DRAINAGE SUMMARY REPORT

For

10 Willard Road
Norwalk, Connecticut

Prepared For

10 Willard LLC

December 10, 2019

Derek E. Daunais, PE
CT License No. 22861
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Project Summary

The applicant is proposing to redevelop 10 Willard Road in Norwalk, CT. This property covers approximately 8.30 acres and is predominantly in the Business #2 Zone. An accessway connects to Willard Road, and the property also has underutilized frontage on Strawberry Hill Avenue. Surrounding properties are generally used for retail or housing.

The existing industrial building will be demolished. Two new buildings will be constructed: A residential apartment building with attached parking garage, and a commercial self-storage building. Other improvements include a pool, parking lot, walks, utility connections, drainage system, and landscaping.

The proposed development will reduce the amount of impervious cover of the site from 5.20 acres (63%) to 4.27 acres (51%). The proposed drainage system is designed to treat runoff from impervious surfaces, recharge groundwater, and reduce peak flow discharge.

For a depiction of the site and the proposed development, refer to a set of plans prepared by D’Andrea Surveying & Engineering P.C. dated December 10, 2019.

Watershed Analysis

Drainage patterns for the site were analyzed using HydroCAD version 10, with runoff data generated for the 1, 2, 5, 10, 25, 50 and 100-year storm frequency events.

In this analysis, the site was divided into various drainage areas discharging to two Points of Concern (POCs). Referring to the watershed maps in Exhibits A & B, POC A is the offsite pipe network to the south, while POC B is Willard Road.

According to the USDA soil delineation map included in Exhibit C, the property lies within a mapped area of HSG-D and HSG-B soils. On-site soil boring results, as summarized on the plans, reveal suitable soils for infiltration at the locations of the proposed retention systems.

Existing Conditions

Under existing conditions, the primary building on site is a utility warehouse. Also on site is a full-size telecommunications tower with associated control house, parking lot, paved accessway, and other paved area. A secondary accessway from Strawberry Hill Avenue is located on adjacent property. A drainage ditch and associated wetland wraps around the northern and eastern sides of the development area and enters a culvert before discharging offsite to the south. The land outside the development area is wooded. There are several on-site parking lot catch basins that discharge to the ditch or connect to offsite drainage networks. Runoff that enters the wetland ditch or otherwise flows offsite is not treated or attenuated. Some offsite area flows into the ditch but otherwise no offsite area contributes runoff to the subject property.

The site is broken up into three drainage areas. The wooded area is modeled as hydrologic soil group B (HSG-B) while the remaining area is modeled as HSG-D. Existing condition drainage areas are depicted on the Watershed Map in Exhibit A. Refer to Appendix B for inputs and results of the HydroCAD model.
Proposed Conditions

Under proposed conditions, the existing warehouse will be demolished. In its place, a residential apartment building with multi-level parking garage will be constructed, along with a commercial building intended as a self-storage facility. Other improvements include a pool, parking lot, walks, utility connections, drainage system, and landscaping. The existing transmitter tower and associated infrastructure will remain.

Runoff from the parking lot, residential building, and commercial building will be collected and treated. A hydrodynamic separator will pre-treat the Water Quality Volume (WQV) of the contributing area. Further treatment will be provided by a subsurface chamber system located under the proposed parking lot, which will both retain and infiltrate the WQV. Overflow will discharge to the existing off-site culvert drainage system. A secondary chamber system will treat runoff from the proposed pool patio.

One non-structural LID technique is employed: Limiting site disturbance. The drainage ditch and most of the currently wooded areas, which cover 2.32 acres (28% of the site), will not be disturbed during or after construction.

The proposed site is modeled using five drainage areas: Those flowing directly to each POC, and those routed to each retention system. Proposed condition drainage areas are depicted on the Watershed Map in Exhibit B. Refer to Appendix C for inputs and results of the HydroCAD model.

Sedimentation and Erosion Controls

The redevelopment of 10 Willard Road will be mostly confined to the area of existing development. The exception is the passive recreation area, which involves selective vegetation removal in a forested area and a footbridge over the drainage ditch. Areas downstream of the proposed development, which includes the drainage ditch and adjacent properties, will be protected by silt fencing. Other limits of disturbance will be marked by construction fencing. Any trees within the project area that are to remain will have their root area protected with fencing. The paved accessway will serve as the construction entrance and will be swept regularly. As on-site catch basins and yard drains are installed, they will be protected from sedimentation with hay bales.

All S&E controls will be installed prior to construction. Periodic on-site inspections will be performed to ensure that these measures are maintained. Once construction is complete and all disturbed areas are properly graded, seeded, and stabilized, the proposed sedimentation and erosion control measures will be removed. Refer to the Sedimentation & Erosion Control Plan.
**Conclusion**

The following tables compare the peak flow rates and volumes to each POC for all modeled storm events from existing to proposed conditions. Peak flows and runoff volumes are reduced to both POCs for all required storm events due to the reduction in impervious surfaces. The retention systems are designed to treat the WQV from their contributing areas, which is 86% of impervious area onsite. Satisfaction of WQV, GRV, and drawdown requirements are shown in Appendix A. Refer to Appendices B and C for additional information.

Since the proposed development of the site will reduce the peak rate and volume of runoff flowing off-site to each point of concern, and measures are proposed to provide treatment of runoff from new impervious surfaces, the design will not cause any adverse impacts to the site or surrounding area.

<table>
<thead>
<tr>
<th>Point of Concern</th>
<th>Storm Frequency</th>
<th>Peak Flow Rate (cfs)</th>
<th>Runoff Volume (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Existing</td>
<td>Proposed</td>
</tr>
<tr>
<td>A</td>
<td>1 year</td>
<td>14.00</td>
<td>13.10</td>
</tr>
<tr>
<td></td>
<td>2-year</td>
<td>17.42</td>
<td>16.58</td>
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<tr>
<td></td>
<td>5-year</td>
<td>23.78</td>
<td>23.07</td>
</tr>
<tr>
<td></td>
<td>10-year</td>
<td>29.33</td>
<td>28.75</td>
</tr>
<tr>
<td></td>
<td>25-year</td>
<td>37.17</td>
<td>36.80</td>
</tr>
<tr>
<td></td>
<td>50-year</td>
<td>43.17</td>
<td>42.96</td>
</tr>
<tr>
<td></td>
<td>100-year</td>
<td>49.69</td>
<td>49.65</td>
</tr>
<tr>
<td>B</td>
<td>1 year</td>
<td>1.48</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>2-year</td>
<td>1.85</td>
<td>1.27</td>
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<td></td>
<td>5-year</td>
<td>2.45</td>
<td>1.73</td>
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<td></td>
<td>10-year</td>
<td>2.96</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td>25-year</td>
<td>3.67</td>
<td>2.67</td>
</tr>
<tr>
<td></td>
<td>50-year</td>
<td>4.19</td>
<td>3.08</td>
</tr>
<tr>
<td></td>
<td>100-year</td>
<td>4.75</td>
<td>3.52</td>
</tr>
</tbody>
</table>

**Note:** The tables above represent the peak flow rates and runoff volumes for Points of Concern A and B, comparing existing and proposed conditions for different storm events and frequencies.
Exhibits “A” & “B”

Watershed Maps – Existing and Proposed Conditions
NOTE:
The site is composed of Urban Land (HSG-D), Charlton-Urban Land complex (HSG-B), and Sutton Fine Sandy Loam (HSG-B).

