# Stormwater Analysis

## 234 Taylor Street
## Littleton, Massachusetts

Planning
Landscape
Architecture
Civil
Engineering
Surveying

**PREPARED FOR:**

## Sanctuary Medicinals

COMMONWEALTH OF MASSACHUSETTS
Susan E. Carter
CIVIL ENGINEER
NO. 41270
REGISTERED PROFESSIONAL ENGINEER
1-11-24

**Date: July 18, 2023**
**Revised Jan. 11, 2024**

PLACES Associates, Inc.
256 Great Road, Suite 4, Littleton, MA 01460
(978) 486-0334 www.placesassociates.com

## Existing Conditions

The site contains 6.34 acres of land which contains an industrial building and appurtenances housing Sanctuary Medicinals. The site is located on the easterly side of Taylor Street and slopes to the east. No wetlands or wetland buffer zones impact the site so the Point of Analysis are the property lines.

There is an existing catchbasin on the site which, as shown on the 1996 site plan, drains to the drainage system on the northerly abutter (N/F Concord Associates Foster Street Trust). All other runoff generally flows towards the northerly, easterly or southerly property lines. This existing catchbasin was installed when both properties were in common ownership and a formal easement is being formalized between the two parties.

NCRS Soil Maps indicate that the soils on the front of the site (westerly) are Paxton-Urban Complex with a Hydrologic Soil Group of C and at the rear of the site, they are Woodbridge Fine Sandy Loam, Hydrologic Soil Group C/D. Soil testing has been performed on the site for the multiple septic systems which have served the building as well as soil probes performed in 2020 in anticipation of a building addition.The most recent soil testing by Soil Evaluators in 2020 and 2022 described the soils as "sandy loam" and the 2022 percolation rates 22 and 28 mpi at depths of 44+". The Rawl's rate (exfiltration rate) for sandy loam is 1.02 in/hr.

## Proposed Conditions

The proposed building and associated paved loading area will be located to the rear of the existing building on a small knoll. Pre-Development subcatchment area 5 and 2 will be impacted by this construction with a minor decrease in surface area to subcatchment 1. The table below will address the impact on this subcatchment area as the others remain unchanged.

Subcatchment 2 to the existing catchbasin will have less impervious surfaces draining to it resulting from the reconfiguration of the rear portion of the parking area offsetting the new walkway pavement. Part of this reconfiguration of the rear parking area is the replacement of this catchbasin to current standards – deep sump and Eliminator oil and grease trap hood. The replacement of the catchbasin will upgrade the BMP for the catchbasin to the extent practicable under the re-development requirements. A reduction in the amount of impervious surfaces tributary to this structure will result in an overall decrease in the rates of runoff, in compliance with Standard 1.

Subcatchment 5 will have the addition of the new roof, access to the new addition and the gravel access area around the addition. The runoff from the proposed roof is considered clean and will be collected and directed to the stormwater infiltration area. Runoff from the paved loading area will be collected into a stormwater treatment unit (CDS or similar hydrodynamic unit) equipped with a catchbasin frame and grate. This hydrodynamic unit will provide 80% TSS removal so that pre-treated runoff can be directed into the stormwater infiltration area.

The stormwater infiltration area will provide recharge to the soils to mitigate the impervious areas and will provide attenuation of the rate of runoff to the pre-development rates. To compare the Pre and Post Development rates of runoff, the discharge from the infiltration system and the overland flows were routed to Link 8 with the Point of Analysis being the north-northeast property line. Runoff to the existing catchbasin is shown as Subcat 2 for Pre and Subcat 20 for Post

development flows.

The hydrologic analysis for this site was performed using the HydroCAD modelling software using the SCS TR-20 methodology to route the stormwater through the site. The design storms were downloaded directly from the NOAA site for the Atlas 40 rainfall amounts as directed by the regulations. Typically, the 2,10 and 100 year events are required for wetlands permits. The HydroCAD printouts provided include detailed printouts of the 25 year storm (Design Storm) and summaries of the 2, 10 and 100 year events.

Summary of Drainage Flow Rates (cfs)

| HydroCAD Analysis Results | | | | |
|---|---|---|---|---|
| Subcatchment | Storm Event Discharge Rates (cfs) | | | |
| Design Storm Event | 2-Year | 10-Year | 25-Year | 100-Year |
| Existing Conditions (Subcat 2) | 3.44 | 6.41 | 8.28 | 11.16 |
| Proposed Conditions (Subcat 20) | 3.20 | 6.06 | 7.88 | 10.68 |

| HydroCAD Analysis Results | | | | |
|---|---|---|---|---|
| Subcatchment | Storm Event Discharge Rates (cfs) | | | |
| Design Storm Event | 2-Year | 10-Year | 25-Year | 100-Year |
| Existing Conditions (Subcat 5) | 1.81 | 4.27 | 5.95 | 8.63 |
| Proposed Conditions (Link 8) | 1.60 | 3.78 | 5.69 | 8.62 |

## Documenting Compliance

*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 site is a combination of re-development and new development. The flows to the existing catchbasin qualify as re-development as the amount of tributary impervious surfaces have decreased. This catchbasin will be replaced by a modern catchbasin with a 4' sump and an Eliminator oil and grease trap.

The new development is the addition and associated pavement for the loading area. The paved surfaces will enter a catchbasin which is a hydrodynamic separator with a grate which will then be directed into the subsurface infiltration system. The clean roof runoff will also be directed into the infiltration system with no increase in the rate of runoff.

*Standard 2 - Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates...To prevent storm damage and downstream and off-site flooding, Standard 2 requires that the post-development peak discharge rate is equal to or less than the pre-development rate from the 2-year and the 10-year 24-hour storms...Proponents must also evaluate the impact of peak discharges from the 100-year 24-hour storm. If this evaluation shows that increased off-site flooding will result from peak discharges from the 100-year 24-hour storms, BMPs must also be provided to attenuate these discharges.*

There will be no increase in rate of runoff for either subcatment area in the work area.

*Standard 3 - Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

Overall Site BMP Sizing:

| NRCS HYDROLOGIC SOIL TYPE | APPROX. SOIL TEXTURE | TARGET DEPTH FACTOR (F) |
|---|---|---|
| A | sand | **0.6-inch** |
| B | loam | **0.35-inch** |
| C | silty loam | **0.25-inch** |
| D | clay | **0.1-inch** |

***Table 2.3.2: Recharge Target Depth by Hydrologic Soil Group***

BMP Sizing:
*Required Water Quality Volume (WQV) = Target Depth Factor x impervious area*

Groundwater Recharge:

Required recharge rate for C soils is 0.25 inch of rainfall for impervious areas.
New Impervious Areas= 14,346 roof+1882 pave= 16,228 s.f. x 0.25"= 338 c.f.

Volume provided below lowest outlet=1,728 c.f. > 338 c.f.

Drawdown Time: 338 cubic feet / (1.02 in/hr x 1,167 sq.ft. x 1/12ft/in) = **3.40 hours >72 hours**

*Standard 4 - Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).*

*For purposes of Standards 3 and 4, impervious surfaces include roads, rooftops, parking lots, and sidewalks, when they are paved with concrete, asphalt, or brick pavers. (Volume 3, Chapter 1, Page 15)*

| | BMP Utilized | Removal Rate | Remains |
|---|---|---|---|
| Treatment | Hydrodynamic separator | 80% | 20% |
| Treatment | Infiltration Pond | 80% | 4% |
| Final Rate | | **96% Total Removed** | |

*Standard 5 - For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

The project does not qualify as a LUHPPL.

*Standard 6 - Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.*

*Standard 7 - A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

The redevelopment standard is applicable in Subcatchment areas 1-4 as there is no increase in impervious surfaces within those subcatchments. Only Subcatchment Area 2 has runoff from paved parking areas which is collected in the existing structure where there is an opportunity to implement BMPs to improve the water quality.

Drainage to the existing catchbasin meets Standard 1 with the replacement of the structure with a modern catchbasin with a deep sump and oil and grease hood. All other subcatchments that are not being disturbed have limited impervious surfaces of roofs and concrete pads related to HVAC equipment.

Runoff to the existing catchbasin (Subcat 2/20) decreases due to a reduction in impervious surfaces, complying with Standard 2. Standard 3, recharge, is improved slightly by the reduction in impervious surfaces. Standard 4 which requires pre-treatment is unchanged and these impervious surfaces (roof and concrete pads) are clean runoff and are not treated and they flow onto landscaped areas of the site.

*Standard 8 - A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

See site plans included with this application.

*Standard 9 - A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

See the Operation and Maintenance Plan included in this document.

*Standard 10 - All illicit discharges to the stormwater management system are prohibited.*

**Illicit Discharge Compliance Statement**

To the best of my knowledge no illicit discharges currently exist on the site and no future illicit discharge will be allowed, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

_____

Sanctuary Medicinals Date
Director of Operations

*To be completed and submitted prior to the start of construction.*

# Stormwater Operation and Maintenance Plan

## Stormwater Operation and Maintenance Plan - Long Term Pollution Prevention

Ongoing maintenance is required for the proper function of the stormwater management system allowing the system prevent pollution for the long term. This document provides a guideline for this work and allows for record keeping.

Stormwater Management System Owner: Sanctuary Medicinals
234 Taylor Street
Littleton, MA 01460

Party Responsible for Maintenance: Director of Operations- Nicholas Satmary
Sanctuary Medicinals

Snow Removal

Snow removal from this private site is the responsibility of the property owner Snow should not be plowed or stockpiled on the catchbasin. Snow storage areas are shown on the site plan. In an extreme weather event, the owner shall be responsible for snow removal offsite if necessary to maintain parking and site access.

Preliminary Stormwater O&M Maintenance Budget

Inspection and maintenance = $250 x 4 times per year = $1,000±

## Site Specific BMP Maintenance Plans

(Reference MADEP Volume 2, Chapter – Structural BMP Specifications for the Massachusetts Stormwater Handbook and/or Manufacturer's specifications)

Routine Maintenance

Routine maintenance of lawns, gardens, and other landscaped areas shall occur as necessary to maintain the property in a neat and orderly fashion. Clippings, leaves and/or mulch shall not be washed into the drainage infrastructure.

Deep Sump/Hooded Catchbasin

Location: double grated catchbasin within limits of existing parking area at low point on site

Inspect or clean deep sump catch basins four times per year at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or when the depth of deposits is greater than or equal to one half the depth from the bottom of the lowest pipe in the basin. Vacuum trucks are to be used to remove trapped sediment and supernatant. Although catch basin debris often contains concentrations of oil and hazardous materials such as petroleum hydrocarbons and metals, MassDEP classifies them as solid

waste. Any contaminated materials must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.00, and handled as hazardous waste. MassDEP regulations prohibit landfills from accepting materials that contain free draining liquids.

Stormwater Water Quality Treatment Units

Location: Structure fitted with a grate, located opposite loading doors, Building Addition

Regular maintenance of the water quality units is essential. The maintenance of these units begins immediately at post-construction prior to putting the unit into service. During the first year of operation, the units should be inspected quarterly to determine the rate of accumulation of sediment and oils. In subsequent years, the units can be inspected at a frequency determined by the accumulation rate of sediment and oils, but in no cases should the inspection frequency exceed six months.

Inspect and complete preventive maintenance in accordance with manufacturer's recommendations. Units should also be cleaned immediately in the event of a spill.

Infiltration System

Location: In grass area between loading area of Building Addition and stonewall (property line)

Inspect the infiltration system at least once per year to ensure that the system is operating as intended. Inspect infiltration system during and after major storms to determine if the system is meeting the expected detention times. Examine the outlet structure for evidence of clogging or outflow release velocities that are greater than design flow and causing erosion. Make any necessary repairs immediately. During inspections, note any changes to the infiltration system or the contributing watershed, because these could affect system performance. Also check system for sediment accumulation. Remove sediment from the in system, as necessary. Providing an on-site sediment disposal area will reduce the overall sediment removal costs.

Outlet Control Structures, Flared End Outlets

Inspect biannually. Inspect for structural soundness and confirm no blockage exists at openings, or within pipe; and no erosion is occurring at outlet control structure inlet or outlet. Remove trash, sediment, debris and vegetation. Restabilize area near inlets and outlets as necessary.



