R: Routing 18.0" Round Pipe n=0.012 L= | Avg. Flow Depth=0.23' Max Vel=3.37 fps Inflow=0.58 cfs 1,899 cf =200.0' S=0.0100 '/' Capacity=11.38 cfs Outflow=0.57 cfs 1,899 cf |
| Reach 3R: Routing n=0.016 L | Avg. Flow Depth=0.03' Max Vel=1.34 fps Inflow=0.09 cfs 423 cf =400.0' S=0.0500 '/' Capacity=102.34 cfs Outflow=0.07 cfs 420 cf |
| Reach 5R: Routing A 18.0" Round Pipe n=0.012 L=2 | Nyg. Flow Depth=0.51' Max Vel=11.90 fps Inflow=6.23 cfs 31,304 cf 200.0' S=0.0500 '/' Capacity=25.45 cfs Outflow=6.23 cfs 31,296 cf |

| 193187-CV01-HYD-PF | Type III 24-hr 25-Year, 24-Hour Storm Rain | nfall=5.50" |
|---------------------------|--|-------------|
| Prepared by CEC, Inc. | Printed | 7/20/2020 |
| HydroCAD® 10.10-3a s/n 10 | 0498 © 2020 HydroCAD Software Solutions LLC | Page 73 |
| | | |
| Reach 6R: Routing | Avg. Flow Depth=0.52' Max Vel=12.02 fps Inflow=6.47 cfs | 32,198 cf |
| 18.0" Round Pi | pe n=0.012 L=50.0' S=0.0500 '/' Capacity=25.45 cfs Outflow=6.47 cfs | 32,196 cf |
| | | |
| Reach 7R: Routing | Avg. Flow Depth=0.09' Max Vel=3.82 fps Inflow=4.94 cfs | 22,079 cf |
| | n=0.016 L=618.0' S=0.0615 '/' Capacity=922.36 cfs Outflow=4.84 cfs | 22,001 cf |
| | Deals Flave-20 451 Starsan-5 004 of Juffave-2 20 of | 11 110 of |
| Pond A1-P: CHAMBERS | Peak Elev=20.45 Storage=5,094 cl Inflow=3.38 cls | 11,410 Cl |
| | | 6 7,900 CI |
| Pond A2-P: CHAMBERS | Peak Elev=18.69' Storage=8.066 cf Inflow=5.83 cfs | 19 355 cf |
| Di | iscarded=0.17 cfs 10.479 cf Primary=1.13 cfs 4.737 cf Outflow=1.31 cfs | 15.216 cf |
| | | |
| Pond A3-P: CHAMBERS | Peak Elev=14.78' Storage=375 cf Inflow=0.62 cfs | s 1,960 cf |
| | Discarded=0.02 cfs 1,056 cf Primary=0.50 cfs 902 cf Outflow=0.52 cfs | 1,958 cf |
| | | |
| Link 1L: Manhole | Inflow=6.23 cfs | 31,304 cf |
| | Primary=6.23 cfs | 31,304 cf |
| Link (L. Manhala | Inflation 47 afe | 22.400 of |
| LINK 4L: Mannole | Intiow=6.47 cfs | 32,198 CT |
| | Primary=6.47 cis | 32, 198 CI |
| | - EXISTING MUNICIPAL DRAINAGESYSTEM | 36 219 cf |
| | Primary=6.95 cfs | 36 219 cf |
| | | 23,210 01 |
| | | |

Total Runoff Area = 290,214 sf Runoff Volume = 61,505 cf Average Runoff Depth = 2.54" 54.99% Pervious = 159,586 sf 45.01% Impervious = 130,628 sf

Summary for Subcatchment A1-OFF: A1-OFF

Runoff 4.94 cfs @ 12.25 hrs, Volume= 22,079 cf, Depth> 2.07" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description | | |
|-------|----------|--------|----------------|--------------|---|
| | 13,269 | 98 | Roofs, HSC | θA | |
| | 34,025 | 98 | Paved park | ing, HSG A | N |
| | 28,415 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A |
| | 49,447 | 43 | Woods/gras | ss comb., F | air, HSG A |
| | 2,961 | 96 | Gravel surface | ace, HSG A | A |
| 1 | 28,117 | 66 | Weighted A | verage | |
| | 80,823 | | 63.09% Per | rvious Area | |
| | 47,294 | | 36.91% Imp | pervious Ar | ea |
| | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 2.4 | 160 | 0.0500 | 0 1.12 | | Shallow Concentrated Flow, shallow conc. flow |
| | | | | | Woodland Kv= 5.0 fps |
| 17.3 | 210 | Total | | | |

Subcatchment A1-OFF: A1-OFF



Summary for Subcatchment A10-PR: A10-PR

Runoff 2.20 cfs @ 12.09 hrs, Volume= 7,156 cf, Depth> 4.36" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| Ar | ea (sf) | CN | Description | l | | |
|-------|---------|-------|-------------|--------------|-------------------------|--|
| | 4,128 | 98 | Roofs, HSC | ΞA | | |
| | 12,420 | 98 | Paved park | ing, HSG A | L . | |
| | 3,163 | 49 | 50-75% Gr | ass cover, F | ⁻ air, HSG A | |
| | 0 | 36 | Woods, Fa | ir, HSG A | | |
| | 0 | 96 | Gravel surf | ace, HSG A | ١ | |
| | 19,711 | 90 | Weighted A | verage | | |
| | 3,163 | | 16.05% Pe | rvious Area | | |
| | 16,548 | | 83.95% Im | pervious Are | ea | |
| | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A10-PR: A10-PR



Summary for Subcatchment A11-PR: A7-PR

Runoff 0.09 cfs @ 12.13 hrs, Volume= 423 cf, Depth> 0.78" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description | | | |
|-------|----------|--------------------------|--------------|--------------|-------------------------|--|
| | 0 | 98 | Roofs, HSC | θA | | |
| | 240 | 98 | Paved park | ing, HSG A | ١ | |
| | 5,070 | 49 | 50-75% Gra | ass cover, F | ⁻ air, HSG A | |
| | 1,172 | 36 | Woods, Fai | ir, HSG A | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | A | |
| | 6,482 | 48 | Weighted A | verage | | |
| | 6,242 | | 96.30% Pe | rvious Area | | |
| | 240 | 40 3.70% Impervious Area | | | | |
| | | | | | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A11-PR: A7-PR



Summary for Subcatchment A12-PR: A12-PR

Runoff 0.62 cfs @ 12.09 hrs, Volume= 1,960 cf, Depth> 3.73" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description | | | |
|-------|----------|-----------------------------|-------------|--------------|--|--|
| | 260 | 98 | Roofs, HSC | θA | | |
| | 4,278 | 98 | Paved park | ing, HSG A | L Contraction of the second seco | |
| | 1,771 | 49 | 50-75% Gra | ass cover, F | ⁻ air, HSG A | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | |
| | 0 | 96 | Gravel surf | ace, HSG A | ١ | |
| | 6,309 | 84 | Weighted A | verage | | |
| | 1,771 | 1,771 28.07% Pervious Area | | | | |
| | 4,538 | ,538 71.93% Impervious Area | | | | |
| | | | | | | |
| Tc | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A12-PR: A12-PR



Summary for Subcatchment A2-PR: A2-PR

Runoff 1.89 cfs @ 12.09 hrs, Volume= 6,061 cf, Depth> 4.14" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"



Summary for Subcatchment A3-PR: A3-PR

Runoff 2.74 cfs @ 12.09 hrs, Volume= 9,004 cf, Depth> 4.47" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"



Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.36 cfs @ 12.18 hrs, Volume= 1,406 cf, Depth> 1.91" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| | Ai | rea (sf) | CN | Description | | |
|---|-------|----------|---------|--------------|--------------|--|
| | | 0 | 98 | Roofs, HSC | θA | |
| | | 0 | 98 | Paved park | ing, HSG A | N |
| | | 0 | 49 | 50-75% Gra | ass cover, l | Fair, HSG A |
| | | 4,743 | 36 | Woods, Fai | r, HSG A | |
| | | 4,094 | 96 | Gravel surfa | ace, HSG A | A |
| | | 8,837 | 64 | Weighted A | verage | |
| | | 8,837 | | 100.00% P | ervious Are | a |
| | | | | | | |
| | Тс | Length | Slope | e Velocity | Capacity | Description |
| (| (min) | (feet) | (ft/ft) |) (ft/sec) | (cfs) | |
| | 3.2 | 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW |
| | | | | | | Grass: Short n= 0.150 P2= 3.20" |
| | 8.8 | 20 | 0.0300 | 0.04 | | Sheet Flow, |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| | 12.0 | 50 | Total | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-PR: A5-PR

Runoff 0.13 cfs @ 12.49 hrs, Volume= 1,269 cf, Depth> 0.45" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| | A | rea (sf) | CN | Description | | | | |
|----|-----|----------|--------|-------------------------|--------------|--|--|--|
| | | 0 | 98 | Roofs, HSC | βA | | | |
| | | 913 | 98 | 98 Paved parking, HSG A | | | | |
| | | 10,323 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | |
| | | 22,629 | 36 | Woods, Fai | r, HSG A | | | |
| | | 0 | 96 | Gravel surfa | ace, HSG A | Ν | | |
| | | 33,865 | 42 | Weighted A | verage | | | |
| | | 32,952 | | 97.30% Per | rvious Area | | | |
| | | 913 | | 2.70% Impe | ervious Area | a | | |
| | | | | | | | | |
| | Тс | Length | Slope | e Velocity | Capacity | Description | | |
| (m | in) | (feet) | (ft/ft |) (ft/sec) | (cfs) | | | |
| 14 | 1.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW | | |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | |
| | 1.7 | 100 | 0.1600 | 0 1.00 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | |
| | | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | |
| (|).6 | 145 | 0.0700 |) 4.26 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | |
| | | | | | | Unpaved Kv= 16.1 fps | | |
| 17 | 7.2 | 295 | Total | | | | | |

Subcatchment A5-PR: A5-PR



Summary for Subcatchment A6-PR: A6-PR

Runoff 1.50 cfs @ 12.08 hrs, Volume= 5,349 cf, Depth> 5.26" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| Area (sf) | CN | Description | | | |
|--------------|-------|--------------|--------------|-----------------------------|--|
| 0 | 98 | Paved parki | ng, HSG A | | |
| 12,206 | 98 | Roofs, HSG | Ā | | |
| 0 | 96 | Gravel surfa | ace, HSG A | N N | |
| 0 | 36 | Woods, Fair | r, HSG A | | |
| 0 | 49 | 50-75% Gra | iss cover, F | Fair, HSG A | |
| 12,206 | 98 | Weighted A | verage | | |
| 12,206 | | 100.00% Im | pervious A | rea | |
| | | | | | |
| Tc Length | Slop | be Velocity | Capacity | Description | |
| (min) (feet) | (ft/1 | ft) (ft/sec) | (cfs) | | |
| 6.0 | | | | Direct Entry, DIRECT 18 MIN | |
| | | | | - | |

Subcatchment A6-PR: A6-PR



Summary for Subcatchment A7-PR: A7-PR

Runoff 0.98 cfs @ 12.09 hrs, Volume= 3,053 cf, Depth> 2.95" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| Ar | rea (sf) | CN | Description | | | |
|-------|----------|------------------------------|-------------|--------------|-------------------------|--|
| | 4,590 | 98 | Roofs, HSC | θA | | |
| | 2,163 | 98 | Paved park | ing, HSG A | ١ | |
| | 5,665 | 49 | 50-75% Gra | ass cover, F | ⁻ air, HSG A | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | |
| | 0 | 96 | Gravel surf | ace, HSG A | 4 | |
| | 12,418 | 76 | Weighted A | verage | | |
| | 5,665 | | 45.62% Pe | rvious Area | | |
| | 6,753 | 6,753 54.38% Impervious Area | | | | |
| Тс | Length | Slor | e Velocity | Canacity | Description | |
| (min) | (foot) | | | (cfs) | Description | |
| | | (11) | | (015) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A7-PR: A7-PR



Summary for Subcatchment A8-PR: A8-PR

Runoff 0.89 cfs @ 12.08 hrs, Volume= = 3,195 cf, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| A | rea (sf) | CN | Description |
|-------|----------|-------|---------------------------------|
| | 7,290 | 98 | Roofs, HSG A |
| | 0 | 98 | Paved parking, HSG A |
| | 0 | 49 | 50-75% Grass cover, Fair, HSG A |
| | 0 | 36 | Woods, Fair, HSG A |
| | 0 | 96 | Gravel surface, HSG A |
| | 7,290 | 98 | Weighted Average |
| | 7,290 | | 100.00% Impervious Area |
| | | | |
| Тс | Length | Slop | e Velocity Capacity Description |
| (min) | (feet) | (ft/f | t) (ft/sec) (cfs) |
| 6.0 | | | Direct Entry, |

Subcatchment A8-PR: A8-PR



Summary for Subcatchment A9-PR: A9-PR

Runoff 0.06 cfs @ 12.52 hrs, Volume= 550 cf, Depth> 0.50" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 25-Year, 24-Hour Storm Rainfall=5.50"

| | Ai | rea (sf) | CN [| Description | | |
|---|-------|----------|---------|--------------|--------------|---|
| | | 0 | 98 F | Roofs, HSC | βA | |
| | | 0 | 98 F | Paved park | ing, HSG A | N Contraction of the second |
| | | 7,203 | 49 5 | 50-75% Gra | ass cover, F | Fair, HSG A |
| | | 6,020 | 36 V | Voods, Fai | r, HSG A | |
| _ | | 0 | 96 (| Gravel surfa | ace, HSG A | A |
| | | 13,223 | 43 V | Veighted A | verage | |
| | | 13,223 | 1 | 100.00% P | ervious Are | а |
| | | | | | | |
| | Тс | Length | Slope | Velocity | Capacity | Description |
| | (min) | (feet) | (ft/ft) | (ft/sec) | (cfs) | |
| | 18.3 | 50 | 0.0300 | 0.05 | | Sheet Flow, SHEET FLOW |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| | 1.7 | 100 | 0.1600 | 1.00 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| | | | | | | Forest w/Heavy Litter Kv= 2.5 fps |
| | 0.6 | 145 | 0.0700 | 4.26 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| _ | | | | | | Unpaved Kv= 16.1 fps |
| | | | | | | |

20.6 295 Total

Subcatchment A9-PR: A9-PR



Summary for Reach 1R: Routing



Summary for Reach 2R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 29,764 sf, 87.66% Impervious, Inflow Depth = 0.77" for 25-Year, 24-Hour Storm event

 Inflow =
 0.58 cfs @ 12.52 hrs, Volume=
 1,899 cf

 Outflow =
 0.57 cfs @ 12.55 hrs, Volume=
 1,899 cf, Atten= 2%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 3.37 fps, Min. Travel Time= 1.0 min Avg. Velocity = 1.74 fps, Avg. Travel Time= 1.9 min

Peak Storage= 34 cf @ 12.53 hrs Average Depth at Peak Storage= 0.23', Surface Width= 1.08' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0100 '/' Inlet Invert= 1.00', Outlet Invert= -1.00'





Reach 2R: Routing

Summary for Reach 3R: Routing

Inflow Area = 6,482 sf, 3.70% Impervious, Inflow Depth > 0.78" for 25-Year, 24-Hour Storm event Inflow 0.09 cfs @ 12.13 hrs, Volume= 423 cf = Outflow 0.07 cfs @ 12.30 hrs, Volume= 420 cf, Atten= 18%, Lag= 10.2 min =

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 1.34 fps, Min. Travel Time= 5.0 min Avg. Velocity = 0.76 fps, Avg. Travel Time= 8.7 min

Peak Storage= 21 cf @ 12.21 hrs Average Depth at Peak Storage= 0.03', Surface Width= 3.27' Bank-Full Depth= 0.50' Flow Area= 12.5 sf, Capacity= 102.34 cfs

0.00' x 0.50' deep channel, n= 0.016 Side Slope Z-value= 0.0 100.0 '/' Top Width= 50.00' Length= 400.0' Slope= 0.0500 '/' Inlet Invert= 20.00', Outlet Invert= 0.00'





Summary for Reach 5R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 251,782 sf, 47.30% Impervious, Inflow Depth > 1.49" for 25-Year, 24-Hour Storm event

 Inflow =
 6.23 cfs @ 12.37 hrs, Volume=
 31,304 cf

 Outflow =
 6.23 cfs @ 12.37 hrs, Volume=
 31,296 cf, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 11.90 fps, Min. Travel Time= 0.3 min Avg. Velocity = 5.13 fps, Avg. Travel Time= 0.6 min

Peak Storage= 105 cf @ 12.37 hrs Average Depth at Peak Storage= 0.51', Surface Width= 1.42' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0500 '/' Inlet Invert= 10.00', Outlet Invert= 0.00'





Reach 5R: Routing

Summary for Reach 6R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 258,091 sf, 47.90% Impervious, Inflow Depth > 1.50" for 25-Year, 24-Hour Storm event

 Inflow =
 6.47 cfs @ 12.37 hrs, Volume=
 32,198 cf

 Outflow =
 6.47 cfs @ 12.37 hrs, Volume=
 32,196 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 12.02 fps, Min. Travel Time= 0.1 min Avg. Velocity = 5.15 fps, Avg. Travel Time= 0.2 min

Peak Storage= 27 cf @ 12.37 hrs Average Depth at Peak Storage= 0.52', Surface Width= 1.42' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 50.0' Slope= 0.0500 '/' Inlet Invert= 2.50', Outlet Invert= 0.00'





Reach 6R: Routing

Summary for Reach 7R: Routing



Summary for Pond A1-P: CHAMBERS

| Inflow Area | a = | 29,764 sf, | 87.66% Impervious, | Inflow Depth > 4.60" | for 25-Year, 24-Hour Storm event |
|-------------|-----|------------|--------------------|----------------------|----------------------------------|
| Inflow | = | 3.38 cfs @ | 12.09 hrs, Volume= | 11,410 cf | |
| Outflow | = | 0.67 cfs @ | 12.52 hrs, Volume= | 7,966 cf, Atten | i= 80%, Lag= 26.1 min |
| Discarded | = | 0.10 cfs @ | 9.28 hrs, Volume= | 6,067 cf | - |
| Primary | = | 0.58 cfs @ | 12.52 hrs, Volume= | 1,899 cf | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 20.45' @ 12.52 hrs Surf.Area= 1,761 sf Storage= 5,094 cf

Plug-Flow detention time= 212.1 min calculated for 7,953 cf (70% of inflow) Center-of-Mass det. time= 118.8 min (890.3 - 771.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 16.10' | 2,519 cf | 22.75'W x 77.40'L x 5.50'H Field A |
| | | | 9,685 cf Overall - 3,388 cf Embedded = 6,297 cf x 40.0% Voids |
| #2A | 16.85' | 3,388 cf | ADS_StormTech MC-3500 d +Capx 30 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 30 Chambers in 3 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf |
| | | 5.907 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 17.00' | 12.0" Round Culvert |
| | | | L= 220.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 17.00' / 14.80' S= 0.0100 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 21.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 20.00' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 16.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.10 cfs @ 9.28 hrs HW=16.16' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.58 cfs @ 12.52 hrs HW=20.45' (Free Discharge) -1=Culvert (Passes 0.58 cfs of 5.00 cfs potential flow) -2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 0.58 cfs @ 2.29 fps)

Pond A1-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= $77.0^{\circ}W \times 45.0^{\circ}H \times 7.50^{\circ}L$ with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

10 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 75.40' Row Length +12.0" End Stone x 2 = 77.40' Base Length 3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

30 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,388.0 cf Chamber Storage

9,684.7 cf Field - 3,388.0 cf Chambers = 6,296.7 cf Stone x 40.0% Voids = 2,518.7 cf Stone Storage

Chamber Storage + Stone Storage = 5,906.6 cf = 0.136 afOverall Storage Efficiency = 61.0%Overall System Size = $77.40' \times 22.75' \times 5.50'$

30 Chambers 358.7 cy Field 233.2 cy Stone





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Pond A1-P: CHAMBERS

Summary for Pond A2-P: CHAMBERS

| Inflow Area | a = | 51,199 sf, | 87.50% Imp | ervious, | Inflow Depth > | 4.54" | for 25- | Year, 24 | 4-Hour Storm eve | ent |
|-------------|-----|------------|--------------|----------|----------------|----------|---------|----------|------------------|-----|
| Inflow | = | 5.83 cfs @ | 12.09 hrs, V | olume= | 19,355 c | f | | | | |
| Outflow | = | 1.31 cfs @ | 12.49 hrs, V | olume= | 15,216 c | f, Atten | = 78%, | Lag= 24 | 4.3 min | |
| Discarded | = | 0.17 cfs @ | 9.48 hrs, V | /olume= | 10,479 c | f | | • | | |
| Primary | = | 1.13 cfs @ | 12.49 hrs, V | ′olume= | 4,737 c | f | | | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 18.69' @ 12.49 hrs Surf.Area= 3,136 sf Storage= 8,066 cf

Plug-Flow detention time= 191.2 min calculated for 15,191 cf (78% of inflow) Center-of-Mass det. time= 113.6 min (892.2 - 778.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 15.00' | 4,421 cf | 37.08'W x 84.57'L x 5.50'H Field A |
| | | | 17,249 cf Overall - 6,196 cf Embedded = 11,052 cf x 40.0% Voids |
| #2A | 15.75' | 6,196 cf | ADS_StormTech MC-3500 d +Cap x 55 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 55 Chambers in 5 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf |
| | | 10,617 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 16.00' | 12.0" Round Culvert |
| | | | L= 21.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 16.00' / 15.50' S= 0.0238 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 20.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Discarded | 15.00' | 2.410 in/hr Exfiltration over Surface area |
| #4 | Device 1 | 17.90' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.17 cfs @ 9.48 hrs HW=15.06' (Free Discharge) **Galaxies** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=1.13 cfs @ 12.49 hrs HW=18.69' (Free Discharge) -1=Culvert (Passes 1.13 cfs of 5.59 cfs potential flow) -2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-4=Orifice/Grate (Orifice Controls 1.13 cfs @ 3.24 fps)

Pond A2-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Effective Size= $70.4^{\circ}W \times 45.0^{\circ}H \Rightarrow 15.33$ sf $\times 7.17L = 110.0$ cf Overall Size= $77.0^{\circ}W \times 45.0^{\circ}H \times 7.50^{\circ}L$ with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

11 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 82.57' Row Length +12.0" End Stone x 2 = 84.57' Base Length 5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

55 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 6,196.4 cf Chamber Storage

17,248.8 cf Field - 6,196.4 cf Chambers = 11,052.4 cf Stone x 40.0% Voids = 4,421.0 cf Stone Storage

Chamber Storage + Stone Storage = 10,617.3 cf = 0.244 af Overall Storage Efficiency = 61.6% Overall System Size = 84.57' x 37.08' x 5.50'

55 Chambers 638.8 cy Field 409.3 cy Stone





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Pond A2-P: CHAMBERS

Summary for Pond A3-P: CHAMBERS

| 6,309 sf, 71 | 1.93% Impervious, | Inflow Depth > 3.73" | for 25-Year, 24-Hour Storm event |
|----------------|---|--|--|
| 0.62 cfs @ 12. | .09 hrs, Volume= | 1,960 cf | |
| 0.52 cfs @ 12. | .14 hrs, Volume= | 1,958 cf, Atte | n= 16%, Lag= 3.3 min |
| 0.02 cfs @ 10. | .32 hrs, Volume= | 1,056 cf | |
| 0.50 cfs @ 12. | .14 hrs, Volume= | 902 cf | |
| (| 6,309 sf, 7 0.62 cfs @ 12 0.52 cfs @ 12 0.02 cfs @ 10 0.50 cfs @ 12 | 6,309 sf, 71.93% Impervious, 0.62 cfs @ 12.09 hrs, Volume= 0.52 cfs @ 12.14 hrs, Volume= 0.02 cfs @ 10.32 hrs, Volume= 0.50 cfs @ 12.14 hrs, Volume= | 6,309 sf, 71.93% Impervious, Inflow Depth > 3.73" 0.62 cfs @ 12.09 hrs, Volume= 1,960 cf 0.52 cfs @ 12.14 hrs, Volume= 1,958 cf, Attel 0.02 cfs @ 10.32 hrs, Volume= 1,056 cf 0.50 cfs @ 12.14 hrs, Volume= 902 cf |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 14.78' @ 12.14 hrs Surf.Area= 353 sf Storage= 375 cf

Plug-Flow detention time= 71.9 min calculated for 1,958 cf (100% of inflow) Center-of-Mass det. time= 71.4 min (877.6 - 806.3)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 13.10' | 347 cf | 11.00'W x 32.10'L x 3.50'H Field A |
| | | | 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids |
| #2A | 13.60' | 368 cf | ADS_StormTech SC-740 +Cap x 8 Inside #1 |
| | | | Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf |
| | | | Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap |
| | | | 8 Chambers in 2 Rows |
| | | 715 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 13.00' | 12.0" Round Culvert |
| | - | | L= 9.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 13.00' / 12.90' S= 0.0111 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 15.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 14.25' | 6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 13.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.02 cfs @ 10.32 hrs HW=13.14' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.49 cfs @ 12.14 hrs HW=14.77' (Free Discharge) **1=Culvert** (Passes 0.49 cfs of 4.27 cfs potential flow)

-2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 0.49 cfs @ 2.51 fps)

Pond A3-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10'Base Length 2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

.