1 INCH = 120 FEET

SCALE

IN FEET

120 0 120

DRAINAGE DITCH, SOIL TYPE BOUNDARY (GREEN), WATERSHED BOUNDARY (RED), FLOWPATH (BLUE)

POC A (OFFSITE DRAIN)

CHAMBERS #1

HSG-D

AREA A2 TO POC A

AREA A1 TO POC A

HSG-B

AREA A4 TO CHAMBERS #2

CHAMBERS #2

AREA A3 TO CHAMBERS #1

AREA B

POC B (STREET)

EXHIBIT "B"
PROPOSED CONDITIONS
Exhibit "C"

USDA Soil Delineation Map
Hydrologic Soil Group—State of Connecticut

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 19, Sep 13, 2019

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

Date(s) aerial images were photographed: Jul 21, 2014—Aug 27, 2014

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

<table>
<thead>
<tr>
<th>Map unit symbol</th>
<th>Map unit name</th>
<th>Rating</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Leicester fine sandy loam</td>
<td>B/D</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>50B</td>
<td>Sutton fine sandy loam, 3 to 8 percent slopes</td>
<td>B/D</td>
<td>3.8</td>
<td>12.6%</td>
</tr>
<tr>
<td>260B</td>
<td>Charlton-Urban land complex, 3 to 8 percent slopes</td>
<td>B</td>
<td>9.5</td>
<td>31.6%</td>
</tr>
<tr>
<td>273C</td>
<td>Urban land-Charlton-Chatfield complex, rocky, 3 to 15 percent slopes</td>
<td>D</td>
<td>2.0</td>
<td>6.5%</td>
</tr>
<tr>
<td>307</td>
<td>Urban land</td>
<td>D</td>
<td>14.8</td>
<td>49.1%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td></td>
<td><strong>30.2</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Description

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

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

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

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

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

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

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

Rating Options

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*
Exhibit “D”

Legal Description of Property
LIMITED WARRANTY DEED

THE SOUTHERN NEW ENGLAND TELEPHONE COMPANY D/B/A FRONTIER COMMUNICATIONS CORPORATION, a Connecticut corporation, having an address at 401 Merritt 7, Norwalk, CT (the "Grantor"), in consideration of the sum of Ten Dollars ($10.00) and other good and valuable consideration received to its full satisfaction from FDSPIN WILLARD LLC, a Connecticut limited liability company, having an address at 1 North Water Street, Suite 100, Norwalk, CT (the "Grantee"), does hereby grant, bargain, sell and confirm unto Grantee, and its successors and assigns forever, all of Grantor's right, title and interest in and to certain real property, and the improvements situated thereon, known as and located at 10 Willard Road, City of Norwalk, County of Fairfield, in the State of Connecticut, and more particularly bounded and described on Exhibit A attached hereto and made a part hereof, together with Grantor's right, title and interest, if any, in and to any appurtenance belonging or appertaining thereto.

Said premises are conveyed subject to:

1. Any and all provisions of any municipal, ordinance or regulation or public or private law with special reference to the provisions of any zoning regulations and regulations governing the said premises.

2. Any and all real property taxes on the current Grand List and any municipal liens or assessments becoming due and payable on or after the delivery of this Deed.

3. Those matters of record and exceptions as set forth on Exhibit B.

TO HAVE AND TO HOLD the above granted and bargained premises, with the appurtenances thereof, unto the Grantee, its successors and assigns forever, and to its own proper use and behoof.

AND FURTHERMORE, subject to the foregoing, the said Grantor does by these presents bind itself and its successors and assigns forever to WARRANT AND DEFEND the above granted and bargained premises to Grantee, its successors and assigns forever, against all lawful claims of all persons claiming by, through or under the said Grantor, but against none other; and further provided, however, that this conveyance and the warranty of Grantor herein contained are also subject to all matters and encumbrances set forth in this Deed.

5738030v1
IN WITNESS WHEREOF, the Grantor has hereunto caused this instrument to be signed this 12 day of July 2017.

IN THE PRESENCE OF:

GRANTOR:
THE SOUTHERN NEW ENGLAND TELEPHONE COMPANY d/b/a FRONTIER COMMUNICATIONS CORPORATION

Print Name: J. B. CONNER

Print Name: Jim Campbell

Mark D. Nielsen, Executive Vice President and Chief Legal Officer

STATE OF CONNECTICUT) ss.
COUNTY OF FAIRFIELD ) ss.

On this 12th day of July, 2017, before me, the undersigned officer, personally appeared Mark D. Nielsen, who acknowledged himself to be the Executive Vice President and Chief Legal Officer of The Southern New England Telephone Company d/b/a Frontier Communications Corporation, a Connecticut corporation, and that he, as such Officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as such Officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Commissioner of the Superior Court
Notary Public
My Commission Expires:

DEBORAH A. GARD
NOTARY PUBLIC OF CONNECTICUT
ID # 142313
My Commission Expires 7/31/2020

5738080v1
EXHIBIT A
Property Description

LEGAL DESCRIPTION OF REAL PROPERTY

The Land is described and/or depicted as follows:

PARCEL ONE

ALL THAT CERTAIN tract of land with the buildings thereon standing, situated in the City of Norwalk, County of Fairfield, and State of Connecticut, being in area 8,187 acres and more particularly described on a certain map on file in the office of the Town Clerk of said Town of Norwalk, entitled, "Map of Property To Be Conveyed By the Norwalk Rod & Gun Club, Inc. to The Southern New England Telephone Company, Norwalk, Conn. Scale 1"=50' Feb., 1984 Certified "Substantially Correct", Fred B. Delius Professional Engineer & Land Surveyor", and bounded:

NORTHERLY: in part by land of Roy A. Johnson and Blanche A. Fox, and in part by land of Lilian A. Church;
EASTERLY: in part by land of Lilian A. Church, and in part by land of George W. Burt;
SOUTHERLY: in part by land of Madalene Carabate, in part by land now or formerly of Caroline Randzuli, in part by land of Rondo Realty Corp., and in part by land of Edgar B. and Constance M. Thompson; and

PARCEL TWO

ALL THAT CERTAIN parcel of parcel of land, situated in the City of Norwalk, County of Fairfield, and State of Connecticut, shown and designated as Parcel "A" on the certain map entitled, "Map of Property To Be Conveyed By Lilian A. Church to The Southern New England Telephone Company, Norwalk, Conn. Scale 1"=40' Feb., 1954", which map is on file in the office of the Town Clerk of Norwalk, reference thereto being made and recited for a more particular description. Bounded as follows:

NORTHERLY: 297.21 feet by other land of Lilian A. Church;
EASTERLY: 50.83 feet by Willard Road;
SOUTHERLY: 293.01 feet by land of George W. Burt, and
WESTERLY: 80.65 feet by land now or formerly of The Norwalk Rod and Gun Club, Inc.;
all as shown on said map.

LESS AND EXCEPTING THEREFROM:

FIRST PARCEL:

ALL THAT CERTAIN parcel of land situated in said Norwalk, designated "Proposed 50' R.O.W." on map of property of "The Southern New England Telephone Co. Norwalk, Conn." Surveyed by, Cann Engineers New Haven, Conn. March, 1955, Rev. Aug. 1955, Rev. Nov. 1971, which map is on file in the office of the Norwalk Town Clerk as Map No. 7818. Said parcel is bounded:

NORTHERLY: 200.80 feet by other land of The Southern New England Telephone Company;
EASTERLY: 60.00 feet by other land of The Southern New England Telephone Company;
SOUTHERLY: 60.00 feet by the Second Parcel herein described, in part, and in part 150.00 feet by land designated "N/R Edgar B. & Constance M. Thompson"; and
WESTERLY: 50.00 feet by Strawberry Hill Ave.

SECOND PARCEL:

1 CT-Norwalk - 10 Willard
ALL THAT CERTAIN parcel of land, situated in said Norwalk, designated "Area = 26,253 Sq. Ft. Including R.O.W." actually 16,236 sq. ft. excluding the R.O.W. described as the FIRST PARCEL above, and bounded:

NORTHERLY: 50.00 feet by said First Parcel; then
EASTERLY: 100.00 feet by other land of The Southern New England Telephone Company; then again
NORTHERLY: 60.00 feet and then again
EASTERLY: 100.00 feet by said other land of The Southern New England Telephone Company;
SOUTHERLY: 110.11 feet by land designated "N/F Caroline" in part, and in part by land designated "N/F Rodd Realty Corp." and
WESTERLY: 201.88 feet by said land designated "N/F Edgar S. & Constance M. Thompson".