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Stormwater BMP Inspection and Maintenance Log
(Print a log for each BMP and maintain a logbook for the project)

BMP:_____

| Date | Inspector | Issues Observed | Corrective Action Taken | Notes |
|---|---|---|---|---|
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# Sizing for Hydrodynamic Separator

CONTECH ENGINEERED SOLUTIONS

# Hydrodynamic Separation Product Calculator

**Sanctuary**

**Sanctuary**

**CDS 2015-4**

| Project Information | | | | | |
|---|---|---|---|---|---|
| **Project Name** | Sanctuary | | | **Option #** | A |
| **Country** | UNITED_STATES | **State** | Massachusetts | **City** | Littleton |

| Contact Information | | | |
|---|---|---|---|
| **First Name** | Patrick | **Last Name** | Burke |
| **Company** | | **Phone #** | 978-486-0334 |
| **Email** | pburke@placesassociates.com | | |

| Design Criteria | | | | | |
|---|---|---|---|---|---|
| **Site Designation** | Sanctuary | | | **Sizing Method** | Net Annual |
| **Screening Required?** | Yes | **Drainage Area (ac)** | 0.05 | **Peak Flow (cfs)** | 0.14 |
| **Groundwater Depth (ft)** | 0 - 5 | **Pipe Invert Depth (ft)** | 0 - 5 | **Bedrock Depth (ft)** | >15 |
| **Multiple Inlets?** | No | **Grate Inlet Required?** | Yes | **Pipe Size (in)** | 12.00 |
| **Required Particle Size Distribution?** | No | **90° between two inlets?** | N/A | **180° between inlet and outlet?** | No |
| **Runoff Coefficient** | 0.90 | **Rainfall Station** | 69 - Boston Airport, MA | **TC (Min)** | 6 |

| Treatment Selection | | | | | |
|---|---|---|---|---|---|
| **Treatment Unit** | CDS | **System Model** | 2015-4 | | |
| **Target Removal** | 80% | **Particle Size Distribution (PSD)** | 125 | **Predicted Net Annual Removal** | 93.53% |

CONTECH ENGINEERED SOLUTIONS

# Hydrodynamic Separation Product Calculator

Sanctuary

Sanctuary

CDS 2015-4

| CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rainfall Intensity[1] (in/hr) | % Rainfall Volume[1] | Cumulative Rainfall Volume | Rainfall Volume Treated | Total Flowrate (cfs) | Treated Flowrate (cfs) | Operating Rate (%) | Removal Efficiency (%) | Incremental Removal (%) |
| 0.0200 | 10.17% | 10.17% | 10.17% | 0.0009 | 0.0009 | 0.13% | 100.00% | 10.17% |
| 0.0400 | 9.65% | 19.82% | 9.65% | 0.0018 | 0.0018 | 0.26% | 100.00% | 9.65% |
| 0.0600 | 9.45% | 29.27% | 9.45% | 0.0027 | 0.0027 | 0.39% | 100.00% | 9.45% |
| 0.0800 | 7.74% | 37.01% | 7.74% | 0.0036 | 0.0036 | 0.51% | 100.00% | 7.74% |
| 0.1000 | 8.57% | 45.58% | 8.57% | 0.0045 | 0.0045 | 0.64% | 100.00% | 8.57% |
| 0.1200 | 6.30% | 51.88% | 6.30% | 0.0054 | 0.0054 | 0.77% | 100.00% | 6.30% |
| 0.1400 | 4.66% | 56.54% | 4.66% | 0.0063 | 0.0063 | 0.90% | 100.00% | 4.66% |
| 0.1600 | 4.64% | 61.18% | 4.64% | 0.0072 | 0.0072 | 1.03% | 100.00% | 4.64% |
| 0.1800 | 3.54% | 64.72% | 3.54% | 0.0081 | 0.0081 | 1.16% | 100.00% | 3.54% |
| 0.2000 | 4.34% | 69.06% | 4.34% | 0.0090 | 0.0090 | 1.29% | 100.00% | 4.34% |
| 0.2500 | 8.00% | 77.06% | 8.00% | 0.0113 | 0.0113 | 1.61% | 100.00% | 8.00% |
| 0.3000 | 5.59% | 82.65% | 5.59% | 0.0135 | 0.0135 | 1.93% | 100.00% | 5.59% |
| 0.3500 | 4.37% | 87.02% | 4.37% | 0.0158 | 0.0158 | 2.26% | 100.00% | 4.37% |
| 0.4000 | 2.53% | 89.55% | 2.53% | 0.0180 | 0.0180 | 2.57% | 100.00% | 2.53% |
| 0.4500 | 2.53% | 92.08% | 2.53% | 0.0203 | 0.0203 | 2.90% | 100.00% | 2.53% |
| 0.5000 | 1.38% | 93.46% | 1.38% | 0.0225 | 0.0225 | 3.21% | 100.00% | 1.38% |
| 0.7500 | 5.04% | 98.50% | 5.04% | 0.0338 | 0.0338 | 4.83% | 100.00% | 5.04% |
| 1.0000 | 1.01% | 99.51% | 1.01% | 0.0450 | 0.0450 | 6.43% | 100.00% | 1.01% |
| 1.5000 | 0.00% | 99.51% | 0.00% | 0.0675 | 0.0675 | 9.64% | 99.48% | 0.00% |
| 2.0000 | 0.00% | 99.51% | 0.00% | 0.0900 | 0.0900 | 12.86% | 98.84% | 0.00% |
| 3.0000 | 0.48% | 99.99% | 0.48% | 0.1350 | 0.1350 | 19.29% | 97.55% | 0.47% |
| | | | | | | | | 99.98% |
| | | | | | | | Removal Efficiency Adjustment[2] = | 6.45% |
| | | | | | | | Predicted % Annual Rainfall Treated = | 93.54% |
| | | | | | | | Predicted Net Annual Load Removal Efficiency = | 93.53% |
| 1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA | | | | | | | | |
| 2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes. | | | | | | | | |

SECTION (_____)
STORM WATER TREATMENT DEVICE

## 1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the CDS® by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 The Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.

1.3 The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a CDS® device manufactured by:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.4 Related Sections

1.4.1 Section 02240: Dewatering
1.4.2 Section 02260: Excavation Support and Protection
1.4.3 Section 02315: Excavation and Fill
1.4.4 Section 02340: Soil Stabilization

1.5 All components shall be subject to inspection by the engineer at the place of manufacture and/or installation. All components are subject to being rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair where final acceptance of the component is contingent on the discretion of the Engineer.

1.6 The manufacturer shall guarantee the SWTD components against all manufacturer originated defects in materials or workmanship for a period of twelve (12) months from the date the components are delivered to the owner for installation. The manufacturer shall upon its determination repair, correct or replace any manufacturer originated defects advised in writing to the manufacturer within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.

1.7 The SWTD manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Certification" certifying that each SWTD is capable of achieving the specified removal efficiencies listed in these specifications. The certification shall be supported by independent third-party research

1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

## 2.0 MATERIALS

2.1 Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Precast concrete components shall conform to applicable sections of ASTM C 478, ASTM C 857 and ASTM C 858 and the following:

- 2.1.1 Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
- 2.1.2 Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
- 2.1.3 Cement shall be Type III Portland Cement conforming to ASTM C 150;
- 2.1.4 Aggregates shall conform to ASTM C 33;
- 2.1.5 Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A 615, A 185, or A 497.
- 2.1.6 Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.
- 2.1.7 Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.

2.2 Internal Components and appurtenances shall conform to the following:

- 2.2.1 Screen and support structure shall be manufactured of Type 316 and 316L stainless steel conforming to ASTM F 1267-01;
- 2.2.2 Hardware shall be manufactured of Type 316 stainless steel conforming to ASTM A 320;
- 2.2.3 Fiberglass components shall conform to applicable sections of ASTM D-4097
- 2.2.4 Access system(s) conform to the following:
- 2.2.5 Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.

## 3.0 PERFORMANCE

3.1 The SWTD shall be sized to either achieve an 80 percent average annual reduction in the total suspended solid load with a particle size distribution having a mean particle size ($d_{50}$) of 125 microns unless otherwise stated.

3.2 The SWTD shall be capable of capturing and retaining 100 percent of pollutants greater than or equal to 2.4 millimeters (mm) regardless of the pollutant's specific gravity (i.e.: floatable and neutrally buoyant materials) for flows up to the device's rated-treatment capacity. The SWTD shall be designed to retain all previously captured pollutants addressed by this

subsection under all flow conditions. The SWTD shall be capable of capturing and retaining total petroleum hydrocarbons. The SWTD shall be capable of achieving a removal efficiency of 92 and 78 percent when the device is operating at 25 and 50 percent of its rated-treatment capacity. These removal efficiencies shall be based on independent third-party research for influent oil concentrations representative of storm water runoff (20 ± 5 mg/L). The SWTD shall be greater than 99 percent effective in controlling dry-weather accidental oil spills.

3.3 The SWTD shall be designed with a sump chamber for the storage of captured sediments and other negatively buoyant pollutants in between maintenance cycles. The minimum storage capacity provided by the sump chamber shall be in accordance with the volume listed in Table 1. The boundaries of the sump chamber shall be limited to that which do not degrade the SWTD's treatment efficiency as captured pollutants accumulate. The sump chamber shall be separate from the treatment processing portion(s) of the SWTD to minimize the probability of fine particle re-suspension. In order to not restrict the Owner's ability to maintain the SWTD, the minimum dimension providing access from the ground surface to the sump chamber shall be 16 inches in diameter.

3.4 The SWTD shall be designed to capture and retain Total Petroleum Hydrocarbons generated by wet-weather flow and dry-weather gross spills and have a capacity listed in Table 1 of the required unit.

3.5 The SWTD shall convey the flow from the peak storm event of the drainage network, in accordance with required hydraulic upstream conditions as defined by the Engineer. If a substitute SWTD is proposed, supporting documentation shall be submitted that demonstrates equal or better upstream hydraulic conditions compared to that specified herein. This documentation shall be signed and sealed by a Professional Engineer registered in the State of the work. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.6 The SWTD shall have completed field tested following TARP Tier II protocol requirements

4.0 EXECUTION

4.1 The contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.

4.2 The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.

4.3 The contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner, which leaves no sharp points or edges.

4.4 The contractor shall removal all loose material and pooling water from the SWTD prior to the transfer of operational responsibility to the Owner.

**TABLE 1**
**Storm Water Treatment Device**
**Storage Capacities**

| CDS Model | Minimum Sump Storage Capacity $(yd^3)/(m^3)$ | Minimum Oil Storage Capacity (gal)/(L) |
|---|---|---|
| CDS2015-4 | 0.9(0.7) | 61(232) |
| CDS2015-5 | 1.5(1.1) | 83(313) |
| CDS2020-5 | 1.5(1.1) | 99(376) |
| CDS2025-5 | 1.5(1.1) | 116(439) |
| CDS3020-6 | 2.1 (1.6) | 184(696) |
| CDS3025-6 | 2.1(1.6) | 210(795) |
| CDS3030-6 | 2.1 (1.6) | 236(895) |
| CDS3035-6 | 2.1 (1.6) | 263(994) |
| CDS3535-7 | 2.9(2.2) | 377(1426) |
| CDS4030-8 | 5.6(4.3) | 426(1612) |
| CDS4040-8 | 5.6 (4.3) | 520(1970) |
| CDS4045-8 | 5.6 (4.3) | 568(2149) |
| CDS5640-10 | 8.7(6.7) | 758(2869) |
| CDS5653-10 | 8.7(6.7) | 965(3652) |
| CDS5668-10 | 8.7(6.7) | 1172(4435) |
| CDS5678-10 | 8.7(6.7) | 1309(4956) |
| | | |
| CDS7070-DV | 3.6(2.8) | 914 (3459) |
| CDS10060-DV | 5.0 (3.8) | 792 (2997) |
| CDS10080-DV | 5.0 (3.8) | 1057 (4000) |
| CDS100100-DV | 5.0 (3.8) | 1320 (4996) |

**END OF SECTION**

SECTION (_____)
STORM WATER TREATMENT DEVICE

## 1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the CDS® by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 The Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.

1.3 The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a CDS® device manufactured by:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.4 Related Sections

1.4.1 Section 02240: Dewatering
1.4.2 Section 02260: Excavation Support and Protection
1.4.3 Section 02315: Excavation and Fill
1.4.4 Section 02340: Soil Stabilization

1.5 All components shall be subject to inspection by the engineer at the place of manufacture and/or installation. All components are subject to being rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair where final acceptance of the component is contingent on the discretion of the Engineer.

1.6 The manufacturer shall guarantee the SWTD components against all manufacturer originated defects in materials or workmanship for a period of twelve (12) months from the date the components are delivered to the owner for installation. The manufacturer shall upon its determination repair, correct or replace any manufacturer originated defects advised in writing to the manufacturer within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.

1.7 The SWTD manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Certification" certifying that each SWTD is capable of achieving the specified removal efficiencies listed in these specifications. The certification shall be supported by independent third-party research

1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

## 2.0 MATERIALS

2.1 Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Precast concrete components shall conform to applicable sections of ASTM C 478, ASTM C 857 and ASTM C 858 and the following:

- 2.1.1 Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
- 2.1.2 Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
- 2.1.3 Cement shall be Type III Portland Cement conforming to ASTM C 150;
- 2.1.4 Aggregates shall conform to ASTM C 33;
- 2.1.5 Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A 615, A 185, or A 497.
- 2.1.6 Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.
- 2.1.7 Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.

2.2 Internal Components and appurtenances shall conform to the following:

- 2.2.1 Screen and support structure shall be manufactured of Type 316 and 316L stainless steel conforming to ASTM F 1267-01;
- 2.2.2 Hardware shall be manufactured of Type 316 stainless steel conforming to ASTM A 320;
- 2.2.3 Fiberglass components shall conform to applicable sections of ASTM D-4097
- 2.2.4 Access system(s) conform to the following:
- 2.2.5 Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.

## 3.0 PERFORMANCE

3.1 The SWTD shall be sized to either achieve an 80 percent average annual reduction in the total suspended solid load with a particle size distribution having a mean particle size ($d_{50}$) of 125 microns unless otherwise stated.

3.2 The SWTD shall be capable of capturing and retaining 100 percent of pollutants greater than or equal to 2.4 millimeters (mm) regardless of the pollutant's specific gravity (i.e.: floatable and neutrally buoyant materials) for flows up to the device's rated-treatment capacity. The SWTD shall be designed to retain all previously captured pollutants addressed by this

subsection under all flow conditions. The SWTD shall be capable of capturing and retaining total petroleum hydrocarbons. The SWTD shall be capable of achieving a removal efficiency of 92 and 78 percent when the device is operating at 25 and 50 percent of its rated-treatment capacity. These removal efficiencies shall be based on independent third-party research for influent oil concentrations representative of storm water runoff (20 ± 5 mg/L). The SWTD shall be greater than 99 percent effective in controlling dry-weather accidental oil spills.

3.3 The SWTD shall be designed with a sump chamber for the storage of captured sediments and other negatively buoyant pollutants in between maintenance cycles. The minimum storage capacity provided by the sump chamber shall be in accordance with the volume listed in Table 1. The boundaries of the sump chamber shall be limited to that which do not degrade the SWTD's treatment efficiency as captured pollutants accumulate. The sump chamber shall be separate from the treatment processing portion(s) of the SWTD to minimize the probability of fine particle re-suspension. In order to not restrict the Owner's ability to maintain the SWTD, the minimum dimension providing access from the ground surface to the sump chamber shall be 16 inches in diameter.

3.4 The SWTD shall be designed to capture and retain Total Petroleum Hydrocarbons generated by wet-weather flow and dry-weather gross spills and have a capacity listed in Table 1 of the required unit.