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af Overall Storage Efficiency = 57.8% Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers 45.8 cy Field 32.2 cy Stone





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Pond A3-P: CHAMBERS

Summary for Link 1L: Manhole

[62] Hint: Exceeded Reach 2R OUTLET depth by 1.00' @ 0.00 hrs

| Inflow . | Area = | = | 251,782 sf, | 47.30% Impervious | , Inflow Depth > 1.49" | for 25-Year, 24-Hour Storm event |
|----------|--------|---|-------------|--------------------|------------------------|----------------------------------|
| Inflow | = | : | 6.23 cfs @ | 12.37 hrs, Volume= | 31,304 cf | |
| Primar | y = | : | 6.23 cfs @ | 12.37 hrs, Volume= | 31,304 cf, Atter | n= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs



Link 1L: Manhole

Summary for Link 4L: Manhole

| Inflow Are | a = | 258,091 sf, | 47.90% Impervious, | Inflow Depth > 1.50 | " for 25-Year, 24-Hour Storm event |
|------------|-----|-------------|--------------------|---------------------|------------------------------------|
| Inflow | = | 6.47 cfs @ | 12.37 hrs, Volume= | 32,198 cf | |
| Primary | = | 6.47 cfs @ | 12.37 hrs, Volume= | 32,198 cf, Att | ten= 0%, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs



Link 4L: Manhole

Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow A | Area = | 290,214 sf, 45.01% Impervie | ous, Inflow Depth > 1.50" for 25-Year, 24-Hour | Storm event |
|----------|--------|-----------------------------|--|-------------|
| Inflow | = | 6.95 cfs @ 12.36 hrs, Volum | ne= 36,219 cf | |
| Primar | y = | 6.95 cfs @ 12.36 hrs, Volum | ne= 36,219 cf, Atten= 0%, Lag= 0.0 min | |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM



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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

| SubcatchmentA1-OFF: A1-OFF Flow Length=210 | Runoff Area=128,117 sf 36.91% Impervious Runoff Depth>2.96" V Slope=0.0500 '/' Tc=17.3 min CN=66 Runoff=7.22 cfs 31,597 cf |
|---|---|
| SubcatchmentA10-PR: A10-PR | Runoff Area=19,711 sf 83.95% Impervious Runoff Depth>5.53" Tc=6.0 min CN=90 Runoff=2.75 cfs 9,076 cf |
| SubcatchmentA11-PR: A7-PR | Runoff Area=6,482 sf 3.70% Impervious Runoff Depth>1.34" Tc=6.0 min CN=48 Runoff=0.19 cfs 721 cf |
| SubcatchmentA12-PR: A12-PR | Runoff Area=6,309 sf 71.93% Impervious Runoff Depth>4.85" Tc=6.0 min CN=84 Runoff=0.80 cfs 2,551 cf |
| SubcatchmentA2-PR: A2-PR | Runoff Area=17,558 sf 79.08% Impervious Runoff Depth>5.30" Tc=6.0 min CN=88 Runoff=2.38 cfs 7,752 cf |
| SubcatchmentA3-PR: A3-PR | Runoff Area=24,198 sf 86.63% Impervious Runoff Depth>5.64" Tc=6.0 min CN=91 Runoff=3.42 cfs 11,372 cf |
| SubcatchmentA4-OFF: A4-OFF Flow Length=5 | Runoff Area=8,837 sf 0.00% Impervious Runoff Depth>2.77" 50' Slope=0.0300 '/' Tc=12.0 min CN=64 Runoff=0.53 cfs 2,038 cf |
| SubcatchmentA5-PR: A5-PR | Runoff Area=33,865 sf 2.70% Impervious Runoff Depth>0.87" Flow Length=295' Tc=17.2 min CN=42 Runoff=0.35 cfs 2,450 cf |
| SubcatchmentA6-PR: A6-PR | Runoff Area=12,206 sf 100.00% Impervious Runoff Depth>6.46" Tc=6.0 min CN=98 Runoff=1.82 cfs 6,568 cf |
| SubcatchmentA7-PR: A7-PR | Runoff Area=12,418 sf 54.38% Impervious Runoff Depth>3.99" Tc=6.0 min CN=76 Runoff=1.32 cfs 4,127 cf |
| SubcatchmentA8-PR: A8-PR | Runoff Area=7,290 sf 100.00% Impervious Runoff Depth>6.46" Tc=6.0 min CN=98 Runoff=1.09 cfs 3,923 cf |
| SubcatchmentA9-PR: A9-PR | Runoff Area=13,223 sf 0.00% Impervious Runoff Depth>0.94" Flow Length=295' Tc=20.6 min CN=43 Runoff=0.15 cfs 1,036 cf |
| Reach 1R: Routing n=0.016 L= | Avg. Flow Depth=0.02' Max Vel=1.81 fps Inflow=0.53 cfs 2,038 cf 542.0' S=0.0609 '/' Capacity=917.83 cfs Outflow=0.48 cfs 2,031 cf |
| Reach 2R: Routing 18.0" Round Pipe n=0.012 L | Avg. Flow Depth=0.37' Max Vel=4.48 fps Inflow=1.53 cfs 4,222 cf =200.0' S=0.0100 '/' Capacity=11.38 cfs Outflow=1.50 cfs 4,222 cf |
| Reach 3R: Routing n=0.016 | Avg. Flow Depth=0.04' Max Vel=1.63 fps Inflow=0.19 cfs 721 cf L=400.0' S=0.0500 '/' Capacity=102.34 cfs Outflow=0.16 cfs 718 cf |
| Reach 5R: Routing A 18.0" Round Pipe n=0.012 L=2 | vg. Flow Depth=0.70' Max Vel=13.98 fps Inflow=11.35 cfs 48,928 cf 200.0' S=0.0500 '/' Capacity=25.45 cfs Outflow=11.34 cfs 48,918 cf |

| 193187-CV01-HYD-PR | Type III 24-hr | ⁻ 100-Year, 24-I | Hour Storm Raiı | nfall=6.70" |
|---|-------------------|-----------------------------|----------------------|-------------|
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| | | | | - |
| Reach 6R: Routing Avg. Flo | ow Depth=0.71' N | Max Vel=14.09 fps | Inflow=11.70 cfs | 50,290 cf |
| 18.0" Round Pipe n=0.012 L=50.0' | S=0.0500 '/' Cap | pacity=25.45 cfs | Outflow=11.69 cfs | 50,288 cf |
| | | | | 04 507 6 |
| Reach 7R: Routing Avg. | Flow Depth=0.11 | Max Vel=4.28 fp | s Inflow=7.22 cfs | 31,597 cf |
| n=0.016 L=618.0 | S=0.06157 Ca | pacity=922.36 cfs | Outflow=7.10 cfs | 31,504 cf |
| Pond A1-P. CHAMBERS | Peak Elev=21 04 | L' Storage=5.515 c | f Inflow=4.21 cfs | 14 320 cf |
| Discarded=0.10 cfs_6 | 344 cf Primary= | 1 53 cfs 4 222 cf | Outflow=1.63 cfs | 10,566 cf |
| | ,orrer rinnery | | | 10,000 01 |
| Pond A2-P: CHAMBERS | Peak Elev=19.63 | 3' Storage=9,522 d | of Inflow=7.26 cfs | 24,371 cf |
| Discarded=0.17 cfs 10 | ,966 cf Primary= | 1.98 cfs 8,721 cf | Outflow=2.16 cfs | 19,687 cf |
| | | | | |
| Pond A3-P: CHAMBERS | Peak Elev=14 | 1.96' Storage=419 | cf Inflow=0.80 cf | s 2,551 cf |
| Discarded=0.02 cfs | 1,125 cf Primary | =0.64 cfs 1,373 cf | Outflow=0.66 cfs | s 2,497 cf |
| Link 11 - Monholo | | | Inflow-11 25 of | 10 020 of |
| | | | Drimon/=11.35 CIS | 40,920 Cl |
| | | | Filliary - 11.55 Cis | 40,920 0 |
| l ink 4l · Manhole | | | Inflow=11.70 cfs | 50.290 cf |
| | | | Primarv=11.70 cfs | 50.290 cf |
| | | | , | , |
| Link A: DESIGN POINT A - EXISTING MUNIC | IPALDRAINAGE | ESYSTEM | Inflow=12.50 cfs | 56,168 cf |
| | | | Primary=12.50 cfs | 56,168 cf |
| | | | - | |

Total Runoff Area = 290,214 sf Runoff Volume = 83,210 cf Average Runoff Depth = 3.44" 54.99% Pervious = 159,586 sf 45.01% Impervious = 130,628 sf

Summary for Subcatchment A1-OFF: A1-OFF

Runoff 7.22 cfs @ 12.25 hrs, Volume= 31,597 cf, Depth> 2.96" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | rea (sf) | CN | Description | | |
|----------------|----------|-----------------------------|---------------------------------|------------|--|
| | 13,269 | 98 | Roofs, HSC | θA | |
| | 34,025 |)25 98 Paved parking, HSG A | | | N Contraction of the second seco |
| | 28,415 | 49 | 50-75% Grass cover, Fair, HSG A | | |
| | 49,447 | 43 | Woods/grass comb., Fair, HSG A | | |
| | 2,961 | 96 | Gravel surfa | ace, HSG A | A |
| 128,117 66 Wei | | Weighted A | verage | | |
| 80,823 | | | 63.09% Pervious Area | | |
| 47,294 | | | 36.91% Impervious Area | | |
| | | | | | |
| Тс | Length | Slope | e Velocity | Capacity | Description |
| (min) | (feet) | (ft/ft |) (ft/sec) | (cfs) | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| 2.4 | 160 | 0.0500 |) 1.12 | | Shallow Concentrated Flow, shallow conc. flow |
| | | | | | Woodland Kv= 5.0 fps |
| 17.3 | 210 | Total | | | |

Subcatchment A1-OFF: A1-OFF


Summary for Subcatchment A10-PR: A10-PR

Runoff 2.75 cfs @ 12.09 hrs, Volume= 9,076 cf, Depth> 5.53" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | vrea (sf) | CN | Description | | | |
|-------|-----------|------------------------|-------------|--------------|---------------|--|
| | 4,128 | 98 | Roofs, HSC | ΞA | | |
| | 12,420 | 98 | Paved park | ing, HSG A | ١ | |
| | 3,163 | 49 | 50-75% Gr | ass cover, F | Fair, HSG A | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | |
| | 0 | 96 | Gravel surf | ace, HSG A | 4 | |
| | 19,711 | 90 | Weighted A | verage | | |
| | 3,163 | | 16.05% Pe | rvious Area | | |
| | 16,548 | 83.95% Impervious Area | | | | |
| | | | | | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A10-PR: A10-PR



Summary for Subcatchment A11-PR: A7-PR

Runoff 0.19 cfs @ 12.11 hrs, Volume= 721 cf, Depth> 1.34" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | rea (sf) | CN | Description | | | |
|-------|----------|-------|--------------|--------------|---------------|--|
| | 0 | 98 | Roofs, HSC | θA | | |
| | 240 | 98 | Paved park | ing, HSG A | ١ | |
| | 5,070 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | |
| | 1,172 | 36 | Woods, Fai | ir, HSG A | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | 4 | |
| | 6,482 | 48 | Weighted A | verage | | |
| | 6,242 | | 96.30% Pe | rvious Area | | |
| | 240 | | 3.70% Impe | ervious Area | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry. | |

Subcatchment A11-PR: A7-PR



Summary for Subcatchment A12-PR: A12-PR

Runoff 0.80 cfs @ 12.09 hrs, Volume= 2,551 cf, Depth> 4.85" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | rea (sf) | CN | Description | | | |
|-------|------------------------------|-------|-------------|--------------|---------------|--|
| | 260 | 98 | Roofs, HSC | ΞA | | |
| | 4,278 | 98 | Paved park | ing, HSG A | ١ | |
| | 1,771 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | |
| | 0 | 36 | Woods, Fai | ir, HSG A | | |
| | 0 | 96 | Gravel surf | ace, HSG A | 4 | |
| | 6,309 | 84 | Weighted A | verage | | |
| | 1,771 | | 28.07% Pe | rvious Area | l | |
| | 4,538 71.93% Impervious Area | | | | | |
| | | | | | | |
| Тс | Length | Slop | e Velocity | Capacity | Description | |
| (min) | (feet) | (ft/f | t) (ft/sec) | (cfs) | | |
| 6.0 | | | | | Direct Entry, | |

Subcatchment A12-PR: A12-PR



Summary for Subcatchment A2-PR: A2-PR

Runoff 2.38 cfs @ 12.09 hrs, Volume= 7,752 cf, Depth> 5.30" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"



Summary for Subcatchment A3-PR: A3-PR

Runoff 3.42 cfs @ 12.09 hrs, Volume= 11,372 cf, Depth> 5.64" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"



Time (hours)

Summary for Subcatchment A4-OFF: A4-OFF

Runoff 0.53 cfs @ 12.17 hrs, Volume= 2,038 cf, Depth> 2.77" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| | Area (sf) | CN | Description | | | | | |
|-------|-----------|---------|--------------|--------------------|--|--|--|--|
| | 0 | 98 | Roofs, HSC | θA | | | | |
| | 0 | 98 | Paved park | ing, HSG A | N Contraction of the second seco | | | |
| | 0 | 49 | 50-75% Gra | ass cover, F | Fair, HSG A | | | |
| | 4,743 | 36 | Woods, Fai | Woods, Fair, HSG A | | | | |
| | 4,094 | 96 | Gravel surfa | ace, HSG A | A | | | |
| | 8,837 | 64 | Weighted A | verage | | | | |
| | 8,837 | | 100.00% Pe | ervious Are | a | | | |
| | | | | | | | | |
| Тс | : Length | Slope | e Velocity | Capacity | Description | | | |
| (min) |) (feet) | (ft/ft) |) (ft/sec) | (cfs) | | | | |
| 3.2 | 2 30 | 0.0300 | 0.16 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Grass: Short n= 0.150 P2= 3.20" | | | |
| 8.8 | 3 20 | 0.0300 | 0.04 | | Sheet Flow, | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 12.0 |) 50 | Total | | | | | | |

Subcatchment A4-OFF: A4-OFF



Summary for Subcatchment A5-PR: A5-PR

Runoff 0.35 cfs @ 12.37 hrs, Volume= 2,450 cf, Depth> 0.87" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| A | rea (sf) | CN | Description | | | | | |
|-------|----------|---------|------------------------------------|--------------|--|--|--|--|
| | 0 | 98 | Roofs, HSC | 6 A | | | | |
| | 913 | 98 | 98 Paved parking, HSG A | | | | | |
| | 10,323 | 49 | 49 50-75% Grass cover, Fair, HSG A | | | | | |
| | 22,629 | 36 | Woods, Fai | r, HSG A | | | | |
| | 0 | 96 | Gravel surfa | ace, HSG A | Ι | | | |
| | 33,865 | 42 | Weighted A | verage | | | | |
| | 32,952 | | 97.30% Pei | rvious Area | | | | |
| | 913 | | 2.70% Impe | ervious Area | а | | | |
| | | | | | | | | |
| Tc | Length | Slope | e Velocity | Capacity | Description | | | |
| (min) | (feet) | (ft/ft) | (ft/sec) | (cfs) | | | | |
| 14.9 | 50 | 0.0500 | 0.06 | | Sheet Flow, SHEET FLOW | | | |
| | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" | | | |
| 1.7 | 100 | 0.1600 |) 1.00 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Forest w/Heavy Litter Kv= 2.5 fps | | | |
| 0.6 | 145 | 0.0700 | 4.26 | | Shallow Concentrated Flow, SHALLOW CONC FLOW | | | |
| | | | | | Unpaved Kv= 16.1 fps | | | |
| 17.2 | 295 | Total | | | | | | |

Subcatchment A5-PR: A5-PR



Summary for Subcatchment A6-PR: A6-PR

Runoff 1.82 cfs @ 12.08 hrs, Volume= 6,568 cf, Depth> 6.46" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"





Summary for Subcatchment A7-PR: A7-PR

Runoff 1.32 cfs @ 12.09 hrs, Volume= 4,127 cf, Depth> 3.99" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| Area (| (sf) CN | I Description |
|--------------------|------------------|--|
| 4,5 | i90 98 | 3 Roofs, HSG A |
| 2,1 | 63 98 | 3 Paved parking, HSG A |
| 5,6 | 65 49 | 50-75% Grass cover, Fair, HSG A |
| | 0 30 | δ Woods, Fair, HSG A |
| | 0 96 | ා Gravel surface, HSG A |
| 12,4 | 18 70 | 3 Weighted Average |
| 5,6 | 65 | 45.62% Pervious Area |
| 6,7 | '53 | 54.38% Impervious Area |
| Tc Ler (min) (f | ngth S eet) (| ope Velocity Capacity Description ft/ft) (ft/sec) (cfs) |
| 6.0 | | Direct Entry, |

Subcatchment A7-PR: A7-PR



Summary for Subcatchment A8-PR: A8-PR

Runoff 1.09 cfs @ 12.08 hrs, Volume= 3,923 cf, Depth> 6.46" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| Area (s | sf) CN | Description | |
|-----------|---------|-----------------------------------|---|
| 7,29 | 90 98 | Roofs, HSG A | _ |
| | 0 98 | Paved parking, HSG A | |
| | 0 49 | 50-75% Grass cover, Fair, HSG A | |
| | 0 36 | Woods, Fair, HSG A | |
| | 0 96 | Gravel surface, HSG A | |
| 7,29 | 90 98 | Weighted Average | |
| 7,29 | 90 | 100.00% Impervious Area | |
| | | | |
| Tc Len | gth Slo | ope Velocity Capacity Description | |
| (min) (fe | et) (f | t/ft) (ft/sec) (cfs) | _ |
| 6.0 | | Direct Entry, | |

Subcatchment A8-PR: A8-PR



Summary for Subcatchment A9-PR: A9-PR

Runoff 0.15 cfs @ 12.41 hrs, Volume= 1,036 cf, Depth> 0.94" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Type III 24-hr 100-Year, 24-Hour Storm Rainfall=6.70"

| _ | Ai | rea (sf) | CN [| Description | | |
|---|-------|----------|---------|-----------------------|--------------|---|
| | | 0 | 98 F | Roofs, HSC | βA | |
| | | 0 | 98 F | Paved park | ing, HSG A | N Contraction of the second |
| | | 7,203 | 49 5 | 50-75% Gra | ass cover, F | Fair, HSG A |
| | | 6,020 | 36 \ | Noods, Fai | r, HSG A | |
| | | 0 | 96 (| Gravel surfa | ace, HSG A | A |
| | | 13,223 | 43 \ | Neighted A | verage | |
| | | 13,223 | | 100.00% Pervious Area | | |
| | | | | | | |
| | Тс | Length | Slope | Velocity | Capacity | Description |
| | (min) | (feet) | (ft/ft) | (ft/sec) | (cfs) | |
| | 18.3 | 50 | 0.0300 | 0.05 | | Sheet Flow, SHEET FLOW |
| | | | | | | Woods: Dense underbrush n= 0.800 P2= 3.20" |
| | 1.7 | 100 | 0.1600 | 1.00 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| | | | | | | Forest w/Heavy Litter Kv= 2.5 fps |
| | 0.6 | 145 | 0.0700 | 4.26 | | Shallow Concentrated Flow, SHALLOW CONC FLOW |
| | | | | | | Uppayod Ky-161 fpc |
| _ | | | | | | Olipaveu KV- 10.1 lps |

20.6 295 Total

Subcatchment A9-PR: A9-PR



Summary for Reach 1R: Routing



Summary for Reach 2R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 29,764 sf, 87.66% Impervious, Inflow Depth =
 1.70" for 100-Year, 24-Hour Storm event

 Inflow =
 1.53 cfs @
 12.32 hrs, Volume=
 4,222 cf

 Outflow =
 1.50 cfs @
 12.35 hrs, Volume=
 4,222 cf, Atten= 1%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 4.48 fps, Min. Travel Time= 0.7 min Avg. Velocity = 1.95 fps, Avg. Travel Time= 1.7 min

Peak Storage= 68 cf @ 12.33 hrs Average Depth at Peak Storage= 0.37', Surface Width= 1.29' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0100 '/' Inlet Invert= 1.00', Outlet Invert= -1.00'





Reach 2R: Routing

Summary for Reach 3R: Routing

Inflow Area = 6,482 sf, 3.70% Impervious, Inflow Depth > 1.34" for 100-Year, 24-Hour Storm event Inflow 0.19 cfs @ 12.11 hrs, Volume= 721 cf = Outflow 0.16 cfs @ 12.24 hrs, Volume= 718 cf, Atten= 14%, Lag= 7.7 min =

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 1.63 fps, Min. Travel Time= 4.1 min Avg. Velocity = 0.85 fps, Avg. Travel Time= 7.8 min

Peak Storage= 40 cf @ 12.17 hrs Average Depth at Peak Storage= 0.04', Surface Width= 4.44' Bank-Full Depth= 0.50' Flow Area= 12.5 sf, Capacity= 102.34 cfs

0.00' x 0.50' deep channel, n= 0.016 Side Slope Z-value= 0.0 100.0 '/' Top Width= 50.00' Length= 400.0' Slope= 0.0500 '/' Inlet Invert= 20.00', Outlet Invert= 0.00'





Reach 3R: Routing

Summary for Reach 5R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 251,782 sf, 47.30% Impervious, Inflow Depth > 2.33" for 100-Year, 24-Hour Storm event

 Inflow =
 11.35 cfs @ 12.33 hrs, Volume=
 48,928 cf

 Outflow =
 11.34 cfs @ 12.34 hrs, Volume=
 48,918 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 13.98 fps, Min. Travel Time= 0.2 min Avg. Velocity = 5.63 fps, Avg. Travel Time= 0.6 min

Peak Storage= 162 cf @ 12.33 hrs Average Depth at Peak Storage= 0.70', Surface Width= 1.50' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 200.0' Slope= 0.0500 '/' Inlet Invert= 10.00', Outlet Invert= 0.00'





Reach 5R: Routing

Summary for Reach 6R: Routing

[52] Hint: Inlet/Outlet conditions not evaluated

 Inflow Area =
 258,091 sf, 47.90% Impervious, Inflow Depth > 2.34" for 100-Year, 24-Hour Storm event

 Inflow =
 11.70 cfs @ 12.33 hrs, Volume=
 50,290 cf

 Outflow =
 11.69 cfs @ 12.33 hrs, Volume=
 50,288 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Max. Velocity= 14.09 fps, Min. Travel Time= 0.1 min Avg. Velocity = 5.66 fps, Avg. Travel Time= 0.1 min

Peak Storage= 41 cf @ 12.33 hrs Average Depth at Peak Storage= 0.71', Surface Width= 1.50' Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.45 cfs

18.0" Round Pipe n= 0.012 Length= 50.0' Slope= 0.0500 '/' Inlet Invert= 2.50', Outlet Invert= 0.00'





Reach 6R: Routing

Summary for Reach 7R: Routing



Summary for Pond A1-P: CHAMBERS

| Inflow Area | a = | 29,764 sf, | 87.66% Impervious, | Inflow Depth > 5.77" | for 100-Year, 24-Hour Storm event |
|-------------|-----|------------|--------------------|----------------------|-----------------------------------|
| Inflow | = | 4.21 cfs @ | 12.09 hrs, Volume= | 14,320 cf | |
| Outflow | = | 1.63 cfs @ | 12.32 hrs, Volume= | 10,566 cf, Atter | n= 61%, Lag= 14.4 min |
| Discarded | = | 0.10 cfs @ | 8.64 hrs, Volume= | 6,344 cf | - |
| Primary | = | 1.53 cfs @ | 12.32 hrs, Volume= | 4,222 cf | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 21.04' @ 12.32 hrs Surf.Area= 1,761 sf Storage= 5,515 cf

Plug-Flow detention time= 171.4 min calculated for 10,549 cf (74% of inflow) Center-of-Mass det. time= 84.2 min (851.2 - 767.0)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 16.10' | 2,519 cf | 22.75'W x 77.40'L x 5.50'H Field A |
| | | | 9,685 cf Overall - 3,388 cf Embedded = 6,297 cf x 40.0% Voids |
| #2A | 16.85' | 3,388 cf | ADS_StormTech MC-3500 d +Capx 30 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 30 Chambers in 3 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf |
| | | 5.907 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 17.00' | 12.0" Round Culvert |
| | | | L= 220.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 17.00' / 14.80' S= 0.0100 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 21.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 20.00' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 16.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.10 cfs @ 8.64 hrs HW=16.16' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=1.51 cfs @ 12.32 hrs HW=21.04' (Free Discharge) -**1=Culvert** (Passes 1.51 cfs of 5.31 cfs potential flow) -2=Broad-Crested Rectangular Weir (Weir Controls 0.10 cfs @ 0.57 fps) -3=Orifice/Grate (Orifice Controls 1.41 cfs @ 4.05 fps)

Pond A1-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= $77.0^{\circ}W \times 45.0^{\circ}H \times 7.50^{\circ}L$ with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

10 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 75.40' Row Length +12.0" End Stone x 2 = 77.40' Base Length 3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

30 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 3,388.0 cf Chamber Storage

9,684.7 cf Field - 3,388.0 cf Chambers = 6,296.7 cf Stone x 40.0% Voids = 2,518.7 cf Stone Storage

Chamber Storage + Stone Storage = 5,906.6 cf = 0.136 afOverall Storage Efficiency = 61.0%Overall System Size = $77.40' \times 22.75' \times 5.50'$