Also known as: 10 Willard Road, Norwalk, Connecticut

And otherwise known as: Block 17, Lot 2
EXHIBIT B
List of Encumbrances

1. Real Estate taxes and Sewer Use charges to the City of Norwalk on the list of October 1, 2016.
2. Water Use charges to the City of Norwalk.
3. Notes, easements, encroachments, and conditions as appear on Maps Nos. 2434, 4120, 4542, 4894, 7618, 8756, 8774, and 12556 of the Norwalk Land Records.
Exhibit “E”

Vicinity Map
Exhibit “F”

Rainfall Depths & Intensity
### PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)\(^1\)

<table>
<thead>
<tr>
<th>Duration</th>
<th>Average recurrence interval (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.366 (0.293-0.455)</td>
</tr>
<tr>
<td>2</td>
<td>0.425 (0.341-0.531)</td>
</tr>
<tr>
<td>5</td>
<td>0.524 (0.418-0.655)</td>
</tr>
<tr>
<td>25</td>
<td>0.718 (0.670-0.762)</td>
</tr>
<tr>
<td>50</td>
<td>0.803 (0.597-1.08)</td>
</tr>
<tr>
<td>100</td>
<td>0.881 (0.620-1.18)</td>
</tr>
<tr>
<td>200</td>
<td>0.985 (0.669-1.41)</td>
</tr>
<tr>
<td>500</td>
<td>1.11 (0.724-1.65)</td>
</tr>
<tr>
<td>1000</td>
<td>1.22 (0.769-1.94)</td>
</tr>
<tr>
<td>5-min</td>
<td>0.518 (0.415-0.645)</td>
</tr>
<tr>
<td>10-min</td>
<td>0.604 (0.483-0.753)</td>
</tr>
<tr>
<td>15-min</td>
<td>0.743 (0.592-0.929)</td>
</tr>
<tr>
<td>30-min</td>
<td>0.859 (0.680-1.08)</td>
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<tr>
<td>60-min</td>
<td>1.01 (0.800-1.27)</td>
</tr>
<tr>
<td>2-hr</td>
<td>0.874 (0.696-1.09)</td>
</tr>
<tr>
<td>3-hr</td>
<td>1.01 (0.800-1.27)</td>
</tr>
<tr>
<td>6-hr</td>
<td>1.01 (0.800-1.27)</td>
</tr>
<tr>
<td>12-hr</td>
<td>1.01 (0.800-1.27)</td>
</tr>
<tr>
<td>24-hr</td>
<td>0.874 (0.696-1.09)</td>
</tr>
<tr>
<td>2-day</td>
<td>0.888 (0.722-1.17)</td>
</tr>
<tr>
<td>3-day</td>
<td>0.888 (0.722-1.17)</td>
</tr>
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<td>4-day</td>
<td>0.888 (0.722-1.17)</td>
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<tr>
<td>7-day</td>
<td>0.888 (0.722-1.17)</td>
</tr>
<tr>
<td>10-day</td>
<td>0.888 (0.722-1.17)</td>
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<td>20-day</td>
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<td>30-day</td>
<td>0.888 (0.722-1.17)</td>
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<td>45-day</td>
<td>0.888 (0.722-1.17)</td>
</tr>
<tr>
<td>60-day</td>
<td>0.888 (0.722-1.17)</td>
</tr>
</tbody>
</table>

\(^1\) Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parentheses are PF estimates at lower and upper confidence intervals. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.
Appendix “A”

Design Calculations
Water Quality Volume (WQV)

\[ WQV = \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{43560 \text{ s.f.}}{1 \text{ acre}} \times (R_I A_I + R_P A_P) \]

Where:
- \( R_I \) = Runoff coefficient for impervious = 0.95 in
- \( R_P \) = Runoff coefficient for pervious = 0.05 in
- \( A_I \) = Area of impervious
- \( A_P \) = Area of pervious

<table>
<thead>
<tr>
<th>Contributing Areas</th>
<th>Storage BMP</th>
<th>Impervious Area (ac)</th>
<th>Pervious Area (ac)</th>
<th>WQV (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>None</td>
<td>0</td>
<td>2.32</td>
<td>421</td>
</tr>
<tr>
<td>A2</td>
<td>None</td>
<td>0.34</td>
<td>1.23</td>
<td>1,396</td>
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<tr>
<td>A3</td>
<td>Chambers #1</td>
<td>3.45</td>
<td>0.23</td>
<td>11,939</td>
</tr>
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<td>Chambers #2</td>
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<td>0.05</td>
<td>733</td>
</tr>
<tr>
<td>B</td>
<td>None</td>
<td>0.25</td>
<td>0.22</td>
<td>902</td>
</tr>
</tbody>
</table>

Areas A2 and B represent land whose runoff can’t feasibly be captured and treated. Some of this area is outside the development envelope, such as the transmitter tower. Area A1 represents forested area that is to remain undisturbed.

Groundwater Recharge Volume (GRV)

\[ GRV = F \times (I_P - I_E) = 0 \text{ ft}^3 \]

Where:
- \( F \) = Target depth factor = 0.10 in (HSG-D)
- \( I_E \) = Existing impervious area (onsite) = 5.20 acres
- \( I_P \) = Proposed impervious area (onsite) = 4.27 acres

GRV is met due to a reduction in impervious area.
Proposed Chamber System #1

Required retention volume (WQV) = 11,939 c.f.

Provided retention volume = 11,976 c.f.
(at outlet el=100.0, refer to attached storage-elevation table)

Proposed Chamber System #2

Required retention volume (WQV) = 733 c.f.

Provided retention volume = 779 c.f.
(at top of system el=103.0, refer to attached storage-elevation table)

Drawdown

\[ \text{drawdown time} = 12 \frac{\text{in}}{ft} \times \frac{V}{kA} \]

Where:
\[
\begin{align*}
V &= \text{Retention Volume} \quad = 11,976 \text{ c.f.} \\
k &= \text{Infiltration (Rawl's) Rate} \quad = 1.02 \text{ in/hr} \\
A &= \text{Infiltration (bottom) Area} \quad = 4,900 \text{ s.f.} \\
\end{align*}
\]

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<tr>
<th>System</th>
<th>Retention Volume (cf)</th>
<th>Infiltration Area (sf)</th>
<th>Drawdown Time (hr)</th>
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<td>Chambers #1</td>
<td>11,976</td>
<td>4,900</td>
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<td>Chambers #2</td>
<td>779</td>
<td>850</td>
<td>11</td>
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Total Suspended Solids (TSS) Removal

\[
TSS \text{ Removal} = R_1 + (100\% - R_1)(R_2)
\]

Where:
\[
\begin{align*}
R_1 &= \text{TSS removal rate for 1st BMP in treatment train} \\
R_2 &= \text{TSS removal rate for 2nd BMP in treatment train}
\end{align*}
\]

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<tr>
<th>First BMP</th>
<th>Removal Rate</th>
<th>Second BMP</th>
<th>Removal Rate</th>
<th>Overall TSS Removal</th>
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<tr>
<td>Hydrodynamic Separator</td>
<td>30%</td>
<td>Chambers #1</td>
<td>90%</td>
<td>93%</td>
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<tr>
<td>Chambers #2</td>
<td>90%</td>
<td>-</td>
<td>-</td>
<td>90%</td>
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Summary for Pond CH1: Chambers #1

[43] Hint: Has no inflow (Outflow=Zero)

<table>
<thead>
<tr>
<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1B</td>
<td>95.50'</td>
<td>0 cf</td>
<td><strong>35.20'W x 128.00'L x 4.50'H Field B</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20,275 cf Overall - 15,569 cf Embedded = 4,706 cf x 0.0% Voids</td>
</tr>
<tr>
<td>#2B</td>
<td>96.00'</td>
<td>11,976 cf</td>
<td><strong>Concrete Galley 4x8x4</strong> x 128 Inside #1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inside= 42.0&quot;W x 43.0&quot;H =&gt; 12.47 sf x 7.50'L = 93.6 cf</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outside= 52.8&quot;W x 48.0&quot;H =&gt; 15.20 sf x 8.00'L = 121.6 cf</td>
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<tr>
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<td></td>
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<td>128 Chambers in 8 Rows</td>
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11,976 cf Total Available Storage

Storage Group B created with Chamber Wizard

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<th>Outlet Devices</th>
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<tr>
<td>#1</td>
<td>Primary</td>
<td>100.00'</td>
<td><strong>18.0&quot; Round Culvert</strong> L= 75.0' Ke= 0.500</td>
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<tr>
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<td></td>
<td></td>
<td>Inlet / Outlet Invert= 100.00' / 96.30' S= 0.0493 '/' Cc= 0.900</td>
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<tr>
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<td></td>
<td></td>
<td>n= 0.015 Corrugated PE, smooth interior, Flow Area= 1.77 sf</td>
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</tbody>
</table>

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)

1=Culvert (Controls 0.00 cfs)
Pond CH1: Chambers #1 - Chamber Wizard Field B

Chamber Model = Concrete Galley 4x8x4 (Concrete Galley, UCPI 4x8x4 Galley or equivalent)
Inside= 42.0"W x 43.0"H => 12.47 sf x 7.50'L = 93.6 cf
Outside= 52.8"W x 48.0"H => 15.20 sf x 8.00'L = 121.6 cf

16 Chambers/Row x 8.00' Long = 128.00' Row Length
8 Rows x 52.8" Wide = 35.20' Base Width
6.0" Base + 48.0" Chamber Height = 4.50' Field Height