3.5 The SWTD shall convey the flow from the peak storm event of the drainage network, in accordance with required hydraulic upstream conditions as defined by the Engineer. If a substitute SWTD is proposed, supporting documentation shall be submitted that demonstrates equal or better upstream hydraulic conditions compared to that specified herein. This documentation shall be signed and sealed by a Professional Engineer registered in the State of the work. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.6 The SWTD shall have completed field tested following TARP Tier II protocol requirements

4.0 EXECUTION

4.1 The contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.

4.2 The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.

4.3 The contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner, which leaves no sharp points or edges.

4.4 The contractor shall removal all loose material and pooling water from the SWTD prior to the transfer of operational responsibility to the Owner.

**TABLE 1**
**Storm Water Treatment Device**
**Storage Capacities**

| CDS Model | Minimum Sump Storage Capacity $(yd^3)/(m^3)$ | Minimum Oil Storage Capacity (gal)/(L) |
|---|---|---|
| CDS2015-4 | 0.9(0.7) | 61(232) |
| CDS2015-5 | 1.5(1.1) | 83(313) |
| CDS2020-5 | 1.5(1.1) | 99(376) |
| CDS2025-5 | 1.5(1.1) | 116(439) |
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| CDS3035-6 | 2.1 (1.6) | 263(994) |
| CDS3535-7 | 2.9(2.2) | 377(1426) |
| CDS4030-8 | 5.6(4.3) | 426(1612) |
| CDS4040-8 | 5.6 (4.3) | 520(1970) |
| CDS4045-8 | 5.6 (4.3) | 568(2149) |
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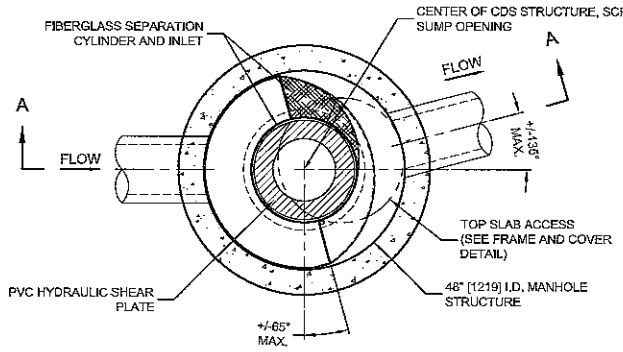
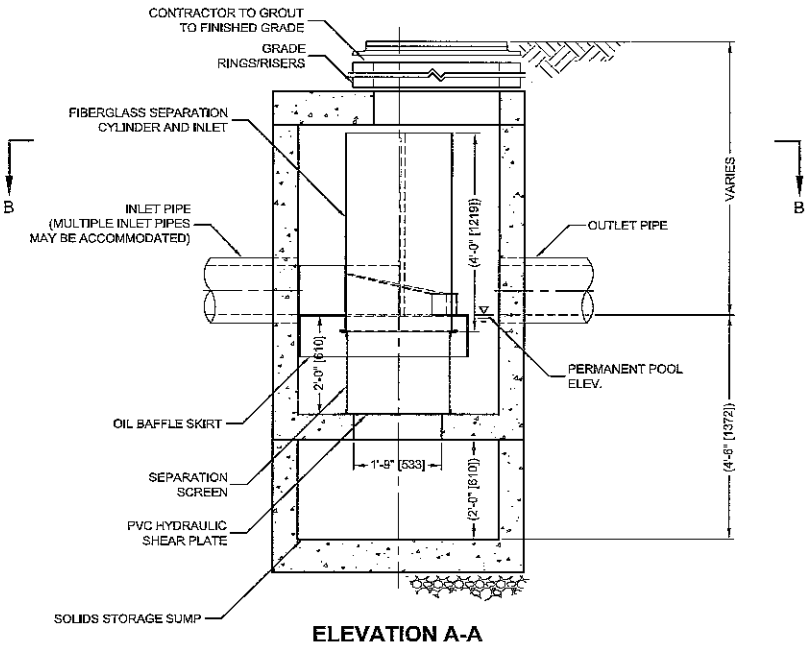
| CDS5653-10 | 8.7(6.7) | 965(3652) |
| CDS5668-10 | 8.7(6.7) | 1172(4435) |
| CDS5678-10 | 8.7(6.7) | 1309(4956) |
| | | |
| CDS7070-DV | 3.6(2.8) | 914 (3459) |
| CDS10060-DV | 5.0 (3.8) | 792 (2997) |
| CDS10080-DV | 5.0 (3.8) | 1057 (4000) |
| CDS100100-DV | 5.0 (3.8) | 1320 (4996) |

**END OF SECTION**




**PLAN VIEW B-B**
N.T.S.

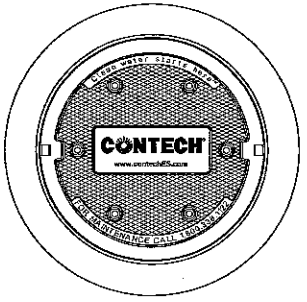



**ELEVATION A-A**
N.T.S.

## CDS2015-4-C DESIGN NOTES

THE STANDARD CDS2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

| CONFIGURATION DESCRIPTION |
|---|
| GRATED INLET ONLY (NO INLET PIPE) |
| GRATED INLET WITH INLET PIPE OR PIPES |
| CURB INLET ONLY (NO INLET PIPE) |
| CURB INLET WITH INLET PIPE OR PIPES |
| SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION) |
| SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS |




**FRAME AND COVER**
(DIAMETER VARIES)
N.T.S.

## SITE SPECIFIC DATA REQUIREMENTS

| | | | |
|---|---|---|---|
| STRUCTURE ID | | | |
| WATER QUALITY FLOW RATE (CFS OR L/s) | | | * |
| PEAK FLOW RATE (CFS OR L/s) | | | * |
| RETURN PERIOD OF PEAK FLOW (YRS) | | | * |
| SCREEN APERTURE (2400 OR 4700) | | | * |
| PIPE DATA: | I.E. | MATERIAL | DIAMETER |
| INLET PIPE 1 | * | * | * |
| INLET PIPE 2 | * | * | * |
| OUTLET PIPE | * | * | * |
| RIM ELEVATION | | | * |
| ANTI-FLOTATION BALLAST | | WIDTH | HEIGHT |
| | | * | * |
| NOTES/SPECIAL REQUIREMENTS: | | | |
| * PER ENGINEER OF RECORD | | | |

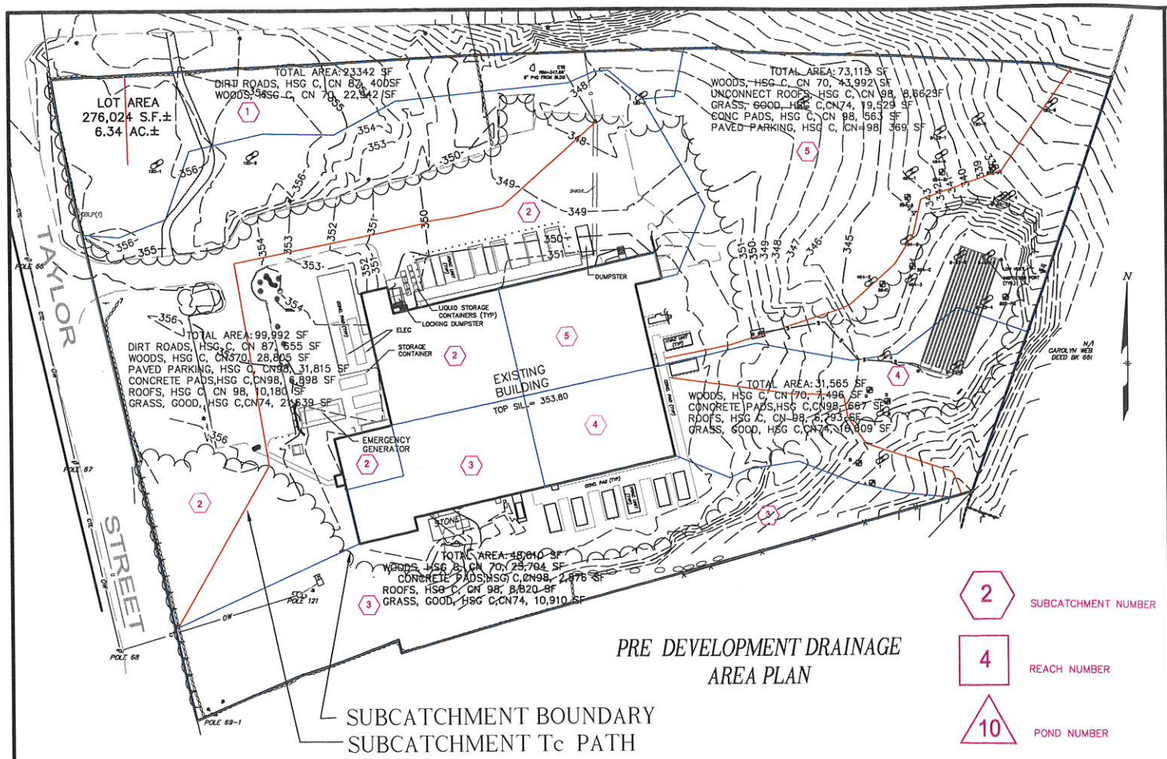
GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

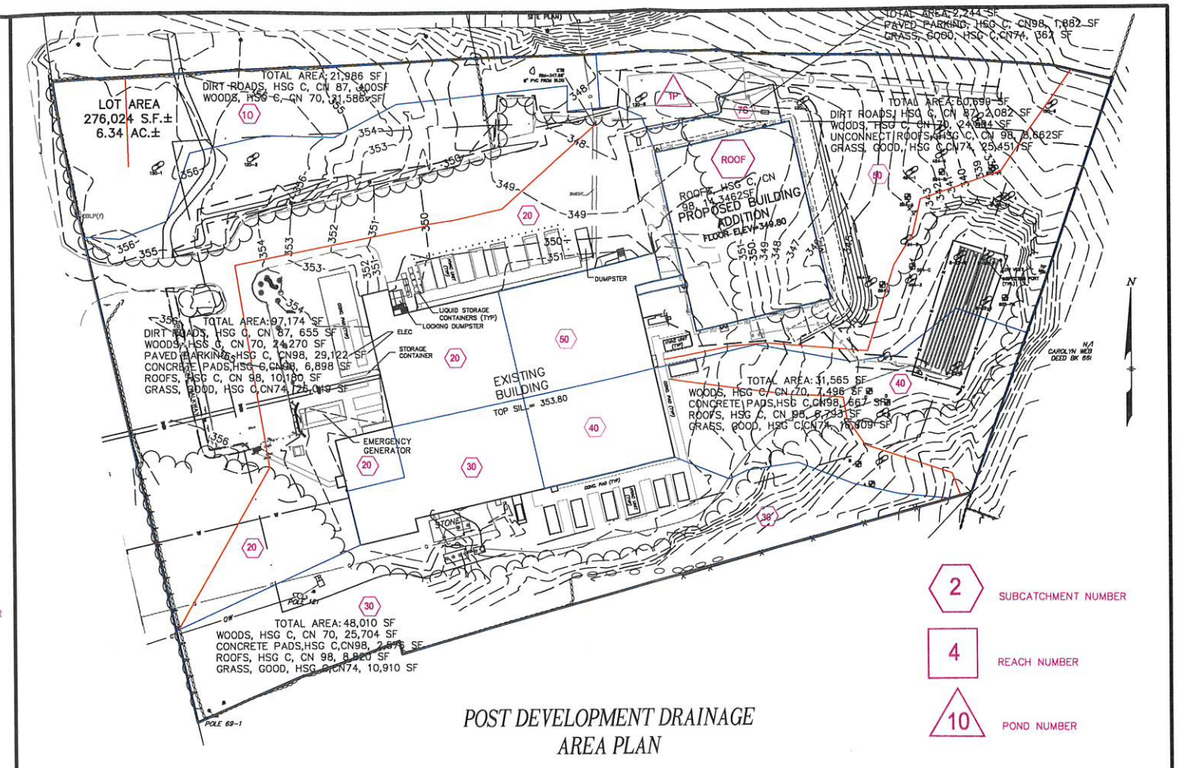
CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2015-4-C
INLINE CDS
STANDARD DETAIL

# DRAINAGE PLANS (WITH SOILS DATA)




*PRE DEVELOPMENT DRAINAGE AREA PLAN*




*POST DEVELOPMENT DRAINAGE AREA PLAN*

BAR SCALE
1"=50'
CHECK GRAPHIC SCALE BEFORE USING

## SOIL TESTING

SOIL PROBE TEST RESULTS 1-14-2020
PERFORMED BY SUSAN E. CARTER, PE S.E 341

120-1 (near Taylor Rd)
0-8" Ap SL 10yr 3/4
8-24" Bw 10 SL 10yr 5/8
24-128" C FSL 2.5 y 6/4 friable, 10% cobbles
93" mottles 7yr 5/8
No Refusal, NGWO, ESHWT@ 93"

120-2 (near Taylor Rd)
0-8" Ap SL 10yr 3/4
8-24" Bw 10 SL 10yr 5/8
24-128" C FSL 2.5 y 6/4 friable, 10-25% cobbles
83" mottles 7yr 5/8
No Refusal, NGWO, ESHWT@ 83"

120-3 (behind 1979 leaching area)
0-8" Ap SL 10yr 3/4
8-24"10 Bw SL 10yr 5/8
24-135" C SL 2.5 y 6/4 friable, 10-25% cobbles, soils more friable below 60"
100" possible mottles
No Refusal, NGWO, ESHWT@ 100"

120-4 (behind 1994 leaching area)
0-8" Ap SL 10yr 3/4
8-24" Bw10 SL 10yr 5/8
24-84" C1 SL 2.5 y 6/4 friable, 50% stone
84-132" C2 SL 10yr ¼
Mottling inconsistent following soil seams between stone
No Refusal, NGWO

120-5 (behind 1994 leaching area)
0-8" Ap SL 10yr 3/4
8-24" Bw10 SL 10yr 5/8
24-55" C1 SL 2.5 y 6/4 friable
55-99" C2 SL 2.5 y 6/4 Firm with inconsistent mottling
99-146" C3 LS 2.5 y 6/4 friable, 20% stone
GWO@ 129" (seepage) No Refusal, ESHWT @ 99+"