30 Chambers 358.7 cy Field 233.2 cy Stone





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Summary for Pond A2-P: CHAMBERS

| Inflow Area | = | 51,199 sf, | 87.50% Impervious, | Inflow Depth > 5.71" | for 100-Year, 24-Hour Storm event |
|----------------------|---|------------|--------------------|----------------------|-----------------------------------|
| Inflow = | = | 7.26 cfs @ | 12.09 hrs, Volume= | 24,371 cf | |
| Outflow = | = | 2.16 cfs @ | 12.41 hrs, Volume= | 19,687 cf, Atter | ו= 70%, Lag= 19.4 min |
| Discarded = | = | 0.17 cfs @ | 8.80 hrs, Volume= | 10,966 cf | - |
| Primary - | = | 1.98 cfs @ | 12.41 hrs, Volume= | 8,721 cf | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 19.63' @ 12.41 hrs Surf.Area= 3,136 sf Storage= 9,522 cf

Plug-Flow detention time= 158.6 min calculated for 19,655 cf (81% of inflow) Center-of-Mass det. time= 85.5 min (858.5 - 773.0)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 15.00' | 4,421 cf | 37.08'W x 84.57'L x 5.50'H Field A |
| | | | 17,249 cf Overall - 6,196 cf Embedded = 11,052 cf x 40.0% Voids |
| #2A | 15.75' | 6,196 cf | ADS_StormTech MC-3500 d +Cap x 55 Inside #1 |
| | | | Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf |
| | | | Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap |
| | | | 55 Chambers in 5 Rows |
| | | | Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf |
| | | 10.617 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 16.00' | 12.0" Round Culvert |
| | - | | L= 21.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 16.00' / 15.50' S= 0.0238 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 20.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Discarded | 15.00' | 2.410 in/hr Exfiltration over Surface area |
| #4 | Device 1 | 17.90' | 8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.17 cfs @ 8.80 hrs HW=15.06' (Free Discharge) **-3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=1.98 cfs @ 12.41 hrs HW=19.62' (Free Discharge) -1=Culvert (Passes 1.98 cfs of 6.68 cfs potential flow) -2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-4=Orifice/Grate (Orifice Controls 1.98 cfs @ 5.68 fps)

Pond A2-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume) Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Effective Size= $70.4^{\circ}W \times 45.0^{\circ}H \Rightarrow 15.33$ sf $\times 7.17L = 110.0$ cf Overall Size= $77.0^{\circ}W \times 45.0^{\circ}H \times 7.50^{\circ}L$ with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

11 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 82.57' Row Length +12.0" End Stone x 2 = 84.57' Base Length 5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width 9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

55 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 6,196.4 cf Chamber Storage

17,248.8 cf Field - 6,196.4 cf Chambers = 11,052.4 cf Stone x 40.0% Voids = 4,421.0 cf Stone Storage

Chamber Storage + Stone Storage = 10,617.3 cf = 0.244 af Overall Storage Efficiency = 61.6% Overall System Size = 84.57' x 37.08' x 5.50'

55 Chambers 638.8 cy Field 409.3 cy Stone





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Pond A2-P: CHAMBERS

Summary for Pond A3-P: CHAMBERS

| Inflow Area | a = | 6,309 sf | , 71.93% Impervious, | Inflow Depth > 4.85" | for 100-Year, 24-Hour Storm event |
|-------------|-----|------------|----------------------|----------------------|-----------------------------------|
| Inflow | = | 0.80 cfs @ | 12.09 hrs, Volume= | 2,551 cf | |
| Outflow | = | 0.66 cfs @ | 12.14 hrs, Volume= | 2,497 cf, Atter | n= 17%, Lag= 3.4 min |
| Discarded | = | 0.02 cfs @ | 9.64 hrs, Volume= | 1,125 cf | - |
| Primary | = | 0.64 cfs @ | 12.14 hrs, Volume= | 1,373 cf | |
| | | | | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs Peak Elev= 14.96' @ 12.14 hrs Surf.Area= 353 sf Storage= 419 cf

Plug-Flow detention time= 65.2 min calculated for 2,493 cf (98% of inflow) Center-of-Mass det. time= 52.6 min (851.5 - 798.9)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1A | 13.10' | 347 cf | 11.00'W x 32.10'L x 3.50'H Field A |
| | | | 1,236 cf Overall - 368 cf Embedded = 868 cf x 40.0% Voids |
| #2A | 13.60' | 368 cf | ADS_StormTech SC-740 +Cap x 8 Inside #1 |
| | | | Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf |
| | | | Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap |
| | | | 8 Chambers in 2 Rows |
| | | 715 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 13.00' | 12.0" Round Culvert |
| | • | | L= 9.0' CPP, square edge headwall, Ke= 0.500 |
| | | | Inlet / Outlet Invert= 13.00' / 12.90' S= 0.0111 '/' Cc= 0.900 |
| | | | n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 15.00' | 4.0' long x 0.5' breadth Broad-Crested Rectangular Weir |
| | | | Head (feet) 0.20 0.40 0.60 0.80 1.00 |
| | | | Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3 | Device 1 | 14.25' | 6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #4 | Discarded | 13.10' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.02 cfs @ 9.64 hrs HW=13.14' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.63 cfs @ 12.14 hrs HW=14.95' (Free Discharge)

1=Culvert (Passes 0.63 cfs of 4.55 cfs potential flow)

-2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 0.63 cfs @ 3.23 fps)

Pond A3-P: CHAMBERS - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10'Base Length 2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

8 Chambers x 45.9 cf = 367.5 cf Chamber Storage

1,235.7 cf Field - 367.5 cf Chambers = 868.2 cf Stone x 40.0% Voids = 347.3 cf Stone Storage

Chamber Storage + Stone Storage = 714.8 cf = 0.016 af Overall Storage Efficiency = 57.8% Overall System Size = 32.10' x 11.00' x 3.50'

8 Chambers 45.8 cy Field 32.2 cy Stone





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Pond A3-P: CHAMBERS

Summary for Link 1L: Manhole

[62] Hint: Exceeded Reach 2R OUTLET depth by 1.00' @ 0.00 hrs

| Inflow A | rea = | 251,782 sf, | 47.30% Impervious, | Inflow Depth > 2 | 2.33" for | 100-Year, 24-Hour Storm event |
|----------|-------|-------------|--------------------|------------------|-----------|-------------------------------|
| Inflow | = | 11.35 cfs @ | 12.33 hrs, Volume= | 48,928 cf | | |
| Primary | = | 11.35 cfs @ | 12.33 hrs, Volume= | 48,928 cf, | Atten= 0 | %, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs



Link 1L: Manhole

Summary for Link 4L: Manhole

| Inflow A | rea = | 258,091 sf, 47.9 | 90% Impervious, | Inflow Depth > | 2.34" | for 100 | -Year, 24-Hour Sto | rm event |
|----------|-------|------------------|-----------------|----------------|----------|---------|--------------------|----------|
| Inflow | = | 11.70 cfs @ 12.3 | 3 hrs, Volume= | 50,290 c | f | | | |
| Primary | = | 11.70 cfs @ 12.3 | 3 hrs, Volume= | 50,290 c | f, Atten | = 0%, L | .ag= 0.0 min | |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs



Link 4L: Manhole

Summary for Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM

| Inflow A | Area = | 290,214 sf, | 45.01% Impervious, | Inflow Depth > 2.3 | 32" for | 100-Year, 24-Hour Storm event |
|----------|--------|-------------|--------------------|--------------------|-----------|-------------------------------|
| Inflow | = | 12.50 cfs @ | 12.33 hrs, Volume= | 56,168 cf | | |
| Primar | y = | 12.50 cfs @ | 12.33 hrs, Volume= | 56,168 cf, A | Atten= 0% | 5, Lag= 0.0 min |

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Link A: DESIGN POINT A - EXISTING MUNICIPAL DRAINAGE SYSTEM



TSS Calculations

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu



Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu



1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu



1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu



1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu







Environmentally Engineered Stormwater Solutions... that exceed your client's needs!




Stormceptor® is an underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention. With thousands of systems operating worldwide, Stormceptor delivers protection every day in every storm.

With patented technology, optimal treatment occurs by allowing free oil to rise and sediment to settle. The Stormceptor design prohibits scour and release of previously captured pollutants, ensuring superior treatment and protection during even the most extreme storm events.

Stormceptor is very easy to design and provides flexibility under varying site constraints such as tight right-of-ways, zero lot lines and retrofit projects. Design flexibility allows for a cost-effective approach to stormwater treatment. Stormceptor has proven performance backed by the longest record of lab and field verification in the industry.

Tested Performance

| Massach | Fine parti usetts – | 95%+ Oil removal STC 450i CAN PROVIDE 80% TSS REMOVAL AT FLOW RATES UP TO 0.40 CFS | | | | |
|--------------------------|--|--|---|--|---------------------------|-----------------------------------|
| Stormceptor STC Model | Inside Diameter | Typical Depth Below Inlet Pipe Invert ¹ | Water Quality Flow Rate Q ² | Pezik Conveyance Flow Rate ³ | Hydrocarbon Capacity ⁴ | Maximum Sediment Capacity ⁴ |
| | (<u>ft</u>) | <u>(in)</u> | (cf | (cfs) | (Gallons) | (<u>ft</u> ³) |
| STC 450i | 4 | 68 | 0.40 | 5.5 | 86 | 46 |
| STC 900 | 6 | 63 | 0.89 | 22 | 251 | 89 |
| STC 2400 | 8 | 104 | 1.58 | 22 | 840 | 205 |
| STC 4800 | 10 | 140 | 2.47 | 22 | 909 | 543 |
| STC 7200 | 12 | 148 | 3.56 | 22 | 1,059 | 839 |
| STC 11000 | 2 x 10 | 142 | 4.94 | 48 | 2,792 | 1,086 |
| STC 16000 | 2 x 12 | 148 | 7.12 | 48 | 3,055 | 1,677 |

¹ Depth Below Pipe Inlet Invert to the Bottom of Base Slab, and Maximum Sediment Capacity can vary to accommodate specific site designs and pollutant loads. Depths can vary to accommodate special designs or site conditions. Contact your local representative for assistance.

² Water Quality Flow Rate (Q) is based on 80% annual average TSS removal of the OK110 particle size distribution.

³ Peak Conveyance Flow Rate is based upon ideal velocity of 3 feet per second and outlet pipe diameters of 18-inch, 36-inch, and 54-inch diameters.

⁴ Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.



www.rinkerstormceptor.com

Manufacturing Plant: Westfield, MA Phone: (413) 562-3647 11-22-13-R13-802 MDEP





UNIVERSITY OF MASSACHUSETTS

AT AMHERST Water Resources Research Center Blaisdell House, UMass 310 Hicks Way Amherst, MA 01003

MASTEP Technology Review

Massachusetts Stormwater Evaluation Project (413) 545-5532 (413) 545-2304 FAX www.mastep.net

Technology Name: Isolator Row

Studies Reviewed: Christensen, Andrew and Vince Neary. Hydraulic Performance and Sediment Trap Efficiency for the StormTech SC-740 Isolator Row. Tennessee Technological University, February 2005.

Neary, Vincent, PhD. Performance Evaluation of Sediment Removal Efficiency Stormtech Isolator Row. Tennessee Tech University. October 20, 2006.

New Jersey Corporation for Advanced Technology. NJCAT Verification of the StormTech Isolator Row. August 2007.

University of New Hampshire Stormwater Center. Final Report on Field Verification Testing of the Stormtech Isolator Row Treatment Unit. Submitted to StormTech LLC June 2008.

University of New Hampshire Stormwater Center. Performance Evaluation Report on of the Stormtech Isolator Row Treatment Unit. September 2010

Date: January 14, 2012

2

Reviewers: Sarah Titus, updated by Jerry Schoen

Rating:

Brief rationale for rating:

The Isolator Row was tested in the field by the UNH Stormwater Center and in the lab by Tennessee Tech University. Field testing monitored 23 events over two years, sampling 13.2" rainfall or about 27% of the annual average. This study was done under a QAPP that was designed to substantially meet TARP and TAPE requirements.

Lab testing examined sediment removal for three different influent mixes; the SIL-CO-SIL 106, SIL-CO-SIL 250 and the OK-110 silica. Across all influent mixes, 21 test runs were done and 14 flow rates were tested at average influent concentrations from 164-424mg/l. NJCAT was able to use the runs to extrapolate the data to calculate weighted removal efficiencies for 25, 50, 75, 100 and 125% of treatment operating rate. Claims for each influent mix were verified by NJCAT. While all of these studies met many requirements necessary for TARP there was no scour testing, statistical analysis or QC data presented for any study. The laboratory studies did not use a certified lab and the one micron filter sock at the outlet was only partially effective at trapping the finer particles from the flow stream. This led to increasing influent and effluent SSC values as the detention time went up during the course of each test run. Removal rates for earlier samples were higher than later samples in the same run.

Requirements not met:

- No discussion of QC test results.
- Sampled <50% of average annual rainfall and less than minimum 13" required total in the field
- No discussion of scour testing

Other comments:

Field study:

- d50 influent particle size 44 microns.
- Effective TSS, SSC, Zinc, total phosphorus, total petroleum hydrocarbon reported throughout study period.
- Zinc and TP removal efficiency improved over the course of the study, presumably due to build of an
 organic filter cake on system's fabric. However, this buildup may also lead to increased incidence of
 bypass in larger storms. This may be a consideration for maintenance planning.
- Negative removal rates for dissolved inorganic nitrogen, suggesting this system is not effective at treating dissolved nitrogen.

Lab study:

- Particle size distributions: OK 110 d50=110, SIL CO SIL 106 d50=22, SIL CO SIL 250= 45 microns.
 In the field the d50 was measured as 0.038mm.
- Flow rates tested in the lab at treatment flow rates from 0.1-1.2cfs. SIL CO SIL 106 was tested at 3.2gpm/ft2 and SIL CO SIL 250 was tested at 3.2 (0.4cfs) and 1.7gpm/ft2 (0.21cfs). The OK 110 was tested at hydraulic loading rates of 4.8 and 8.1 gpm/ft2.

Average influent SSC for the SIL CO SIL 106 test runs 270mg/L. The average influent SSC was 211 and 424mg/L for the SIL CO SIL 250 influent at 3.2 and 1.7gpm respectively. The OK 110 tests calculated influent SSC ranged from 140-230mg/L with an average of 183.18. Field testing measured influent TSS at a mean 58mg/l.



UNIVERSITY OF MASSACHUSETTS

AT AMHERST Water Resources Research Center Blaisdell House, UMass 310 Hicks Way Amherst, MA 01003

(413) 545-5532 (413) 545-2304 FAX www.mastep.net

MASTEP Technology Review

- Technology Name: Stormceptor 450i.
- Studies Reviewed: Multi-Phase Physical Model Testing of a Stormceptor STC450i
- Date: March 14, 2009
- Reviewers: Jerry Schoen
- Rating: 2

Brief rationale for rating:

This laboratory study is generally well conducted and documented. No documentation of a quality assurance project, plan but quality control data was reported. Sediment analysis was done by the SSC method, but not the TSS method. Although SSC is considered by many scientists to be the preferred method, it is at odds with Massachusetts stormwater regulations, which are based on TSS treatment. Comparing SSC and TSS results is considered an inexact science.

TARP Requirements Not Met*:

- No documentation of a Quality Assurance Project Plan
- TSS analysis was not performed.

Other Comments

- SSC removal efficiency, calculated according to the NJDEP weighted formula, was 59.5 63.6%.
- SSC removal evaluated using event mean concentration and modified mass balance method, the latter considered to be a particularly accurate method of evaluating sediment removal in a laboratory setting.
- Particle Size Distribution (with d50 of 67 microns) closely matched the 55% sand, 40% silt, 5% clay mix recommended by NJDEP.
- A full range of flows (2% 125%) was tested.
- Scour test was performed at 500% of design flow. This is more rigorous than the 125% recommended for scour tests. Effluent concentrations for the scour tests ranged from 5.9 – 6.1mg/l, not considered a significant level of scour.

* Laboratory testing was based on the NJDEP TARP laboratory testing guidelines.

Water Quality Volume and Recharge Calculations



Project Name: Wharf Street Redevelopment Date: 7/16/2020 Project Location: 44 Wharf Street, Weymouth, MA Calculated By: DWP Project Number: 193-187 Checked By: KPS Structure Name: Stormwater Chambers (A3-P) Description: Water Quality Unit Subcatchment: A12-PR Total Drainage Area: 6,309 sq ft 0.14 ac Total Impervious Area: 4,278 sq ft *Excludes Roof Areas 0.10 ac 0.776317341 Runoff Depth to be Treated: 1.0 inches **Required Water Quality Volume:** 800.0 ac ft 357 cf Water Quality Volume Provided:368 cf in Pond A3-P FLOW RATE CONVERSION Q = (qu)(A)(WQV)Where: Q = flow rate associated with the 1-inch of runoff, in cfs qu = the unit peak discharge, in csm/in. A = impervious surface drainage area, in square miles WQV = water quality volume in watershed inches Given: 0.0015625 mi² 1-acre = 5 minute = 0.083 hours qu (**1**-inch) = 774 csm/in Calculation: qu= 774 A= 0.10 ac WQV= 1.0 in Required Water Quality Flow Rate: 0.12 cfs WQU-A6 will provide 80% TSS Removal Efficiency for flows up to 0.40 cfs

193187-CV01-HYD-PR

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| Elevation | Surface | Storage | Elevation | Surface | Storage |
|-----------|------------|--------------|-----------|------------|--------------|
| (feet) | (sq-ft) | (cubic-feet) | (feet) | (sq-ft) | (cubic-feet) |
| 13.10 | 353 | 0 | 13.62 | 353 | 76 |
| 13.11 | 353 | 1 | 13.63 | 353 | 79 |
| 13.12 | 353 | 3 | 13.64 | 353 | 81 |
| 13.13 | 353 | 4 | 13.65 | 353 | 84 |
| 13.14 | 353 | 6 | 13.66 | 353 | 87 |
| 13.15 | 353 | 1 | 13.67 | 353 | 89 |
| 13.10 | 353 | 8 | 13.68 | 353 | 92 |
| 13.17 | 303 | 10 | 13.09 | 303 | 95 |
| 13.10 | 303 252 | 11 | 13.70 | 303 252 | 97 |
| 13.19 | 303 | 13 | 13.71 | 303 | 100 |
| 13.20 | 353 | 14 | 12.72 | 353 | 105 |
| 13.21 | 353 | 10 | 13.73 | 353 | 103 |
| 13.22 | 353 | 18 | 13.74 | 353 | 100 |
| 13.23 | 353 | 20 | 13.76 | 353 | 113 |
| 13.25 | 353 | 20 | 13.77 | 353 | 116 |
| 13.26 | 353 | 23 | 13.78 | 353 | 119 |
| 13.27 | 353 | 24 | 13.79 | 353 | 122 |
| 13.28 | 353 | 25 | 13.80 | 353 | 124 |
| 13.29 | 353 | 27 | 13.81 | 353 | 127 |
| 13.30 | 353 | 28 | 13.82 | 353 | 130 |
| 13.31 | 353 | 30 | 13.83 | 353 | 132 |
| 13.32 | 353 | 31 | 13.84 | 353 | 135 |
| 13.33 | 353 | 32 | 13.85 | 353 | 138 |
| 13.34 | 353 | 34 | 13.86 | 353 | 140 |
| 13.35 | 353 | 35 | 13.87 | 353 | 143 |
| 13.36 | 353 | 37 | 13.88 | 353 | 145 |
| 13.37 | 353 | 38 | 13.89 | 353 | 148 |
| 13.38 | 353 | 40 | 13.90 | 353 | 151 |
| 13.39 | 353 | 41 | 13.91 | 353 | 153 |
| 13.40 | 353 | 42 | 13.92 | 353 | 156 |
| 13.41 | 353 | 44 | 13.93 | 353 | 159 |
| 13.42 | 353 | 45 | 13.94 | 353 | 101 |
| 13.43 | 303 252 | 47 | 13.95 | 303 252 | 104 |
| 13.44 | 303 | 40 | 13.90 | 303 | 107 |
| 13.45 | 353 | 49 51 | 13.97 | 353 | 109 |
| 13.40 | 353 | 52 | 13.90 | 353 | 175 |
| 13.48 | 353 | 54 | 14 00 | 353 | 173 |
| 13 49 | 353 | 55 | 14.00 | 353 | 180 |
| 13 50 | 353 | 56 | 14 02 | 353 | 182 |
| 13.51 | 353 | 58 | 14.03 | 353 | 185 |
| 13.52 | 353 | 59 | 14.04 | 353 | 188 |
| 13.53 | 353 | 61 | 14.05 | 353 | 190 |
| 13.54 | 353 | 62 | 14.06 | 353 | 193 |
| 13.55 | 353 | 64 | 14.07 | 353 | 196 |
| 13.56 | 353 | 65 | 14.08 | 353 | 198 |
| 13.57 | 353 | 66 | 14.09 | 353 | 201 |
| 13.58 | 353 | 68 | 14.10 | 353 | 203 |
| 13.59 | 353 | 69 | 14.11 | 353 | 206 |
| 13.60 | 353 | 71 | 14.12 | 353 | 209 |
| 13.01 | 353 | 13 | 14.13 | 353 | 211 |
| | | | | | |

Stage-Area-Storage for Pond A3-P: CHAMBERS

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Stage-Area-Storage for Pond A3-P: CHAMBERS (continued)

| Elevation | Surface | Storage | Elevation | Surface | Storage | |
|-----------|------------|--------------|-----------|---------|--------------|------------------------|
| (feet) | (sq-ft) | (cubic-feet) | (feet) | (sq-ft) | (cubic-feet) | |
| 14.14 | 353 | 214 | 14.66 | 353 | 346 | |
| 14.15 | 353 | 217 | 14.67 | 353 | 349 | |
| 14.16 | 353 | 219 | 14.68 | 353 | 351 | |
| 14.17 | 353 | 222 | 14.69 | 353 | 354 | |
| 14.18 | 353 | 224 | 14.70 | 353 | 356 | |
| 14.19 | 353 | 227 | 14.71 | 353 | 359 | |
| 14.20 | 353 | 230 | 14.72 | 353 | 361 | |
| 14.21 | 353 | 232 | 14.73 | 353 | 363 | |
| 14.22 | 353 | 235 | 14.74 | 353 | 366 | |
| 14.23 | 353 | 237 | 14.75 | 353 | 368 | |
| 14.24 | 353 | 240 | 14.76 | 353 | 371 | |
| 14.25 | 353 | 242 | 14.77 | 353 | 373 | |
| 14.26 | 353 | 245 | 14.78 | 353 | 376 | STORAGE PROVIDED BELOW |
| 14.27 | 353 | 248 | 14.79 | 353 | 378 | LOW FLOW OUTLET |
| 14.28 | 353 | 250 | 14.80 | 353 | 381 | |
| 14.29 | 353 | 253 | 14.81 | 353 | 383 | |
| 14.30 | 353 | 255 | 14.82 | 353 | 385 | |
| 14.31 | 353 | 258 | 14.83 | 353 | 388 | |
| 14.32 | 353 | 260 | 14.84 | 353 | 390 | |
| 14.33 | 353 | 263 | 14 85 | 353 | 393 | |
| 14.34 | 353 | 266 | 14 86 | 353 | 395 | |
| 14.35 | 353 | 268 | 14 87 | 353 | 397 | |
| 14.36 | 353 | 200 | 14.88 | 353 | 400 | |
| 14.37 | 353 | 273 | 14.80 | 353 | 400 | |
| 14.38 | 353 | 276 | 14.00 | 353 | 405 | |
| 1/ 30 | 353 | 270 | 1/ 01 | 353 | 400 | |
| 14.00 | 353 | 281 | 14.01 | 353 | 409 | |
| 14.40 | 353 | 201 | 1/ 03 | 353 | 400 | |
| 14.41 | 353 | 200 | 14.55 | 353 | 412 | |
| 14.42 | 353 | 200 | 14.94 | 353 | 414 | |
| 14.43 | 353 | 209 | 14.95 | 353 | 410 | |
| 14.44 | 353 | 201 | 14.50 | 353 | 413 | |
| 14.45 | 353 | 294 | 14.97 | 353 | 421 | |
| 14.40 | 353 | 290 | 14.90 | 353 | 424 | |
| 14.47 | 252 | 299 | 14.99 | 252 | 420 | |
| 14.40 | 353 | 301 | 15.00 | 353 | 420 | |
| 14.49 | 353 | 206 | 15.01 | 353 | 431 | |
| 14.50 | 353 | 300 | 15.02 | 353 | 400 | |
| 14.51 | 353 | 211 | 15.03 | 353 | 433 | |
| 14.52 | 303 252 | 311 | 15.04 | 303 | 430 | |
| 14.55 | 303 | 314 | 15.05 | 303 | 440 | |
| 14.04 | 303 252 | 310 | 15.00 | 303 | 442 | |
| 14.00 | 303 250 | 319 | 15.07 | 303 | 440 | |
| 14.50 | 303 | 321 | 15.08 | 353 | 447 | |
| 14.57 | 353 | 324 | 15.09 | 353 | 449 | |
| 14.58 | 353 | 326 | 15.10 | 353 | 452 | |
| 14.59 | 353 | 329 | 15.11 | 353 | 454 | |
| 14.60 | 353 | 331 | 15.12 | 353 | 456 | |
| 14.61 | 353 | 334 | 15.13 | 353 | 458 | |
| 14.62 | 353 | 336 | 15.14 | 353 | 461 | |
| 14.63 | 353 | 339 | 15.15 | 353 | 463 | |
| 14.64 | 353 | 341 | 15.16 | 353 | 465 | |
| 14.65 | 353 | 344 | 15.17 | 353 | 468 | |
| | | | | | | |