128 Chambers x 93.6 cf = 11,976.0 cf Chamber Storage
128 Chambers x 121.6 cf = 15,569.4 cf Displacement

20,275.2 cf Field - 15,569.4 cf Chambers = 4,705.8 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 11,976.0 cf = 0.275 af
Overall Storage Efficiency = 59.1%
Overall System Size = 128.00' x 35.20' x 4.50'

128 Chambers
750.9 cy Field
174.3 cy Stone
## Stage-Area-Storage for Pond CH1: Chambers #1

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<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
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Outlet: El. 100.0, 11,976 c.f.
### Summary for Pond CH2: Chambers #2

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<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1A</td>
<td>100.80'</td>
<td>0 cf</td>
<td><strong>18.00'W x 47.31'L x 2.21'H Field A</strong>&lt;br&gt;1,881 cf Overall - 779 cf Embedded = 1,101 cf x 0.0% Voids</td>
</tr>
<tr>
<td>#2A</td>
<td>101.30'</td>
<td>779 cf</td>
<td><strong>Cultec R-180</strong> x 35 Inside #1&lt;br&gt;Effective Size = 33.6&quot;W x 20.0&quot;H =&gt; 3.44 sf x 6.33'L = 21.8 cf&lt;br&gt;Overall Size = 36.0&quot;W x 20.5&quot;H x 7.33'L with 1.00' Overlap&lt;br&gt;Row Length Adjustment = +1.00' x 3.44 sf x 5 rows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>779 cf</td>
<td>Total Available Storage</td>
</tr>
</tbody>
</table>

Storage Group A created with Chamber Wizard
Pond CH2: Chambers #2 - Chamber Wizard Field A

Chamber Model = Cultec R-180 (Cultec Recharger® 180HD)
Effective Size = 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf
Overall Size = 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap
Row Length Adjustment = +1.00' x 3.44 sf x 5 rows

36.0" Wide + 3.0" Spacing = 39.0" C-C Row Spacing

7 Chambers/Row x 6.33' Long +1.00' Row Adjustment = 45.31' Row Length +12.0" End Stone x 2 = 47.31'
Base Length
5 Rows x 36.0" Wide + 3.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Base + 20.5" Chamber Height = 2.21' Field Height

35 Chambers x 21.8 cf +1.00' Row Adjustment x 3.44 sf x 5 Rows = 779.2 cf Chamber Storage

1,880.6 cf Field - 779.2 cf Chambers = 1,101.4 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 779.2 cf = 0.018 af
Overall Storage Efficiency = 41.4%
Overall System Size = 47.31' x 18.00' x 2.21'

35 Chambers
69.7 cy Field
40.8 cy Stone
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<th>Storage (cubic-feet)</th>
<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
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Appendix “B”

HydroCAD Analysis – Existing Conditions
### Area Listing (all nodes)

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<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
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<tr>
<td>33,977</td>
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<td>&gt;75% Grass cover, Good, HSG D (A2, B)</td>
</tr>
<tr>
<td>157,252</td>
<td>98.0</td>
<td>Pavement (A2, B)</td>
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<tr>
<td>69,260</td>
<td>98.0</td>
<td>Roof (A2)</td>
</tr>
<tr>
<td>101,059</td>
<td>55.0</td>
<td>Woods, Good, HSG B (A1)</td>
</tr>
<tr>
<td><strong>361,548</strong></td>
<td><strong>84.3</strong></td>
<td><strong>TOTAL AREA</strong></td>
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</table>
Existing
Prepared by RVDI
HydroCAD® 10.00-25 s/n 08137 © 2019 HydroCAD Software Solutions LLC

Time span = 0.00-24.00 hrs, dt = 0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area = 2.320 ac  0.00% Impervious  Runoff Depth > 0.16"  Flow Length = 800'
Slope = 0.0050  Tc = 7.6 min  CN = 55.0  Runoff = 0.11 cfs  1,356 cf

Subcatchment A2: Development to Drain
Runoff Area = 5.370 ac  88.27% Impervious  Runoff Depth > 2.46"
Tc = 6.0 min  CN = WQ  Runoff = 14.00 cfs  48,001 cf

Subcatchment B: To Road
Runoff Area = 0.610 ac  75.41% Impervious  Runoff Depth > 2.27"
Tc = 6.0 min  CN = WQ  Runoff = 1.48 cfs  5,030 cf

Link A: Drain
Inflow = 14.00 cfs  49,357 cf
Primary = 14.00 cfs  49,357 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 54,387 cf  Average Runoff Depth = 1.81"  37.35% Pervious = 135,036 sf  62.65% Impervious = 226,512 sf
Existing
Prepared by RVDI
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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment A1: Wooded to Drain**
- Runoff Area=2.320 ac
- 0.00% Impervious
- Runoff Depth=0.34"
- Flow Length=800'
- Slope=0.0050 '/'
- Tc=7.6 min
- CN=55.0
- Runoff=0.38 cfs
- 2,874 cf

**Subcatchment A2: Development to Drain**
- Runoff Area=5.370 ac
- 88.27% Impervious
- Runoff Depth=3.06"
- Tc=6.0 min
- CN=WQ
- Runoff=17.28 cfs
- 59,706 cf

**Subcatchment B: To Road**
- Runoff Area=0.610 ac
- 75.41% Impervious
- Runoff Depth=2.85"
- Tc=6.0 min
- CN=WQ
- Runoff=1.85 cfs
- 6,319 cf

**Link A: Drain**
- Inflow=17.42 cfs
- Primary=17.42 cfs
- 62,580 cf

Total Runoff Area = 361,548 sf
Runoff Volume = 68,899 cf
Average Runoff Depth = 2.29"
37.35% Pervious = 135,036 sf
62.65% Impervious = 226,512 sf
Existing
Prepared by RVDI
Type III 24-hr 5-Year Rainfall = 4.50" 
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Printed 12/9/2019 
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Time span = 0.00-24.00 hrs, dt = 0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH = SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area = 2.320 ac  0.00% Impervious  Runoff Depth > 0.74"  
Flow Length = 800'  Slope = 0.0050' /'  Tc = 7.6 min  CN = 55.0  Runoff = 1.37 cfs  6,236 cf

Subcatchment A2: Development to Drain
Runoff Area = 5.370 ac  88.27% Impervious  Runoff Depth > 4.05"  
Tc = 6.0 min  CN = WQ  Runoff = 22.65 cfs  78,932 cf

Subcatchment B: To Road
Runoff Area = 0.610 ac  75.41% Impervious  Runoff Depth > 3.82"  
Tc = 6.0 min  CN = WQ  Runoff = 2.45 cfs  8,453 cf

Link A: Drain
Inflow = 23.78 cfs  85,168 cf  
Primary = 23.78 cfs  85,168 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 93,622 cf  Average Runoff Depth = 3.11"  
37.35% Pervious = 135,036 sf  62.65% Impervious = 226,512 sf
Existing

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area=2.320 ac  0.00% Impervious  Runoff Depth>1.15"
Flow Length=800'  Slope=0.0050 '/'  Tc=7.6 min  CN=55.0  Runoff=2.47 cfs  9,696 cf

Subcatchment A2: Development to Drain
Runoff Area=5.370 ac  88.27% Impervious  Runoff Depth>4.87"
Tc=6.0 min  CN=WQ  Runoff=27.13 cfs  95,019 cf

Subcatchment B: To Road
Runoff Area=0.610 ac  75.41% Impervious  Runoff Depth>4.63"
Tc=6.0 min  CN=WQ  Runoff=2.96 cfs  10,250 cf

Link A: Drain
Inflow=29.33 cfs  104,716 cf
Primary=29.33 cfs  104,716 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 114,965 cf  Average Runoff Depth = 3.82"
37.35% Pervious = 135,036 sf  62.65% Impervious = 226,512 sf
Existing
Prepared by RVDI
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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area=2.320 ac  0.00% Impervious  Runoff Depth>1.80"
Flow Length=800'  Slope=0.0050 '/'  Tc=7.6 min  CN=55.0  Runoff=4.24 cfs  15,188 cf

Subcatchment A2: Development to Drain
Runoff Area=5.370 ac  88.27% Impervious  Runoff Depth>6.01"
Tc=6.0 min  CN=WQ  Runoff=33.26 cfs  117,133 cf

Subcatchment B: To Road
Runoff Area=0.610 ac  75.41% Impervious  Runoff Depth>5.75"
Tc=6.0 min  CN=WQ  Runoff=3.67 cfs  12,729 cf