120-6 (near corner of walls at low point of property)
0-8" Ap SL 10yr 3/4
8-24" Bw10 SL 10yr 5/8
24-114" C Ls 2.5 y 6/4 friable, 10% gravel
Mottling @ 39" measured in lower side of test hole
No Refusal, NGWO, ESHWT 39"

120-7 (40' from northerly property line)
0-8" Ap SL 10yr 3/4
8-24" Bw10 SL 10yr 5/8
24-127" C Ls 2.5 y 6/4
Mottling @ 72" high and low chroma
No Refusal, NGWO, ESHWT 72"

120-8 (40' from northerly property line)
0-8" Ap SL 10yr 3/4
8-24" Bw10 SL 10yr 5/8
24-112" C compact SL 2.5 y 6/4
Possible refusal @ 112" large angular rock, NGWO
This hole is similar to 120-1 AND 120-2

## SOIL TESTING (2022)

PERFORMED BY: WILLIAM E. MURRAY, S.E. 1723
PLACES ASSOCIATES, INC.
WITNESSED BY: JAMES GAREFFI, R.S. NABOH

Testhole # 822-1 DATE: 8-12-2022 Elevation: 340.6

| Depth from Surface (inches) | Soil Horizon | Soil texture (USDA) | Soil Color (Munsel) | Soil Mottling | Other |
|---|---|---|---|---|---|
| 0"-12" | Ap | FSL | 10YR 3/3 | | MASSIVE, DRY FRIABLE WITH ROOTS |
| 12"-30" | B | FSL | 10YR 5/6 | | MASSIVE, DRY FRIABLE, GRAD. BORDER |
| 30"-100" | C | FSL | 10YR 7/2 | 48" 10YR 5/3 | MASSIVE, DRY SMEARED@48" |

Groundwater Observed: NONE" Refusal @ NONE
Estimated Seasonal High Groundwater: 48" Elevation: 338.6

Testhole # 822-2 DATE: 8-12-2022 Elevation: 339.2

| Depth from Surface (inches) | Soil Horizon | Soil texture (USDA) | Soil Color (Munsel) | Soil Mottling | Other |
|---|---|---|---|---|---|
| 0"-10" | Ap | FSL | 10YR 3/3 | NONE | MASSIVE, DRY FRIABLE BORDER CLEAR |
| 10"-24" | B | FSL | 10YR 5/6 | NONE | MASSIVE, DRY FRIABLE, GRAD. BORDER |
| 24"-108" | C | FSL | 10YR 6/3 | 48" 10YR 5/3 | MASSIVE, DRY MOTTLES FINE SAND |

Groundwater Observed: NONE Refusal @ NONE
Estimated Seasonal High Groundwater: 48" Elevation: 335.2
PERC P-1 22 MPI @47"

Testhole # 822-3 DATE: 8-12-2022 Elevation: 342.5

| Depth from Surface (inches) | Soil Horizon | Soil texture (USDA) | Soil Color (Munsel) | Soil Mottling | Other |
|---|---|---|---|---|---|
| 0"-9" | Ap | FSL | 10YR 4/2 | | MASSIVE, DRY FRIABLE BORDER CLEAR |
| 9"-23" | B | FSL | 10YR 6/6 | | MASSIVE, DRY FRIABLE, GRAD. BORDER |
| 23"-120" | C | FSL | 10YR 6/3 | 48" | MASSIVE, DRY |

Groundwater Observed: NONE Refusal @ NONE
Estimated Seasonal High Groundwater: 48" Elevation: 337.4

Testhole # 822-4 DATE: 8-12-2022 Elevation: 344.2

| Depth from Surface (inches) | Soil Horizon | Soil texture (USDA) | Soil Color (Munsel) | Soil Mottling | Other |
|---|---|---|---|---|---|
| 0"-10" | Ap | FSL | 10YR 3/3 | | MASSIVE, DRY FRIABLE BORDER CLEAR |
| 10"-24" | B | FSL | 10YR 5/6 | | MASSIVE, DRY FRIABLE, GRAD. BORDER |
| 24"-84" | C1 | FSL | 10YR 6/3 | | MASSIVE, DRY FRACTURE STONE & SOILS |
| 84"-106" | C2 | FSL | 10YR 6/3 | | MASSIVE, DRY FRACTURE STONE & SOILS |

Groundwater Observed: NONE Refusal @ NONE
Estimated Seasonal High Groundwater: 50" Elevation: 340.0
PERC P-2 28 MPI @44"

Testhole # 822-5 DATE: 8-12-2022 Elevation: 344.5

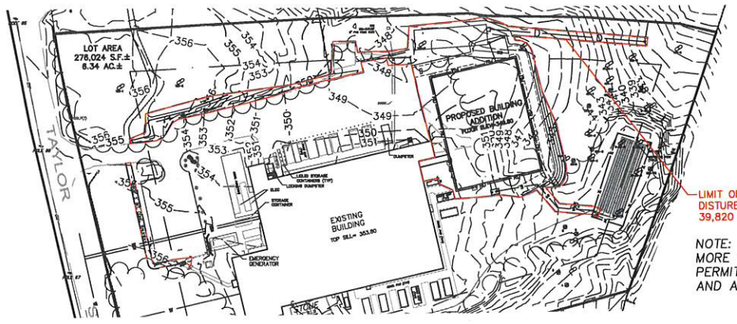
| Depth from Surface (inches) | Soil Horizon | Soil texture (USDA) | Soil Color (Munsel) | Soil Mottling | Other |
|---|---|---|---|---|---|
| 0"-12" | Ap | FSL | 10YR 3/3 | | MASSIVE, DRY FRIABLE BORDER CLEAR |
| 12"-24" | B | FSL | 10YR 5/6 | | MASSIVE, DRY FRIABLE, GRAD. BORDER |
| 24"-120" | C | FSL | 10YR 6/3 | 48" | MASSIVE, DRY FRIABLE |

Groundwater Observed: NONE Refusal @ NONE
Estimated Seasonal High Groundwater: 48" Elevation: 340.5

Testhole # 822-6 DATE: 8-12-2022 Elevation: 342.5

| Depth from Surface (inches) | Soil Horizon | Soil texture (USDA) | Soil Color (Munsel) | Soil Mottling | Other |
|---|---|---|---|---|---|
| 0"-5" | Ap | FSL | 10YR 5/2 | NONE | MASSIVE, DRY FRIABLE BORDER CLEAR |
| 59"-26" | B | FSL | 10YR 6/4 | NONE | MASSIVE, DRY FRIABLE, GRAD. BORDER |
| 26"-93" | C | FSL | 10YR 5/3 | 50" | MASSIVE, DRY FRIABLE |

Groundwater Observed: NONE Refusal @ NONE
Estimated Seasonal High Groundwater: 50" Elevation: 338.5




*SKETCH OF DISTURBED AREA*

80' 0 80' 160'
BAR SCALE
1"=80'
CHECK GRAPHIC SCALE BEFORE USING

NOTE: LAND DISTURBANCE OF 1 ACRE OR MORE REQUIRES BOTH A STORMWATER PERMIT FROM THE TOWN OF LITTLETON AND A NPDES CGP FROM THE EPA.

REVISIONS:
1-4-24 PER PEER REVIEW

# *PRE AND POST DEVELOPMENT DRAINAGE AREA PLAN*

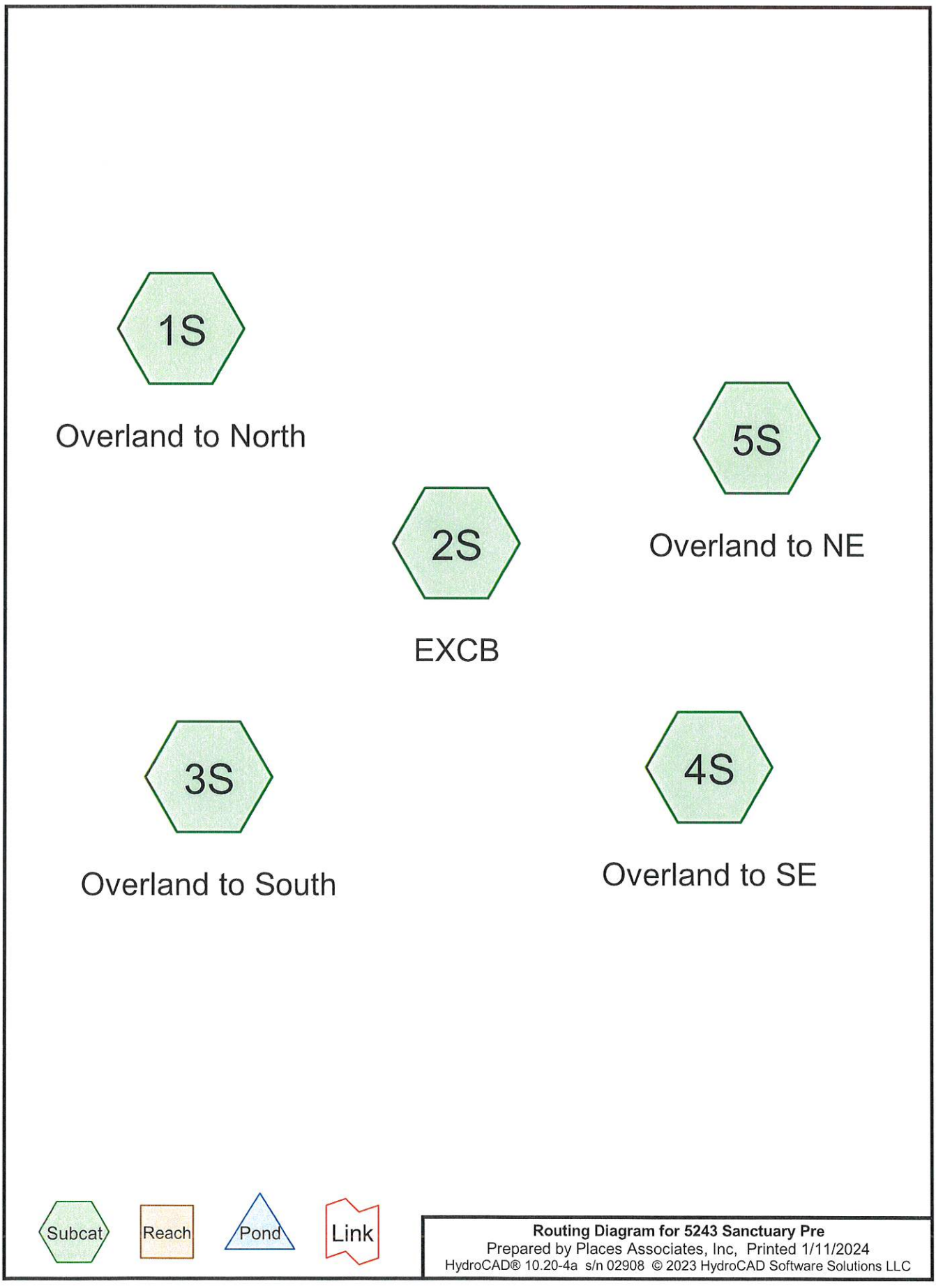
LOCATION: *234 TAYLOR STREET*
CITY/TOWN: *LITTLETON. MA*
PREPARED FOR:
*SANCTUARY MEDICINALS*
SCALE: 1"=50' DATE: JULY 2023

PLACES Associates, Inc.
Planning
Landscape Architecture
Civil Engineering
Surveying
256 Great Road, Suite 4
Littleton, MA 01460
(978) 486-0334
www.placesassociates.com

PROJECT No.: 5243 PLAN No.: 5243 DRAIN

# HydroCAD Data

# PRE- DEVELOPMENT




**Routing Diagram for 5243 Sanctuary Pre**
Prepared by Places Associates, Inc, Printed 1/11/2024

## Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|---|---|---|---|---|---|---|---|---|
| 1 | 2-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 3.19 | 2 |
| 2 | 10-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 4.92 | 2 |
| 3 | 25-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 6.00 | 2 |
| 4 | 100-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 7.66 | 2 |

## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 68,687 | 74 | >75% Grass cover, Good, HSG C (2S, 3S, 4S, 5S) |
| 400 | 87 | Dirt roads, HSG C (1S) |
| 655 | 87 | Dirt roads, HSG C - path (2S) |
| 32,184 | 98 | Paved parking, HSG C (2S, 5S) |
| 10,180 | 98 | Roofs, HSG C (2S) |
| 2,576 | 98 | Unconnected pavement, HSG C - conc pads (3S) |
| 563 | 98 | Unconnected pavement, HSG C - conc pads (5S) |
| 24,275 | 98 | Unconnected roofs, HSG C (3S, 4S, 5S) |
| 667 | 98 | Unconnected roofs, HSG C - conc paths (4S) |
| 6,898 | 98 | Unconnected roofs, HSG C- conc pads (2S) |
| 128,939 | 70 | Woods, Good, HSG C (1S, 2S, 3S, 4S, 5S) |
| **276,024** | **79** | **TOTAL AREA** |

PRE 2 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Overland to North** Runoff Area=23,342 sf 0.00% Impervious Runoff Depth=0.82"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=0.32 cfs 1,599 cf

**Subcatchment 2S: EXCB** Runoff Area=99,992 sf 48.90% Impervious Runoff Depth=1.75"
Flow Length=592' Tc=15.1 min CN=85 Runoff=3.44 cfs 14,575 cf

**Subcatchment 3S: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=1.03"
Tc=6.0 min UI Adjusted CN=74 Runoff=1.31 cfs 4,125 cf

**Subcatchment 4S: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=1.15"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=0.96 cfs 3,012 cf

**Subcatchment 5S: Overland to NE** Runoff Area=73,115 sf 13.12% Impervious Runoff Depth=0.98"
Flow Length=299' Tc=6.7 min UI Adjusted CN=73 Runoff=1.81 cfs 5,949 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 29,260 cf Average Runoff Depth = 1.27"**
**71.98% Pervious = 198,681 sf 28.02% Impervious = 77,343 sf**