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Stage-Area-Storage for Pond A3-P: CHAMBERS (continued)

| Elevation (feet) | Surface (sg-ft) | Storage (cubic-feet) | Elevation (feet) | Surface (sg-ft) | Storage (cubic-feet) |
|---------------------|--------------------|-------------------------|---------------------|--------------------|-------------------------|
| 15.18 | 353 | 470 | 15.70 | 353 | 579 |
| 15.19 | 353 | 472 | 15.71 | 353 | 581 |
| 15.20 | 353 | 474 | 15.72 | 353 | 583 |
| 15.21 | 353 | 477 | 15.73 | 353 | 585 |
| 15.22 | 353 | 479 | 15.74 | 353 | 587 |
| 15.23 | 303 | 481 | 15.75 | 303 | 589 |
| 15.24 | 353 | 403 | 15.70 | 353 | 590 |
| 15.26 | 353 | 488 | 15.78 | 353 | 594 |
| 15.27 | 353 | 490 | 15.79 | 353 | 596 |
| 15.28 | 353 | 492 | 15.80 | 353 | 598 |
| 15.29 | 353 | 494 | 15.81 | 353 | 599 |
| 15.30 | 353 | 497 | 15.82 | 353 | 601 |
| 15.31 | 353 | 499 | 15.83 | 353 | 603 |
| 15.32 | 353 | 503 | 15.64 | 353 | 605 |
| 15.33 | 353 | 505 | 15.86 | 353 | 608 |
| 15.35 | 353 | 508 | 15.87 | 353 | 610 |
| 15.36 | 353 | 510 | 15.88 | 353 | 611 |
| 15.37 | 353 | 512 | 15.89 | 353 | 613 |
| 15.38 | 353 | 514 | 15.90 | 353 | 614 |
| 15.39 | 353 | 516 | 15.91 | 353 | 616 |
| 15.40 | 353 353 | 518 | 15.92 | 353 | 618 610 |
| 15.41 | 353 | 523 | 15.93 | 353 | 621 |
| 15.43 | 353 | 525 | 15.95 | 353 | 622 |
| 15.44 | 353 | 527 | 15.96 | 353 | 624 |
| 15.45 | 353 | 529 | 15.97 | 353 | 625 |
| 15.46 | 353 | 531 | 15.98 | 353 | 627 |
| 15.47 | 353 | 533 | 15.99 | 353 | 628 |
| 15.48 | 353 | 535 | 16.00 | 353 | 630 |
| 15.49 | 353 | 539 | 16.01 | 353 | 633 |
| 15.51 | 353 | 541 | 16.02 | 353 | 634 |
| 15.52 | 353 | 544 | 16.04 | 353 | 636 |
| 15.53 | 353 | 546 | 16.05 | 353 | 637 |
| 15.54 | 353 | 548 | 16.06 | 353 | 638 |
| 15.55 | 353 | 550 | 16.07 | 353 | 640 |
| 15.56 | 353 | 552 | 16.08 | 353 | 641 |
| 15.57 | 353 353 | 556 556 | 16.09 | 353 353 | 643 |
| 15.50 | 353 | 558 | 16 11 | 353 | 646 |
| 15.60 | 353 | 560 | 16.12 | 353 | 647 |
| 15.61 | 353 | 562 | 16.13 | 353 | 648 |
| 15.62 | 353 | 564 | 16.14 | 353 | 650 |
| 15.63 | 353 | 566 | 16.15 | 353 | 651 |
| 15.64 | 353 | 568 | 16.16 | 353 | 653 |
| 15.65 | 303 353 | 570 572 | 10.17 | 303 353 | 654 655 |
| 15.67 | 353 | 574 | 16 19 | 353 | 657 |
| 15.68 | 353 | 575 | 16.20 | 353 | 658 |
| 15.69 | 353 | 577 | 16.21 | 353 | 660 |
| | | | | | |

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Stage-Area-Storage for Pond A3-P: CHAMBERS (continued)

| Elevation | Surface | Storage |
|-----------|------------|--------------|
| (feet) | (sq-ft) | (cubic-feet) |
| 16.22 | 353 | 661 |
| 16.23 | 353 | 663 |
| 16.24 | 353 | 664 |
| 16.25 | 353 | 665 |
| 16.26 | 353 | 667 |
| 16.27 | 353 | 668 |
| 16.28 | 353 | 670 |
| 16.29 | 353 | 671 |
| 16.30 | 353 | 672 |
| 16.31 | 353 | 674 |
| 16.32 | 353 | 675 |
| 16.33 | 353 | 677 |
| 16.34 | 353 | 678 |
| 16.35 | 353 | 679 |
| 16.36 | 353 | 681 |
| 16.37 | 353 | 682 |
| 16.38 | 353 | 684 |
| 16.39 | 353 | 685 |
| 16.40 | 353 | 687 |
| 16.41 | 353 | 688 |
| 16.42 | 353 | 689 |
| 16.43 | 353 | 691 |
| 16.44 | 353 | 692 |
| 16.45 | 353 | 694 |
| 16.46 | 353 | 695 |
| 16.47 | 353 | 696 |
| 16.48 | 353 | 698 |
| 16.49 | 353 | 699 |
| 16.50 | 353 | 701 |
| 16.51 | 353 | 702 |
| 10.52 | 303 | 704 |
| 10.53 | 353 | 705 |
| 10.54 | 303 | 700 |
| 10.00 | 303 252 | 700 |
| 10.00 | 303 252 | 709 |
| 10.07 | 303 252 | 710 |
| 10.00 | 303 252 | / IZ 712 |
| 10.09 | 303 252 | / 13 74 E |
| 10.00 | 353 | /15 |



| Project Name: Project Location: Project Number: | Wharf Street Redev 44 Wharf Street, We 193-187 | elopment eymouth, MA | C | Date: Calculated By: Checked By: | 7/16/2020 DWP KPS |
|---|--|---|--|--|-------------------------|
| Structure Name: | WQU - A9 | Description: | Water Qual | ity Inlet | |
| Subcatchment: | A3-PR | Total Drainage Area: | 24,198 0.56 | sq ft ac | |
| | | Total Impervious Area: | 20,962 0.48 | sq ft ac | *Excludes Roof Areas |
| 0.776317341 | R | unoff Depth to be Treated: | 1.0 | inches | |
| | Required | Water Quality Volume: | 0.040 | ac ft |] |
| | | | 1747 | cf | |
| Where: | Q = flow qu = the A = imp | FLOW RATE CONVERSIO Q = (qu)(A)(WQV) v rate associated with the 1 - unit peak discharge, in csm ervious surface drainage ar | <u>DN</u> inch of runoff /in. ea, in square | , in cfs miles | |
| Given: | WQV = wat | er quality volume in watersh | ied inches | | |
| | 1-acre = 5 minute = qu (1 -inch) = | 0.0015625 mi⁻ 0.083 hours 774 csm/in | | | |
| Calculation: | qu= 774 A= 0.48 WQV= 1.0 | 3 ac in | 0.50 | | 1 |
| | Required wa | ater Quality Flow Rate: | 0.58 | CIS | |
| | WQU-A9 estima | ted to provide 50% TS at this flow rate | SS Remova | al Efficiency | |



| Project Name: Project Location: Project Number: | Wharf Street Redev 44 Wharf Street, We 193-187 | elopment eymouth, MA | (| Date: Calculated By: Checked By: | 7/16/2020 DWP KPS |
|---|--|---|---|--|-------------------------|
| Structure Name: | WQU-A10 | Description: | Water Qua | lity Unit | |
| Subcatchment: | A10-PR | Total Drainage Area: | 19,711 0.45 | sq ft ac | |
| | | Total Impervious Area: | 12,420 0.29 | sq ft ac | *Excludes Roof Areas |
| 0.776317341 | Ru | noff Depth to be Treated: | 1.0 | inches | |
| | Required V | Vater Quality Volume: | 0.024 1035 | ac ft cf |] |
| | | FLOW RATE CONVERS | ION | | |
| | | Q = (qu)(A)(WQV) | | | |
| Wilcie. | Q = flow qu = the A = imp WQV = wat | r rate associated with the 1 unit peak discharge, in csn ervious surface drainage a er quality volume in waters | -inch of runo n/in. ırea, in squar .hed inches | ff, in cfs e miles | |
| Given: | 1-acre = 5 minute = qu (1 -inch) = | 0.0015625 mi ² 0.083 hours 774 csm/in | | | |
| Calculation: | qu= 774 A= 0.29 WQV= 1.0 |) ac in | | | |
| | Required Wa | ter Quality Flow Rate: | 0.34 | cfs |] |
| | WQU-A10 will | provide 80% TSS Re flows up to 0.40 o | emoval Eff cfs | iciency for | |
| | | | | | |



| Project Name: Project Location: Project Number: | Wharf Street Redevelopment 44 Wharf Street, Weymouth, MA | C | Date: alculated By: | 7/16/2020 DWP |
|---|---|------------|------------------------|------------------|
| | 135-107 | | Checked by. | KF O |
| Structure Name: | Stormwater Chambers (A2-P) Description: | Water Qual | ity Unit | |
| Subcatchment: | A10-PR & A-3PR Total Drainage Area: | 43,909 | sq ft | |
| | | 1.01 | ac | |
| | Total Impervious Area: | 33,382 | sq ft | *Excludes |
| | | 0.77 | ac | Roof Areas |
| 0.776317341 | Runoff Depth to be Treated: | 1.0 | inches | |
| | Required Water Quality Volume: | 0.064 | ac ft |] |
| | | 2782 | cf | |
| | | | | _ |

Water Quality Volume Provided:6,376 cf in Pond A2-P

193187-CV01-HYD-PR

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| Elevation | Surface | Storage | Elevation | Surface | Storage |
|-----------|----------------|--------------|-----------|----------------|----------------|
| (feet) | (sq-ft) | (cubic-feet) | (feet) | (sq-ft) | (cubic-feet) |
| 15.00 | 3,136 | 0 | 16.04 | 3,136 | 1,713 |
| 15.02 | 3,136 | 25 | 16.06 | 3,136 | 1,766 |
| 15.04 | 3,136 | 50 | 16.08 | 3,136 | 1,819 |
| 15.06 | 3,136 | /5 | 16.10 | 3,136 | 1,872 |
| 15.08 | 3,136 | 100 | 16.12 | 3,136 | 1,925 |
| 15.10 | 3,136 | 125 | 16.14 | 3,136 | 1,978 |
| 15.12 | 3,130 | 151 | 16.10 | 3,130 | 2,031 |
| 15.14 | 3,130 | 201 | 10.10 | 3,130 | 2,000 |
| 15.10 | 3,130 | 201 | 16.20 | 3,130 | 2,130 |
| 15.10 | 3,130 | 220 | 16.22 | 3,130 | 2,100 |
| 15.20 | 3 136 | 276 | 16.24 | 3,130 | 2,241 |
| 15.22 | 3 136 | 301 | 16.28 | 3 136 | 2,204 |
| 15.26 | 3 136 | 326 | 16.30 | 3 136 | 2 399 |
| 15.28 | 3,136 | 351 | 16.32 | 3,136 | 2,451 |
| 15.30 | 3,136 | 376 | 16.34 | 3,136 | 2,503 |
| 15.32 | 3,136 | 401 | 16.36 | 3,136 | 2,556 |
| 15.34 | 3,136 | 427 | 16.38 | 3,136 | 2,608 |
| 15.36 | 3,136 | 452 | 16.40 | 3,136 | 2,660 |
| 15.38 | 3,136 | 477 | 16.42 | 3,136 | 2,712 |
| 15.40 | 3,136 | 502 | 16.44 | 3,136 | 2,764 |
| 15.42 | 3,136 | 527 | 16.46 | 3,136 | 2,816 |
| 15.44 | 3,136 | 552 | 16.48 | 3,136 | 2,868 |
| 15.46 | 3,136 | 577 | 16.50 | 3,136 | 2,920 |
| 15.48 | 3,136 | 602 | 16.52 | 3,136 | 2,972 |
| 15.50 | 3,136 | 627 | 16.54 | 3,136 | 3,024 |
| 15.52 | 3,136 | 652 | 16.56 | 3,136 | 3,076 |
| 15.54 | 3,130 | 6// 702 | 16.58 | 3,130 | 3,127 |
| 10.00 | 3,130 | 702 | 10.00 | 3,130 | 3,179 |
| 15.56 | 3,130 | 720 | 16.64 | 3,130 | 3,231 3,282 |
| 15.60 | 3,130 | 733 | 16.66 | 3,130 | 3 3 3 1 |
| 15.62 | 3 136 | 803 | 16.68 | 3 136 | 3 385 |
| 15.66 | 3 136 | 828 | 16 70 | 3 136 | 3 437 |
| 15.68 | 3,136 | 853 | 16.72 | 3,136 | 3,488 |
| 15.70 | 3,136 | 878 | 16.74 | 3,136 | 3,539 |
| 15.72 | 3,136 | 903 | 16.76 | 3,136 | 3,590 |
| 15.74 | 3,136 | 928 | 16.78 | 3,136 | 3,641 |
| 15.76 | 3,136 | 968 | 16.80 | 3,136 | 3,693 |
| 15.78 | 3,136 | 1,021 | 16.82 | 3,136 | 3,744 |
| 15.80 | 3,136 | 1,075 | 16.84 | 3,136 | 3,794 |
| 15.82 | 3,136 | 1,128 | 16.86 | 3,136 | 3,845 |
| 15.84 | 3,136 | 1,181 | 16.88 | 3,136 | 3,896 |
| 15.86 | 3,136 | 1,235 | 16.90 | 3,136 | 3,947 |
| 15.88 | 3,136 | 1,288 | 16.92 | 3,136 | 3,998 |
| 15.90 | 3,136 | 1,342 | 16.94 | 3,136 | 4,048 |
| 15.92 | 3,130 | 1,395 | 10.90 | 3,130 | 4,099 |
| 15.94 | 3,130 2,126 | 1,440 | 10.90 | 3,130 2,126 | 4,149 |
| 15.90 | 3 136 | 1,501 | 17.00 | 3 136 | 4,200 1 250 |
| 16.00 | 3 136 | 1 607 | 17.02 | 3 136 | 4,200 |
| 16.02 | 3,136 | 1,660 | 17.06 | 3,136 | 4,350 |
| | -, | ., | | -, | ., |

Stage-Area-Storage for Pond A2-P: CHAMBERS

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Stage-Area-Storage for Pond A2-P: CHAMBERS (continued)

| Elevation | Surface | Storage | Elevation | Surface | Storage | |
|-----------|---------|---------------|----------------|---------|-----------------|------------------------|
| | (SQ-IL) | | | (SQ-IL) | | |
| 17.08 | 3,130 | 4,400 | 18.12 | 3,130 | 6,874 | |
| 17.10 | 3,130 | 4,451 | 18.14 | 3,136 | 6,919 | |
| 17.12 | 3,136 | 4,500 | 18.16 | 3,136 | 6,963 | |
| 17.14 | 3,136 | 4,550 | 18.18 | 3,136 | 7,007 | |
| 17.16 | 3,136 | 4,600 | 18.20 | 3,136 | 7,051 | |
| 17.18 | 3,136 | 4,650 | 18.22 | 3,136 | 7,095 | |
| 17.20 | 3,136 | 4,699 | 18.24 | 3,136 | 7,138 | |
| 17.22 | 3,136 | 4,749 | 18.26 | 3,136 | 7,182 | |
| 17.24 | 3,136 | 4,798 | 18.28 | 3,136 | 7,225 | |
| 17.26 | 3,136 | 4,848 | 18.30 | 3,136 | 7,268 | |
| 17.28 | 3,136 | 4,897 | 18.32 | 3,136 | 7,311 | |
| 17.30 | 3,136 | 4,946 | 18.34 | 3,136 | 7,354 | |
| 17.32 | 3,136 | 4,995 | 18.36 | 3,136 | 7,397 | |
| 17.34 | 3,136 | 5,044 | 18.38 | 3,136 | 7,439 | |
| 17.36 | 3,136 | 5,093 | 18.40 | 3,136 | 7,481 | |
| 17.38 | 3,136 | 5,142 | 18.42 | 3,136 | 7,524 | |
| 17.40 | 3,136 | 5,191 | 18.44 | 3,136 | 7,565 | |
| 17.42 | 3,136 | 5,239 | 18.46 | 3,136 | 7,607 | |
| 17.44 | 3,136 | 5,288 | 18.48 | 3,136 | 7,649 | |
| 17.46 | 3,136 | 5,336 | 18.50 | 3,136 | 7,690 | |
| 17.48 | 3,136 | 5,385 | 18.52 | 3,136 | 7,731 | |
| 17.50 | 3,136 | 5,433 | 18.54 | 3,136 | 7,772 | |
| 17.52 | 3,136 | 5,481 | 18.56 | 3,136 | 7,813 | |
| 17.54 | 3,136 | 5,529 | 18.58 | 3,136 | 7,853 | |
| 17.56 | 3,136 | 5,577 | 18.60 | 3,136 | 7,894 | |
| 17.58 | 3,136 | 5,625 | 18.62 | 3,136 | 7,934 | |
| 17.60 | 3,136 | 5.673 | 18.64 | 3,136 | 7.973 | |
| 17.62 | 3,136 | 5,721 | 18.66 | 3,136 | 8.013 | |
| 17.64 | 3,136 | 5,768 | 18.68 | 3,136 | 8.052 | |
| 17.66 | 3,136 | 5,816 | 18.70 | 3,136 | 8.092 | |
| 17.68 | 3,136 | 5,863 | 18.72 | 3,136 | 8,131 | |
| 17 70 | 3 136 | 5,910 | 18 74 | 3 136 | 8 169 | |
| 17.72 | 3,136 | 5,957 | 18.76 | 3,136 | 8,208 | |
| 17 74 | 3 136 | 6 004 | 18 78 | 3 136 | 8 246 | |
| 17 76 | 3 136 | 6 051 | 18 80 | 3 136 | 8 284 | |
| 17.78 | 3 136 | 6,098 | 18.82 | 3 136 | 8,321 | |
| 17.80 | 3 136 | 6 145 | 18.84 | 3 136 | 8,358 | |
| 17.80 | 3 136 | 6 191 | 18.86 | 3 136 | 8 395 | |
| 17.84 | 3 136 | 6 238 | 18.88 | 3 136 | 8 4 3 2 | |
| 17.86 | 3 136 | 6 284 | 18.90 | 3 136 | 8 468 | |
| 17.88 | 3 136 | 6 3 3 0 | 18.00 | 3 136 | 8 504 | |
| 17.00 | 3 136 | 6 376 | 18 94 | 3 136 | 8 540 | |
| 17.00 | 3 136 | 6 4 2 2 | 18.96 | 3 136 | 8 575 | |
| 17.02 | 3 136 | 6 / 68 | 18 08 | 3 136 | 8 610 | |
| 17.04 | 3,130 | 6 51 <i>1</i> | 10.00 | 3,130 | 2,010 2,615 | |
| 17.00 | 3 126 | 6 550 | 10.00 | 3 126 | 0,040 2 670 | |
| 18.00 | 3,130 | 6 605 | 10.02 | 3 126 | Q,079 | STORAGE PROVIDED BELOW |
| 18.00 | 3 126 | 6,005 | 10.04 | 3 126 | Q 7/F | LOW FLOW OUTLET |
| 10.02 | 3,130 | 0,000 | 19.00 | 3 126 | 0,140 0 770 | |
| 10.04 | 3,130 | 6 740 | 19.00 | 3,130 | 0,110 | |
| 10.00 | 3 130 | 0,740 | 10.10 | 3,100 | 0,010 | |
| 10.00 | 3,130 | 0,700 | 19.1Z 10.17 | 3,130 | 0,04 I 0 071 | |
| 10.10 | 5,150 | 0,030 | 19.14 | 3,130 | 0,071 | |
| | | | | | | |

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Stage-Area-Storage for Pond A2-P: CHAMBERS (continued)

| Elevation (feet) | Surface (sɑ-ft) | Storage (cubic-feet) | Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) |
|---------------------|--------------------|-------------------------|---------------------|--------------------|-------------------------|
| 19 16 | 3 136 | 8 901 | 20.20 | 3 136 | 10 241 |
| 19.18 | 3 136 | 8 931 | 20.22 | 3 136 | 10,266 |
| 19.10 | 3 136 | 8 960 | 20.22 | 3 136 | 10,200 |
| 19.20 | 3 136 | 8 989 | 20.24 | 3 136 | 10,201 |
| 10.22 | 3 136 | 0,000 | 20.20 | 3 136 | 10,310 |
| 10.24 | 3 136 | 9,017 | 20.20 | 3 136 | 10,341 |
| 10.20 | 3 136 | 0,073 | 20.30 | 3 136 | 10,000 |
| 19.20 | 3 136 | 9,075 | 20.32 | 3 136 | 10,002 |
| 10.00 | 3 136 | 9 127 | 20.34 | 3 136 | 10,417 |
| 10.32 | 3 136 | 9 154 | 20.30 | 3 136 | 10,442 |
| 10.04 | 3 136 | 0 181 | 20.00 | 3 136 | 10,407 |
| 10.30 | 3 136 | 9 208 | 20.40 | 3 136 | 10,432 |
| 19.00 | 3 136 | 9 234 | 20.42 | 3 136 | 10,517 |
| 10.40 | 3 136 | 9,204 | 20.44 | 3 136 | 10,542 |
| 10.42 | 3 136 | 9,201 | 20.40 | 3 136 | 10,507 |
| 19.44 | 3 136 | 9,200 | 20.40 | 3 136 | 10,002 |
| 19.40 | 3 136 | 9,338 | 20.00 | 0,100 | 10,017 |
| 19.50 | 3 136 | 9,363 | | | |
| 19.52 | 3 136 | 9,388 | | | |
| 19.54 | 3 136 | 9 4 1 3 | | | |
| 19.56 | 3 136 | 9 438 | | | |
| 19.58 | 3 136 | 9 463 | | | |
| 19.60 | 3 136 | 9 488 | | | |
| 19.62 | 3 136 | 9 513 | | | |
| 19.64 | 3,136 | 9,538 | | | |
| 19.66 | 3,136 | 9,564 | | | |
| 19.68 | 3,136 | 9,589 | | | |
| 19.70 | 3,136 | 9,614 | | | |
| 19.72 | 3,136 | 9.639 | | | |
| 19.74 | 3,136 | 9.664 | | | |
| 19.76 | 3,136 | 9,689 | | | |
| 19.78 | 3,136 | 9,714 | | | |
| 19.80 | 3,136 | 9,739 | | | |
| 19.82 | 3,136 | 9,764 | | | |
| 19.84 | 3,136 | 9,789 | | | |
| 19.86 | 3,136 | 9,814 | | | |
| 19.88 | 3,136 | 9,840 | | | |
| 19.90 | 3,136 | 9,865 | | | |
| 19.92 | 3,136 | 9,890 | | | |
| 19.94 | 3,136 | 9,915 | | | |
| 19.96 | 3,136 | 9,940 | | | |
| 19.98 | 3,136 | 9,965 | | | |
| 20.00 | 3,136 | 9,990 | | | |
| 20.02 | 3,136 | 10,015 | | | |
| 20.04 | 3,136 | 10,040 | | | |
| 20.06 | 3,136 | 10,065 | | | |
| 20.08 | 3,136 | 10,090 | | | |
| 20.10 | 3,136 | 10,116 | | | |
| 20.12 | 3,136 | 10,141 | | | |
| 20.14 | 3,136 | 10,166 | | | |
| 20.16 | 3,136 | 10,191 | | | |
| 20.18 | 3,136 | 10,216 | | | |
| | | | | | |



Project Name:Wharf Street RedevelopmentProject Location:44 Wharf Street, Weymouth, MAProject Number:193-187

Date: 7/16/2020 Calculated By: DWP Checked By: KPS

| Structure Name: | Storm Chambers (A1-P) | Description: | Water Quali | ty Unit | |
|-----------------|-----------------------|--------------------|----------------|-------------|-------------------------|
| Subcatchment: | A2-PR To | tal Drainage Area: | 17,558 0.40 | sq ft ac | |
| | Tota | I Impervious Area: | 13,884 0.32 | sq ft ac | *Excludes Roof Areas |
| 0.776317341 | Runoff De | pth to be Treated: | 1.0 | inches | |
| | Required Water | Quality Volume: | 0.027 | ac ft | |
| | | | 1157 | cf | |

Water Quality Volume Provided:4,702 cf in Pond A1-P

FLOW RATE CONVERSION

Q = (qu)(A)(WQV)

Where:

Q = flow rate associated with the **1**-inch of runoff, in cfs qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area, in square miles

WQV = water quality volume in watershed inches

Given:

| 1-acre = | 0.0015625 mi ² |
|------------------------|---------------------------|
| 5 minute = | 0.083 hours |
| qu (1 -inch) = | 774 csm/in |