Link A: Drain
Inflow=37.17 cfs  132,321 cf
Primary=37.17 cfs  132,321 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 145,050 cf  Average Runoff Depth = 4.81"
37.35% Pervious = 135,036 sf  62.65% Impervious = 226,512 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
- Runoff Area=2.320 ac
- 0.00% Impervious
- Runoff Depth>2.34"
- Flow Length=800'
- Slope=0.0050 '/'
- Tc=7.6 min
- CN=55.0
- Runoff=5.70 cfs
- 19,746 cf

Subcatchment A2: Development to Drain
- Runoff Area=5.370 ac
- 88.27% Impervious
- Runoff Depth>6.86"
- Tc=6.0 min
- CN=WQ
- Runoff=37.85 cfs
- 133,717 cf

Subcatchment B: To Road
- Runoff Area=0.610 ac
- 75.41% Impervious
- Runoff Depth>6.59"
- Tc=6.0 min
- CN=WQ
- Runoff=4.19 cfs
- 14,594 cf

Link A: Drain
- Inflow=43.17 cfs
- 153,464 cf
- Primary=43.17 cfs
- 153,464 cf

Total Runoff Area = 361,548 sf
Runoff Volume = 168,058 cf
Average Runoff Depth = 5.58"
37.35% Pervious = 135,036 sf
62.65% Impervious = 226,512 sf
existing

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type iii 24-hr 100-year rainfall=8.27"

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time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
runoff by scs tr-20 method, uh=scs, weighted-q
reach routing by dyn-stor-ind method - pond routing by dyn-stor-ind method

subcatchment a1: wooded to drain
runoff area=2.320 ac 0.00% impervious runoff depth>2.96"
flow length=800’ slope=0.0050 '/' tc=7.6 min cn=55.0 runoff=7.37 cfs 24,967 cf

subcatchment a2: development to drain
runoff area=5.370 ac 88.27% impervious runoff depth>7.77"
tc=6.0 min cn=wq runoff=42.76 cfs 151,490 cf

subcatchment b: to road
runoff area=0.610 ac 75.41% impervious runoff depth>7.49"
tc=6.0 min cn=wq runoff=4.75 cfs 16,596 cf

link a: drain
inflow=49.69 cfs 176,457 cf
primary=49.69 cfs 176,457 cf

total runoff area = 361,548 sf runoff volume = 193,053 cf average runoff depth = 6.41"
37.35% pervious = 135,036 sf 62.65% impervious = 226,512 sf
Summary for Subcatchment A1: Wooded to Drain

Runoff = 4.24 cfs @ 12.12 hrs, Volume= 15,188 cf, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.49"

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<td>n= 0.080 Earth, long dense weeds</td>
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Subcatchment A1: Wooded to Drain

Type III 24-hr
25-Year Rainfall=6.49"
Runoff Area=2.320 ac
Runoff Volume=15,188 cf
Runoff Depth>1.80"
Flow Length=800'
Slope=0.0050 '/'
Tc=7.6 min
CN=55.0
Summary for Subcatchment A2: Development to Drain

Runoff = 33.26 cfs @ 12.08 hrs, Volume= 117,133 cf, Depth> 6.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.49"

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<td>0.630</td>
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<td>88.27% Impervious Area</td>
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<table>
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<th>Slope</th>
<th>Velocity</th>
<th>Capacity</th>
<th>Description</th>
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<td>Direct Entry, minimum</td>
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Subcatchment A2: Development to Drain

Type III 24-hr
25-Year Rainfall=6.49"
Runoff Area=5.370 ac
Runoff Volume=117,133 cf
Runoff Depth>6.01"
Tc=6.0 min
CN=WQ
Summary for Subcatchment B: To Road

Runoff = 3.67 cfs @ 12.08 hrs, Volume = 12,729 cf, Depth > 5.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-Year Rainfall = 6.49"

<table>
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<th>Area (ac)</th>
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<td>98.0                Pavement</td>
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<td>&gt;75% Grass cover, Good, HSG D</td>
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<tr>
<td>0.610</td>
<td>Weighted Average</td>
<td></td>
</tr>
<tr>
<td>0.150</td>
<td>80.0</td>
<td>24.59% Pervious Area</td>
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<tr>
<td>0.460</td>
<td>98.0</td>
<td>75.41% Impervious Area</td>
</tr>
</tbody>
</table>

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

Subcatchment B: To Road

Type III 24-hr
25-Year Rainfall = 6.49"
Runoff Area = 0.610 ac
Runoff Volume = 12,729 cf
Runoff Depth > 5.75"
Tc = 6.0 min
CN = WQ
Summary for Link A: Drain

Inflow Area = 334,976 sf, 61.64% Impervious, Inflow Depth > 4.74" for 25-Year event
Inflow = 37.17 cfs @ 12.09 hrs, Volume = 132,321 cf
Primary = 37.17 cfs @ 12.09 hrs, Volume = 132,321 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link A: Drain

Hydrograph

Inflow Area=334,976 sf
Appendix “C”

HydroCAD Analysis – Proposed Conditions
## Area Listing (selected nodes)

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<th>Area (sq-ft)</th>
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<th>Description</th>
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</thead>
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<tr>
<td>46,174</td>
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<td>Drive (A2, A3, B)</td>
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<td>98.0</td>
<td>Mech Area (A2)</td>
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<td>98.0</td>
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<tr>
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<td>98.0</td>
<td>Roof (A3)</td>
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<td>98.0</td>
<td>Walk (A3)</td>
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<tr>
<td>101,059</td>
<td>55.0</td>
<td>Woods, Good, HSG B (A1)</td>
</tr>
<tr>
<td>361,548</td>
<td>82.2</td>
<td>TOTAL AREA</td>
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</tbody>
</table>
Time span = 0.00-24.00 hrs, dt = 0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH = SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area = 2.320 ac  0.00% Impervious  Runoff Depth > 0.16"  
Flow Length = 800'  Slope = 0.0050 '/'  Tc = 7.6 min  CN = 55.0  Runoff = 0.11 cfs  1,356 cf

Subcatchment A2: Development to Drain
Runoff Area = 1.570 ac  21.66% Impervious  Runoff Depth > 1.47"  
Tc = 6.0 min  CN = WQ  Runoff = 2.57 cfs  8,397 cf

Subcatchment A3: To Chambers #1
Runoff Area = 3.680 ac  93.75% Impervious  Runoff Depth > 2.54"  
Tc = 6.0 min  CN = WQ  Runoff = 9.89 cfs  33,982 cf

Subcatchment A4: To Chambers #2
Runoff Area = 0.260 ac  80.77% Impervious  Runoff Depth > 2.35"  
Tc = 6.0 min  CN = WQ  Runoff = 0.65 cfs  2,219 cf

Subcatchment B: To Road
Runoff Area = 0.470 ac  53.19% Impervious  Runoff Depth > 1.94"  
Tc = 6.0 min  CN = WQ  Runoff = 0.98 cfs  3,313 cf

Link A: Drain
Inflow = 13.10 cfs  45,953 cf  
Primary = 13.10 cfs  45,953 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 49,266 cf  Average Runoff Depth = 1.64"  
48.80% Pervious = 176,418 sf  51.20% Impervious = 185,130 sf
**Proposed**  
**Type III 24-hr 2-Year Rainfall = 3.49"**

Prepared by RVDI  
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Page 4

Time span = 0.00-24.00 hrs, dt = 0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH = SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Runoff Area</th>
<th>Impervious</th>
<th>Runoff Depth</th>
<th>Flow Length</th>
<th>Slope</th>
<th>Tc</th>
<th>CN</th>
<th>Runoff</th>
<th>Inflow</th>
<th>Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1: Wooded to Drain</td>
<td>2.320 ac</td>
<td>0.00%</td>
<td>&gt;0.34&quot;</td>
<td>800'</td>
<td>0.0050</td>
<td>7.6 min</td>
<td>55.0</td>
<td>0.38 cfs</td>
<td>2,874 cf</td>
<td>16.58 cfs</td>
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<tr>
<td>A2: Development to Drain</td>
<td>1.570 ac</td>
<td>21.66%</td>
<td>&gt;1.98&quot;</td>
<td></td>
<td></td>
<td>3.49 cfs</td>
<td></td>
<td>11,277 cf</td>
<td>.INPUT</td>
<td></td>
</tr>
<tr>
<td>A3: To Chambers #1</td>
<td>3.680 ac</td>
<td>93.75%</td>
<td>&gt;3.15&quot;</td>
<td></td>
<td></td>
<td>6.0 min</td>
<td>WQ</td>
<td>Runoff = 12.15 cfs</td>
<td>42,108 cf</td>
<td></td>
</tr>
<tr>
<td>A4: To Chambers #2</td>
<td>0.260 ac</td>
<td>80.77%</td>
<td>&gt;2.94&quot;</td>
<td></td>
<td></td>
<td>6.0 min</td>
<td>WQ</td>
<td>Runoff = 0.81 cfs</td>
<td>2,776 cf</td>
<td></td>
</tr>
<tr>
<td>B: To Road</td>
<td>0.470 ac</td>
<td>53.19%</td>
<td>&gt;2.49&quot;</td>
<td></td>
<td></td>
<td>6.0 min</td>
<td>WQ</td>
<td>Runoff = 1.27 cfs</td>
<td>4,252 cf</td>
<td></td>
</tr>
</tbody>
</table>