## Summary for Subcatchment 1S: Overland to North

Runoff = 0.32 cfs @ 12.28 hrs, Volume= 1,599 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| Area (sf) | CN | Description |
|---|---|---|
| 22,942 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 23,342 | 70 | Weighted Average |
| 23,342 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 2S: EXCB

Runoff = 3.44 cfs @ 12.23 hrs, Volume= 14,575 cf, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 28,805 | 70 | Woods, Good, HSG C |
| * | 655 | 87 | Dirt roads, HSG C - path |
| | 31,815 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected roofs, HSG C- conc pads |
| | 10,180 | 98 | Roofs, HSG C |
| | 21,639 | 74 | >75% Grass cover, Good, HSG C |
| | 99,992 | 85 | Weighted Average |
| | 51,099 | | 51.10% Pervious Area |
| | 48,893 | | 48.90% Impervious Area |
| | 6,898 | | 14.11% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 3S: Overland to South

Runoff = 1.31 cfs @ 12.14 hrs, Volume= 4,125 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 4S: Overland to SE

Runoff = 0.96 cfs @ 12.14 hrs, Volume= 3,012 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected roofs, HSG C - conc paths |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 5S: Overland to NE

Runoff = 1.81 cfs @ 12.14 hrs, Volume= 5,949 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 43,992 | 70 | | Woods, Good, HSG C |
| | 8,662 | 98 | | Unconnected roofs, HSG C |
| | 19,529 | 74 | | >75% Grass cover, Good, HSG C |
| * | 563 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 369 | 98 | | Paved parking, HSG C |
| | 73,115 | 75 | 73 | Weighted Average, UI Adjusted |
| | 63,521 | | | 86.88% Pervious Area |
| | 9,594 | | | 13.12% Impervious Area |
| | 9,225 | | | 96.15% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

PRE 10 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Overland to North** Runoff Area=23,342 sf 0.00% Impervious Runoff Depth=1.98"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=0.85 cfs 3,846 cf

**Subcatchment 2S: EXCB** Runoff Area=99,992 sf 48.90% Impervious Runoff Depth=3.29"
Flow Length=592' Tc=15.1 min CN=85 Runoff=6.41 cfs 27,449 cf

**Subcatchment 3S: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=2.30"
Tc=6.0 min UI Adjusted CN=74 Runoff=2.99 cfs 9,204 cf

**Subcatchment 4S: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=2.47"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=2.11 cfs 6,496 cf

**Subcatchment 5S: Overland to NE** Runoff Area=73,115 sf 13.12% Impervious Runoff Depth=2.22"
Flow Length=299' Tc=6.7 min UI Adjusted CN=73 Runoff=4.27 cfs 13,514 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 60,510 cf Average Runoff Depth = 2.63"**
**71.98% Pervious = 198,681 sf 28.02% Impervious = 77,343 sf**

## Summary for Subcatchment 1S: Overland to North

Runoff = 0.85 cfs @ 12.26 hrs, Volume= 3,846 cf, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| Area (sf) | CN | Description |
|---|---|---|
| 22,942 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 23,342 | 70 | Weighted Average |
| 23,342 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 2S: EXCB

Runoff = 6.41 cfs @ 12.23 hrs, Volume= 27,449 cf, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 28,805 | 70 | Woods, Good, HSG C |
| * | 655 | 87 | Dirt roads, HSG C - path |
| | 31,815 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected roofs, HSG C- conc pads |
| | 10,180 | 98 | Roofs, HSG C |
| | 21,639 | 74 | >75% Grass cover, Good, HSG C |
| | 99,992 | 85 | Weighted Average |
| | 51,099 | | 51.10% Pervious Area |
| | 48,893 | | 48.90% Impervious Area |
| | 6,898 | | 14.11% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 3S: Overland to South

Runoff = 2.99 cfs @ 12.13 hrs, Volume= 9,204 cf, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 4S: Overland to SE

Runoff = 2.11 cfs @ 12.13 hrs, Volume= 6,496 cf, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected roofs, HSG C - conc paths |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 5S: Overland to NE

Runoff = 4.27 cfs @ 12.14 hrs, Volume= 13,514 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 43,992 | 70 | | Woods, Good, HSG C |
| | 8,662 | 98 | | Unconnected roofs, HSG C |
| | 19,529 | 74 | | >75% Grass cover, Good, HSG C |
| * | 563 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 369 | 98 | | Paved parking, HSG C |
| | 73,115 | 75 | 73 | Weighted Average, UI Adjusted |
| | 63,521 | | | 86.88% Pervious Area |
| | 9,594 | | | 13.12% Impervious Area |
| | 9,225 | | | 96.15% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

PRE 25 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Overland to North** Runoff Area=23,342 sf 0.00% Impervious Runoff Depth=2.81"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=1.22 cfs 5,457 cf

**Subcatchment 2S: EXCB** Runoff Area=99,992 sf 48.90% Impervious Runoff Depth=4.30"
Flow Length=592' Tc=15.1 min CN=85 Runoff=8.28 cfs 35,851 cf

**Subcatchment 3S: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=3.18"
Tc=6.0 min UI Adjusted CN=74 Runoff=4.13 cfs 12,742 cf

**Subcatchment 4S: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=3.38"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=2.88 cfs 8,891 cf

**Subcatchment 5S: Overland to NE** Runoff Area=73,115 sf 13.12% Impervious Runoff Depth=3.09"
Flow Length=299' Tc=6.7 min UI Adjusted CN=73 Runoff=5.95 cfs 18,819 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 81,760 cf Average Runoff Depth = 3.55"**
**71.98% Pervious = 198,681 sf 28.02% Impervious = 77,343 sf**

## Summary for Subcatchment 1S: Overland to North

Runoff = 1.22 cfs @ 12.26 hrs, Volume= 5,457 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| Area (sf) | CN | Description |
|---|---|---|
| 22,942 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 23,342 | 70 | Weighted Average |
| 23,342 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 2S: EXCB

Runoff = 8.28 cfs @ 12.23 hrs, Volume= 35,851 cf, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 28,805 | 70 | Woods, Good, HSG C |
| * | 655 | 87 | Dirt roads, HSG C - path |
| | 31,815 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected roofs, HSG C- conc pads |
| | 10,180 | 98 | Roofs, HSG C |
| | 21,639 | 74 | >75% Grass cover, Good, HSG C |
| | 99,992 | 85 | Weighted Average |
| | 51,099 | | 51.10% Pervious Area |
| | 48,893 | | 48.90% Impervious Area |
| | 6,898 | | 14.11% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 3S: Overland to South

Runoff = 4.13 cfs @ 12.13 hrs, Volume= 12,742 cf, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 4S: Overland to SE

Runoff = 2.88 cfs @ 12.13 hrs, Volume= 8,891 cf, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected roofs, HSG C - conc paths |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 5S: Overland to NE

Runoff = 5.95 cfs @ 12.14 hrs, Volume= 18,819 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 43,992 | 70 | | Woods, Good, HSG C |
| | 8,662 | 98 | | Unconnected roofs, HSG C |
| | 19,529 | 74 | | >75% Grass cover, Good, HSG C |
| * | 563 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 369 | 98 | | Paved parking, HSG C |
| | 73,115 | 75 | 73 | Weighted Average, UI Adjusted |
| | 63,521 | | | 86.88% Pervious Area |
| | 9,594 | | | 13.12% Impervious Area |
| | 9,225 | | | 96.15% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

PRE 100 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Overland to North** Runoff Area=23,342 sf 0.00% Impervious Runoff Depth=4.17"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=1.82 cfs 8,118 cf

**Subcatchment 2S: EXCB** Runoff Area=99,992 sf 48.90% Impervious Runoff Depth=5.89"
Flow Length=592' Tc=15.1 min CN=85 Runoff=11.16 cfs 49,043 cf

**Subcatchment 3S: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=4.62"
Tc=6.0 min UI Adjusted CN=74 Runoff=5.95 cfs 18,495 cf

**Subcatchment 4S: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=4.85"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=4.08 cfs 12,756 cf

**Subcatchment 5S: Overland to NE** Runoff Area=73,115 sf 13.12% Impervious Runoff Depth=4.51"
Flow Length=299' Tc=6.7 min UI Adjusted CN=73 Runoff=8.63 cfs 27,478 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 115,891 cf Average Runoff Depth = 5.04"**
**71.98% Pervious = 198,681 sf 28.02% Impervious = 77,343 sf**

## Summary for Subcatchment 1S: Overland to North

Runoff = 1.82 cfs @ 12.26 hrs, Volume= 8,118 cf, Depth= 4.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| Area (sf) | CN | Description |
|---|---|---|
| 22,942 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 23,342 | 70 | Weighted Average |
| 23,342 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 2S: EXCB

Runoff = 11.16 cfs @ 12.23 hrs, Volume= 49,043 cf, Depth= 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 28,805 | 70 | Woods, Good, HSG C |
| * | 655 | 87 | Dirt roads, HSG C - path |
| | 31,815 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected roofs, HSG C- conc pads |
| | 10,180 | 98 | Roofs, HSG C |
| | 21,639 | 74 | >75% Grass cover, Good, HSG C |
| | 99,992 | 85 | Weighted Average |
| | 51,099 | | 51.10% Pervious Area |
| | 48,893 | | 48.90% Impervious Area |
| | 6,898 | | 14.11% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 3S: Overland to South

Runoff = 5.95 cfs @ 12.13 hrs, Volume= 18,495 cf, Depth= 4.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 4S: Overland to SE

Runoff = 4.08 cfs @ 12.13 hrs, Volume= 12,756 cf, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected roofs, HSG C - conc paths |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 5S: Overland to NE

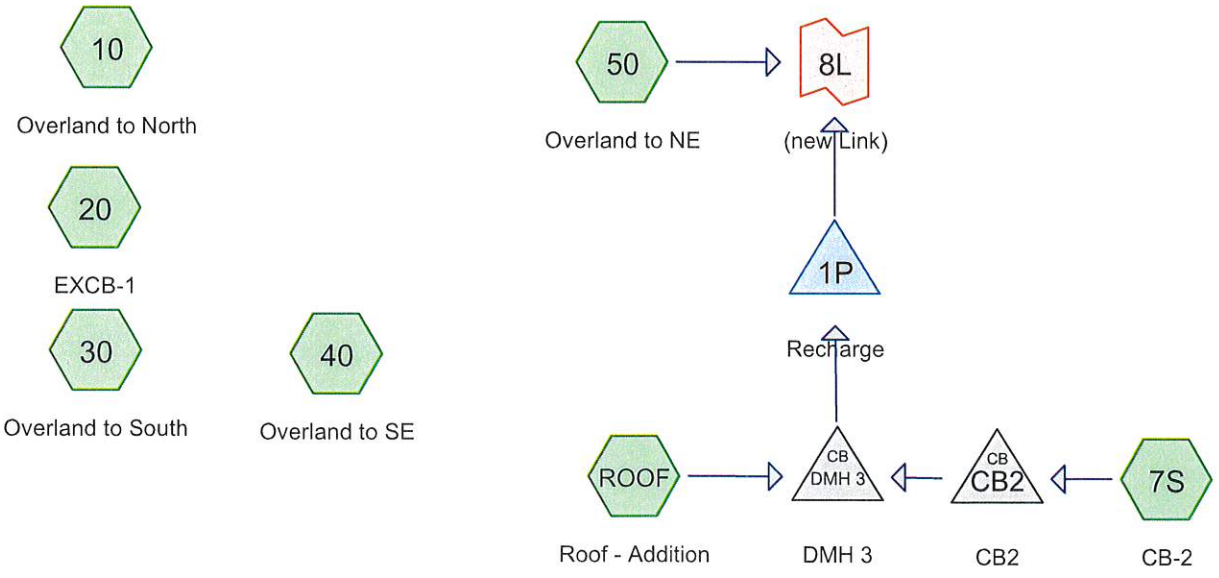
Runoff = 8.63 cfs @ 12.14 hrs, Volume= 27,478 cf, Depth= 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 43,992 | 70 | | Woods, Good, HSG C |
| | 8,662 | 98 | | Unconnected roofs, HSG C |
| | 19,529 | 74 | | >75% Grass cover, Good, HSG C |
| * | 563 | 98 | | Unconnected pavement, HSG C - conc pads |
| | 369 | 98 | | Paved parking, HSG C |
| | 73,115 | 75 | 73 | Weighted Average, UI Adjusted |
| | 63,521 | | | 86.88% Pervious Area |
| | 9,594 | | | 13.12% Impervious Area |
| | 9,225 | | | 96.15% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

# POST- DEVELOPMENT




Subcat Reach Pond Link

**Routing Diagram for 5243 Sanctuary Post-Rev 12-23**
Prepared by Places Associates, Inc, Printed 1/11/2024

## Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|---|---|---|---|---|---|---|---|---|
| 1 | 2-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 3.19 | 2 |
| 2 | 10-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 4.92 | 2 |
| 3 | 25-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 6.00 | 2 |
| 4 | 100-yr | NOAA 24-hr | D | Default | 24.00 | 1 | 7.66 | 2 |

## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 79,381 | 74 | >75% Grass cover, Good, HSG C (7S, 20, 30, 40, 50) |
| 3,137 | 87 | Dirt roads, HSG C (10, 20, 50) |
| 31,004 | 98 | Paved parking, HSG C (7S, 20) |
| 10,180 | 98 | Roofs, HSG C (20) |
| 6,898 | 98 | Unconnected pavement, HSG C - conc paths (20) |
| 2,576 | 98 | Unconnected pavement, HSG C - conc. pads (30) |
| 667 | 98 | Unconnected pavement, HSG C- conc pads (40) |
| 38,621 | 98 | Unconnected roofs, HSG C (30, 40, 50, ROOF) |
| 103,560 | 70 | Woods, Good, HSG C (10, 20, 30, 40, 50) |
| **276,024** | **80** | **TOTAL AREA** |