Calculation:

qu= **774** A= 0.32 ac WQV= 1.0 in

Required Water Quality Flow Rate: 0.39

WQU-A10 will provide 80% TSS Removal Efficiency for flows up to 0.40 cfs

cfs

193187-CV01-HYD-PR

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| Elevation | Surface | Storage | Elevation | Surface | Storage |
|-----------|---------|--------------|-----------|---------|--------------|
| (feet) | (sq-ft) | (cubic-feet) | (feet) | (sq-ft) | (cubic-feet) |
| 16.10 | 1,761 | 0 | 17.14 | 1,761 | 956 |
| 16.12 | 1,761 | 14 | 17.16 | 1,761 | 985 |
| 16.14 | 1,761 | 28 | 17.18 | 1,761 | 1,015 |
| 16.16 | 1,761 | 42 | 17.20 | 1,761 | 1,044 |
| 16.18 | 1,761 | 56 | 17.22 | 1,761 | 1,073 |
| 16.20 | 1,761 | /0 | 17.24 | 1,761 | 1,102 |
| 16.22 | 1,761 | 85 | 17.26 | 1,761 | 1,132 |
| 16.24 | 1,761 | 99 | 17.28 | 1,761 | 1,161 |
| 16.20 | 1,761 | 113 | 17.30 | 1,761 | 1,190 |
| 10.28 | 1,701 | 127 | 17.32 | 1,701 | 1,219 |
| 16.30 | 1,701 | 141 | 17.34 | 1,701 | 1,240 |
| 16.32 | 1,701 | 100 | 17.30 | 1,701 | 1,277 |
| 16.34 | 1,701 | 103 | 17.30 | 1,701 | 1,300 |
| 16.38 | 1,701 | 105 | 17.40 | 1,701 | 1,355 |
| 16.40 | 1 761 | 211 | 17.42 | 1 761 | 1 303 |
| 16.42 | 1 761 | 225 | 17.44 | 1 761 | 1 422 |
| 16.44 | 1,761 | 239 | 17.48 | 1,761 | 1,451 |
| 16.46 | 1,761 | 254 | 17.50 | 1,761 | 1,480 |
| 16.48 | 1.761 | 268 | 17.52 | 1.761 | 1,509 |
| 16.50 | 1,761 | 282 | 17.54 | 1,761 | 1,538 |
| 16.52 | 1,761 | 296 | 17.56 | 1,761 | 1,567 |
| 16.54 | 1,761 | 310 | 17.58 | 1,761 | 1,596 |
| 16.56 | 1,761 | 324 | 17.60 | 1,761 | 1,624 |
| 16.58 | 1,761 | 338 | 17.62 | 1,761 | 1,653 |
| 16.60 | 1,761 | 352 | 17.64 | 1,761 | 1,682 |
| 16.62 | 1,761 | 366 | 17.66 | 1,761 | 1,711 |
| 16.64 | 1,761 | 380 | 17.68 | 1,761 | 1,739 |
| 16.66 | 1,761 | 394 | 17.70 | 1,761 | 1,768 |
| 16.68 | 1,761 | 409 | 17.72 | 1,761 | 1,796 |
| 16.70 | 1,761 | 423 | 17.74 | 1,761 | 1,825 |
| 16.72 | 1,761 | 437 | 17.76 | 1,761 | 1,853 |
| 10.74 | 1,701 | 451 | 17.78 | 1,701 | 1,882 |
| 16.70 | 1,701 | 403 | 17.00 | 1,701 | 1,910 |
| 16.80 | 1,701 | 479 | 17.02 | 1,701 | 1,939 |
| 16.82 | 1,701 | 493 507 | 17.86 | 1 761 | 1,907 |
| 16.84 | 1 761 | 521 | 17.88 | 1 761 | 2 024 |
| 16.86 | 1 761 | 543 | 17.00 | 1 761 | 2 052 |
| 16.88 | 1,761 | 573 | 17.92 | 1,761 | 2,080 |
| 16.90 | 1,761 | 602 | 17.94 | 1,761 | 2,109 |
| 16.92 | 1.761 | 632 | 17.96 | 1.761 | 2.137 |
| 16.94 | 1,761 | 661 | 17.98 | 1,761 | 2,165 |
| 16.96 | 1,761 | 691 | 18.00 | 1,761 | 2,193 |
| 16.98 | 1,761 | 721 | 18.02 | 1,761 | 2,221 |
| 17.00 | 1,761 | 750 | 18.04 | 1,761 | 2,249 |
| 17.02 | 1,761 | 780 | 18.06 | 1,761 | 2,277 |
| 17.04 | 1,761 | 809 | 18.08 | 1,761 | 2,305 |
| 17.06 | 1,761 | 838 | 18.10 | 1,761 | 2,333 |
| 17.08 | 1,761 | 868 | 18.12 | 1,761 | 2,361 |
| 17.10 | 1,761 | 897 | 18.14 | 1,761 | 2,389 |
| 17.12 | 1,701 | 927 | 10.10 | 1,701 | 2,417 |
| | | | | | |

Stage-Area-Storage for Pond A1-P: CHAMBERS

Prepared by CEC, Inc. HydroCAD® 10.10-3a s/n 10498 © 2020 HydroCAD Software Solutions LLC

| Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) | Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) | |
|---------------------|--------------------|-------------------------|---------------------|--------------------|-------------------------|------------------------|
| 18.18 | 1.761 | 2.444 | 19.22 | 1.761 | 3.816 | |
| 18.20 | 1,761 | 2,472 | 19.24 | 1,761 | 3,841 | |
| 18.22 | 1,761 | 2,500 | 19.26 | 1.761 | 3.865 | |
| 18.24 | 1.761 | 2.527 | 19.28 | 1.761 | 3.890 | |
| 18.26 | 1,761 | 2,555 | 19.30 | 1,761 | 3,914 | |
| 18.28 | 1 761 | 2 583 | 19.32 | 1 761 | 3,939 | |
| 18.30 | 1 761 | 2 610 | 19.34 | 1 761 | 3,963 | |
| 18.32 | 1 761 | 2 637 | 19.36 | 1 761 | 3 987 | |
| 18.34 | 1 761 | 2 665 | 19.38 | 1 761 | 4 011 | |
| 18.36 | 1 761 | 2 692 | 19 40 | 1 761 | 4 035 | |
| 18.38 | 1 761 | 2 720 | 19 42 | 1 761 | 4 059 | |
| 18.40 | 1 761 | 2 747 | 19.44 | 1,761 | 4 083 | |
| 18.42 | 1 761 | 2,747 | 19.44 | 1,761 | 4 106 | |
| 18 44 | 1 761 | 2,774 | 10.40 | 1,761 | 4,100 | |
| 18.46 | 1 761 | 2,001 | 19.40 | 1,761 | 4 153 | |
| 18.48 | 1,761 | 2,020 | 10.50 | 1,701 | 4,100 | |
| 18.50 | 1,701 | 2,000 | 19.52 | 1,701 | 4,177 | |
| 18.50 | 1,701 | 2,002 | 19.54 | 1,701 | 4,200 | |
| 19.52 | 1,701 | 2,303 | 19.50 | 1,701 | 4,223 | |
| 19.54 | 1,701 | 2,930 | 19.50 | 1,701 | 4,240 | |
| 10.00 | 1,701 | 2,903 | 19.00 | 1,701 | 4,209 | |
| 10.00 | 1,701 | 2,990 | 19.02 | 1,701 | 4,292 | |
| 10.00 | 1,701 | 3,017 | 19.04 | 1,701 | 4,313 | |
| 10.02 | 1,701 | 3,043 | 19.00 | 1,701 | 4,337 | |
| 18.04 | 1,701 | 3,070 | 19.08 | 1,701 | 4,300 | |
| 18.00 | 1,701 | 3,097 | 19.70 | 1,701 | 4,382 | |
| 18.68 | 1,761 | 3,123 | 19.72 | 1,761 | 4,405 | |
| 18.70 | 1,761 | 3,150 | 19.74 | 1,761 | 4,427 | |
| 18.72 | 1,761 | 3,176 | 19.76 | 1,761 | 4,449 | |
| 18.74 | 1,761 | 3,203 | 19.78 | 1,761 | 4,471 | |
| 18.76 | 1,761 | 3,229 | 19.80 | 1,761 | 4,492 | STORAGE PROVIDED BELOW |
| 18.78 | 1,761 | 3,255 | 19.82 | 1,761 | 4,514 | LOW FLOW OUTLET |
| 18.80 | 1,761 | 3,281 | 19.84 | 1,761 | 4,536 | 1 |
| 18.82 | 1,761 | 3,307 | 19.86 | 1,761 | 4,557 | |
| 18.84 | 1,761 | 3,334 | 19.88 | 1,761 | 4,578 | |
| 18.86 | 1,761 | 3,360 | 19.90 | 1,761 | 4,599 | |
| 18.88 | 1,761 | 3,386 | 19.92 | 1,761 | 4,620 | |
| 18.90 | 1,761 | 3,411 | 19.94 | 1,761 | 4,641 | |
| 18.92 | 1,761 | 3,437 | 19.96 | 1,761 | 4,662 | |
| 18.94 | 1,761 | 3,463 | 19.98 | 1,761 | 4,682 | |
| 18.96 | 1,761 | 3,489 | 20.00 | 1,761 | 4,702 | |
| 18.98 | 1,761 | 3,514 | 20.02 | 1,761 | 4,722 | |
| 19.00 | 1,761 | 3,540 | 20.04 | 1,761 | 4,742 | |
| 19.02 | 1,761 | 3,565 | 20.06 | 1,761 | 4,762 | |
| 19.04 | 1,761 | 3,591 | 20.08 | 1,761 | 4,781 | |
| 19.06 | 1,761 | 3,616 | 20.10 | 1,761 | 4,800 | |
| 19.08 | 1,761 | 3,641 | 20.12 | 1,761 | 4,819 | |
| 19.10 | 1,761 | 3,667 | 20.14 | 1,761 | 4,838 | |
| 19.12 | 1,761 | 3,692 | 20.16 | 1,761 | 4,857 | |
| 19.14 | 1,761 | 3,717 | 20.18 | 1,761 | 4,875 | |
| 19.16 | 1,761 | 3,742 | 20.20 | 1,761 | 4,892 | |
| 19.18 | 1,761 | 3,767 | 20.22 | 1,761 | 4,910 | |
| 19.20 | 1,761 | 3,791 | 20.24 | 1,761 | 4,927 | |
| | | | | | | |

Stage-Area-Storage for Pond A1-P: CHAMBERS (continued)

HydroCAD® 10.10-3a s/n 10498 © 2020 HydroCAD Software Solutions LLC

Stage-Area-Storage for Pond A1-P: CHAMBERS (continued)

| Elevation | Surface | Storage | Elevation | Surface | Storage |
|----------------|-------------------------|----------------|-----------|-------------------------|------------------------------|
| 20.26 | <u>(Sq-II)</u> 1 761 | | 21.30 | <u>(Sq-II)</u> 1 761 | <u>(Cubic-leet)</u> 5 605 |
| 20.20 | 1,701 | 4,944 4 960 | 21.30 | 1,701 | 5,095 |
| 20.30 | 1,761 | 4,976 | 21.34 | 1,761 | 5.724 |
| 20.32 | 1,761 | 4,992 | 21.36 | 1,761 | 5,738 |
| 20.34 | 1,761 | 5,008 | 21.38 | 1,761 | 5,752 |
| 20.36 | 1,761 | 5,024 | 21.40 | 1,761 | 5,766 |
| 20.38 | 1,761 | 5,039 | 21.42 | 1,761 | 5,780 |
| 20.40 | 1,761 | 5,055 | 21.44 | 1,761 | 5,794 |
| 20.42 | 1,761 | 5,070 | 21.46 | 1,761 | 5,808 |
| 20.44 | 1,761 | 5,085 | 21.48 | 1,761 | 5,822 |
| 20.40 | 1,701 | 5,100 5,115 | 21.50 | 1,701 | 5,830 |
| 20.40 | 1,701 | 5,115 | 21.52 | 1,701 | 5,650 |
| 20.50 | 1,761 | 5 145 | 21.54 | 1,761 | 5 878 |
| 20.54 | 1,761 | 5,159 | 21.58 | 1,761 | 5.893 |
| 20.56 | 1,761 | 5,174 | 21.60 | 1,761 | 5,907 |
| 20.58 | 1,761 | 5,188 | | , - | -, |
| 20.60 | 1,761 | 5,202 | | | |
| 20.62 | 1,761 | 5,216 | | | |
| 20.64 | 1,761 | 5,230 | | | |
| 20.66 | 1,761 | 5,245 | | | |
| 20.68 | 1,761 | 5,259 | | | |
| 20.70 | 1,701 | 5,273 5,287 | | | |
| 20.72 | 1,701 | 5,207 | | | |
| 20.76 | 1,761 | 5.315 | | | |
| 20.78 | 1,761 | 5,329 | | | |
| 20.80 | 1,761 | 5,343 | | | |
| 20.82 | 1,761 | 5,357 | | | |
| 20.84 | 1,761 | 5,371 | | | |
| 20.86 | 1,761 | 5,385 | | | |
| 20.88 | 1,761 | 5,400 | | | |
| 20.90 | 1,761 | 5,414 | | | |
| 20.92 | 1,701 | 5,420 5,420 | | | |
| 20.94 | 1,701 | 5,442 | | | |
| 20.98 | 1,761 | 5 470 | | | |
| 21.00 | 1,761 | 5,484 | | | |
| 21.02 | 1,761 | 5,498 | | | |
| 21.04 | 1,761 | 5,512 | | | |
| 21.06 | 1,761 | 5,526 | | | |
| 21.08 | 1,761 | 5,540 | | | |
| 21.10 | 1,761 | 5,554 | | | |
| 21.12 | 1,761 | 5,569 | | | |
| ∠1.14 21.16 | 1,701 | 0,000 5 507 | | | |
| 21.10 | 1 761 | 5 611 | | | |
| 21.20 | 1,761 | 5.625 | | | |
| 21.22 | 1,761 | 5.639 | | | |
| 21.24 | 1,761 | 5,653 | | | |
| 21.26 | 1,761 | 5,667 | | | |
| 21.28 | 1,761 | 5,681 | | | |
| | | | | | |

Hydraulic Analysis



Groundwater Recharge Calculations

Project Name: Wharf Street Redevelopment Project Location: 44 Wharf Street, Weymouth, MA Project Number: 193-187 Date: 7/16/2020 Calculated By: DWP Checked By: KPS

OVERALL SITE RECHARGE

Existing Conditions Impervious Area

| Hydraulic | | Area | Recharge | Volume |
|------------|---------|---------|------------|---------|
| Soil Group | (sq ft) | (acres) | Depth (in) | (cu ft) |
| А | 61,132 | 1.40 | 0.60 | 3,057 |
| В | 0 | 0.00 | 0.35 | 0 |
| С | 0 | 0.00 | 0.25 | 0 |
| D | 0 | 0.00 | 0.10 | 0 |
| TOTAL | 61,132 | 1.40 | | 3,057 |

Proposed Conditions Impervious Area

| Hydraulic | | Area | Recharge | Volume |
|------------|---------|---------|------------|---------|
| Soil Group | (sq ft) | (acres) | Depth (in) | (cu ft) |
| A | 83,334 | 1.91 | 0.60 | 4,167 |
| В | 0 | 0.00 | 0.35 | 0 |
| С | 0 | 0.00 | 0.25 | 0 |
| D | 0 | 0.00 | 0.10 | 0 |
| TOTAL | 83,334 | 1.91 | | 4,167 |

Net Required Recharge Volume: 1,110 cu ft

Capture Area Adjustment

* Impervious Area to Recharge Facility: 1.86 ac * (includes portions of the pavement and the entire roof Total Site Impervious Area:) 1.91 ac ** Impervious Ratio: 1.03 ** (Total Site Impervious / Impervious Area to Recharge Facility) **Adjusted Required** 4,286 cu ft **Recharge Volume:** Provided Recharge Volume Stormtech Chambers (A1-P) Subcatchment 1A / 709 cf Y)

| Our | | 1,100 | 01 | |
|----------|--------------------------|------------------|--------|---------------------------|
| Subcatch | hment 1B & 1C | 6,376 | cf | Stormtech Chambers (A2-P) |
| Subcatcl | hment 2A & 2B | 393 | cf | Stormtech Chambers (A3-P) |
| | TOTAL | 11,478 | cf | |
| | Total Pro Recharge Vo | ovided olume: | 11,478 | cu ft |

| | | Groundwater Recharge Calculations | ļ |
|---|------------------------|--|---|
| Project Name: Wharf Street Redevelopment Project Location: 44 Wharf Street, Weymouth MA Project Number: 193-187 | ι. | Date: 7/16/2020 Calculated By: DWP Checked By: KPS | |
| Stormwater BMP: <u>Subcatchment A2-PR, A6-PR</u> | Descript | ion: Stormtech Chambers (A1-P) | |
| Provided Recharge Volume | | | |
| Bottom of Stone: 16.1 | 0 ft | | |
| Low Flow Outlet Elevation: 20.0 | 00 ft | | |
| *** Recharge Provided: 470 | 9 cu ft *** | (See attached HydroCAD output) | |
| Total Provide Recharge Volume | d 4,709 cu ft e: | | |
| 72-hour Drawdown Calculation | | | |
| Provided Recharge Volume: 4.70 | 9 cu ft | | |
| Saturated Hydraulic Conductivity: 2.4 | 1 in / hr | (Rawls Rate for HSG C was used) | |
| Bottom Area: 1,76 | 51 sq ft | · · · · · | |
| Drawdown Time: 13. | .3 hours | | |



Groundwater Recharge Calculations

Project Name: Wharf Street Redevelopment Project Location: 44 Wharf Street, Weymouth, MA Project Number: 193-187 Date: 7/16/2020 Calculated By: DWP Checked By: KPS

Stormwater BMP: Subcatchment A10-PR, A3-PR, A8-PR Description: Stormtech Chambers (A2-P)

Provided Recharge Volume

| Bottom of Stone: | 15.00 | ft | |
|----------------------------|-------|-------|------------------------------------|
| Low Flow Outlet Elevation: | 17.90 | ft | |
| *** Recharge Provided: | 5,191 | cu ft | *** (See attached HydroCAD output) |

| Total Provided | 6 976 | f t |
|------------------|-------|------------|
| Recharge Volume: | 0,370 | cun |

72-hour Drawdown Calculation

| Saturated Hydraulic Conductivity: | 2.41 | in / hr | (Rawls Rate for HSG C was used) |
|-----------------------------------|-------|---------|---------------------------------|
| Bottom Area: | 3,136 | sq ft | |
| Drawdown Time: | 10.1 | hours | |

| | | | | | Groundwater Re Calculatior | echarge ns |
|---|---------------------------------|---------------------------|----------|------|--|-------------------------|
| Project Name: Wharf Street Redevelopment Project Location: 44 Wharf Street, Weymouth, M Project Number: 193-187 | ЛА | | | | Date: Calculated By: Checked By: | 7/16/2020 DWP KPS |
| Stormwater BMP: Subcatchment A12-PR | | De | scriptio | on: | Stormtech Chambers (A3-I | <u>P</u>) |
| Provided Recharge Volume | | | | | | |
| Bottom of Stone: 13. Low Flow Outlet Elevation: 14. *** Recharge Provided: 3 | .10 .75 893 | ft ft cu ft | *** | (See | attached HydroCAD output) | |
| Total Provid Recharge Volum | ed ne: | 393 | cu ft | | | |
| 72-hour Drawdown Calculation | | | | | | |
| Provided Recharge Volume: 3 Saturated Hydraulic Conductivity: 2 Bottom Area: 3 | 8 <mark>68</mark> .41 853 | cu ft in / hr sq ft | | (Rav | vls Rate for HSG C was used) | |
| Drawdown Time: | 5.2 | hours | | | | |



Storm Drainage Calculations

| Design | P |
|--------|-------|
| Desiun | - E (|

25

Design Parameters:

Year Storm Boston

IDF Curve

Project Number: 183-187

Project Name: The Overlook

Project Location: 44 Wharf Street, Weymouth, MA

k_e= 0.5

| | LOC | CATION | | | DESIGN | | | CA | PACITY | | PROFILE | | | NOTES | |
|---------------|---------------|---------------|------|-----|--------|------|-------|--------|--------|--------|---------|-------|-------|-------|---|
| DESCRIPTION | FROM | то | Q | V | n | PIPE | SLOPE | Q full | V full | LENGTH | FALL | RIM | INV | INV | |
| | | | cfs | fps | | SIZE | | ft^3/s | ft/s | ft | ft | | UPPER | LOWER | |
| MBTA CULVERT | UNKNOWN | OUTLET | 1.9 | 5.5 | 0.012 | 8 | 0.020 | 1.9 | 5.3 | 10 | 0.20 | 30.00 | 34.40 | 34.20 | ASSUMED TO BE FLOWING FULL (1.9 CFS) |
| MBTA OFFSITE | HW-A5 | OCS-A4 | 3.6 | 7.4 | 0.012 | 12 | 0.031 | 6.8 | 8.6 | 221 | 6.80 | 25.00 | 25.00 | 18.20 | A4-OFF + A5-PR + MBTA CULVERT + 25% OF A1-OFF |
| OFFSITE | AD-A13 | OCS-A4 | 2.5 | 4.5 | 0.012 | 12 | 0.010 | 3.9 | 5.0 | 44 | 0.45 | 25.00 | 18.65 | 18.20 | 50% OF A1-OFF |
| | WQU-A14 | A1-P CHAMBERS | 1.9 | 4.3 | 0.012 | 12 | 0.011 | 4.1 | 5.2 | 9 | 0.10 | 23.60 | 19.10 | 19.00 | A2-PR |
| A1-P CHAMBERS | ROOFDRAIN | A1-P CHAMBERS | 1.5 | 5.2 | 0.012 | 8 | 0.020 | 1.9 | 5.3 | 22 | 0.44 | 25.00 | 19.44 | 19.00 | A6-PR |
| | A1-P CHAMBERS | OCS-A4 | 0.6 | 4.6 | 0.012 | 12 | 0.044 | 8.1 | 10.4 | 9 | 0.40 | 23.50 | 26.30 | 25.90 | OUTLET FROM A1-P CHAMBERS |
| MAIN LINE | OCS-A4 | DMH-A3 | 6.7 | 5.7 | 0.012 | 18 | 0.010 | 11.4 | 6.4 | 220 | 2.20 | 24.10 | 16.75 | 14.55 | CONFLUENCE FROM UPSTREAM AREAS |
| OFFSITE ROAD | EX DMH | DMH-A15 | 3.6 | 4.7 | 0.013 | 12 | 0.018 | 4.7 | 6.0 | 91 | 1.60 | 33.90 | 29.00 | 27.40 | ASSUMED TO BE FLOWING FULL AT LIMITING SLOPE (4.7 CFS) |
| OFESITE | AD-A16 | DMH-A15 | 1.2 | 3.7 | 0.012 | 12 | 0.010 | 3.9 | 5.0 | 44 | 0.45 | 22.00 | 18.00 | 17.55 | 25% OF A1-OFF |
| OFTSILE | DMH-A15 | DMH-A3 | 4.8 | 6.3 | 0.012 | 12 | 0.015 | 4.8 | 6.1 | 36 | 0.55 | 30.00 | 17.55 | 17.00 | CONFLUENCE FROM UPSTREAM AREAS |
| | CB-A12 | WQU-A10 | 0.7 | 3.9 | 0.012 | 12 | 0.020 | 5.5 | 7.0 | 49 | 1.00 | 23.50 | 18.30 | 17.30 | 1/3 OF A10-PR |
| | CB-A11 | WQU-A10 | 0.7 | 3.8 | 0.012 | 12 | 0.020 | 5.4 | 6.9 | 46 | 0.90 | 20.20 | 18.20 | 17.30 | 1/3 OF A10-PR |
| A2-P CHAMBERS | WQU-A10 | A2-P CHAMBERS | 1.5 | 4.1 | 0.012 | 12 | 0.012 | 4.2 | 5.3 | 18 | 0.21 | 22.50 | 16.00 | 15.79 | CB-A11 + CB-A12 |
| AZT OF AMBERG | ROOFDRAIN | A2-P CHAMBERS | 0.9 | 4.4 | 0.012 | 8 | 0.020 | 1.9 | 5.4 | 81 | 1.65 | 22.30 | 17.40 | 15.75 | 1/3 OF A10-PR |
| | WQU-A9 | A2-P CHAMBERS | 2.7 | 5.9 | 0.012 | 12 | 0.020 | 5.5 | 7.0 | 42 | 0.85 | 19.60 | 16.60 | 15.75 | A3-PR |
| | OCS-A8 | DMH-A3 | 1.1 | 3.6 | 0.012 | 12 | 0.010 | 3.9 | 4.9 | 21 | 0.21 | 22.50 | 15.75 | 15.54 | OUTLET FROM A2-P CHAMBERS |
| MAIN LINE | DMH-A3 | OCS-A2 | 12.7 | 8.6 | 0.012 | 18 | 0.018 | 15.3 | 8.7 | 157 | 2.85 | 22.44 | 14.55 | 11.70 | |
| | TD-A7 | WQU-A6 | 0.3 | 2.1 | 0.012 | 6 | 0.005 | 0.4 | 2.2 | 89 | 0.45 | 15.50 | 14.13 | 13.68 | 1/2 OF A-12-PR |
| SUBCATCHMENT | CB-A6A | WQU-A6 | 0.3 | 2.3 | 0.012 | 12 | 0.010 | 3.9 | 4.9 | 14 | 0.14 | 17.87 | 13.82 | 13.68 | 1/2 OF A-12-PR |
| 12-PR | WQU-A6 | CHAMBERS | 0.6 | 2.8 | 0.012 | 12 | 0.009 | 3.6 | 4.6 | 9 | 0.08 | 18.49 | 13.68 | 13.60 | TD-A7 + CBA6A |
| | CHAMBERS | OCS-A2 | 0.5 | 2.8 | 0.012 | 12 | 0.011 | 4.1 | 5.2 | 9 | 0.10 | 19.20 | 13.60 | 13.50 | OUTLET FROM A3-P CHAMBERS |
| DISCHARGE | OCS-A2 | DMH-A11 | 13.2 | 9.0 | 0.012 | 18 | 0.020 | 16.0 | 9.1 | 48 | 0.95 | 19.11 | 11.70 | 10.75 | CONFLUENCE FROM UPSTREAM AREAS - TAILWATER ASSUMED AT CROWN OF PIPE |
| | AD-B5 | AD-B4 | 0.2 | 2.2 | 0.012 | 8 | 0.010 | 1.3 | 3.8 | 40 | 0.40 | 15.20 | 12.50 | 12.10 | 1/5 of A7-PR |
| | AD-B4 | AD-B3 | 0.2 | 2.2 | 0.012 | 8 | 0.010 | 1.3 | 3.8 | 40 | 0.40 | 15.30 | 12.10 | 11.70 | 1/5 of A7-PR |
| SUBCATCHMENT | AD-B3 | AD-B2 | 0.2 | 2.2 | 0.012 | 8 | 0.010 | 1.3 | 3.7 | 42 | 0.40 | 15.30 | 11.70 | 11.30 | 1/5 of A7-PR |
| A7-PR | AD-B2 | WQU-B1 | 0.2 | 2.2 | 0.012 | 8 | 0.011 | 1.4 | 3.9 | 47 | 0.50 | 15.30 | 11.30 | 10.80 | 1/5 of A7-PR |
| | RD | WQU-B1 | 0.2 | 2.2 | 0.012 | 8 | 0.010 | 1.3 | 3.8 | 170 | 1.70 | 15.50 | 13.00 | 11.30 | 1/5 of A7-PR |
| | WQU-B1 | EX. DMH | 1.0 | 3.5 | 0.012 | 12 | 0.011 | 4.0 | 5.1 | 26 | 0.28 | 16.00 | 11.28 | 11.00 | A7-PR - TAILWATER ASSUMED AT CROWN OF PIPE |

* Culverts sized to convey storms up to and including 25-year storm event. Refer to HydroCAD for hydrologic analysis.

Manufacturer's O&M Procedures

......



Stormwater Treatment Made Simple!

TSS & Oil Removal Scour Prevention Small Footprint



Environmentally Engineered Stormwater Solutions... that exceed your client's needs!



www.rinkerstormceptor.com Phone: (413) 562-3647



Stormceptor[®] is an underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention. With thousands of systems operating worldwide, Stormceptor delivers protection every day in every storm.

With patented technology, optimal treatment occurs by allowing free oil to rise and sediment to settle. The Stormceptor design prohibits scour and release of previously captured pollutants, ensuring superior treatment and protection during even the most extreme storm events.

Stormceptor is very easy to design and provides flexibility under varying site constraints such as tight right-of-ways, zero lot lines and retrofit projects. Design flexibility allows for a cost-effective approach to stormwater treatment. Stormceptor has proven performance backed by the longest record of lab and field verification in the industry.

Tested Performance

■ Fine particle capture ■ Prevents scour or release ■ 95%+ Oil removal

Water Quality (Q) Flow Rate Table – Massachusetts Pretreatment

| Stormceptor OSR Model | Inside Diameter | Typical Depth Below Inlet Pipe Invert ¹ | Water Quality Flow Rate Q ² | Peak Conveyance Flow Rate ³ | Hydrocarbon Capacity ⁴ | Maximum Sediment Capacity ⁴ |
|--------------------------|--------------------|---|--|--|---------------------------|-----------------------------------|
| | (ft) | (in) | (cfs) | (cfs) | (Gallons) | (ft³) |
| 065 | 4 | 71 | 1.78 | 5.5 | 115 | 46 |
| 140 | 6 | 63 | 3.99 | 22 | 233 | 58 |
| 250 | 8 | 104 | 7.10 | 22 | 792 | 156 |
| 390 | 10 | 140 | 11.09 | 22 | 1,233 | 465 |
| 560 | 12 | 148 | 15.98 | 22 | 1,384 | 690 |
| 780 | 2 x 10 | 140 | 22.19 | 48 | 2,430 | 930 |
| 1125 | 2 x 12 | 148 | 31.95 | 48 | 2,689 | 1,378 |

¹ Depth Below Pipe Inlet Invert to the Bottom of Base Slab, and Maximum Sediment Capacity can vary to accommodate specific site designs and pollutant loads. Depths can vary to accommodate special designs or site conditions. Contact your local representative for assistance.

² Water Quality Flow Rate (Q) is based on 50% TSS annual average removal of the OK-110 particle size distribution.

³ Peak Conveyance Flow Rate is based upon ideal velocity of 3 feet per second and outlet pipe diameters of 18-inch, 36-inch, and 54-inch diameters.
⁴ Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.



www.rinkerstormceptor.com

Manufacturing Plant: Westfield, MA Phone: (413) 562-3647 11-8-13-R13-002 MDEP



Illicit Discharge Compliance Statement

ILLICIT DISCHARGE COMPLIANCE STATEMENT

I VERIFY THAT NO ILLICIT DISCHARGES EXIST FROM <u>THE OVERLOOK</u> <u>REDEVELOPMENT</u> LOCATED AT <u>44 WHARF STREET IN WEYMOUTH,</u> <u>MASSACHUSETTS</u>. THROUGH THE IMPLEMENTATION OF THE *CONSTRUCTION PERIOD POLLUTION PREVENTION AND SEDIMENTATION AND EROSION CONTROL PLAN* AS WELL AS THE *OPERATION AND MAINTENANCE PLAN*, MEASURES ARE SET FORTH TO PREVENT ILLICIT DISCHARGES FROM ENTERING THE STORMWATER MANAGEMENT DRAINAGE SYSTEM.

| SIGNATURE | PRINT NAME | DATE |
|--|---|----------------------|
| | COMBANY | |
| IIILE | COMPANY | |
| | | |
| SIGNATURE | PRINT NAME | DATE |
| TITLE | COMPANY | |
| | | |
| NOTE: THIS CERTIFIC. CONVEYED TO THE PI | ATION MUST BE SIGNED BEFORE STORN ROPOSED STORMWATER DRAINAGE SY | MWATER IS STEM IN |

ACCORDANCE WITH STANDARD 10 OF THE MASSACHUSETTS STORMWATER

Civil & Environmental Consultants, Inc.

MANAGEMENT STANDARDS.

APPENDIX D

SITE PLANS



VICINITY MAP SCALE: 1"=2000'

| | | DRAWING INDEX |
|-----------------|-------------------|-------------------------------------|
| SHEET NUMBER | DRAWING NUMBER | SHEET TITLE |
| CIVIL ENG | INEERING PL | ANS |
| 1 | C000 | COVER SHEET |
| 2 | C001 | GENERAL NOTES |
| 3 | C100 | DEMOLITION AND EROSION CONTROL PLAN |
| 4 | C200 | LAYOUT AND MATERIALS PLAN |
| 5 | C300 | GRADING AND DRAINAGE PLAN |
| 6 | C500 | UTILITIES PLAN |
| 7 | C800 | DETAIL SHEET 1 |
| 8 | C801 | DETAIL SHEET 2 |
| 9 | C802 | DETAIL SHEET 3 |
| 10 | C803 | DETAIL SHEET 4 |
| 11 | C804 | DETAIL SHEET 5 |
| LAND SUR | VEY PLANS | |
| 1 | 1 | BOUNDARY AND TOPOGRAPHIC SURVEY |
| 2 | 2 | BOUNDARY AND TOPOGRAPHIC SURVEY |
| 3 | 3 | BOUNDARY AND TOPOGRAPHIC SURVEY |
| LANDSCAF | PE PLANS | |
| 1 | L100 | SITE PLANTING PLAN |
| 2 | L200 | PLANT SCHEDULE AND PLANTING DETAILS |



APPROVAL BLOCK SIGNATURE DAT SIGNATURE DATE SIGNATURE DATE SIGNATURE DATE SIGNATURE DATE



Dig Safe Systems, Inc. 1-888-DIG-SAFE 1-888-344-7233)

THE OVERLOOK MULTI-FAMILY REDEVELOPMENT

44 WHARF STREET, WEYMOUTH, MASSACHUSETTS, 02189

LOCAL PERMITTING JULY 2020

SITE MAP SCALE: 1"=200' REFERENCE: ORTHORGRAPHIC AERIAL IMAGERY AND MAPS ARE BASED ON GIS DATA OBTAINED FROM MASSGIS PROVIDED BY THE BUREAU OF GEOGRAPHIC INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS, EXECUTIVE OFFICE OF TECHNOLOGY AND SECURITY SERVICES.



OWNER/TEAM INFORMATION

CIVIL ENGINEER CIVIL & ENVIRONMENTAL CONSULTANTS, INC. 31 BELLOWS ROAD RAYNHAM, MA 02767 PH: (774) 501–2176 CONTACT: KARLIS SKULTE

TRANSPORTATION ENGINEER MCMAHON ASSOCIATES, INC. 350 MYLES STANDISH BLVD #103 TAUNTON, MA 02780 PH: (508) 823-2245

ARCHITECT BKA ARCHITECTS 142 CRESCENT STREET BROCKTON, MA 02302 PH: (508) 583-5603

LAND SURVEYOR CONTROL POINT ASSOCIATES, INC. 352 TURNPIKE ROAD SOUTHBOROUGH, MA 01772 PH: (508) 948-3000

APPLICANT HERITAGE COMPANIES 70 QUINCY AVENUE QUINCY, MA 02169 PH: (617) 221-1033 CONTACT: MICHAEL KILEY

OWNER FRANCER MANUFACTURING & SUPPLY CORPORATION 44 WHARF STREET WEYMOUTH, MA 02189

LANDSCAPE ARCHITECT

HAWK DESIGN 39 PLEASANT ST. SAGAMORE, MA 02561 PH: (508) 833-8800

SITE DATA

ADDRESS:

PARCEL I.D.: TOTAL AREA: ZONING DISTRICT:

44 WHARF STREET WEYMOUTH, MA 02189 19-172-25 ±153,276 SF I-2 (GENERAL INDUSTRIAL) HISTORIC MILL OVERLAY DISTRIC (HMOD)

Civil & Environmental Consultants, Inc. 31 Bellows Road · Raynham, MA 02767 Ph: 774.501.2176 · 866.312.2024 · Fax: 774.501.2669 www.cecinc.com

HERITAGE COMPANIES THE OVERLOOK **44 WHARF STREET** WEYMOUTH, MASSACHUSETTS

DWP CHECKED BY: JULY 21, 2020 DWG SCALE:

RAWN BY:

COVER SHEET

AS SHOWN PROJECT NO: DRAWING NO .: **C000**

SHEET 1 OF 11

DRAFT

193-187

KPS APPROVED BY:

| FOR PERMITTING ONL | Y |
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REVISION RECORD

SUBMITTAL RECORD

DESCRIPTION

DESCRIPTION

GENERAL NOTES

- 1. EXISTING CONDITIONS AS DEPICTED ON THESE PLANS ARE GENERAL AND ILLUSTRATIVE IN NATURE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EXAMINE THE SITE AND BE FAMILIAR WITH EXISTING CONDITIONS PRIOR TO BIDDING ON THIS PROJECT. IF CONDITIONS ENCOUNTERED DURING EXAMINATION ARE SIGNIFICANTLY DIFFERENT FROM THOSE SHOWN, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND TOWN OF WEYMOUTH IMMEDIATELY.
- 2. TOPOGRAPHIC AND BOUNDARY SURVEY WAS PERFORMED BY CONTROL POINT ASSOCIATES. INC. IN APRIL 2020 AND IS DEPICTED ON AN EXISTING CONDITIONS PLAN PREPARED BY CONTROL POINT ASSOCIATES, INC. DATED MAY 11, 2020. CEC IS NOT RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. 3. WETLANDS DELINEATION LINE WAS PLACED IN THE FIELD BY LUCAS ENVIRONMENTAL, LLC IN APRIL 2020 AND
- FIELD LOCATED BY CONTROL POINT ASSOCIATES, INC. 4. THE CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL EXISTING UTILITIES (INCLUDING THOSE LABELED
- PER RECORD DATA) PRIOR TO THE BEGINNING OF CONSTRUCTION OR EARTH MOVING OPERATIONS. INFORM ENGINEER AND TOWN OF WEYMOUTH OF ANY CONFLICTS DETRIMENTAL TO THE DESIGN INTENT.
- 5. THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, SUNDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE OWNER AND ENGINEER PRIOR TO EXCAVATION.
- 6. THE CONTRACTOR AND SUBCONTRACTORS SHALL BE RESPONSIBLE FOR COMPLYING WITH APPLICABLE FEDERAL STATE AND LOCAL REQUIREMENTS, TOGETHER WITH EXERCISING PRECAUTIONS AT ALL TIMES FOR THE PROTECTION OF PERSONS (INCLUDING EMPLOYEES) AND PROPERTY. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND SUBCONTRACTORS TO INITIATE, MAINTAIN AND SUPERVISE ALL SAFETY REQUIREMENTS, PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK.
- 7. THE CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER AND OWNER'S REPRESENTATIVE FOR ANY AND ALL INJURIES AND/OR DAMAGES TO PERSONNEL, EQUIPMENT AND/OR EXISTING FACILITIES OCCURRING IN THE COURSE OF THE DEMOLITION AND CONSTRUCTION DESCRIBED IN THE PLANS AND SPECIFICATIONS.
- 8. CONTRACTOR SHALL OBTAIN A PERMIT FOR ALL CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH LOCAL, STATE, & FEDERAL REGULATIONS.
- 9. THE CONTRACTOR SHALL COMPLY WITH ALL LOCAL CODES, OBTAIN ALL APPLICABLE PERMITS, AND PAY ALL REQUIRED FEES PRIOR TO BEGINNING WORK.
- 10. ANY WORK PERFORMED IN RIGHT OF WAYS SHALL BE IN ACCORDANCE WITH THE APPLICABLE LOCAL OR STATE REQUIREMENTS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN THE NECESSARY PERMITS FOR THE WORK, SCHEDULE NECESSARY INSPECTIONS, AND PROVIDE THE NECESSARY TRAFFIC CONTROL MEASURES AND DEVICES, ETC., FOR WORK PERFORMED IN THE RIGHT OF WAYS.
- 11. THE CONTRACTOR IS TO PERFORM ALL INSPECTIONS AS REQUIRED BY THE UNITED STATES EPA FOR THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND FURNISH OWNERS REPRESENTATIVE WITH WRITTEN REPORTS.
- 12. CONTRACTOR SHALL IMPLEMENT ALL SOIL AND EROSION CONTROL PRACTICES IN ACCORDANCE WITH THE EROSION AND SEDIMENT CONTROL PLAN, STORM WATER POLLUTION PREVENTION PLAN AND STATE AND LOCAL REGULATIONS
- 13. ALL GROUND SURFACE AREAS THAT HAVE BEEN EXPOSED OR LEFT BARE AS A RESULT OF CONSTRUCTION AND ARE TO FINAL GRADE AND ARE TO REMAIN SO, SHALL BE SEEDED AND MULCHED AS SOON AS PRACTICAL IN ACCORDANCE WITH SPECIFICATIONS. IF NO SPECIFICATIONS ARE SUPPLIED, USE STATE OF MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.
- 14. ALL CONSTRUCTION WORK SHALL BE DONE ACCORDING TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS AND APPLICABLE STANDARDS OF THE TOWN OF WEYMOUTH. WHEN IN CONFLICT, THE TOWN OF WEYMOUTH REQUIREMENTS SHALL PREVAIL.
- 15. ALL WORK PERFORMED BY THE CONTRACTOR SHALL CONFORM TO THE LATEST REGULATIONS OF THE AMERICANS WITH DISABILITIES ACT.
- 16. THE CONTRACTOR SHALL REFER TO OTHER PLANS WITHIN THIS CONSTRUCTION SET FOR OTHER PERTINENT INFORMATION. IT IS NOT THE ENGINEER'S INTENT THAT ANY SINGLE PLAN SHEET IN THIS SET OF DOCUMENTS FULLY DEPICTS ALL WORK ASSOCIATED WITH THE PROJECT.
- 17. BEFORE INSTALLATION OF STORM OR SANITARY SEWER, OR OTHER UTILITY, THE CONTRACTOR SHALL VERIFY ALL CROSSINGS, BY EXCAVATION WHERE NECESSARY, AND INFORM THE OWNER AND THE ENGINEER OF ANY CONFLICTS. THE ENGINEER WILL BE HELD HARMLESS IN THE EVENT HE IS NOT NOTIFIED OF DESIGN CONFLICTS PRIOR TO CONSTRUCTION.
- 18. ADJUST/RECONSTRUCT ALL EXISTING CASTINGS, CLEANOUTS, ETC. WITHIN PROJECT AREA TO GRADE AS REQUIRED.
- 19. CONTRACTOR TO REMOVE & REPLACE PAVEMENT AS SPECIFIED.
- 20. ALL STANDARD PARKING SPACES ARE 9' BY 18'.

21. SITE SIGNAGE AND STRIPING SHALL BE IN ACCORDANCE WITH THE MASSACHUSETTS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

DEMOLITION NOTES

- 1. ALL EXISTING ABOVE AND BELOW GROUND STRUCTURES WITHIN THE LIMITS OF CONSTRUCTION SHALL BE REMOVED UNLESS NOTED OTHERWISE WITHIN THIS CONSTRUCTION SET AND/OR PROJECT SPECIFICATIONS. THIS INCLUDES FOUNDATION SLABS, WALLS AND FOOTINGS. CAVITIES LEFT BY STRUCTURE REMOVAL SHALL BE BACKFILLED WITH SATISFACTORY MATERIALS AND COMPACTED TO THE GEOTECHNICAL ENGINEER'S RECOMMENDATION.
- 2. NO TREES SHALL BE REMOVED. NOR VEGETATION DISTURBED BEYOND THE LIMITS OF CONSTRUCTION WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE OWNER'S REPRESENTATIVE.
- 3. TREE PROTECTION FENCING SHALL BE IN ACCORDANCE WITH THE DETAILED DRAWINGS. DO NOT OPERATE OR STORE EQUIPMENT, NOR HANDLE OR STORE MATERIALS WITHIN THE DRIP LINES OF THE TREES SHOWN TO REMAIN.
- 4. PROTECTION OF EXISTING TREES AND VEGETATION: PROTECT EXISTING TREES AND OTHER VEGETATION INDICATED TO REMAIN IN PLACE AGAINST UNNECESSARY CUTTING, BREAKING OR SKINNING OF ROOTS, SKINNING OR BRUISING OF BARK. SMOTHERING OF TREES BY STOCKPILING CONSTRUCTION MATERIALS OR EXCAVATED MATERIALS WITHIN DRIP LINE, EXCESS FOOT OR VEHICULAR TRAFFIC, OR PARKING OF VEHICLES WITHIN DRIP LINE. PROVIDE TEMPORARY GUARDS TO PROTECT TREES AND VEGETATION TO BE LEFT STANDING.
- 5. ALL DEMOLITION WASTE AND CONSTRUCTION DEBRIS SHALL BECOME THE PROPERTY OF THE CONTRACTOR UNLESS OTHERWISE DESIGNATED AND SHALL BE REMOVED BY THE CONTRACTOR AND DISPOSED OF OFFSITE IN A STATE APPROVED WASTE SITE AND IN ACCORDANCE WITH ALL LOCAL AND STATE CODES AND PERMIT REQUIREMENTS. TAKE CARE TO PROTECT UTILITIES THAT ARE TO REMAIN. REPAIR DAMAGE ACCORDING TO THE APPROPRIATE UTILITY COMPANY STANDARDS AND AT THE CONTRACTOR'S EXPENSE.
- 6. ALL UTILITY DISCONNECTION, REMOVAL, RELOCATION, CUTTING, CAPPING AND/OR ABANDONMENT SHALL BE COORDINATED WITH THE APPROPRIATE UTILITY COMPANY / AGENCY.
- 7. THE BURNING OF CLEARED MATERIAL AND DEBRIS SHALL NOT BE ALLOWED UNLESS CONTRACTOR OBTAINS PRIOR WRITTEN AUTHORIZATION FROM THE LOCAL AUTHORITIES.
- 8. EROSION & SEDIMENT CONTROL MEASURES AROUND AREAS OF DEMOLITION SHALL BE PROPERLY INSTALLED AND FUNCTION PROPERLY PRIOR TO INITIATION OF DEMOLITION ACTIVITIES.
- 9. IF ASBESTOS OR HAZARDOUS MATERIALS ARE FOUND ON SITE, SUCH MATERIALS SHALL BE REMOVED BY A LICENSED HAZARDOUS MATERIALS CONTRACTOR. CONTRACTOR SHALL NOTIFY OWNER IMMEDIATELY IF HAZARDOUS MATERIALS ARE ENCOUNTERED.
- 10. CONTRACTOR SHALL ADHERE TO ALL LOCAL, STATE, FEDERAL AND OSHA REGULATIONS DURING ALL DEMOLITION ACTIVITIES.
- 11. CONTRACTOR SHALL PROTECT ALL CORNER PINS, MONUMENTS, PROPERTY CORNERS AND BENCHMARKS DURING DEMOLITION ACTIVITIES. IF DISTURBED, CONTRACTOR SHALL HAVE DISTURBED ITEMS RESET BY A LICENSED SURVEYOR AT NO ADDITIONAL COST TO THE OWNER.
- 12. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES, STRUCTURES, AND FEATURES TO REMAIN. ANY ITEMS TO REMAIN THAT HAVE BEEN DISTURBED OR DAMAGED AS A RESULT OF CONSTRUCTION SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AT CONTRACTOR'S EXPENSE.
- 13. CONTRACTOR SHALL PROVIDE AND MAINTAIN TRAFFIC CONTROL MEASURES IN ACCORDANCE WITH STATE DEPARTMENT OF TRANSPORTATION REGULATIONS AND AS REQUIRED BY LOCAL AGENCIES WHEN WORKING IN AND/OR ALONG STREETS, ROADS, HIGHWAYS, ETC .. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN APPROVAL AND COORDINATE WITH LOCAL AND/OR STATE AGENCIES REGARDING THE NEED, EXTENT AND LIMITATIONS ASSOCIATED WITH INSTALLING AND MAINTAINING TRAFFIC CONTROL MEASURES.
- 14. PROVIDE NEAT, STRAIGHT, FULL DEPTH, SAW CUTS OF EXISTING PAVEMENT WHERE INDICATED ALONG LIMITS OF PAVEMENT DEMOLITION.

- ENVIRONMENTAL STUDIES SHALL BE MADE AVAILABLE UPON REQUEST.
- RECEIVE LANDSCAPING.
- ACTIVITIES.

LAYOUT NOTES

- 4. THE CONTRACTOR SHALL PROTECT ALL TREES TO REMAIN.
- 7. COORDINATES ARE FOR BUILDING COLUMNS, EXTERIOR BUILDING WALLS, CENTER OF DRIVEWAYS, CENTER OF
- INLETS, UNLESS OTHERWISE NOTED.

- PATTERNS, CHANGES TO LANDSCAPING, ETC.

GRADING NOTES

- ELEVATION AT THE DRAWDOWN POINT UNLESS NOTED OTHERWISE.

- PROJECT
- GEOTECHNICAL ENGINEER
- ON THE LANDSCAPE PLANS (6" MINIMUM).

- UNLESS NOTED OTHERWISE.
- GOVERNMENTAL AGENCY.
- NECESSARY TO ACHIEVE DESIGN GRADES AND SPECIFICATIONS.

STORM DRAINAGE NOTES

- STRUCTURE, UNLESS NOTED OTHERWISE.
- OF THE STORM DRAINAGE SYSTEM CONSTRUCTION.
- 3. ALL STORMWATER MANAGEMENT FACILITIES, INCLUDING COLLECTION AND CONVEYANCE STRUCTURES, SHALL BE
- PRIVATE AND MAINTAINED BY THE OWNER.

- OTHERWISE NOTED.

15. ALL UTILITY AND STRUCTURE REMOVAL, RELOCATION, CUTTING, CAPPING AND/OR ABANDONMENT SHALL COORDINATED AND PROPERLY DOCUMENTED BY A CERTIFIED PROFESSIONAL, WHEN APPLICABLE, WITH THE APPROPRIATE UTILITY COMPANY, MUNICIPALITY AND/OR AGENCY. DEMOLITION OF REGULATED ITEMS MAY INCLUDE, BUT ARE NOT LIMITED TO; WELLS, ASBESTOS, UNDER GROUND STORAGE TANKS, SEPTIC TANKS AND ELECTRIC TRANSFORMERS. DEMOLITION CONTRACTOR SHALL REFER TO ANY ENVIRONMENTAL STUDIES FOR DEMOLITION RECOMMENDATIONS AND GUIDANCE. AVAILABLE ENVIRONMENTAL STUDIES MAY INCLUDE, BUT ARE NOT LIMITED TO PHASE I ESA, PHASE II, WETLAND AND STREAM DELINEATION AND ASBESTOS SURVEY. ALL APPLICABLE

16. ALL PAVEMENT, BASE COURSES, SIDEWALKS, CURBS, BUILDINGS, FOUNDATIONS, ETC., WITHIN THE AREA TO BE DEMOLISHED SHALL BE REMOVED TO FULL DEPTH. EXISTING BASE COURSE MATERIALS MAY BE WORKED INTO THE NEW PAVEMENT OR BUILDING SUBGRADE IF THE GRADATION. CONSISTENCY, COMPACTION, SUBGRADE CONDITION, ETC., ARE IN ACCORDANCE WITH THE SPECIFICATIONS AND RECOMMENDATIONS OF THE GEOTECHNICAL INVESTIGATION REPORT. BASE COURSE MATERIALS SHALL NOT BE WORKED INTO THE SUBGRADE AREAS TO

17. THE CONTRACTOR SHALL USE SUITABLE METHODS TO CONTROL DUST AND DIRT CAUSED BY THE DEMOLITION

1. THE CONTRACTOR SHALL CHECK EXISTING GRADES, DIMENSIONS, AND INVERTS IN THE FIELD AND REPORT ANY DISCREPANCIES TO THE OWNER'S REPRESENTATIVE PRIOR TO BEGINNING WORK.

2. THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES, INCLUDING IRRIGATION LINES, AND SHALL TAKE CARE TO PROTECT UTILITIES THAT ARE TO REMAIN. THE CONTRACTOR SHALL RELOCATE EXISTING UTILITIES AS INDICATED OR AS NECESSARY FOR CONSTRUCTION.

3. THE CONTRACTOR SHALL PROVIDE A SMOOTH TRANSITION BETWEEN EXISTING PAVEMENT AND NEW PAVEMENT. FIELD ADJUSTMENT OF FINAL GRADES MAY BE NECESSARY. THE CONTRACTOR SHALL INSTALL ALL UTILITIES, INCLUDING IRRIGATION SLEEVING, PRIOR TO THE INSTALLATION OF PAVED SURFACES.

5. ALL DAMAGE TO EXISTING PAVEMENT TO REMAIN WHICH RESULTS FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED WITH EQUIVALENT MATERIALS AT THE CONTRACTOR'S EXPENSE.

6. SITE DIMENSIONS SHOWN ARE TO THE FACE OF CURB OR EDGE OF PAVEMENT UNLESS OTHERWISE NOTED.

SANITARY SEWER MANHOLES, AND CENTER OF STRUCTURES PLACED SIX INCHES INSIDE FACE OF CURB FOR DRAIN

8. CONTRACTOR SHALL MAINTAIN ONE SET OF AS-BUILT / RECORD DRAWINGS ON-SITE DURING CONSTRUCTION FOR DISTRIBUTION TO THE OWNER AND/OR OWNER'S REPRESENTATIVE UPON COMPLETION.

9. REFER TO THE ARCHITECTURAL, PLUMBING & ELECTRICAL DRAWINGS FOR EXACT DIMENSIONS AND LOCATIONS OF UTILITY SERVICE ENTRY LOCATIONS AND PRECISE BUILDING DIMENSIONS.

10. THIS SITE LAYOUT IS SPECIFIC TO THE APPROVALS NECESSARY FOR THE CONSTRUCTION IN ACCORDANCE WITH THE TOWN OF WEYMOUTH. NO CHANGES TO THE SITE LAYOUT ARE ALLOWED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER. CHANGES MADE TO THE SITE LAYOUT WITHOUT APPROVAL ARE SOLELY THE RESPONSIBILITY OF THE CONTRACTOR. CHANGES INCLUDE BUT ARE NOT LIMITED TO, INCREASED IMPERVIOUS PAVEMENT, ADDITION / DELETION OF PARKING SPACES, MOVEMENT OF CURB LINES, CHANGES TO DRAINAGE STRUCTURES AND

1. ALL PROPOSED GRADES SHOWN ARE FINAL GRADES, TOP OF GROUND LEVEL, TOP OF PAVEMENT, OR GRATE 2. REFER TO AND FOLLOW THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT PREPARED FOR THIS PROJECT. 3. ALL FILL UNDER PAVEMENT SHALL BE COMPACTED TO THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.

4. CONTRACTOR SHALL STRICTLY ADHERE TO THE EROSION & SEDIMENT CONTROL PLAN PREPARED FOR THIS

5. EARTHWORK SHALL INCLUDE CLEARING AND GRUBBING, STRIPPING AND STOCKPILING TOPSOIL, MASS GRADING, EXCAVATION, FILLING, UNDER CUT AND REPLACEMENT, IF REQUIRED, AND COMPACTIO 6. CONTRACTOR TO REFILL UNDERCUT AREAS WITH SUITABLE MATERIAL AND COMPACT AS RECOMMENDED BY THE

7. CONTRACTOR TO PLACE TOPSOIL OVER THE SUBGRADE OF UNPAVED, DISTURBED AREAS TO A DEPTH INDICATED

8. PAVEMENT SLOPES ACROSS ACCESSIBLE PARKING STALLS AND ADJOINING ACCESS AISLES SHALL BE MAXIMUM 2% AND SHALL CONFORM TO THE LATEST REGULATIONS OF THE AMERICANS WITH DISABILITIES ACT.

9. ALL SLOPES IN NON-PAVED AREAS SHALL BE 3:1 (HORIZONTAL:VERTICAL) MAXIMUM UNLESS NOTED OTHERWISE 10. ALL AREAS NOT PAVED SHALL BE STABILIZED IN ACCORDANCE WITH THE EROSION & SEDIMENT CONTROL PLAN,

11. COMPACTED FILLS ARE TO BE MADE TO A MINIMUM OF THREE FEET ABOVE THE CROWN OF ANY PROPOSED SEWER PRIOR TO CUTTING OF TRENCHES FOR PLACEMENT OF SAID SEWERS. ALL FILLS SHALL BE CONTROLLED. COMPACTED, AND INSPECTED BY AN APPROVED TESTING LABORATORY OR AN INSPECTOR FROM THE APPROPRIATE

12. ALL EXCESS SOIL MATERIALS SHALL BECOME THE PROPERTY OF THE CONTRACTOR UNLESS NOTED OTHERWISE. EXCESS SOIL MATERIALS SHALL BE REMOVED BY THE CONTRACTOR AND DISPOSED OF OFFSITE AT NO ADDITIONAL COST TO THE OWNER IN ACCORDANCE WITH ALL LOCAL AND STATE CODES AND PERMIT REQUIREMENTS. 13. THE CONTRACTOR IS RESPONSIBLE FOR BALANCING THE SITE EARTHWORK BY IMPORTING OR EXPORTING AS

1. DISTANCES SHOWN ON PIPING ARE HORIZONTAL DISTANCES FROM CENTER OF STRUCTURE TO CENTER OF

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE INSTALLATION, INSPECTION, TESTING AND FINAL ACCEPTANCE OF ALL NEW STORMWATER MANAGEMENT FACILITIES. CONTRACTOR SHALL COORDINATE WITH ALL APPLICABLE REGULATING AGENCIES CONCERNING INSTALLATION, INSPECTION AND APPROVAL

INSTALLED IN ACCORDANCE WITH ALL APPLICABLE LOCAL AND STATE CODES AND REGULATIONS. 4. ALL PROPOSED STORM SEWERS, SURFACE OR OTHER DRAINAGE FACILITIES WITHIN THE PROPERTY ARE TO BE

5. THE CONTRACTOR IS TO CONSTRUCT CURBS, CATCH BASINS, DOWNSPOUTS, PIPING AND CONNECTION ETC. AS REQUIRED TO CONVEY THE ROOF AND PAVED SURFACE DRAINAGE TO THE INFILTRATION CHAMBERS.

6. ALL CATCH BASINS AND MANHOLES WITH A DEPTH GREATER THAN 4' SHALL BE PROVIDED WITH STEPS. STEPS SHALL MEET THE REQUIREMENTS OF MASSACHUSETTS DEPARTMENT OF TRANSPORTATION SPECIFICATIONS.

7. STORM SEWER PIPE LABELED "ST" SHALL BE ONE OF THE FOLLOWING: PVC SDR-35, OR HIGH DENSITY POLYETHYLENE UNLESS NOTED OTHERWISE. STORM SEWER PIPE LABELED "RCP" SHALL BE REINFORCED CONCRETE PIPE. ALL STORM SEWER PIPE IS TO BE INSTALLED PER MASSDOT SPECIFICATIONS, UNLESS

8. STORM SEWER IS TO BE BEDDED WITH CLEAN GRANULAR MATERIAL-AGGREGATES NOT TO BE LARGER THAN 3/4" AND NOT SMALLER THAN NO. 8 SIEVE, AND SHALL BE FREE OF SILT AND FINES. BEDDING TO EXTEND MINIMUM OF 6" BELOW & 12" ABOVE THE PIPE AND AS SHOWN ON THE DETAILS.

UTILITY NOTES

- 1. ALL PROPOSED UTILITY LINES AND EXTENSIONS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE PRIVATE UTILITY COMPANY SPECIFICATIONS. CONTRACTOR SHALL COORDINATE UTILITY DISCONNECTIONS WITH THE APPROPRIATE AGENCY.
- 2. PROVIDE FIRE DEPARTMENT CONNECTION WITH 30 DEGREE TURN DOWN PER LOCAL FIRE DEPARTMENT REQUIREMENTS. UNDERGROUND PIPING SERVING REMOTE FIRE DEPARTMENT CONNECTION SHALL BE DUCTILE IRON PIPING WITH RUBBER-GASKET PUSH-ON JOINTS. ABOVE GROUND PIPING AT LOCATION OF FIRE DEPARTMENT CONNECTION SHALL BE GALVANIZED, PROVIDE FLANGE ABOVE GRADE AT TRANSITION. PROVIDE CONCRETE THRUST BLOCKING AT ALL CHANGES OF DIRECTION AND MOUNT FIRE DEPARTMENT CONNECTION PIPING IN A 12" X 12" CONCRETE PAD 4" THICK. PROVIDE BALL DRIP VALVE AT BASE OF VERTICAL PIPING SERVING FIRE DEPARTMENT CONNECTION AND SURROUND WITH PEA GRAVEL.
- 3. THE CONTRACTOR IS PARTICULARLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF THE EXISTING UTILITIES SHOWN HEREON IS BASED ON TOPOGRAPHIC SURVEYS AND RECORD DRAWINGS. THE CONTRACTOR SHALL NOT RELY UPON THIS INFORMATION AS BEING EXACT OR COMPLETE. SHOULD UNCHARTED UTILITIES BE ENCOUNTERED DURING EXCAVATION OPERATIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AS SOON AS POSSIBLE FOR INSTRUCTIONS. THE CONTRACTOR SHALL CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION AND REQUEST FIELD VERIFICATION OF UTILITY LOCATIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO RELOCATE EXISTING UTILITIES CONFLICTING WITH IMPROVEMENTS SHOWN HEREON IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS GOVERNING SUCH OPERATIONS.
- 4. THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS PRIOR TO COMMENCEMENT OF CONSTRUCTION.
- 5. MAINTAIN MINIMUM 10-FOOT HORIZONTAL AND 18-INCH MINIMUM VERTICAL SEPARATION BETWEEN SANITARY SEWER, STORM SEWER AND WATER SUPPLY LINE, UNLESS NOTED OTHERWISE.
- 6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE SEQUENCING OF CONSTRUCTION FOR ALL UTILITY LINES SO THAT WATER LINES, GAS LINES, AND UNDERGROUND ELECTRIC DO NOT CONFLICT WITH SANITARY SEWERS OR STORM SEWERS. INSTALL UTILITIES PRIOR TO PAVEMENT CONSTRUCTION.
- 7. ALL TRENCH SPOILS SHALL BECOME THE PROPERTY OF THE CONTRACTOR UNLESS NOTED OTHERWISE. TRENCH SPOILS SHALL BE REMOVED BY THE CONTRACTOR AND DISPOSED OF OFFSITE AT NO ADDITIONAL COST TO THE OWNER IN ACCORDANCE WITH ALL LOCAL AND STATE CODES AND PERMIT REQUIREMENTS.
- 8. SANITARY SEWER SHALL BE PVC-SDR 35 PER ASTM D-3034 OR APPROVED EQUAL (CONFORMING TO TOWN OF WEYMOUTH WATER & SEWER DEPARTMENT RULES AND REGULATIONS) INSTALLED AT A MINIMUM SLOPE OF ONE PERCENT (1.00%) UNLESS NOTED OTHERWISE. SANITARY SEWER SERVICE SHALL BE INSTALLED AT A MINIMUM DEPTH OF FOUR FEET (4') UNLESS NOTED OTHERWISE. A MINIMUM OF 18" CLEARANCE SHALL BE MAINTAINED AT ALL WATER LINE & SANITARY SEWER CROSSINGS. SANITARY SEWER SERVICE JOINTS SHALL CONFORM TO ASTM D-3212.
- 9. SANITARY SEWER IS TO BE BEDDED WITH CLEAN GRANULAR MATERIAL-AGGREGATES NOT TO BE LARGER THAN 3/4" AND NOT SMALLER THAN NO. 8 SIEVE, AND SHALL BE FREE OF SILT AND FINES. BEDDING TO EXTEND MINIMUM OF 6" BELOW & 12" ABOVE THE PIPE AND AS SHOWN ON THE DETAILS.
- 10. DISTANCES SHOWN FOR BOTH SANITARY AND STORM SEWER PIPES ARE MEASURED FROM CENTER OF STRUCTURE, CONTRACTOR SHALL BE RESPONSIBLE FOR ACTUAL FIELD CUT LENGTH. COORDINATES FOR STORM & SANITARY STRUCTURES ARE SHOWN TO THE CENTER STRUCTURE UNLESS NOTED OTHERWISE.
- 11. ROOF DRAINS, FOUNDATION DRAINS AND ALL OTHER CLEAR WATER CONNECTIONS TO THE SANITARY SEWER SYSTEMS ARE PROHIBITED.
- 12. CONTRACTOR SHALL ADJUST ALL EXISTING UTILITY SURFACE FEATURES INCLUDING BUT NOT LIMITED TO CASTINGS, VALVE BOXES, PEDESTALS, CLEANOUTS, ETC. TO MATCH PROPOSED FINISHED GRADES, UNLESS NOTED OTHERWISE.
- 13. THE CONTRACTOR SHALL PROVIDE RECORD DRAWINGS OF ALL IMPROVEMENTS. DRAWINGS SHALL INCLUDE AT LEAST TWO DIMENSIONS TO EACH VALVE AND MANHOLE FROM KNOWN SITE FEATURES. DRAWINGS SHALL INCLUDE HORIZONTAL AND VERTICAL INFORMATION ON ALL NEW UTILITIES AS WELL AS EXISTING UTILITIES ENCOUNTERED.
- 14. ALL WATERLINE CROSSINGS SHALL MAINTAIN A VERTICAL SEPARATION OF 18" MINIMUM. SANITARY SEWER SHALL BE LOCATED 18" BELOW WATERMAIN AT ALL CROSSINGS. WATERMAIN SHALL BE LOCATED A MINIMUM OF 10' HORIZONTALLY FROM ANY SANITARY SEWER OR STORM SEWER. ALL MEASUREMENTS SHALL BE TAKEN FROM OUTSIDE OF SEWER PIPE TO THE OUTSIDE OF WATERMAIN PIPE. ONE FULL LENGTH OF WATERMAIN PIPE SHALL BE LOCATED AT ALL CROSSINGS TO ENABLE BOTH JOINTS TO BE LOCATED AS FAR FROM SEWER AS POSSIBLE.
- 15. ALL WATER SERVICE PIPE SIZES 3" THRU 12" SHALL BE DUCTILE IRON PIPE CLASS 52 PIPE PER LOCAL JURISDICTION, FROM WATERMAIN THRU METER SETTING(S) INCLUDING THE METER BYPASS.
- 16. ALL WATER SERVICE PIPE, 2" AND SMALLER, SHALL BE K SOFT COPPER FROM WATERMAIN THRU CURB STOP, OR APPROVED EQUAL.
- 17. WATERLINE IS TO BE BEDDED WITH CLEAN GRANULAR MATERIAL-AGGREGATES NOT TO BE LARGER THAN 3/4" AND NOT SMALLER THAN NO. 8 SIEVE, AND SHALL BE FREE OF SILT AND FINES. BEDDING TO EXTEND MINIMUM OF 6" BELOW & 12" ABOVE THE PIPE AND AS SHOWN ON THE DETAILS.



APPROVAL BLOCK SIGNATURE DATE SIGNATURE DATE SIGNATURE DATE SIGNATURE DATE SIGNATURE DATE FOR PERMITTING ONLY **Civil & Environmental Consultants, Inc.** NOT FOR CONSTRUCTION 31 Bellows Road · Raynham, MA 02767 Ph: 774.501.2176 · 866.312.2024 · Fax: 774.501.2669 www.cecinc.com **REVISION RECORD** HERITAGE COMPANIES DESCRIPTION THE OVERLOOK **44 WHARF STREET** WEYMOUTH, MASSACHUSETTS SUBMITTAL RECORD DRAF DESCRIPTION RAWN BY: DWP CHECKED BY: KPS APPROVED BY: JULY 21, 2020 DWG SCALE: AS SHOWN PROJECT NO: 193-187 DRAWING NO. **GENERAL NOTES** SHEET 2 OF 11



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| | \geq \leq | | | N | JAN IN | $\sum \lambda$ | BITUMIN | | R250' |
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| | | | 100.5' LA | | | $\langle \langle \rangle$ | | | |
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| | ्र हे ^{МП} | H CONCRE | ETE PAD | KLOC. OF | | | | | |
| | N51'51 | | APPROX | K. LOC. OF | | EN EN | [99.4] | | |
| | ₩ 143.91 1925 120 | | APPROX | K. LOC. OF ABS EASEMEN EF #J <u>R20'</u> | | EN EN | [99.4'] | | |
| | W XJE XJE X51:2:12:12:12:12:12:12:12:12:12:12:12:12: | H CONCRE | APPROX | K. 10C. OF 125 EASEMEN EF # 3<u></u>20' | | EN | [99.4'] | | |
| | W 25.15.15.15.18 | H CONCRE | TE PAD | (. 10C. OF <u>P5</u> EASEMEN EF #3 <u>R20'</u> | | EN EN | [99.4'] | | |
| | XARD SETBACK | H CONCRE | | A. LOC. OF AS EASEMEN EF #3R20' | LA | EN | [99.4'] | | |
| D | M. 62, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15 | H CONCRE | PROPOSED FIRE ACCESS DRIVE | C. LOC. OF ABS EASEMEN EF # B20' | | | [99.4'] | | |
| D | E N, 162, 15.15.15 N, 162, 15.15 N, 165 N, | H CONCRE | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) | C. LOC. OF VR5 EASEMEN EF #3R20' | LA EMERGENC GATE | EN EN | [99.4] | | |
| D | 15-FT SIDE YARD SETBACK | H CONCRE | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) | EF #3 <u>R20'</u> | LA EMERGENC GATE | EN EN | [99.4] | | |
| D | M. 62, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15 | H CONCRE | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) | EF #3R20 | LA EMERGENC GATE | EN EN | [99.4]] [121.6] | | |
| D | M. 62, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15 | H CONCRE | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) | EF #320 | LA EMERGENC GATE | | [99.4]] | | |
| D | W, 62, 15.15.15 M, 66, 15.15 M, 66, 15.15 M, 66, 15-15 M, 75-15 M, 75-15 M | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) | EF # <u>R20</u> | | | [99.4] | | 5802 |
| D | March 15-FT SIDE YARD SETBACK | H CONCRE 40.0' 25-FT FF | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) | EF #3R20 | | | [99.4]] [121.6]] | | |
| 9:57 PW | M. 52, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15 | H CONCRE 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS | EF #3R20 | | EN EN | [99.4]] [121.6] | | |
| 020 9:57 PM | WT XSTONE AND SETBACK | H CONCRE 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | EF #3R20' | | EN EN | [99.4]] [121.6] | | |
| 21/2020 9:57 PM | NSTONE BOUND STONE | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | EF #320' | LA EMERGENC GATE LA | EN EN | [99.4]] [121.6] | | |
| P: 7/21/2020 9:57 PM | NSTISTIZE NSTISTIZE NSTONE BOUND FOUND | 40.0' | ROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | | EN EN | | | |
| - LP: 7/21/2020 9:57 РМ | NSTISTIZE NSTINE STONE BOUND FOUND | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | | EN EN | | | |
| ыс) – LP: 7/21/2020 9:57 РМ П | STONE - VICE ADA BAN | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | | EN EN | | | |
| dpetrovic) – LP: 7/21/2020 9:57 PM O | STONE BOUND FOUND ADA RAMI CROSSWA | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | REMOVE AND REPLACE E | | | | LANDS |
| 0 – dpetrovic) – LP: 7/21/2020 9:57 PM O | ADA RAMI | | ROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | -REMOVE AND REPLACE E | | [99.4] [121.6] | | |
| 1/2020 – dpetrovic) – LP: 7/21/2020 9:57 PM O | ADA RAMI | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | LA EMERGENC GATE LA LA LA EMERGENC | | [99.4] [121.6] | | LANDS RETAIN DRIVEV REMOVE AND |
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| l} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM O | STONE BOUND FOUND STONE BOUND ADA RAMI CROSSWA D/L INSTALL MATCH E | 40.0' | ROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | LA EMERGENC GATE LA LA CATE CATE CATE CATE CATE CATE CATE CAT | | [99.4] [121.6] | | LANDS RETAIN DRIVEV REMOVE AND |
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| RALS PLANY LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM O | ADA RAMI CROSSWA D/L IRON ROD FOUND | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | LA EMERGENC GATE LA LA REMOVE AND REPLACE E | | | | LANDS RETAIN DRIVEV REMOVE AND |
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| v01-C200.dwgfLaYOUT AND MATERIALS PLANY LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM П | STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND ADA RAMI CROSSWA DVI INSTALL MATCH E | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED FIRE (IF REQ | | | | [99.4] [121.6] | | LANDS RETAIN DRIVEV REMOVE AND |
| 87-CV01-C200.dwg{LAYOUT AND MATERIALS PLANY LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM T | STONE BOUND FOUND FOUND BOUND FOUND FOUND BOUND FOUND FOUND FOUND FOUND FOUND | 40.0' | PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE | | | | | | LANDS RETAIN DRIVEV REMOVE AND |
| (193187-CV01-C200.dwgfLAYOUT AND MATERALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM T | STONE BOUND FOUND ADA RAMI CROSSWA DYL INSTALL MATCH E | 40.0' | RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE B) ED DOMES AND AVEMENT | | | | | | |
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| 30D\Dwg\cvo1\193187-Cvo1-C200.dwg{LAYOUT AND MATERIALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM 0 | STONE BOUND STONE BOUND STONE FOUND STEE DEVELOPMENT ZC TOTAL AREA OF PARCEL: ZONING DISTRICT: | | DATA | A C. OF PASEMENT F #3R20 F #3R20 F F F F F F F F F F F F F | EMERGENC GATE EMERGENC GATE LA LA LA LA CONTROLOGIONE LA LA CONTROLOGIONE LA LA LA CONTROLOGIONE CONTROLOGIONE CONTROLICONTROLOGIO | | (92.4) | D PROVIDED | |
| 17\-CADD\Dwg\CV01\193187-CV01-C200.dwg{LAYOUT AND MATERIALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM T | STONE BOUND FOUND STONE BOUND FOUND STEE DEVELOPMENT ZC TOTAL AREA OF PARCEL: ZONING DISTRICT: | | DATA | A C. OF PASEMENT F # R20 F # R20 F A C C. OF PASEMENT F F # R20 F A C C. OF PASEMENT F F A C C. OF PASEMENT F A C C. OF PASEMENT F A C C. OF PASEMENT F A C C. OF F A C C. OF | EMERGENC GATE EMERGENC GATE LA LA LA LA LA LA LA LA LA LA LA LA LA | EN EN EN EXISTING SIGN | Interviewence of the second se | D PROVIDED | |
| 13-187\-CADD\Dwg\CV01\193187-CV01-C200.dwg{LAYOUT AND MATERIALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM T | STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND STONE BOUND FOUND TOTAL AREA OF PARCEL: ZONING DISTRICT: MINIMUM LOT AREA (SO. FT.): | | DATA | P | EMERGENC GATE EMERGENC GATE LA LA LA LA LA LA LA LA LA LA LA LA LA | EXISTING SIGN | Land Count REQUIRED 45 UNITS 68 39 UNITS 78 84 UNITS 146 5 1 45 1 45 1 45 1 45 1 45 1 45 1 4 5 1 4 5 1 4 | D PROVIDED | |
| 19/193-187\-CADD\Dwg\CV01\193187-CV01-C200.dwg{LAYOUT AND MATERIALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM T | STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE FOUND CROSSWA DIZ INSTALL MATCH EN FOUND STEE DEVELOPMENT ZO TOTAL AREA OF PARCEL: ZONING DISTRICT: MINIMUM LOT AREA (SQ. FT.): MINIMUM LOT AREA (SQ. FT.): MINIMUM FRONT YAPD. | | DATA PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED VEGETATED EMERGENCY ACCESS DRIVE DRIVE PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED VEGETATED EMERGENCY ACCESS DRIVE DRIVE PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED VEGETATED EMERGENCY ACCESS DRIVE DRIVE PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED VEGETATED EMERGENCY ACCESS DRIVE DRIVE EMERGENCY ACCESS DRIVE EMERGENCY | | ARKING DATA | EN EN EN EN EN EN EN EN EN EN EN EN EN E | Land | D PROVIDED | |
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| cojects/2019/193-187\-CADD\Dwg\CV01\193187-CV01-C200.dwg{LAYOUT AND MATERALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PW | STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND STONE BOUND FOUND FOUND STONE BOUND FOUND FOUND FOUND STEE STONE BOUND FOUND FOUND FOUND STEE STONE BOUND FOUND FOUND FOUND FOUND STEE STONE FOUND FOU | 40.0' 40.0' 25-FT FF 25-FT FF P (TYPE LK TRUNCATE XISTING P 0 0 0 0 0 15 15 15 15 15 15 15 15 15 15 | DATA PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED VEGETATED EMERGENCY ACCESS DRIVE DRIVE DATA DATA DATA 1–2 (GENERAL IND AVEMENT DATA 1–2 (GENERAL IND HMOD (HISTORIC MILL OVERLAY D INONE 4 ± 4.2 FT. (EX. BU ± 153,276 S.F. 4 ± 4.2 FT. (EX. BU ± 10.5 FT. (EX. BU ± 20.2 FT. (PR. BU ± 20.2 FT. | A C C C OF PASE ASEMEN F # R20 F A C C OF PASE ASEMEN F R20 F F R20 F F R20 F F | ARKING DATA FREMOVE AND REPLACE E ARKING DATA ARKING DATA FREMOVE AND REPLACE E STUDIOS & 1 BEDROOMS: 1.5 SPACE/UNIT 2 BEDROOMS: 2 SPACE/UNIT TOTAL: TOTAL ADA ACCESSIBLE SPA STANDARD ACCESSIBLE SPA | EXISTING SIGN | Image: second system Image: second system Image: second | PROVIDED - 146 5 1 4 | |
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| -boston/projects/2019/193-187/-CADD/Dwg/CV01/193187-CV01-C200.dwg{LAYOUT AND MATERIALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PW D | STONE BOUND FOUND STONE BOUND STONE BOUND FOUND STONE BOUND STONE STONE BOUND FOUND STONE BOUND STONE STONE BOUND FOUND STONE BOUND STONE STONE BOUND STONE STONE BOUND STONE STONE BOUND STONE | H CONCRE 40.0' 25-FT 25-FT FF P (TYPE LK TRUNCATE XISTING F S: 25 15 20 NOR NOR | DATA PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) RONT YARD SETBACK REINFORCED VEGETATED EMERGENCY ACCESS DRIVE DDOMES AND AVEMENT DOMES AND AVEMENT DOMES AND AVEMENT DOMES AND AVEMENT DOMES AND AVEMENT DOMES AND AVEMENT DOMES AND CONTRACTOR DOMES AND CONTRACTOR CONTRACTOR DOMES AND CONTRACTOR DOMES AND CONTRACTOR DOMES AND CONTRACTOR CONTRACTOR DOMES AND CONTRACTOR DOMES AND CONTRACTOR CONTRACTOR DOMES AND CONTRACTOR CONTRACTOR DOMES AND CONTRACTOR CONTRACTOR DOMES AND CONTRACTOR CONTRACTOR DOMES AND CONTRACTOR | A C C OF F #3820 F #3820 F #3820 F #3820 F F F F F F F F F F F F F | ARKING DATA EMERGENC GATE EMERGENC GATE EMERGENC GATE LA LA LA LA EMERGENC CATE LA LA EMERGENC GATE LA LA LA LA LA LA LA COMPLIANT COMPLACE E COMPLACE E COMPLACE SIBLE STUDIOS & 1 BEDROOMS: 1.5 SPACE/UNIT COMPLACE SIBLE SPA STANDARD ACCESSIBLE SPA STANDARD ACCESSI | EXISTING SIGN | (22.4) (22.6) | PROVIDED PROVIDED - 146 5 1 4 DED PARKING SABILITIES ACT. S ACT, FOR RED BY 208.2 PARKING SPACE | |
| //svr-boston/projects/2019/193-187/-CADD/Dwg/CV01/193187-CV01-C200.dwg{LAYOUT AND MATERIALS PLAN} LS:(7/21/2020 - dpetrovic) - LP: 7/21/2020 9:57 PM D | STONE BOUND FOUND FOUND STONE BOUND FOUND FOUND SITE DEVELOPMENT ZO INSTALL MATCH EN FOUND SITE DEVELOPMENT ZO INSTALL MATCH EN FOUND SITE DEVELOPMENT ZO TOTAL AREA OF PARCEL: ZONING DISTRICT: MINIMUM LOT AREA (SQ. FT.): MAXIMUM NUMBER OF STORIES MINIMUM SIDE YARD: MINIMUM REAR YARD: MINIMUM REAR YARD: MINIMUM REAR YARD: MINIMUM LOT FRONTAGE: MINIMUM LOT FRONTAGE: MINIMUM LOT WIDTH: | A CONCRE 40.0' 25-FT FF 25-FT FF | DATA PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROPOSED FIRE ACCESS DRIVE (IF REQUIRED) PROVIDED TO THE TO THE | A C. OF PASEMENT F #3820 F #3820 F #3820 F F F F F F F F F F F F F | ARKING DATA EMERGENC GATE EMERGENC GATE LA LA LA EMERGENC CATE LA LA EMERGENC GATE LA LA LA LA LA LA LA LA LA LA | EXISTING SIGN | (22.4) (22.6) | PROVIDED PROVIDED PROVIDED - 146 5 1 4 DED PARKING SABILITIES ACT. S ACT, FOR RED BY 208.2 PARKING SPACE | |

LEGEND




\\svr-boston\projects\2019\193-187\-CADD\Dwg\CV01\193187-CV01-C300.dwgf4 GRADING AND DRAINAGE} LS:(7/21/2020 - kskuite) - LP: 7/22/







8









1. DETAIL SHOWN FOR REFERENCE ONLY. REFER TO LATEST EDITION OF NATIONAL GRID SPECIFICATIONS FOR





 ϕ = 30° | FINE TO MEDIUM SAND or SILTY SAND

(3) 41" (1030 mm) Blocks / GRADE TO DRAIN SURFACE

41" (1030 mm)

41" (1030 mm)

41" (1030 mm)

60" (1520 mm)

 \bigcirc

60" (1520 mm)

60" (1520 mm)

8988

WATER AWAY FROM WALL

∑ **φ = 30°**

N.T.S.

- TOP BLOCK

250 lb / ft² (12 kPa)

7 BLOCK HIGH SECTION

9'-6" (2.90

1'-0" (305 mm)

1'-0" (305

(initial)

<u>NOTES</u>

WITH WALL MANUFACTURER.

801

(1) 28" (710 mm) Block

(3) 60" (1520 mm) Blocks

Setback = 1 ⁵/₈" (41 mm)

(5° Wall Batter Angle)

- LATEST AUTHORZIED VERSION. 2. CONTRACTOR TO REVIEW NATIONA GRID STANDARDS AND SALL INSTALL ALL ELECTRIC EQUIPMENT IN ACCORDANCE WITH NATIONAL GRID STANDARDS AND DETAILS. AUTHORIZATION FROM NATIONAL GRID IS
- 1. DETAIL SHOWN FOR REFERENCE ONLY. REFER TO LATEST EDITION OF NATIONAL GRID SPECIFICATIONS FOR







National Grid / Supplement to Specifications for Electrical Installations / ESB 759B July 2010







N.T.S.



TYPICAL REDI-ROCK WALL SECTIONS

GRASSPAVE2 AT ASPHALT EDGE $\overline{7}$ 801 N.T.S.

NO DATE KARLIS SKULTE NO DATE CIVIL No. 47703

4

| FOR PERMITTING ONLY NOT FOR CONSTRUCTION | Civil & Environmental Consultants, Inc. 31 Bellows Road · Raynham, MA 02767 Ph: 774.501.2176 · 866.312.2024 · Fax: 774.501.2669 www.cecinc.com | | | | |
|---|---|--------------------|--------------------------------------|---|-------------------|
| REVISION RECORD DESCRIPTION | | HER 44 WEYMO | RITAGE THE OV 4 WHAR UTH, M | COMPANIES ERLOOK F STREET ASSACHUSETTS | _ |
| SUBMITTAL RECORD | | DWD | | | |
| DESCRIPTION | | .IULV 21 2020 | DWG SCALE | | 193-187 |
| | 2 | DETA | IL SHEET 2 | DRAWING NO.: DRAWING NO.: SHEET 8 | A BO1 OF 11 |









SHEET 9 OF 11





| | | DESCRIPTION | AASHTO MATERIAL | COMPACTION / DENSITY |
|--------|---|--|--|--|
| | | Decertif Hert | CLASSIFICATIONS | REQUIREMENT |
| D | FINAL FILL: FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER | ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS. | N/A | PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS. |
| С | INITIAL FILL: FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER. | GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER. | AASHTO M145 ¹ A-1, A-2-4, A-3 OR AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10 | BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN). |
| В | EMBEDMENT STONE: FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE. | CLEAN, CRUSHED, ANGULAR STONE | AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57 | NO COMPACTION REQUIRED. |
| A | FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER. | CLEAN, CRUSHED, ANGULAR STONE | AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57 | PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ^{2,3} |
| PLEASE | NOTE: | | | |

| FOR PERMITTING ONLY | Ci | vil & Environmen 31 Bellows Road · R | tal Consulaynham, MA 027 | ultants, In | . C. | в |
|----------------------|-----------|---|--------------------------------|--------------|-------------|---|
| NOT FOR CONSTRUCTION | | Ph: 774.501.2176 • 866.312 WWW.CeC | 2.2024 · Fax: 774. cinc.com | 501.2669 | | |
| REVISION RECORD | | | | | | |
| DESCRIPTION | | HERITAGE | | IIE5 | | |
| | _ | THE OVE | ERLOOK | | | |
| | _ | 44 WHAR | F STREE | Т | | |
| | | WEYMOUTH MA | SSACH | USETTS | | |
| SUBMITTAL RECORD | | | | | | |
| DESCRIPTION | DRAWN BY: | DWP CHECKED BY: | KPS | APPROVED BY: | DRAFT | |
| | DATE: | JULY 21, 2020 DWG SCALE: | AS SHOWN | PROJECT NO: | 193-187 | |
| | | | | DRAWING NO.: | | А |
| | | DETAIL SHEET 5 | | C8 | 04 | |
| | | | | | OF 11 | |

| A. 11N | SFECTION FORTS (IF FRESENT) |
|--------|---|
| A.1. | REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN |
| A.2. | REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED |
| A.3. | USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF |
| | SEDIMENT AND RECORD ON MAINTENANCE LOG |
| A.4. | LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION |
| | OF SEDIMENT LEVELS (OPTIONAL) |
| A.5. | IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF |
| | NOT, PROCEED TO STEP 3. |
| B. AL | L ISOLATOR ROWS |
| B.1. | REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF |
| | ISOLATOR ROW |
| B.2. | USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW |





NOTES:

LOCUS MAP © 2013 ESRI WORLD STREET MAPS NOT TO SCALE

- 1. PROPERTY KNOWN AS LOTS 25 & 26 AS SHOWN ON THE TOWN OF WEYMOUTH, NORFOLK COUNTY, COMMONWEALTH OF MASSACHUSETTS MAP NO. 19.
- 2. LOT 25 AREA = 153,276 SQUARE FEET OR 3.519 ACRES LOT 26 AREA = 85,605 SQUARE FEET OR 1.962 ACRES
- TOTAL AREA = 238,881 SQUARE FEET OR 5.481 ACRES
- 3. LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE. LOCATIONS AND SIZES ARE BASED ON UTILITY MARK-OUTS, ABOVE GROUND STRUCTURES THAT WERE VISIBLE & ACCESSIBLE IN THE FIELD, AND THE MAPS AS LISTED IN THE REFERENCES AVAILABLE AT THE TIME OF THE SURVEY. AVAILABLE AS-BUILT PLANS AND UTILITY MARKOUT DOES NOT ENSURE MAPPING OF ALL UNDERGROUND UTILITIES AND STRUCTURES. BEFORE ANY EXCAVATION IS TO BEGIN, ALL UNDERGROUND UTILITIES SHOULD BE VERIFIED AS TO THEIR LOCATION, SIZE AND TYPE BY THE PROPER UTILITY COMPANIES. CONTROL POINT ASSOCIATES, INC. DOES NOT GUARANTEE THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED.
- 4. THIS PLAN IS BASED ON INFORMATION PROVIDED BY A SURVEY PREPARED IN THE FIELD BY CONTROL POINT ASSOCIATES, INC. AND OTHER REFERENCE MATERIAL AS LISTED HEREON.
- 5. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND IS SUBJECT TO THE RESTRICTIONS, COVENANTS AND/OR EASEMENTS THAT MAY BE CONTAINED THEREIN.
- 6. BY GRAPHIC PLOTTING ONLY PROPERTY IS LOCATED IN THE FOLLOWING FLOOD HAZARD ZONES; ZONE "X-UNSHADED" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.), ZONE "AE" (SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD, WHERE THE BASE FLOOD ELEVATION IS DETERMINED, EL=10.), & ZONE "REGULATORY FLOOD WAY" (FLOODWAY AREAS IN ZONE "AE". THE FLOODWAY IS THE CHANNEL OF A STREAM PLUS ANY ADJACENT FLOODPLAIN AREAS THAT MUST BE KEPT FREE OF ENCROACHMENT SO THAT THE 1% ANNUAL CHANCE FLOOD CAN BE CARRIED WITHOUT SUBSTANTIAL INCREASE IN THE FLOOD HEIGHTS.) PER REF. #2
- 7. THE EXISTENCE OF UNDERGROUND STORAGE TANKS, IF ANY, WAS NOT KNOWN AT THE TIME OF THE FIELD SURVEY.
- 8. ELEVATIONS REFER TO THE TOWN OF WEYMOUTH VERTICAL DATUM OBTAINED BY ADDING 6.63 FEET TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), WHICH WAS ESTABLISHED BASED ON GPS OBSERVATIONS UTILIZING THE KEYSTONE VRS NETWORK (KEYNETGPS) TAKEN AT THE TIME OF THE FIELD SURVEY. THE FEMA FLOOD HAZARD ZONE (AE, ELEVATION 10) SHOWN HEREON REPRESENTS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
 - TEMPORARY BENCH MARKS SET:
 - TBM-A: RR SPIKE IN UTILITY POLE #5-1, ELEVATION = 23.26'
 - TBM-B: MAG NAIL IN ASPHALT PAVEMENT, ELEVATION = 24.56

PRIOR TO CONSTRUCTION IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THAT THE BENCHMARKS ILLUSTRATED ON THIS SKETCH HAVE NOT BEEN DISTURBED AND THEIR ELEVATIONS HAVE BEEN CONFIRMED. ANY CONFLICTS MUST BE REPORTED PRIOR TO CONSTRUCTION.

- THE DELINEATION LINE WAS PLACED IN THE FIELD BY LUCAS ENVIRONMENTAL, LLC IN APRIL, 2020 AND FIELD LOCATED BY CONTROL POINT ASSOCIATES, INC. ON 4/17/2020.
- 10. THE OFFSETS SHOWN ARE NOT TO BE USED FOR THE CONSTRUCTION OF ANY STRUCTURE, FENCE, PERMANENT ADDITION, ETC.

REFERENCES:

- 1. THE TAX ASSESSOR'S MAP OF WEYMOUTH, NORFOLK COUNTY, MAP 19.
- 2. MAP ENTITLED "NATIONAL FLOOD INSURANCE PROGRAM, FIRM, FLOOD INSURANCE RATE MAP, NORFOLK COUNTY, MASSACHUSETTS (ALL JURISDICTIONS), PANEL 231 OF 430," MAP NUMBER 25021C0231E, EFFECTIVE DATE: JULY 17, 2012.
- MAP ENTITLED "SUBDIVISION PLAN OF LAND EAST STREET & WHARF STREET, WEYMOUTH MASSACHUSETTS", PREPARED BY: CCR ASSOCIATES, DATED: NOVEMBER 12, 2003, RECORDED WITH THE NORFOLK COUNTY REGISTRY OF DEEDS IN PLAN BOOK 520 PAGE 85.
- 4. MAP ENTITLED "PLAN SHOWING SUBDIVISION OF LAND IN EAST WEYMOUTH, MASS. FOR WEYMOUTH INDUSTRIAL ASSOCIATION", PREPARED BY: RUSSELL H. WHITING, DATED: MARCH 30, 1921, RECORDED WITH THE NORFOLK COUNTY REGISTRY OF DEEDS IN PLAN BOOK 1486 PAGE 501.
- 5. MAP ENTITLED "PLAN OF LAND WEYMOUTH, MASS. FOR GEO. E. KEITH COMPANY", PREPARED BY: RUSSELL H. WHITING, DATED: JANUARY 8, 1921, RECORDED WITH THE NORFOLK COUNTY REGISTRY OF DEEDS IN PLAN BOOK 98 PAGE 4764.
- MAP ENTITLED "TAKING OF FEES & EASEMENTS EAST WEYMOUTH PUMPING STATION", PREPARED BY: THE SEWER DEPARTMENT OF WEYMOUTH, AS PLAN T-31-54, DATED: JULY 1, 1989, RECORDED WITH THE NORFOLK COUNTY REGISTRY OF DEEDS IN PLAN BOOK 3338 PAGE 2.
- MAP ENTITLED "COMPILED PLAN OF LAND DEPOT STREET WEYMOUTH, MASS.", PREPARED BY: C.F. ARNOLD ASSOCIATES, INC., DATED: MARCH 21, 1995, RECORDED WITH THE NORFOLK COUNTY REGISTRY OF DEEDS IN PLAN BOOK 430 PAGE 302.
- MAP ENTITLED "PLAN OF LAND IN WEYMOUTH, MASS. OF THE TOWN DUMP", PREPARED BY: FRANK A. LAGROTTERIA: MARCH 25, 1959, RECORDED WITH THE NORFOLK COUNTY REGISTRY OF DEEDS IN PLAN BOOK 208 PAGE 63.
- 9. MAP ENTITLED "PROPOSED PARK AN RECREATION LAND DESIGNATION AT CAPPED LANDFILL SITE, WHARF STREET", PREPARED BY: DEPARTMENT OF PUBLIC WORKS TOWN OF WEYMOUTH, DATED: JANUARY 7, 2017, RECORDED WITH THE NORFOLK COUNTY REGISTRY OF DEEDS IN PLAN BOOK 658 PAGE 100.
- 10. GAS MAPPING PROVIDED BY NATIONAL GRID GAS BOSTON.
- 11. MAPPING OF RIVERFRONT AREA, BASED ON ELEVATIONS ON NAVD88, PROVIDED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
- 12. MAP ENTITLED "TOWN OF WEYMOUTH DEPARTMENT OF PUBLIC WORKS, SEWER RECORD PLAN, DEPOT STREET," DATED NOVEMBER 11, 2005, PROVIDED BY THE TOWN OF WEYMOUTH D.P.W.
- 13. MAP ENTITLED "TOWN OF WEYMOUTH DEPARTMENT OF PUBLIC WORKS, SEWER RECORD PLAN WHARF STREET INCINERATOR," DATED JANUARY 17, 1974, PROVIDED BY THE TOWN OF WEYMOUTH D.P.W.

SEE SHEET 2 & 3 FOR TOPOGRAPHIC DETAIL

| PERFORMED IN THE FIELD UNDER MY HE BEST OF MY KNOWLEDGE, BELIEF, SURVEY HAS BEEN PERFORMED IN RENTLY ACCEPTED ACCURACY OCUMENT UNLESS EMBOSSED IN OR STAMPED WITH A BLUE INK SEAL | GERBY L BOLBRIGHT NO. 49211 | FIELD DATE 4-25-2020 FIELD BOOK NO. 20-02MA FIELD BOOK PG. 63-68 & 83 | BOUNDARY & TOPOGRAPHIC SURVEY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. 44 WHARF STREET LOT 25 & 26, MAP 19 TOWN OF WEYMOUTH, NORFOLK COUNTY COMMONWEALTH OF MASSACHUSETTS | | | | | |
|--|-----------------------------------|--|---|---|--|--|---|--|
| | 7-20-2020 | FIELD CREW S.B.H. DRAWN: B.A.V. | C A 352 SO 508 | S S O C I TURNPIKE RC UTHBOROUGH .948.3000 - 508 | OL PC A T E S, DAD 4, MA 01772 .948.3003 FAX | DINT AL INC. CHAI HAUPP. MANHA MT LA WA | BANY, NY 518 JFONT, PA 215 AUGE, NY 631 TTAN, NY 646 AUREL, NJ 609 ARREN, NJ 908 | -217-5010 -712-9800 -580-2645 -780-0411 -857-2099 -668-0099 |
| DLDRIGHT, PLS | DATE | REVIEWED: S.P.P. | APPROVED: G.L.H. | DATE 6-25-2020 | scale 1"= 50' | FILE NO. 03-200107-00 | dwg. no. 1 OF | 3 |





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4 SEASONAL COLOR / PERENNIAL DETAIL NOT TO SCALE

SOIL SCHEDULE

| LOCATION | DEPTH | DESCRIPTION | | |
|---|-------|---|--|--|
| GENERAL PLANTING BEDS | 2" | 1/3 PEAT - MANURE BLEND 1/3 HIGH ORGANIC LOAM 1/3 EXISTING SOIL | | |
| FLOWER BEDS | 2" | SCREENED LOAM 1/3 PEAT - MANURE BLEND LIME - PELATIZED OR GROUND (50 LB. PER 100 SF.) GROUND BONE MEAL (50 LB. PER 100 SF.) 10-10-10 INORGANIC FERTILIZER (50 LB. PER 5000 SF.) | | |
| LAWNS - SOD \$ SEED | 6" | 6" SCREENED LOAM | | |
| PITS/TREE WELLS "STANDARD MIX" FOR BACKFILL | 2" | 1/3 PEAT - MANURE BLEND SOIL MIX 'A' - 1/3 HIGH ORGANIC LOAM 1/3 EXISTING SOIL | | |

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|----|---|---------------------------------|--------|-------------|------------|
| ΤY | BOTANICAL NAME | COMMON NAME | CONT | CAL | PLANT SIZE |
| | Acer rubrum | Red Maple | B & B | 3-3.5" CAL. | |
| | Acer rubrum `Bowhall` | Bowhall Red Maple | B & B | 3-3.5" CAL. | |
| | Cornus florida `Cherokee Princess` | Cherokee Princess Dogwood | B & B | 2-2.5"-CAL. | |
| | Magnolia stellata `Centennial` | Star Magnolia | B & B | 2-2.5"-CAL. | |
| | Platanus x acerifolia `Bloodgood` | London Plane Tree | B & B | 3-3.5" CAL. | |
| | Quercus rubra | Red Oak | B & B | 3-3.5" CAL. | |
| | Zelkova serrata `Village Green` | Sawleaf Zelkova | B & B | 3-3.5" CAL. | |
| | | | CONT | CAL | |
| Y | | | | | |
| | Amelanchier grandifiora Robin Hill | Robin Hill Serviceberry | B&B | | 8-10 HI. |
| | Buxus x Green Mountain | Green Mountain Boxwood | B&B | | 2-2.5 HI |
| | Clethra alnifolia | Summersweet Clethra | B&B | | 2-2.5 HT |
| | Clethra alnifolia `Hummingbird` | Hummingbird Clethra | B & B | | 2-2.5`HT. |
| | Forsythia x intermedia `New Hampshire Gold` | New Hampshire Gold Forsythia | Cont. | | 2-2.5`HT. |
| | Hydrangea macrophylla `Bloomstruck` | Bloomstruck Hydrangea | Cont. | | 2-2.5`HT. |
| | Hydrangea paniculata `Bombshell` | Bombshell Hydrangea | Cont. | | 2-2.5`HT. |
| | Hydrangea quercifolia `Pee Wee` | Pee Wee Oakleaf Hydrangea | Cont. | | 2-2.5`HT. |
| | Hibiscus syriacus `Aphrodite` | Aphrodite Rose of Sharon | B & B | | 5-6`HT. |
| | Ilex crenata `Green Lustre` | Green Luster Japanese Holly | B & B | | 2-2.5`HT. |
| | Ilex crenata `Helleri` | Heler Japanese Holly | Cont. | | 18-24" HT. |
| | Ilex glabra `Shamrock` | Shamrock Inkberry | B & B | | 2-2.5`HT. |
| | Itea virginica `Little Henry` | Little Henry Sweetspire | B & B | | 15-18" HT. |
| | Ilex verticillata `Red Sprite` | Red Sprite Winterberry | Cont. | | 2-2.5`HT. |
| | Pennisetum alopecuroides `Hameln` | Hameln Fountain Grass | 2 GAL | | |
| | Pieris japonica `Brouwer`s Beauty` | Brouwer`s Beauty Andromeda | B & B | | 2-2.5` HT. |
| | Physocarpus opulifolius `Coppertina` | Coppertina Ninebark | B & B | | 3-3.5`HT. |
| | Panicum virgatum `Northwind` | Switch Grass | 3 GAL | | |
| | Rhododendron x `Cunningham`s White` | Cunningham's White Rhododendron | B & B | | 2-2.5` HT. |
| | Rosa x `Icy Drift` | White Drift Rose | Cont. | | 18-24" SPD |
| | Rosa Knockout `White Out` | White Knock Out Rose | Cont. | | 18-24" SPD |
| | Taxus x media `Tauntoni` | Tauton Yew | B & B | | 2-2.5` HT. |
| | Thuja occidentalis `Emerald Green` | Emerald Green Arborvitae | B & B | | 6-7`HT. |
| | Viburnum carlesii `Compactum` | Compact Korean Spice Viburnum | Cont. | | 2-2.5` HT. |
| | Viburnum dentatum `Blue Muffin` | Blue Muffin Arrowwood Viburnum | B & B | | 3-3.5`HT. |
| | ΒΟΤΑΝΙζΑΙ ΝΑΜΕ | | | | |
| | Lirione muscari 'Variegata' | Variegated Lily Turf | | | |
| | Pudbockia fulgida `Coldeturm` | | | | |
| , | | | | | |
| | Seasonal Color / Perennials | Seasonal Color / Perennials | I GAL. | | |

| Civil & Env 31 I Ph: 774.50 | ironmen Bellows Road · F 01.2176 · 866.312 | tal Cons aynham, MA 02 2.2024 · Fax: 774 | ultant 2767 4.501.2669 | s, Inc. |
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