**Total Runoff Area = 361,548 sf**  
Runoff Volume = 63,287 cf  
Average Runoff Depth = 2.10"  
48.80% Pervious = 176,418 sf  
51.20% Impervious = 185,130 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment A1: Wooded to Drain**  
Runoff Area=2.320 ac  0.00% Impervious  Runoff Depth>0.74"  
Flow Length=800'  Slope=0.0050 '/'  Tc=7.6 min  CN=55.0  Runoff=1.37 cfs  6,236 cf

**Subcatchment A2: Development to Drain**  
Runoff Area=1.570 ac  21.66% Impervious  Runoff Depth>2.85"  
Tc=6.0 min  CN=WQ  Runoff=5.04 cfs  16,236 cf

**Subcatchment A3: To Chambers #1**  
Runoff Area=3.680 ac  93.75% Impervious  Runoff Depth>4.15"  
Tc=6.0 min  CN=WQ  Runoff=15.83 cfs  55,411 cf

**Subcatchment A4: To Chambers #2**  
Runoff Area=0.260 ac  80.77% Impervious  Runoff Depth>3.91"  
Tc=6.0 min  CN=WQ  Runoff=1.07 cfs  3,694 cf

**Subcatchment B: To Road**  
Runoff Area=0.470 ac  53.19% Impervious  Runoff Depth>3.42"  
Tc=6.0 min  CN=WQ  Runoff=1.73 cfs  5,830 cf

**Link A: Drain**  
Inflow=23.07 cfs  81,577 cf  
Primary=23.07 cfs  81,577 cf

**Total Runoff Area = 361,548 sf**  
**Runoff Volume = 87,407 cf**  
**Average Runoff Depth = 2.90"**  
**48.80% Pervious = 176,418 sf**  
**51.20% Impervious = 185,130 sf**
Proposed

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area=2.320 ac  0.00% Impervious  Runoff Depth>1.15"
Flow Length=800'  Slope=0.0050 '/'  Tc=7.6 min  CN=55.0  Runoff=2.47 cfs  9,696 cf

Subcatchment A2: Development to Drain
Runoff Area=1.570 ac  21.66% Impervious  Runoff Depth>3.60"
Tc=6.0 min  CN=WQ  Runoff=6.37 cfs  20,527 cf

Subcatchment A3: To Chambers #1
Runoff Area=3.680 ac  93.75% Impervious  Runoff Depth>4.98"
Tc=6.0 min  CN=WQ  Runoff=18.89 cfs  66,515 cf

Subcatchment A4: To Chambers #2
Runoff Area=0.260 ac  80.77% Impervious  Runoff Depth>4.73"
Tc=6.0 min  CN=WQ  Runoff=1.28 cfs  4,465 cf

Subcatchment B: To Road
Runoff Area=0.470 ac  53.19% Impervious  Runoff Depth>4.20"
Tc=6.0 min  CN=WQ  Runoff=2.13 cfs  7,173 cf

Link A: Drain
Inflow=28.75 cfs  101,203 cf
Primary=28.75 cfs  101,203 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 108,376 cf  Average Runoff Depth = 3.60"
48.80% Pervious = 176,418 sf  51.20% Impervious = 185,130 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Runoff Area</th>
<th>Impervious</th>
<th>Runoff Depth</th>
<th>Flow Length</th>
<th>Slope</th>
<th>Tc</th>
<th>CN</th>
<th>Runoff Rate</th>
<th>Runoff Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcatchment A1: Wooded to Drain</td>
<td>2.320 ac</td>
<td>0.00%</td>
<td>1.80&quot;</td>
<td>800'</td>
<td>0.0050 '/'</td>
<td>7.6 min</td>
<td>55.0</td>
<td>4.24 cfs</td>
<td>15,188 cf</td>
</tr>
<tr>
<td>Subcatchment A2: Development to Drain</td>
<td>1.570 ac</td>
<td>21.66%</td>
<td>4.66&quot;</td>
<td>800'</td>
<td>0.0050 '/'</td>
<td>6.0 min</td>
<td>WQ</td>
<td>6.22 cfs</td>
<td>26,559 cf</td>
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<tr>
<td>Subcatchment A3: To Chambers #1</td>
<td>3.680 ac</td>
<td>93.75%</td>
<td>6.12&quot;</td>
<td>800'</td>
<td>0.0050 '/'</td>
<td>6.0 min</td>
<td>WQ</td>
<td>23.09 cfs</td>
<td>81,753 cf</td>
</tr>
<tr>
<td>Subcatchment A4: To Chambers #2</td>
<td>0.260 ac</td>
<td>80.77%</td>
<td>5.86&quot;</td>
<td>800'</td>
<td>0.0050 '/'</td>
<td>6.0 min</td>
<td>WQ</td>
<td>1.58 cfs</td>
<td>5,528 cf</td>
</tr>
<tr>
<td>Subcatchment B: To Road</td>
<td>0.470 ac</td>
<td>53.19%</td>
<td>5.30&quot;</td>
<td>800'</td>
<td>0.0050 '/'</td>
<td>6.0 min</td>
<td>WQ</td>
<td>2.67 cfs</td>
<td>9,040 cf</td>
</tr>
</tbody>
</table>

Link A: Drain

Total Runoff Area = 361,548 sf  
Runoff Volume = 138,067 cf  
Average Runoff Depth = 4.58"  
48.80% Pervious = 176,418 sf  
51.20% Impervious = 185,130 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area=2.320 ac  0.00% Impervious  Runoff Depth>2.34"  
Flow Length=800’  Slope=0.0050 ’’/’’  Tc=7.6 min  CN=55.0  Runoff=5.70 cfs 19,746 cf

Subcatchment A2: Development to Drain
Runoff Area=1.570 ac  21.66% Impervious  Runoff Depth>5.47”  
Tc=6.0 min  CN=WQ  Runoff=9.60 cfs 31,153 cf

Subcatchment A3: To Chambers #1
Runoff Area=3.680 ac  93.75% Impervious  Runoff Depth>6.97”  
Tc=6.0 min  CN=WQ  Runoff=26.22 cfs 93,167 cf

Subcatchment A4: To Chambers #2
Runoff Area=0.260 ac  80.77% Impervious  Runoff Depth>6.70”  
Tc=6.0 min  CN=WQ  Runoff=1.81 cfs 6,326 cf

Subcatchment B: To Road
Runoff Area=0.470 ac  53.19% Impervious  Runoff Depth>6.13”  
Tc=6.0 min  CN=WQ  Runoff=3.08 cfs 10,452 cf

Link A: Drain
Inflow=42.96 cfs  150,392 cf
Primary=42.96 cfs  150,392 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 160,844 cf  Average Runoff Depth = 5.34”
48.80% Pervious = 176,418 sf  51.20% Impervious = 185,130 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Wooded to Drain
Runoff Area=2.320 ac  0.00% Impervious  Runoff Depth>2.96"
Flow Length=800'  Slope=0.0050 '/'  Tc=7.6 min  CN=55.0  Runoff=7.37 cfs  24,967 cf

Subcatchment A2: Development to Drain
Runoff Area=1.570 ac  21.66% Impervious  Runoff Depth>6.34"
Tc=6.0 min  CN=WQ  Runoff=11.09 cfs  36,124 cf

Subcatchment A3: To Chambers #1
Runoff Area=3.680 ac  93.75% Impervious  Runoff Depth>7.89"
Tc=6.0 min  CN=WQ  Runoff=29.57 cfs  105,390 cf