POST 2 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 7S: CB-2** Runoff Area=2,244 sf 83.87% Impervious Runoff Depth=2.53"
Tc=6.0 min CN=94 Runoff=0.14 cfs 474 cf

**Subcatchment 10: Overland to North** Runoff Area=21,986 sf 0.00% Impervious Runoff Depth=0.82"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=0.30 cfs 1,507 cf

**Subcatchment 20: EXCB-1** Runoff Area=97,174 sf 47.54% Impervious Runoff Depth=1.67"
Flow Length=592' Tc=15.1 min CN=84 Runoff=3.20 cfs 13,555 cf

**Subcatchment 30: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=1.03"
Tc=6.0 min UI Adjusted CN=74 Runoff=1.31 cfs 4,125 cf

**Subcatchment 40: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=1.15"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=0.96 cfs 3,012 cf

**Subcatchment 50: Overland to NE** Runoff Area=60,699 sf 14.27% Impervious Runoff Depth=1.03"
Flow Length=299' Tc=6.7 min UI Adjusted CN=74 Runoff=1.60 cfs 5,215 cf

**Subcatchment ROOF: Roof - Addition** Runoff Area=14,346 sf 100.00% Impervious Runoff Depth=2.96"
Tc=6.0 min CN=98 Runoff=1.00 cfs 3,536 cf

**Pond 1P: Recharge** Peak Elev=345.06' Storage=1,804 cf Inflow=1.14 cfs 4,010 cf
Discarded=0.07 cfs 3,949 cf Primary=0.02 cfs 61 cf Outflow=0.08 cfs 4,010 cf

**Pond CB2: CB2** Peak Elev=345.49' Inflow=0.14 cfs 474 cf
12.0" Round Culvert n=0.013 L=16.0' S=0.0125 '/' Outflow=0.14 cfs 474 cf

**Pond DMH 3: DMH 3** Peak Elev=345.36' Inflow=1.14 cfs 4,010 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0400 '/' Outflow=1.14 cfs 4,010 cf

**Link 8L: (new Link)** Inflow=1.60 cfs 5,275 cf
Primary=1.60 cfs 5,275 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 31,423 cf Average Runoff Depth = 1.37"**
**67.41% Pervious = 186,078 sf 32.59% Impervious = 89,946 sf**

## Summary for Subcatchment 7S: CB-2

Runoff = 0.14 cfs @ 12.13 hrs, Volume= 474 cf, Depth= 2.53"
Routed to Pond CB2 : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| Area (sf) | CN | Description |
|---|---|---|
| 1,882 | 98 | Paved parking, HSG C |
| 362 | 74 | >75% Grass cover, Good, HSG C |
| 2,244 | 94 | Weighted Average |
| 362 | | 16.13% Pervious Area |
| 1,882 | | 83.87% Impervious Area |

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

## Summary for Subcatchment 10: Overland to North

Runoff = 0.30 cfs @ 12.28 hrs, Volume= 1,507 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| Area (sf) | CN | Description |
|---|---|---|
| 21,586 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 21,986 | 70 | Weighted Average |
| 21,986 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 20: EXCB-1

Runoff = 3.20 cfs @ 12.23 hrs, Volume= 13,555 cf, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 24,270 | 70 | Woods, Good, HSG C |
| | 655 | 87 | Dirt roads, HSG C |
| | 29,122 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected pavement, HSG C - conc paths |
| | 10,180 | 98 | Roofs, HSG C |
| | 26,049 | 74 | >75% Grass cover, Good, HSG C |
| | 97,174 | 84 | Weighted Average |
| | 50,974 | | 52.46% Pervious Area |
| | 46,200 | | 47.54% Impervious Area |
| | 6,898 | | 14.93% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 30: Overland to South

Runoff = 1.31 cfs @ 12.14 hrs, Volume= 4,125 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc. pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 40: Overland to SE

Runoff = 0.96 cfs @ 12.14 hrs, Volume= 3,012 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected pavement, HSG C- conc pads |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 50: Overland to NE

Runoff = 1.60 cfs @ 12.14 hrs, Volume= 5,215 cf, Depth= 1.03"
Routed to Link 8L : (new Link)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| Area (sf) | CN | Adj | Description |
|---|---|---|---|
| 24,504 | 70 | | Woods, Good, HSG C |
| 8,662 | 98 | | Unconnected roofs, HSG C |
| 25,451 | 74 | | >75% Grass cover, Good, HSG C |
| 2,082 | 87 | | Dirt roads, HSG C |
| 60,699 | 76 | 74 | Weighted Average, UI Adjusted |
| 52,037 | | | 85.73% Pervious Area |
| 8,662 | | | 14.27% Impervious Area |
| 8,662 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

## Summary for Subcatchment ROOF: Roof - Addition

Runoff = 1.00 cfs @ 12.13 hrs, Volume= 3,536 cf, Depth= 2.96"
Routed to Pond DMH 3 : DMH 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-yr Rainfall=3.19"

| Area (sf) | CN | Description |
|---|---|---|
| 14,346 | 98 | Unconnected roofs, HSG C |
| 14,346 | | 100.00% Impervious Area |
| 14,346 | | 100.00% Unconnected |

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

## Summary for Pond 1P: Recharge

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth = 2.90" for 2-yr event
Inflow = 1.14 cfs @ 12.13 hrs, Volume= 4,010 cf
Outflow = 0.08 cfs @ 13.43 hrs, Volume= 4,010 cf, Atten= 93%, Lag= 77.9 min
Discarded = 0.07 cfs @ 13.43 hrs, Volume= 3,949 cf
Primary = 0.02 cfs @ 13.43 hrs, Volume= 61 cf
Routed to Link 8L : (new Link)

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.06' @ 13.43 hrs Surf.Area= 1,668 sf Storage= 1,804 cf

Plug-Flow detention time= 249.7 min calculated for 4,008 cf (100% of inflow)
Center-of-Mass det. time= 249.7 min ( 1,012.1 - 762.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 343.50' | 1,314 cf | **19.17'W x 87.00'L x 3.21'H Field A**<br>5,350 cf Overall - 2,064 cf Embedded = 3,286 cf x 40.0% Voids |
| #2A | 344.00' | 2,064 cf | **Cultec R-280HD** x 48 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 4 rows |
| | | 3,379 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 343.50' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 341.20' |
| #2 | Primary | 342.00' | **12.0" Round Culvert**<br>L= 122.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 342.00' / 335.00' S= 0.0574 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 346.25' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #4 | Device 2 | 345.40' | **4.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 2 | 345.00' | **4.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |

**Discarded OutFlow** Max=0.07 cfs @ 13.43 hrs HW=345.06' (Free Discharge)
└**1=Exfiltration** ( Controls 0.07 cfs)

**Primary OutFlow** Max=0.01 cfs @ 13.43 hrs HW=345.06' (Free Discharge)
└**2=Culvert** (Passes 0.01 cfs of 6.05 cfs potential flow)
├**3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
├**4=Orifice/Grate** ( Controls 0.00 cfs)
└**5=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.77 fps)

## Pond 1P: Recharge - Chamber Wizard Field A

**Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)**
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 4 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

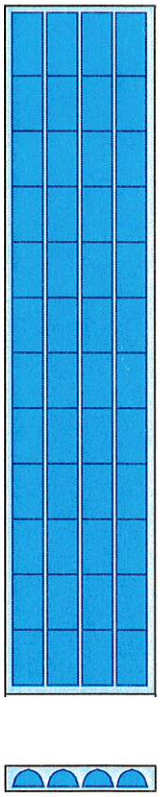
12 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 85.00' Row Length +12.0" End Stone x 2 = 87.00' Base Length
4 Rows x 47.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 19.17' Base Width
6.0" Stone Base + 26.5" Chamber Height + 6.0" Stone Cover = 3.21' Field Height

48 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 4 Rows = 2,064.4 cf Chamber Storage

5,349.9 cf Field - 2,064.4 cf Chambers = 3,285.5 cf Stone x 40.0% Voids = 1,314.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,378.6 cf = 0.078 af
Overall Storage Efficiency = 63.2%
Overall System Size = 87.00' x 19.17' x 3.21'

48 Chambers
198.1 cy Field
121.7 cy Stone



## Summary for Pond CB2: CB2

Inflow Area = 2,244 sf, 83.87% Impervious, Inflow Depth = 2.53" for 2-yr event
Inflow = 0.14 cfs @ 12.13 hrs, Volume= 474 cf
Outflow = 0.14 cfs @ 12.13 hrs, Volume= 474 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.14 cfs @ 12.13 hrs, Volume= 474 cf
Routed to Pond DMH 3 : DMH 3

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.49' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 345.30' | **12.0" Round Culvert**<br>L= 16.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 345.30' / 345.10' S= 0.0125 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.14 cfs @ 12.13 hrs HW=345.49' (Free Discharge)
**1=Culvert** (Barrel Controls 0.14 cfs @ 2.13 fps)

## Summary for Pond DMH 3: DMH 3

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth = 2.90" for 2-yr event
Inflow = 1.14 cfs @ 12.13 hrs, Volume= 4,010 cf
Outflow = 1.14 cfs @ 12.13 hrs, Volume= 4,010 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.14 cfs @ 12.13 hrs, Volume= 4,010 cf
Routed to Pond 1P : Recharge

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.36' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 344.80' | **12.0" Round Culvert**<br>L= 5.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 344.80' / 344.60' S= 0.0400 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.14 cfs @ 12.13 hrs HW=345.36' (Free Discharge)
**1=Culvert** (Barrel Controls 1.14 cfs @ 3.61 fps)

## Summary for Link 8L: (new Link)

Inflow Area = 77,289 sf, 32.20% Impervious, Inflow Depth = 0.82" for 2-yr event
Inflow = 1.60 cfs @ 12.14 hrs, Volume= 5,275 cf
Primary = 1.60 cfs @ 12.14 hrs, Volume= 5,275 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

POST 10 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 7S: CB-2** Runoff Area=2,244 sf 83.87% Impervious Runoff Depth=4.23"
Tc=6.0 min CN=94 Runoff=0.23 cfs 791 cf

**Subcatchment 10: Overland to North** Runoff Area=21,986 sf 0.00% Impervious Runoff Depth=1.98"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=0.80 cfs 3,623 cf

**Subcatchment 20: EXCB-1** Runoff Area=97,174 sf 47.54% Impervious Runoff Depth=3.20"
Flow Length=592' Tc=15.1 min CN=84 Runoff=6.06 cfs 25,891 cf

**Subcatchment 30: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=2.30"
Tc=6.0 min UI Adjusted CN=74 Runoff=2.99 cfs 9,204 cf

**Subcatchment 40: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=2.47"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=2.11 cfs 6,496 cf

**Subcatchment 50: Overland to NE** Runoff Area=60,699 sf 14.27% Impervious Runoff Depth=2.30"
Flow Length=299' Tc=6.7 min UI Adjusted CN=74 Runoff=3.68 cfs 11,637 cf

**Subcatchment ROOF: Roof - Addition** Runoff Area=14,346 sf 100.00% Impervious Runoff Depth>4.68"
Tc=6.0 min CN=98 Runoff=1.55 cfs 5,598 cf

**Pond 1P: Recharge** Peak Elev=345.52' Storage=2,382 cf Inflow=1.78 cfs 6,389 cf
Discarded=0.07 cfs 4,807 cf Primary=0.44 cfs 1,582 cf Outflow=0.51 cfs 6,389 cf

**Pond CB2: CB2** Peak Elev=345.54' Inflow=0.23 cfs 791 cf
12.0" Round Culvert n=0.013 L=16.0' S=0.0125 '/' Outflow=0.23 cfs 791 cf

**Pond DMH 3: DMH 3** Peak Elev=345.55' Inflow=1.78 cfs 6,389 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0400 '/' Outflow=1.78 cfs 6,389 cf

**Link 8L: (new Link)** Inflow=3.78 cfs 13,219 cf
Primary=3.78 cfs 13,219 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 63,241 cf Average Runoff Depth = 2.75"**
**67.41% Pervious = 186,078 sf 32.59% Impervious = 89,946 sf**

## Summary for Subcatchment 7S: CB-2

Runoff = 0.23 cfs @ 12.13 hrs, Volume= 791 cf, Depth= 4.23"
Routed to Pond CB2 : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| Area (sf) | CN | Description |
|---|---|---|
| 1,882 | 98 | Paved parking, HSG C |
| 362 | 74 | >75% Grass cover, Good, HSG C |
| 2,244 | 94 | Weighted Average |
| 362 | | 16.13% Pervious Area |
| 1,882 | | 83.87% Impervious Area |

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

## Summary for Subcatchment 10: Overland to North

Runoff = 0.80 cfs @ 12.26 hrs, Volume= 3,623 cf, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| Area (sf) | CN | Description |
|---|---|---|
| 21,586 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 21,986 | 70 | Weighted Average |
| 21,986 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 20: EXCB-1

Runoff = 6.06 cfs @ 12.23 hrs, Volume= 25,891 cf, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 24,270 | 70 | Woods, Good, HSG C |
| | 655 | 87 | Dirt roads, HSG C |
| | 29,122 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected pavement, HSG C - conc paths |
| | 10,180 | 98 | Roofs, HSG C |
| | 26,049 | 74 | >75% Grass cover, Good, HSG C |
| | 97,174 | 84 | Weighted Average |
| | 50,974 | | 52.46% Pervious Area |
| | 46,200 | | 47.54% Impervious Area |
| | 6,898 | | 14.93% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 30: Overland to South

Runoff = 2.99 cfs @ 12.13 hrs, Volume= 9,204 cf, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc. pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 40: Overland to SE

Runoff = 2.11 cfs @ 12.13 hrs, Volume= 6,496 cf, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected pavement, HSG C- conc pads |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 50: Overland to NE

Runoff = 3.68 cfs @ 12.14 hrs, Volume= 11,637 cf, Depth= 2.30"
Routed to Link 8L : (new Link)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| Area (sf) | CN | Adj | Description |
|---|---|---|---|
| 24,504 | 70 | | Woods, Good, HSG C |
| 8,662 | 98 | | Unconnected roofs, HSG C |
| 25,451 | 74 | | >75% Grass cover, Good, HSG C |
| 2,082 | 87 | | Dirt roads, HSG C |
| 60,699 | 76 | 74 | Weighted Average, UI Adjusted |
| 52,037 | | | 85.73% Pervious Area |
| 8,662 | | | 14.27% Impervious Area |
| 8,662 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