Subcatchment A4: To Chambers #2
Runoff Area=0.260 ac  80.77% Impervious  Runoff Depth>7.61"
Tc=6.0 min  CN=WQ  Runoff=2.04 cfs  7,182 cf

Subcatchment B: To Road
Runoff Area=0.470 ac  53.19% Impervious  Runoff Depth>7.02"
Tc=6.0 min  CN=WQ  Runoff=3.52 cfs  11,972 cf

Link A: Drain
Inflow=49.65 cfs  173,664 cf
Primary=49.65 cfs  173,664 cf

Total Runoff Area = 361,548 sf  Runoff Volume = 185,635 cf  Average Runoff Depth = 6.16"
48.80% Pervious = 176,418 sf  51.20% Impervious = 185,130 sf
Summary for Subcatchment A1: Wooded to Drain

Runoff = 4.24 cfs @ 12.12 hrs, Volume= 15,188 cf, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.49"

<table>
<thead>
<tr>
<th>Area (ac)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.320</td>
<td>55.0</td>
<td>Woods, Good, HSG B</td>
</tr>
<tr>
<td>2.320</td>
<td>55.0</td>
<td>100.00% Pervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.6</td>
<td>800</td>
<td>0.0050</td>
<td>1.75</td>
<td>35.01</td>
<td>Trap/Vee/Rect Channel Flow, Drainage Ditch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bot.W=8.00' D=2.50'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n= 0.080  Earth, long dense weeds</td>
</tr>
</tbody>
</table>

Subcatchment A1: Wooded to Drain

Hydrograph

Type III 24-hr
25-Year Rainfall=6.49"
Runoff Area=2.320 ac
Runoff Volume=15,188 cf
Runoff Depth>1.80"
Flow Length=800'
Slope=0.0050 '/'
Tc=7.6 min
CN=55.0
Summary for Subcatchment A2: Development to Drain

Runoff = 8.22 cfs @ 12.09 hrs, Volume = 26,559 cf, Depth > 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-Year Rainfall = 6.49"

<table>
<thead>
<tr>
<th>Area (ac)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 0.020</td>
<td>98.0</td>
<td>Drive</td>
</tr>
<tr>
<td>* 0.320</td>
<td>98.0</td>
<td>Mech Area</td>
</tr>
<tr>
<td>1.230</td>
<td>80.0</td>
<td>&gt;75% Grass cover, Good, HSG D</td>
</tr>
<tr>
<td>1.570</td>
<td></td>
<td>Weighted Average</td>
</tr>
<tr>
<td>1.230</td>
<td>80.0</td>
<td>78.34% Pervious Area</td>
</tr>
<tr>
<td>0.340</td>
<td>98.0</td>
<td>21.66% Impervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry, minimum</td>
</tr>
</tbody>
</table>

Subcatchment A2: Development to Drain

Hydrograph

Type III 24-hr
25-Year Rainfall = 6.49"
Runoff Area = 1.570 ac
Runoff Volume = 26,559 cf
Runoff Depth > 4.66"
Tc = 6.0 min
CN = WQ
Summary for Subcatchment A3: To Chambers #1

Runoff = 23.09 cfs @ 12.08 hrs, Volume= 81,753 cf, Depth> 6.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.49"

<table>
<thead>
<tr>
<th>Area (ac)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 2.580</td>
<td>98.0</td>
<td>Roof</td>
</tr>
<tr>
<td>* 0.790</td>
<td>98.0</td>
<td>Drive</td>
</tr>
<tr>
<td>* 0.080</td>
<td>98.0</td>
<td>Walk</td>
</tr>
<tr>
<td>0.230</td>
<td>80.0</td>
<td>&gt;75% Grass cover, Good, HSG D</td>
</tr>
<tr>
<td>3.680</td>
<td></td>
<td>Weighted Average</td>
</tr>
<tr>
<td>0.230</td>
<td>80.0</td>
<td>6.25% Pervious Area</td>
</tr>
<tr>
<td>3.450</td>
<td>98.0</td>
<td>93.75% Impervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry, minimum</td>
</tr>
</tbody>
</table>

Subcatchment A3: To Chambers #1

Hydrograph

Type III 24-hr
25-Year Rainfall=6.49"
Runoff Area=3.680 ac
Runoff Volume=81,753 cf
Runoff Depth>6.12"
Tc=6.0 min
CN=WQ
Summary for Subcatchment A4: To Chambers #2

Runoff = 1.58 cfs @ 12.08 hrs, Volume = 5,528 cf, Depth > 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-Year Rainfall = 6.49"

<table>
<thead>
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<th>Area (ac)</th>
<th>CN</th>
<th>Description</th>
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<tr>
<td>* 0.210</td>
<td>98.0</td>
<td>Patio</td>
</tr>
<tr>
<td>0.050</td>
<td>80.0</td>
<td>&gt;75% Grass cover, Good, HSG D</td>
</tr>
<tr>
<td>0.260</td>
<td></td>
<td>Weighted Average</td>
</tr>
<tr>
<td>0.050</td>
<td>80.0</td>
<td>19.23% Pervious Area</td>
</tr>
<tr>
<td>0.210</td>
<td>98.0</td>
<td>80.77% Impervious Area</td>
</tr>
</tbody>
</table>

Tc | Length | Slope | Velocity | Capacity | Description
---|--------|-------|----------|----------|----------------
6.0 |        |       |          |          | Direct Entry, minimum

Subcatchment A4: To Chambers #2

Hydrograph

Type III 24-hr
25-Year Rainfall = 6.49"
Runoff Area = 0.260 ac
Runoff Volume = 5,528 cf
Runoff Depth > 5.86"
Tc = 6.0 min
CN = WQ
Summary for Subcatchment B: To Road

Runoff = 2.67 cfs @ 12.08 hrs, Volume= 9,040 cf, Depth> 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.49"

<table>
<thead>
<tr>
<th>Area (ac)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.250</td>
<td>98.0</td>
<td>Drive</td>
</tr>
<tr>
<td>0.220</td>
<td>80.0</td>
<td>&gt;75% Grass cover, Good, HSG D</td>
</tr>
<tr>
<td>0.470</td>
<td></td>
<td>Weighted Average</td>
</tr>
<tr>
<td>0.220</td>
<td>80.0</td>
<td>46.81% Pervious Area</td>
</tr>
<tr>
<td>0.250</td>
<td>98.0</td>
<td>53.19% Impervious Area</td>
</tr>
</tbody>
</table>

Tc | Length | Slope | Velocity | Capacity | Description  |
---|--------|-------|----------|----------|--------------|
6.0 |        |       |          |          | Direct Entry, minimum |

Subcatchment B: To Road

Type III 24-hr
25-Year Rainfall=6.49"
Runoff Area=0.470 ac
Runoff Volume=9,040 cf
Runoff Depth>5.30"
Tc=6.0 min
CN=WQ
Summary for Link A: Drain

Inflow Area = 341,075 sf, 51.09% Impervious, Inflow Depth > 4.54\" for 25-Year event
Inflow = 36.80 cfs @ 12.09 hrs, Volume = 129,027 cf
Primary = 36.80 cfs @ 12.09 hrs, Volume = 129,027 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Inflow Area=341,075 sf
Appendix “D”

Stormwater Plan
Checklist
Stormwater System Design Plan and Report Checklist for Submission

- Project narrative including:
  - [Provide page number where located]
  - Common address of site ✓
  - Project name ✓
  - Legal description of site ✓
  - Vicinity map ✓
  - Description of past, present, and proposed uses of the site ✓
  - Description of the proposed drainage system, including:
    - LID elements incorporated in the design ✓
    - Water quality treatments ✓
    - How impervious surfaces have been minimized to the extent practical ✓
    - Outfall or discharge location (open watercourse versus existing downstream drainage system)
  - Description of how zero increase in rate of runoff is met through the design, including a table documenting existing and proposed peak flows from the site for the 50, 10, 4, 2, and 1 percent annual chance events ✓

- Cover sheet with drawing index: (only required if not submitted with the Site Plan review) ✓
  - Title block - Title shall include type of submittal from Site Development Review Request.
  - Legend - on site plan ✓
  - North arrow ✓
  - Property boundary of subject property (including parcels or portions thereof, of abutting land in roadways within 100 feet of the property boundary) ✓
  - Site location map (recommended scale 1" = 1,000') with north arrow ✓

- Existing conditions map(s) detailing:
  - [Provide page number where located] ✓
  - Base mapping for the Storm Drainage Plan shall consist of an existing conditions survey prepared in accordance with the Minimum Standards for Surveys and Maps in the State of Connecticut. The class of survey shall be A-2 and T-2 and shall be represented as such on the map. The base map shall be sealed and signed by a Professional Land Surveyor licensed in the State of Connecticut.
  - The plan shall indicate the scale of the drawing and if possible be at a scale of 1" = 20' or 1" = 40'.
  - The plan shall depict the existing topography at contour intervals of 2 feet for the site and at a minimum of 100 feet beyond the property limits of the subject property.
  - Topography that is flatter than 2 percent requires additional spot elevations, and the contour interval shall be a 1-foot contour interval instead of a 2-foot contour interval.
  - The plan shall show all required spot elevations.
  - The plan shall indicate the referenced or assumed elevation datum (the FEMA datum shall be used for sites located within a Flood Hazard Zone).
  - The plan shall have one permanent benchmark on the site within 100 feet of the proposed construction work area on the site.
  - The plan shall include roads, buildings, driveways, parking areas, patios, walks, walls, other structures on the property, storm drainage, sanitary sewers, subsurface sewage disposal systems (septic systems), curbs, sidewalks, trees, retaining walls, utilities such as water, gas, and electric etc.
  - The plan shall show the locations of stormwater discharges.
  - The plan shall show wetlands, perennial, intermittent streams.
  - The plan shall show vegetation and the proposed limits of clearing and disturbance.
  - The plan shall show the locations of deep test and infiltration tests.
The plan shall show resource protection areas such as wetlands, lakes, ponds, and other setbacks (stream buffer zones, drinking water well setbacks, septic system setbacks, etc.).

The plan shall show utilities and easements.

The plan shall show the location of FEMA floodplain and floodway limits and the relationship of the site to upstream and downstream properties and drainage systems.

The plan shall show existing channel modifications (e.g., bridge or culvert installations).

The plan shall show existing peak-flow attenuation facilities.

**Proposed conditions map(s) detailing:**

Exhibit B

[Provide page number where located]

- The plan shall indicate the scale of the drawing and if possible be at a scale of 1" = 20' or 1" = 40'. ✓
- The plan shall depict the proposed topography at contour intervals of 2 feet for the site and at a minimum of 100 feet beyond the property limits of the subject property. ✓
- Topography that is flatter than 2 percent requires additional spot elevations, and the contour interval shall be a 1-foot contour interval instead of a 2-foot contour interval. ✓
- The plan shall show all required spot elevations. ✓
- The plan shall show proposed roads, buildings, driveways, parking areas, and other impervious surfaces. ✓
- The plan shall show proposed utilities (e.g., water, sewer, gas, electric) and utility easements. ✓
- The plan shall show proposed storm drain infrastructure (e.g., inlets, manholes, storm drains). ✓
- The plan shall show proposed channel modifications (e.g., bridge or culvert installations). ✓
- The plan shall show temporary and permanent conveyance systems (grass channels, swales, ditches, storm drains, etc.) building grades, dimensions, and directions of flow. ✓
- The plan shall show the location, size, maintenance access, and limits of disturbance of proposed structural stormwater management practices and low impact development (treatment practices, flood control facilities, stormwater diversion structures, etc.). ✓
- The plan shall show final landscaping plans for structural stormwater management practices and site revegetation (if no structural items are proposed, this portion of the plan may be signed by a licensed landscape architect or other environmental professional). ✓
- The plan shall show locations of nonstructural stormwater management practices (i.e., source controls). ✓
- The plan shall show the excavation and fill quantities in a table if required by the Director. ✓
- The plan shall be sealed and signed by a Professional Engineer licensed in the State of Connecticut. ✓
✓ Existing conditions hydrologic analysis including:
   [Provide page number where located]
   ✓ Existing conditions map
   ✓ Delineation of each of the existing drainage areas and subwatersheds found on the development site (e.g., size, soil types, land cover characteristics)
   n/a Delineation of any off-site drainage areas that contribute stormwater runoff to the development site (e.g., size, soil types, land cover characteristics)
   ✓ Calculation of the stormwater runoff rates (cfs) and volumes (ft³) generated, under existing conditions, in each of the drainage areas found on the development site
   n/a Calculation of the stormwater runoff rates (cfs) and volumes (ft³) generated, under existing conditions, in each of the off-site drainage areas that contribute stormwater runoff to the development site
   ✓ Documentation (e.g., model diagram) and calculations showing how the existing conditions hydrologic analysis was completed

✓ Proposed conditions hydrologic analysis, which includes:
   [Provide page number where located]
   ✓ Proposed conditions map
   ✓ Delineation of each of the proposed drainage areas found on the development site (e.g., size, soil types, land cover characteristics)
   n/a Delineation of the proposed conditions of any off-site drainage areas that contribute stormwater runoff to the development site (e.g., size, soil types, land cover characteristics)
   ✓ Calculation of the stormwater runoff rates (cfs) and volumes (ft³) generated, under proposed conditions, in each of the drainage areas found on the development site
   n/a Calculation of the stormwater runoff rates (cfs) and volumes (ft³) generated, under proposed conditions, in each of the off-site drainage areas that contribute stormwater runoff to the development site
   ✓ Design computations of any detention or retention systems proposed as part of the project
   ✓ Documentation (e.g., model diagram) and calculations showing how the proposed conditions hydrologic analysis was completed

Postconstruction drainage system design computations including:
   n/a
   [Provide page number where located]
   — Drainage diagrams indicating design/analysis points and all stormwater features
   — Subwatershed mapping to each inlet structure
   — Tailwater used in the drainage system analysis
   — Analysis of the receiving drainage system if discharge is to an existing system
   — Computations supporting design of the drainage system including pipe capacity and hydraulic grade line determinations
   — Table of watershed areas, times of concentration, and runoff coefficients for each subwatershed area
   — Profiles of drainage conveyance systems showing proposed structures, proposed grade, flow depth, hydraulic grade line, pipe and channel slopes, soil profiles in swales, bedding details, subdrain details, and types of construction materials
   — Indicate the discharge location of all building roof leaders. If a building will discharge to more than one discharge location, these locations need to be indicated along with the pertinent area of contributing rooftop.
   — Gutter flow analysis for applications that propose new roads or improvements to existing public roads
Typical Checklist for Preparing Erosion and Sediment Control Plans and Narratives

Erosion and Sediment Control Plans shall comply with the requirements of the current version of the Connecticut Guidelines for Soil Erosion and Sediment Control. Provide the following information on a minimum size 24"x36" plan. Make sure the site name and address are included in the paragraph and check the submittal for legibility, page numbers, and correct spelling.

**Narrative ✓**
- Describe existing site conditions (vegetation, drainage patterns, topography) and proposed site conditions (ground cover, drainage patterns, and site grading).
- Project description — purpose of grading or construction activity, total area to be disturbed
- Adjacent property and uses
- Critical or sensitive areas — steep slopes, streams, wetlands, sinkholes, etc.
- Construction scheduling — duration of clearing, open grading, installation of permanent stormwater controls
- Inspection and maintenance schedule for BMPs and erosion control devices
- Briefly describe the design standards used for any detention structures

**Erosion and Sediment Control Plan**
- The plan shall be based on the Site Plan and show the Sediment and Soil Erosion Controls.
- Indicate the scale of the drawing and if possible be at a scale of 1" = 20' or 1" = 40'.
- Include a north arrow and drawing legend.
- Include a vicinity map: a small map showing the surrounding area, including landmarks, streams, and roads.
- Show existing and proposed conditions so that the proper location for the installation of the erosion and sediment control measures can be determined.
- Show construction fencing delineating the limits of disturbance and areas not to be disturbed.
- Show construction fence delineating areas of the BMPs to be protected from compaction (i.e., area of root zones for trees to remain).
- Show construction phasing and erosion and sediment control sequencing.
- Include details for BMPs and erosion control devices.
- Show any required computations.
- Show the operations and maintenance of the erosion and sedimentation controls.
- Show existing and proposed contours at an appropriate interval.
- Show all buildings, roads, parking lots, and other structures.
- Show all construction access routes, borrow areas, and spoil areas.
- Existing and proposed drainage structures: sizes, materials, slopes, other important dimensions
- Indicate drainage patterns and watershed boundaries; include drainage area for each watershed.
- Include property boundaries and easements.
- Show all critical or sensitive areas on the site, including existing vegetation and all trees 6" or greater caliper in diameter.
- The plan shall be sealed and signed by a Professional Engineer licensed in the State of Connecticut.