## Summary for Subcatchment ROOF: Roof - Addition

Runoff = 1.55 cfs @ 12.13 hrs, Volume= 5,598 cf, Depth> 4.68"
Routed to Pond DMH 3 : DMH 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-yr Rainfall=4.92"

| Area (sf) | CN | Description |
|---|---|---|
| 14,346 | 98 | Unconnected roofs, HSG C |
| 14,346 | | 100.00% Impervious Area |
| 14,346 | | 100.00% Unconnected |

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

## Summary for Pond 1P: Recharge

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth > 4.62" for 10-yr event
Inflow = 1.78 cfs @ 12.13 hrs, Volume= 6,389 cf
Outflow = 0.51 cfs @ 12.34 hrs, Volume= 6,389 cf, Atten= 71%, Lag= 12.9 min
Discarded = 0.07 cfs @ 12.34 hrs, Volume= 4,807 cf
Primary = 0.44 cfs @ 12.34 hrs, Volume= 1,582 cf
Routed to Link 8L : (new Link)

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.52' @ 12.34 hrs Surf.Area= 1,668 sf Storage= 2,382 cf

Plug-Flow detention time= 207.5 min calculated for 6,387 cf (100% of inflow)
Center-of-Mass det. time= 207.5 min ( 960.6 - 753.1 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 343.50' | 1,314 cf | **19.17'W x 87.00'L x 3.21'H Field A**<br>5,350 cf Overall - 2,064 cf Embedded = 3,286 cf x 40.0% Voids |
| #2A | 344.00' | 2,064 cf | **Cultec R-280HD** x 48 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 4 rows |
| | | 3,379 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 343.50' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 341.20' |
| #2 | Primary | 342.00' | **12.0" Round Culvert**<br>L= 122.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 342.00' / 335.00' S= 0.0574 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 346.25' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #4 | Device 2 | 345.40' | **4.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 2 | 345.00' | **4.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |

**Discarded OutFlow** Max=0.07 cfs @ 12.34 hrs HW=345.52' (Free Discharge)
└**1=Exfiltration** ( Controls 0.07 cfs)

**Primary OutFlow** Max=0.44 cfs @ 12.34 hrs HW=345.52' (Free Discharge)
└**2=Culvert** (Passes 0.44 cfs of 6.57 cfs potential flow)
├**3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
├**4=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.10 fps)
└**5=Orifice/Grate** (Orifice Controls 0.40 cfs @ 2.38 fps)

## Pond 1P: Recharge - Chamber Wizard Field A

**Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)**
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 4 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

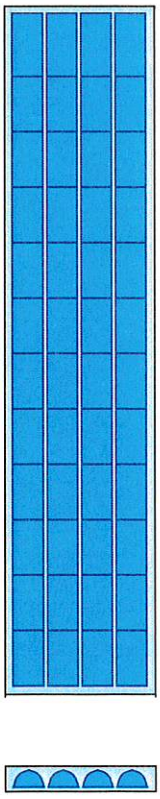
12 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 85.00' Row Length +12.0" End Stone x 2 = 87.00' Base Length
4 Rows x 47.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 19.17' Base Width
6.0" Stone Base + 26.5" Chamber Height + 6.0" Stone Cover = 3.21' Field Height

48 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 4 Rows = 2,064.4 cf Chamber Storage

5,349.9 cf Field - 2,064.4 cf Chambers = 3,285.5 cf Stone x 40.0% Voids = 1,314.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,378.6 cf = 0.078 af
Overall Storage Efficiency = 63.2%
Overall System Size = 87.00' x 19.17' x 3.21'

48 Chambers
198.1 cy Field
121.7 cy Stone



## Summary for Pond CB2: CB2

Inflow Area = 2,244 sf, 83.87% Impervious, Inflow Depth = 4.23" for 10-yr event
Inflow = 0.23 cfs @ 12.13 hrs, Volume= 791 cf
Outflow = 0.23 cfs @ 12.13 hrs, Volume= 791 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.23 cfs @ 12.13 hrs, Volume= 791 cf
Routed to Pond DMH 3 : DMH 3

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.54' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 345.30' | **12.0" Round Culvert**<br>L= 16.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 345.30' / 345.10' S= 0.0125 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.23 cfs @ 12.13 hrs HW=345.54' (Free Discharge)
**1=Culvert** (Barrel Controls 0.23 cfs @ 2.37 fps)

## Summary for Pond DMH 3: DMH 3

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth > 4.62" for 10-yr event
Inflow = 1.78 cfs @ 12.13 hrs, Volume= 6,389 cf
Outflow = 1.78 cfs @ 12.13 hrs, Volume= 6,389 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.78 cfs @ 12.13 hrs, Volume= 6,389 cf
Routed to Pond 1P : Recharge

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.55' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 344.80' | **12.0" Round Culvert**<br>L= 5.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 344.80' / 344.60' S= 0.0400 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.78 cfs @ 12.13 hrs HW=345.55' (Free Discharge)
**1=Culvert** (Barrel Controls 1.78 cfs @ 3.90 fps)

## Summary for Link 8L: (new Link)

Inflow Area = 77,289 sf, 32.20% Impervious, Inflow Depth = 2.05" for 10-yr event
Inflow = 3.78 cfs @ 12.14 hrs, Volume= 13,219 cf
Primary = 3.78 cfs @ 12.14 hrs, Volume= 13,219 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

POST 25 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 7S: CB-2** Runoff Area=2,244 sf 83.87% Impervious Runoff Depth=5.30"
Tc=6.0 min CN=94 Runoff=0.29 cfs 990 cf

**Subcatchment 10: Overland to North** Runoff Area=21,986 sf 0.00% Impervious Runoff Depth=2.81"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=1.15 cfs 5,140 cf

**Subcatchment 20: EXCB-1** Runoff Area=97,174 sf 47.54% Impervious Runoff Depth=4.20"
Flow Length=592' Tc=15.1 min CN=84 Runoff=7.88 cfs 33,983 cf

**Subcatchment 30: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=3.18"
Tc=6.0 min UI Adjusted CN=74 Runoff=4.13 cfs 12,742 cf

**Subcatchment 40: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=3.38"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=2.88 cfs 8,891 cf

**Subcatchment 50: Overland to NE** Runoff Area=60,699 sf 14.27% Impervious Runoff Depth=3.18"
Flow Length=299' Tc=6.7 min UI Adjusted CN=74 Runoff=5.09 cfs 16,110 cf

**Subcatchment ROOF: Roof - Addition** Runoff Area=14,346 sf 100.00% Impervious Runoff Depth>5.76"
Tc=6.0 min CN=98 Runoff=1.89 cfs 6,886 cf

**Pond 1P: Recharge** Peak Elev=345.84' Storage=2,737 cf Inflow=2.18 cfs 7,876 cf
Discarded=0.08 cfs 5,203 cf Primary=0.88 cfs 2,658 cf Outflow=0.96 cfs 7,861 cf

**Pond CB2: CB2** Peak Elev=345.57' Inflow=0.29 cfs 990 cf
12.0" Round Culvert n=0.013 L=16.0' S=0.0125 '/' Outflow=0.29 cfs 990 cf

**Pond DMH 3: DMH 3** Peak Elev=345.66' Inflow=2.18 cfs 7,876 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0400 '/' Outflow=2.18 cfs 7,876 cf

**Link 8L: (new Link)** Inflow=5.69 cfs 18,768 cf
Primary=5.69 cfs 18,768 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 84,742 cf Average Runoff Depth = 3.68"**
**67.41% Pervious = 186,078 sf 32.59% Impervious = 89,946 sf**

## Summary for Subcatchment 7S: CB-2

Runoff = 0.29 cfs @ 12.13 hrs, Volume= 990 cf, Depth= 5.30"
Routed to Pond CB2 : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| Area (sf) | CN | Description |
|---|---|---|
| 1,882 | 98 | Paved parking, HSG C |
| 362 | 74 | >75% Grass cover, Good, HSG C |
| 2,244 | 94 | Weighted Average |
| 362 | | 16.13% Pervious Area |
| 1,882 | | 83.87% Impervious Area |

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

## Summary for Subcatchment 10: Overland to North

Runoff = 1.15 cfs @ 12.26 hrs, Volume= 5,140 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| Area (sf) | CN | Description |
|---|---|---|
| 21,586 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 21,986 | 70 | Weighted Average |
| 21,986 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 20: EXCB-1

Runoff = 7.88 cfs @ 12.23 hrs, Volume= 33,983 cf, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 24,270 | 70 | Woods, Good, HSG C |
| | 655 | 87 | Dirt roads, HSG C |
| | 29,122 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected pavement, HSG C - conc paths |
| | 10,180 | 98 | Roofs, HSG C |
| | 26,049 | 74 | >75% Grass cover, Good, HSG C |
| | 97,174 | 84 | Weighted Average |
| | 50,974 | | 52.46% Pervious Area |
| | 46,200 | | 47.54% Impervious Area |
| | 6,898 | | 14.93% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 30: Overland to South

Runoff = 4.13 cfs @ 12.13 hrs, Volume= 12,742 cf, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc. pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 40: Overland to SE

Runoff = 2.88 cfs @ 12.13 hrs, Volume= 8,891 cf, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected pavement, HSG C- conc pads |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 50: Overland to NE

Runoff = 5.09 cfs @ 12.14 hrs, Volume= 16,110 cf, Depth= 3.18"
Routed to Link 8L : (new Link)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| Area (sf) | CN | Adj | Description |
|---|---|---|---|
| 24,504 | 70 | | Woods, Good, HSG C |
| 8,662 | 98 | | Unconnected roofs, HSG C |
| 25,451 | 74 | | >75% Grass cover, Good, HSG C |
| 2,082 | 87 | | Dirt roads, HSG C |
| 60,699 | 76 | 74 | Weighted Average, UI Adjusted |
| 52,037 | | | 85.73% Pervious Area |
| 8,662 | | | 14.27% Impervious Area |
| 8,662 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

## Summary for Subcatchment ROOF: Roof - Addition

Runoff = 1.89 cfs @ 12.13 hrs, Volume= 6,886 cf, Depth> 5.76"
Routed to Pond DMH 3 : DMH 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-yr Rainfall=6.00"

| Area (sf) | CN | Description |
|---|---|---|
| 14,346 | 98 | Unconnected roofs, HSG C |
| 14,346 | | 100.00% Impervious Area |
| 14,346 | | 100.00% Unconnected |

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

## Summary for Pond 1P: Recharge

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth > 5.70" for 25-yr event
Inflow = 2.18 cfs @ 12.13 hrs, Volume= 7,876 cf
Outflow = 0.96 cfs @ 12.25 hrs, Volume= 7,861 cf, Atten= 56%, Lag= 7.2 min
Discarded = 0.08 cfs @ 12.25 hrs, Volume= 5,203 cf
Primary = 0.88 cfs @ 12.25 hrs, Volume= 2,658 cf
Routed to Link 8L : (new Link)

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.84' @ 12.25 hrs Surf.Area= 1,668 sf Storage= 2,737 cf

Plug-Flow detention time= 189.6 min calculated for 7,861 cf (100% of inflow)
Center-of-Mass det. time= 188.2 min ( 937.8 - 749.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 343.50' | 1,314 cf | **19.17'W x 87.00'L x 3.21'H Field A**<br>5,350 cf Overall - 2,064 cf Embedded = 3,286 cf x 40.0% Voids |
| #2A | 344.00' | 2,064 cf | **Cultec R-280HD** x 48 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 4 rows |
| | | 3,379 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 343.50' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 341.20' |
| #2 | Primary | 342.00' | **12.0" Round Culvert**<br>L= 122.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 342.00' / 335.00' S= 0.0574 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 346.25' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #4 | Device 2 | 345.40' | **4.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 2 | 345.00' | **4.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |

**Discarded OutFlow** Max=0.08 cfs @ 12.25 hrs HW=345.84' (Free Discharge)
└**1=Exfiltration** ( Controls 0.08 cfs)

**Primary OutFlow** Max=0.88 cfs @ 12.25 hrs HW=345.84' (Free Discharge)
└**2=Culvert** (Passes 0.88 cfs of 6.91 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Orifice Controls 0.27 cfs @ 2.46 fps)
  └**5=Orifice/Grate** (Orifice Controls 0.61 cfs @ 3.66 fps)

## Pond 1P: Recharge - Chamber Wizard Field A

**Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)**
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 4 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

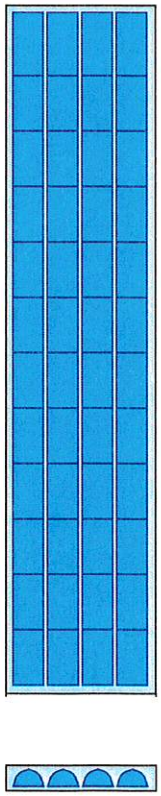
12 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 85.00' Row Length +12.0" End Stone x 2 = 87.00' Base Length
4 Rows x 47.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 19.17' Base Width
6.0" Stone Base + 26.5" Chamber Height + 6.0" Stone Cover = 3.21' Field Height

48 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 4 Rows = 2,064.4 cf Chamber Storage

5,349.9 cf Field - 2,064.4 cf Chambers = 3,285.5 cf Stone x 40.0% Voids = 1,314.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,378.6 cf = 0.078 af
Overall Storage Efficiency = 63.2%
Overall System Size = 87.00' x 19.17' x 3.21'

48 Chambers
198.1 cy Field
121.7 cy Stone



## Summary for Pond CB2: CB2

Inflow Area = 2,244 sf, 83.87% Impervious, Inflow Depth = 5.30" for 25-yr event
Inflow = 0.29 cfs @ 12.13 hrs, Volume= 990 cf
Outflow = 0.29 cfs @ 12.13 hrs, Volume= 990 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.13 hrs, Volume= 990 cf
Routed to Pond DMH 3 : DMH 3

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.57' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 345.30' | **12.0" Round Culvert**<br>L= 16.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 345.30' / 345.10' S= 0.0125 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.29 cfs @ 12.13 hrs HW=345.57' (Free Discharge)
**1=Culvert** (Barrel Controls 0.29 cfs @ 2.49 fps)

## Summary for Pond DMH 3: DMH 3

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth > 5.70" for 25-yr event
Inflow = 2.18 cfs @ 12.13 hrs, Volume= 7,876 cf
Outflow = 2.18 cfs @ 12.13 hrs, Volume= 7,876 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.18 cfs @ 12.13 hrs, Volume= 7,876 cf
Routed to Pond 1P : Recharge

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.66' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 344.80' | **12.0" Round Culvert**<br>L= 5.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 344.80' / 344.60' S= 0.0400 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.17 cfs @ 12.13 hrs HW=345.66' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 2.17 cfs @ 4.05 fps)

## Summary for Link 8L: (new Link)

Inflow Area = 77,289 sf, 32.20% Impervious, Inflow Depth = 2.91" for 25-yr event
Inflow = 5.69 cfs @ 12.15 hrs, Volume= 18,768 cf
Primary = 5.69 cfs @ 12.15 hrs, Volume= 18,768 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

# POST 100 YEAR

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 7S: CB-2** Runoff Area=2,244 sf 83.87% Impervious Runoff Depth=6.94"
Tc=6.0 min CN=94 Runoff=0.37 cfs 1,299 cf

**Subcatchment 10: Overland to North** Runoff Area=21,986 sf 0.00% Impervious Runoff Depth=4.17"
Flow Length=70' Slope=0.0100 '/' Tc=17.0 min CN=70 Runoff=1.72 cfs 7,647 cf

**Subcatchment 20: EXCB-1** Runoff Area=97,174 sf 47.54% Impervious Runoff Depth=5.77"
Flow Length=592' Tc=15.1 min CN=84 Runoff=10.68 cfs 46,719 cf

**Subcatchment 30: Overland to South** Runoff Area=48,010 sf 23.74% Impervious Runoff Depth=4.62"
Tc=6.0 min UI Adjusted CN=74 Runoff=5.95 cfs 18,495 cf

**Subcatchment 40: Overland to SE** Runoff Area=31,565 sf 23.63% Impervious Runoff Depth=4.85"
Flow Length=229' Tc=6.0 min UI Adjusted CN=76 Runoff=4.08 cfs 12,756 cf

**Subcatchment 50: Overland to NE** Runoff Area=60,699 sf 14.27% Impervious Runoff Depth=4.62"
Flow Length=299' Tc=6.7 min UI Adjusted CN=74 Runoff=7.33 cfs 23,383 cf

**Subcatchment ROOF: Roof - Addition** Runoff Area=14,346 sf 100.00% Impervious Runoff Depth>7.41"
Tc=6.0 min CN=98 Runoff=2.42 cfs 8,864 cf

**Pond 1P: Recharge** Peak Elev=346.38' Storage=3,159 cf Inflow=2.79 cfs 10,162 cf
Discarded=0.09 cfs 5,569 cf Primary=1.94 cfs 4,415 cf Outflow=2.03 cfs 9,983 cf

**Pond CB2: CB2** Peak Elev=345.61' Inflow=0.37 cfs 1,299 cf
12.0" Round Culvert n=0.013 L=16.0' S=0.0125 '/' Outflow=0.37 cfs 1,299 cf

**Pond DMH 3: DMH 3** Peak Elev=345.84' Inflow=2.79 cfs 10,162 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0400 '/' Outflow=2.79 cfs 10,162 cf

**Link 8L: (new Link)** Inflow=8.62 cfs 27,798 cf
Primary=8.62 cfs 27,798 cf

**Total Runoff Area = 276,024 sf Runoff Volume = 119,162 cf Average Runoff Depth = 5.18"**
**67.41% Pervious = 186,078 sf 32.59% Impervious = 89,946 sf**

## Summary for Subcatchment 7S: CB-2

Runoff = 0.37 cfs @ 12.13 hrs, Volume= 1,299 cf, Depth= 6.94"
Routed to Pond CB2 : CB2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| Area (sf) | CN | Description |
|---|---|---|
| 1,882 | 98 | Paved parking, HSG C |
| 362 | 74 | >75% Grass cover, Good, HSG C |
| 2,244 | 94 | Weighted Average |
| 362 | | 16.13% Pervious Area |
| 1,882 | | 83.87% Impervious Area |

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

## Summary for Subcatchment 10: Overland to North

Runoff = 1.72 cfs @ 12.26 hrs, Volume= 7,647 cf, Depth= 4.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| Area (sf) | CN | Description |
|---|---|---|
| 21,586 | 70 | Woods, Good, HSG C |
| 400 | 87 | Dirt roads, HSG C |
| 21,986 | 70 | Weighted Average |
| 21,986 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.3 | 50 | 0.0100 | 0.05 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 0.7 | 20 | 0.0100 | 0.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 70 | Total | | | |

## Summary for Subcatchment 20: EXCB-1

Runoff = 10.68 cfs @ 12.23 hrs, Volume= 46,719 cf, Depth= 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 24,270 | 70 | Woods, Good, HSG C |
| | 655 | 87 | Dirt roads, HSG C |
| | 29,122 | 98 | Paved parking, HSG C |
| * | 6,898 | 98 | Unconnected pavement, HSG C - conc paths |
| | 10,180 | 98 | Roofs, HSG C |
| | 26,049 | 74 | >75% Grass cover, Good, HSG C |
| | 97,174 | 84 | Weighted Average |
| | 50,974 | | 52.46% Pervious Area |
| | 46,200 | | 47.54% Impervious Area |
| | 6,898 | | 14.93% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.5 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20" |
| 1.7 | 90 | 0.0300 | 0.87 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.3 | 170 | 0.0120 | 2.22 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 132 | 0.0300 | 3.52 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 1.0 | 150 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 15.1 | 592 | Total | | | |

## Summary for Subcatchment 30: Overland to South

Runoff = 5.95 cfs @ 12.13 hrs, Volume= 18,495 cf, Depth= 4.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 25,704 | 70 | | Woods, Good, HSG C |
| | 8,820 | 98 | | Unconnected roofs, HSG C |
| | 10,910 | 74 | | >75% Grass cover, Good, HSG C |
| * | 2,576 | 98 | | Unconnected pavement, HSG C - conc. pads |
| | 48,010 | 78 | 74 | Weighted Average, UI Adjusted |
| | 36,614 | | | 76.26% Pervious Area |
| | 11,396 | | | 23.74% Impervious Area |
| | 11,396 | | | 100.00% Unconnected |

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

## Summary for Subcatchment 40: Overland to SE

Runoff = 4.08 cfs @ 12.13 hrs, Volume= 12,756 cf, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| | Area (sf) | CN | Adj | Description |
|---|---|---|---|---|
| | 7,496 | 70 | | Woods, Good, HSG C |
| | 6,793 | 98 | | Unconnected roofs, HSG C |
| | 16,609 | 74 | | >75% Grass cover, Good, HSG C |
| * | 667 | 98 | | Unconnected pavement, HSG C- conc pads |
| | 31,565 | 79 | 76 | Weighted Average, UI Adjusted |
| | 24,105 | | | 76.37% Pervious Area |
| | 7,460 | | | 23.63% Impervious Area |
| | 7,460 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.5 | 53 | 0.0740 | 1.90 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 16 | 0.1560 | 2.76 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 1.3 | 110 | 0.0810 | 1.42 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 5.8 | 229 | Total, Increased to minimum Tc = 6.0 min | | | |

## Summary for Subcatchment 50: Overland to NE

Runoff = 7.33 cfs @ 12.14 hrs, Volume= 23,383 cf, Depth= 4.62"
Routed to Link 8L : (new Link)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| Area (sf) | CN | Adj | Description |
|---|---|---|---|
| 24,504 | 70 | | Woods, Good, HSG C |
| 8,662 | 98 | | Unconnected roofs, HSG C |
| 25,451 | 74 | | >75% Grass cover, Good, HSG C |
| 2,082 | 87 | | Dirt roads, HSG C |
| 60,699 | 76 | 74 | Weighted Average, UI Adjusted |
| 52,037 | | | 85.73% Pervious Area |
| 8,662 | | | 14.27% Impervious Area |
| 8,662 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 3.9 | 50 | 0.0500 | 0.21 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.20" |
| 0.9 | 84 | 0.0480 | 1.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 10 | 0.3000 | 2.74 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 1.8 | 155 | 0.0830 | 1.44 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.7 | 299 | Total | | | |

## Summary for Subcatchment ROOF: Roof - Addition

Runoff = 2.42 cfs @ 12.13 hrs, Volume= 8,864 cf, Depth> 7.41"
Routed to Pond DMH 3 : DMH 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-yr Rainfall=7.66"

| Area (sf) | CN | Description |
|---|---|---|
| 14,346 | 98 | Unconnected roofs, HSG C |
| 14,346 | | 100.00% Impervious Area |
| 14,346 | | 100.00% Unconnected |

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

## Summary for Pond 1P: Recharge

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth > 7.35" for 100-yr event
Inflow = 2.79 cfs @ 12.13 hrs, Volume= 10,162 cf
Outflow = 2.03 cfs @ 12.18 hrs, Volume= 9,983 cf, Atten= 27%, Lag= 3.4 min
Discarded = 0.09 cfs @ 12.18 hrs, Volume= 5,569 cf
Primary = 1.94 cfs @ 12.18 hrs, Volume= 4,415 cf
Routed to Link 8L : (new Link)

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 346.38' @ 12.18 hrs Surf.Area= 1,668 sf Storage= 3,159 cf

Plug-Flow detention time= 166.4 min calculated for 9,983 cf (98% of inflow)
Center-of-Mass det. time= 154.7 min ( 900.6 - 745.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 343.50' | 1,314 cf | **19.17'W x 87.00'L x 3.21'H Field A**<br>5,350 cf Overall - 2,064 cf Embedded = 3,286 cf x 40.0% Voids |
| #2A | 344.00' | 2,064 cf | **Cultec R-280HD** x 48 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 4 rows |
| | | 3,379 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 343.50' | **1.020 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 341.20' |
| #2 | Primary | 342.00' | **12.0" Round Culvert**<br>L= 122.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 342.00' / 335.00' S= 0.0574 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 346.25' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #4 | Device 2 | 345.40' | **4.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 2 | 345.00' | **4.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |

**Discarded OutFlow** Max=0.09 cfs @ 12.18 hrs HW=346.38' (Free Discharge)
└**1=Exfiltration** ( Controls 0.09 cfs)

**Primary OutFlow** Max=1.93 cfs @ 12.18 hrs HW=346.38' (Free Discharge)
└**2=Culvert** (Passes 1.93 cfs of 7.45 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.59 cfs @ 1.17 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.48 cfs @ 4.33 fps)
  └**5=Orifice/Grate** (Orifice Controls 0.85 cfs @ 5.10 fps)

## Pond 1P: Recharge - Chamber Wizard Field A

**Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)**
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 4 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

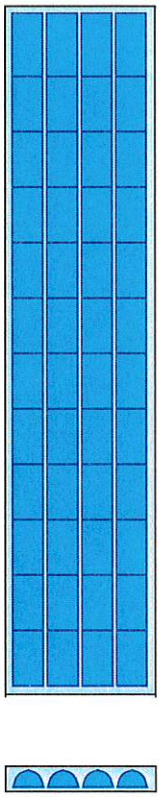
12 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 85.00' Row Length +12.0" End Stone x 2 = 87.00' Base Length
4 Rows x 47.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 19.17' Base Width
6.0" Stone Base + 26.5" Chamber Height + 6.0" Stone Cover = 3.21' Field Height

48 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 4 Rows = 2,064.4 cf Chamber Storage

5,349.9 cf Field - 2,064.4 cf Chambers = 3,285.5 cf Stone x 40.0% Voids = 1,314.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,378.6 cf = 0.078 af
Overall Storage Efficiency = 63.2%
Overall System Size = 87.00' x 19.17' x 3.21'

48 Chambers
198.1 cy Field
121.7 cy Stone



## Summary for Pond CB2: CB2

Inflow Area = 2,244 sf, 83.87% Impervious, Inflow Depth = 6.94" for 100-yr event
Inflow = 0.37 cfs @ 12.13 hrs, Volume= 1,299 cf
Outflow = 0.37 cfs @ 12.13 hrs, Volume= 1,299 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.13 hrs, Volume= 1,299 cf
Routed to Pond DMH 3 : DMH 3

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.61' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 345.30' | **12.0" Round Culvert**<br>L= 16.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 345.30' / 345.10' S= 0.0125 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.37 cfs @ 12.13 hrs HW=345.61' (Free Discharge)
**1=Culvert** (Barrel Controls 0.37 cfs @ 2.63 fps)

## Summary for Pond DMH 3: DMH 3

Inflow Area = 16,590 sf, 97.82% Impervious, Inflow Depth > 7.35" for 100-yr event
Inflow = 2.79 cfs @ 12.13 hrs, Volume= 10,162 cf
Outflow = 2.79 cfs @ 12.13 hrs, Volume= 10,162 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.79 cfs @ 12.13 hrs, Volume= 10,162 cf
Routed to Pond 1P : Recharge

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 345.84' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 344.80' | **12.0" Round Culvert**<br>L= 5.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 344.80' / 344.60' S= 0.0400 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.78 cfs @ 12.13 hrs HW=345.84' (Free Discharge)
**1=Culvert** (Inlet Controls 2.78 cfs @ 3.54 fps)

## Summary for Link 8L: (new Link)

Inflow Area = 77,289 sf, 32.20% Impervious, Inflow Depth = 4.32" for 100-yr event
Inflow = 8.62 cfs @ 12.16 hrs, Volume= 27,798 cf
Primary = 8.62 cfs @ 12.16 hrs, Volume= 27,798 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs