STORMWATER MANAGEMENT REPORT

Prepared For

PROPOSED SITE DEVELOPMENT

OENOKE RIDGE

65 OENOKE RIDGE, NEW CANAAN, CT

August 28, 2019
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1. **INTRODUCTION**

McChord Engineering Associates, Inc. has been commissioned by Waveny Care Center Health Services to perform stormwater management computations for the proposed site development at 65 Oenoke Ridge in New Canaan, Connecticut. The property consists of 3.5285-acres. It is located on the east side of Oenoke Ridge, which is a continuation of Main Street northbound. It is in both the Noroton River and Fivemile River watershed basins and outside of any public water supply watersheds. Figure 1 shows the location of the property on the United States Geological Survey (USGS) map.

![Figure 1: Location Map](image)

The property is currently developed with the New Canaan Inn building, a single family residence, hardscape, lawn, an asphalt driveway and parking area. The edges of the property are Oenoke Ridge, St. Mark’s Church and woodland separating the Oenoke Condominium complex to the east and the New Canaan Historical Society and St. Michael’s Lutheran Church to the south. Topography on the site consists of gradual slopes that drain east.

The proposed site development includes the demolition of the single family residence and subsequent construction of a new ±45,000 sq. ft. multi-level residential building with associated hardscape areas and lawn. The existing asphalt driveway will be expanded and rehabilitated as required to service the new building. The new building will be connected to the existing sanitary sewer system on site.
2. **Scope of Study**

This stormwater management report contains studies comparing peak rate of runoff between the existing conditions and the proposed development to ensure that the proposed development will have no adverse impact on adjoining property owners or downstream drainage systems. The site will be developed with its own on-site stormwater management system capable of controlling the increase in peak runoff.

3. **Analysis Methodology**

Runoff was modeled with HydroCAD 8.50 software produced by HydroCAD Software Solutions LLC. This software uses the NRCS TR-20 method for analyzing stormwater runoff. Soil characteristics, cover conditions, slope, time of concentration, and historical rainfall data are all parameters that are utilized by this method. The analysis considered the 2, 5, 10, and 25-year storm events. Precipitation data was taken from the NOAA Atlas 14 Point Precipitation Frequency Estimates for the subject property.

4. **Stormwater Management Strategy**

Currently, a majority of the stormwater runoff on-site (including rooftop runoff) is collected by catch basins or headwall inlets and conveyed to the Town Storm Sewer System in Heritage Hill Road. Runoff that is not collected flows overland to the east following the topography. The St. Mark’s Church property was included in this analysis as a portion of the great lawn and parking area is collected by the aforementioned catch basins.

The proposed stormwater management plan maintains existing drainage patterns on the site. Runoff from the proposed building rooftop, hardscape area and lawn will be collected by roof leaders and yard drains and routed to an underground detention system consisting of three (3) 90-ft long rows of 8-ft wide x 6-ft tall precast concrete box culverts with a storage capacity of approximately 12,960 cubic feet. The outlet structure for the detention system will consist of a manhole with two (2) low-flow orifices and an overflow weir to throttle down the peak flow rate before connecting back into the existing storm sewer. As part of the driveway reconstruction, new catch basins and manholes are proposed to convey runoff from the driveway and parking areas to the existing storm sewer. A new manhole will be proposed to replace an existing headwall inlet to connect the new catch basins to the existing storm sewer. Refer to Appendix A for the Existing and Proposed Drainage Basin Maps.

Two hydrodynamic separators are proposed. One hydrodynamic separator will be located prior to the detention system to collect and treat runoff from the proposed building rooftop and hardscape before entering the detention system. The other hydrodynamic separator will be located where the existing headwall is to be removed and will collect and treat runoff from the new driveway and existing parking areas before discharging to the existing storm sewer. A hydrodynamic separator forces runoff into a helical flow pattern that promotes the settling and capture of suspended solids. They are sized to accommodate the peak flow associated with the WQV, also known as the WQF. The separators are designed to capture 80% of the total suspended solids that pass through them. They will also capture 100% of floatables. Once treated, runoff from the separators will be directed to the existing storm sewer within the subject property. The discharge point to the abutting property (and ultimately the Heritage Hill
Road storm sewer) will be preserved. For detailed computations on the hydrodynamic separator sizing see Appendix C.

Detailed information on the size and configuration of the proposed stormwater management measures is available on the most recent revision of the "Site Layout and Utility Plan" prepared by this office. A Stormwater Facilities Maintenance Plan is also included in Appendix D.

5. **ANALYSIS & RESULTS**

5.1 PEAK FLOW CONTROL

Runoff from the proposed development was analyzed under existing and proposed conditions. The existing conditions analysis modeled the site under two points of concern, runoff that was captured and conveyed through the storm sewer to Heritage Hill Road and runoff that flowed overland to the east. The proposed conditions analysis divided the runoff captured by the storm sewer into areas that are detained through the proposed underground detention system and areas that freely flow through the storm sewer without detention. The proposed runoff that is not captured will flow overland to the east conforming to existing conditions drainage patterns.

Using the NRCS TR-20 method, the peak rate of runoff for the 2, 5, 10 and 25-year storm events was computed for the site. Soils on the property were determined using the NRCS Web Soil Survey. Cover conditions were derived from site observations and the "Site Layout and Utility Plan" prepared by this office, dated August 28, 2019. The resulting peak flow rates from the property under both the existing and proposed conditions are summarized in Table 1. For detailed computations see Appendix B.

<table>
<thead>
<tr>
<th>Table 1: Peak Flow Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Point of Concern</strong></td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Overland Flow</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total Storm Sewer Flow</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

The analysis shows that there is no increase in the peak rate of runoff to from the property during any of the analyzed storm events to either point of concern.

A drainage review was also conducted of adjacent properties to determine if the proposed development would affect any downstream confluence points. A visual inspection was made and available GIS mapping was reviewed. There is no apparent confluence point in close proximity to the proposed development. The proposed stormwater management system was also checked to see how it would perform during a 100-year storm. The proposed system is
adequately sized to handle the peak flow elevations resulting from a 100-year storm. No erosion or drainage issues immediately downstream of the proposed development were evident at the time of our review.

5.2 WATER QUALITY

Water quality will be controlled using hydrodynamic separators. The methods outlined in the Connecticut Stormwater Quality Manual were used to determine the Water Quality Flow (WQF) for each separator. Specifications provided by the hydrodynamic separator manufacturer were then used to select each unit. Table 2 summarizes the treatment mechanism and sizing criteria. Detailed computations are included in Appendix C.

<table>
<thead>
<tr>
<th>Location</th>
<th>WQV (ft³)</th>
<th>WQF (cfs)</th>
<th>Specified Unit</th>
<th>Treatment (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Detention System</td>
<td>4,090</td>
<td>1.14</td>
<td>ConTech CDS 2015-4</td>
<td>1.40</td>
</tr>
<tr>
<td>Prior to Existing Storm Sewer</td>
<td>8,512</td>
<td>2.36</td>
<td>ConTech CDS 2025-5</td>
<td>3.20</td>
</tr>
</tbody>
</table>

The analysis shows that the proposed treatment mechanisms are sufficiently sized to treat site runoff for water quality.

6. CONCLUSIONS

Based on our analysis, McChord Engineering Associates, Inc. has demonstrated that the proposed stormwater management system will adequately control the increase in runoff and provide sufficient water quality for the proposed site development at 65 Oenoke Ridge in New Canaan, CT. It is the opinion of this office and the conclusion of this report that the proposed site development will have no adverse impacts to the adjoining property owners or any downstream drainage systems.
APPENDIX A:

DRAINAGE BASIN MAPS
APPENDIX B:

PEAK FLOW COMPUTATIONS
E1a
Total Overland Flow

E2a
Subject Property - Storm Sewer Flow

SUM

E2b
New Canaan Inn and Parking Areas - Storm Sewer Flow

Total Storm Sewer Flow
### Area Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
<th>(subcatchment-numbers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>173,530</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C (E1a,E2a,E2b)</td>
<td></td>
</tr>
<tr>
<td>110,653</td>
<td>98</td>
<td>Impervious Area (E1a,E2a,E2b)</td>
<td></td>
</tr>
<tr>
<td><strong>284,183</strong></td>
<td></td>
<td><strong>TOTAL AREA</strong></td>
<td></td>
</tr>
</tbody>
</table>
Summary for Subcatchment E1a: Total Overland Flow

Runoff = 3.78 cfs @ 12.24 hrs, Volume = 16,502 cf, Depth = 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span = 0.00-30.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.66"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 5,093</td>
<td>98</td>
<td>Impervious Area</td>
</tr>
<tr>
<td>44,983</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>50,056</td>
<td>76</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>44,983</td>
<td></td>
<td>Pervious Area</td>
</tr>
<tr>
<td>5,093</td>
<td></td>
<td>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>16.5</td>
<td>150</td>
<td>0.0271</td>
<td>0.15</td>
<td></td>
<td>Sheet Flow, AB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Grass. Dense n= 0.240 P2= 3.58&quot;</td>
</tr>
<tr>
<td>1.1</td>
<td>292</td>
<td>0.0780</td>
<td>4.50</td>
<td></td>
<td>Shallow Concentrated Flow, BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unpaved Kv= 16.1 fps</td>
</tr>
</tbody>
</table>

17.6 442 Total

Subcatchment E1a: Total Overland Flow

Hydrograph

Type III 24-hr 25-yr Rainfall=6.66"
Runoff Area=50,056 sf
Runoff Volume=16,502 cf
Runoff Depth=3.96"
Flow Length=442'
Tc=17.6 min
CN=76
Summary for Subcatchment E2a: Subject Property - Storm Sewer Flow

Runoff = 2.73 cfs @ 12.23 hrs, Volume = 11,883 cf, Depth = 4.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span = 0.00-30.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-yr Rainfall = 6.66"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>26,578</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>33,361</td>
<td>79</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>26,578</td>
<td></td>
<td>Pervious Area</td>
</tr>
<tr>
<td>6,783</td>
<td></td>
<td>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>16.1</td>
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<td>0.0290</td>
<td>0.16</td>
<td></td>
<td>Sheet Flow, AB</td>
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<tr>
<td>1.1</td>
<td>322</td>
<td>0.0890</td>
<td>4.80</td>
<td></td>
<td>Shallow Concentrated Flow, BC</td>
</tr>
<tr>
<td>0.1</td>
<td>143</td>
<td>0.0800</td>
<td>16.13</td>
<td>19.79</td>
<td>Circular Channel (pipe), CD</td>
</tr>
</tbody>
</table>
|          |               |              |                   |                | Diam = 15.0" Area = 1.2 sf Perim = 3.9' r = 0.31'
|          |               |              |                   |                | n = 0.012 Concrete pipe, finished               |
| 0.2      | 150           | 0.0840       | 14.24             | 11.19          | Circular Channel (pipe), DE                      |
|          |               |              |                   |                | Diam = 12.0" Area = 0.8 sf Perim = 3.1' r = 0.25'
|          |               |              |                   |                | n = 0.012 Concrete pipe, finished               |

| 17.5     | 765           | Total        |                   |                |                                                  |
Subcatchment E2a: Subject Property - Storm Sewer Flow

Hydrograph

Type III 24-hr 25-yr Rainfall=6.66"
Runoff Area=33,361 sf
Runoff Volume=11,883 cf
Runoff Depth=4.27"
Flow Length=765'
Tc=17.5 min
CN=79
# Summary for Subcatchment E2b: New Canaan Inn and Parking Areas - Storm Sewer Flow

Runoff = 17.67 cfs @ 12.27 hrs, Volume= 84,311 cf, Depth= 5.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.66"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 98,777</td>
<td>96</td>
<td>Impervious Area</td>
</tr>
<tr>
<td>101,989</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>200,766</td>
<td>86</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>101,989</td>
<td></td>
<td>Pervious Area</td>
</tr>
<tr>
<td>98,777</td>
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<td>Impervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc</th>
<th>Length</th>
<th>Slope</th>
<th>Velocity</th>
<th>Capacity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>min</td>
<td>(feet)</td>
<td>(ft/ft)</td>
<td>(ft/sec)</td>
<td>(cfs)</td>
<td></td>
</tr>
<tr>
<td>18.7</td>
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<td>0.0200</td>
<td>0.13</td>
<td></td>
<td>Sheet Flow, AB</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>Grass: Dense n= 0.240 P2= 3.58&quot;</td>
</tr>
<tr>
<td>0.7</td>
<td>126</td>
<td>0.0320</td>
<td>2.88</td>
<td></td>
<td>Shallow Concentrated Flow, BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unpaved Kv= 16.1 fps</td>
</tr>
<tr>
<td>0.7</td>
<td>202</td>
<td>0.0500</td>
<td>4.54</td>
<td></td>
<td>Shallow Concentrated Flow, CD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Paved Kv= 20.3 fps</td>
</tr>
<tr>
<td>0.1</td>
<td>69</td>
<td>0.0770</td>
<td>13.64</td>
<td>10.71</td>
<td>Circular Channel (pipe), DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diam= 12.0&quot; Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished</td>
</tr>
<tr>
<td>0.1</td>
<td>47</td>
<td>0.0720</td>
<td>13.19</td>
<td>10.36</td>
<td>Circular Channel (pipe), EF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diam= 12.0&quot; Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished</td>
</tr>
<tr>
<td>0.3</td>
<td>194</td>
<td>0.0430</td>
<td>10.19</td>
<td>8.00</td>
<td>Circular Channel (pipe), FG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diam= 12.0&quot; Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished</td>
</tr>
<tr>
<td>0.1</td>
<td>120</td>
<td>0.1300</td>
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<td>13.92</td>
<td>Circular Channel (pipe), GH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diam= 12.0&quot; Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished</td>
</tr>
<tr>
<td>20.7</td>
<td>908</td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>
Subcatchment E2b: New Canaan Inn and Parking Areas - Storm Sewer Flow

Hydrograph

Type III 24-hr 25-yr Rainfall=6.66" Rainfall=6.66"
Runoff Area=200,766 sf Runoff Volume=84,311 cf
Runoff Depth=5.04" Runoff Depth=5.04"
Flow Length=908' Flow Length=908'
Tc=20.7 min Tc=20.7 min
CN=86 CN=86
Summary for Link SUM: Total Storm Sewer Flow

Inflow Area = 234,127 sf, 45.09% Impervious, Inflow Depth = 4.93" for 25-yr event
Inflow = 20.36 cfs @ 12.26 hrs, Volume= 96,194 cf
Primary = 20.36 cfs @ 12.26 hrs, Volume= 96,194 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Inflow Area=234,127 sf
Total Overland Flow

P1c

P1a
Subject Property - Storm Sewer to Detention

DET
Detention System

P1b
New Canaan Inn and Parking Areas - Storm Sewer Flow

SUM
Sum of Hydrographs
<table>
<thead>
<tr>
<th>Area</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>135,630</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C (P1a,P1b,P1c)</td>
</tr>
<tr>
<td>157,400</td>
<td>98</td>
<td>Impervious Area (P1a,P1b,P1c)</td>
</tr>
<tr>
<td>293,030</td>
<td></td>
<td>TOTAL AREA</td>
</tr>
</tbody>
</table>
Summary for Subcatchment P1a: Subject Property - Storm Sewer to Detention

Runoff = 9.67 cfs @ 12.07 hrs, Volume = 31,326 cf, Depth = 5.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span = 0.00-30.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.66"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,959</td>
<td>98</td>
<td>Impervious Area</td>
</tr>
<tr>
<td>13,486</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>64,425</td>
<td>93</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>13,466</td>
<td></td>
<td>Pervious Area</td>
</tr>
<tr>
<td>50,959</td>
<td></td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

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

Subcatchment P1a: Subject Property - Storm Sewer to Detention

Type III 24-hr 25-yr Rainfall=6.66"
Runoff Area=64,425 sf
Runoff Volume=31,326 cf
Runoff Depth=5.83"
Tc=5.0 min
CN=93
Summary for Subcatchment P1b: New Canaan Inn and Parking Areas - Storm Sewer Flow

Runoff = 18.09 cfs @ 12.27 hrs, Volume= 86,320 cf, Depth= 5.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.66"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 102,068</td>
<td>98</td>
<td>Impervious Area</td>
</tr>
<tr>
<td>103,483</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>205,551</td>
<td>86</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>103,483</td>
<td></td>
<td>Pervious Area</td>
</tr>
<tr>
<td>102,068</td>
<td></td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

Tc (min) Length (feet) Slope (ft/ft) Velocity (ft/sec) Capacity (cfs) Description
20.7 Direct Entry, same as existgn

Subcatchment P1b: New Canaan Inn and Parking Areas - Storm Sewer Flow

Type III 24-hr 25-yr Rainfall=6.66"
Runoff Area=205,551 sf
Runoff Volume=86,320 cf
Runoff Depth=5.04"
Tc=20.7 min
CN=86
**Summary for Subcatchment P1c: Total Overland Flow**

Runoff = 2.51 cfs @ 12.11 hrs, Volume = 8,212 cf, Depth = 4.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span = 0.00-30.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-yr Rainfall = 6.66"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,373</td>
<td>98</td>
<td>Impervious Area</td>
</tr>
<tr>
<td>18,681</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>23,054</td>
<td>79</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>18,681</td>
<td></td>
<td>Pervious Area</td>
</tr>
<tr>
<td>4,373</td>
<td></td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

Tc | Length | Slope | Velocity | Capacity | Description
---|--------|-------|----------|----------|-----------------|
7.5 | 90     | 0.0700| 0.20     |          | Sheet Flow, AB
Grass: Dense n = 0.240 P2 = 3.58"

**Subcatchment P1c: Total Overland Flow**

Type III 24-hr 25-yr Rainfall = 6.66"
Runoff Area = 23,054 sf
Runoff Volume = 8,212 cf
Runoff Depth = 4.27"
Flow Length = 90'
Slope = 0.0700 '/'
Tc = 7.5 min
CN = 79
Summary for Pond DET: Detention System

Inflow Area = 64,425 sf, 79.10% Impervious, Inflow Depth = 5.83" for 25-yr event
Inflow = 9.67 cfs @ 12.07 hrs, Volume= 31,326 cf
Outflow = 2.63 cfs @ 12.41 hrs, Volume= 31,292 cf, Attenuation 73%, Lag= 20.1 min
Primary = 2.63 cfs @ 12.41 hrs, Volume= 31,292 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 72.78' @ 12.41 hrs  Surf.Area= 2,160 sf  Storage= 11,837 cf

Plug-Flow detention time= 104.6 min calculated for 31,292 cf (100% of inflow)
Center-of-Mass det. time= 103.9 min (873.1 - 769.2)

<table>
<thead>
<tr>
<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>67.30'</td>
<td>12,960 cf</td>
<td>8.00'W x 90.00'L x 6.00'H Box Culverts x 3</td>
</tr>
</tbody>
</table>

Device | Routing | Invert | Outlet Devices |
--------|---------|--------|----------------|
#1      | Primary | 67.30' | 4.0' Vert. Low Flow Orifice C= 0.600 |
#2      | Primary | 70.60' | 6.0' Vert. Low Flow Orifice C= 0.600 |
#3      | Primary | 72.70' | 4.0' long x 5.00' rise Overflow Weir 2 End Contraction(s) 2.0' Crest Height |

Primary OutFlow Max=2.58 cfs @ 12.41 hrs HW=72.78' (Free Discharge)
1=Low Flow Orifice (Orifice Controls 0.97 cfs @ 11.10 fps)
2=Low Flow Orifice (Orifice Controls 1.31 cfs @ 6.69 fps)
3=Overflow Weir (Weir Controls 0.30 cfs @ 0.93 fps)

Pond DET: Detention System

Inflow Area=64,425 sf  
Peak Elev=72.78'  
Storage=11,837 cf
Summary for Link SUM: Sum of Hydrographs

Inflow Area = 269,976 sf, 56.68% Impervious, Inflow Depth > 5.23" for 25-yr event
Inflow = 20.30 cfs @ 12.28 hrs, Volume= 117,612 cf
Primary = 20.30 cfs @ 12.28 hrs, Volume= 117,612 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link SUM: Sum of Hydrographs

Inflow Area=269,976 sf
APPENDIX C:

WATER QUALITY FLOW COMPUTATIONS
# Hydrodynamic Separator Sizing

65 Oenoke Ridge, New Canaan, CT

## Water Quality Flow (WQF) Calculation Worksheet

<table>
<thead>
<tr>
<th>Location</th>
<th>A (ft²)</th>
<th>Imperv. Area (ft²)</th>
<th>% Imperv.</th>
<th>R</th>
<th>WQF (ft²)</th>
<th>Q (Runoff Depth in)</th>
<th>P (Storm in)</th>
<th>CN Curve #</th>
<th>tₚ (hrs)</th>
<th>Iₚ</th>
<th>I Initial Abstract</th>
<th>qᵦ (Unit Discharge (cfs/m²))</th>
<th>WQF (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Detention System</td>
<td>64,425</td>
<td>50,959</td>
<td>79.1</td>
<td>0.782</td>
<td>4,090</td>
<td>0.782</td>
<td>1</td>
<td>98</td>
<td>0.08</td>
<td>0.041</td>
<td>650</td>
<td>1.14</td>
<td></td>
</tr>
<tr>
<td>Prior to Existing Storm Sewer</td>
<td>205,551</td>
<td>102,068</td>
<td>49.7</td>
<td>0.497</td>
<td>8,512</td>
<td>0.497</td>
<td>1</td>
<td>94</td>
<td>0.348</td>
<td>0.128</td>
<td>643</td>
<td>2.36</td>
<td></td>
</tr>
</tbody>
</table>

\[ CN = \frac{1000}{10 + 5P - 10Q - 10Q^2 + 1.22PQ^2} \]

where: \( CN \) = Runoff Curve Number

\( P \) = design precipitation, inches

\( Q \) = runoff depth (in wetted inches)

\[ WQF = (\eta_p)A(\Delta P) \]

where: \( WQF \) = water quality flow (cfs)

\( \eta_p \) = unit peak discharge (cfs/ft², 1.2 inch)

\( A \) = drainage area (ft²)

\( \Delta P \) = runoff depth (in wetted inches)

\[ = \frac{WQF(area - runooff depth)}{Drainage Area (acres)} \]

![Diagram](Image)

**Table 4-1:** \( I_p \) values for runoff curve numbers

<table>
<thead>
<tr>
<th>Curve number</th>
<th>( I_p ) (in)</th>
<th>Curve number</th>
<th>( I_p ) (in)</th>
<th>Curve number</th>
<th>( I_p ) (in)</th>
<th>Curve number</th>
<th>( I_p ) (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>0.00</td>
<td>55</td>
<td>0.15</td>
<td>70</td>
<td>0.25</td>
<td>85</td>
<td>0.35</td>
</tr>
<tr>
<td>44</td>
<td>0.07</td>
<td>60</td>
<td>0.19</td>
<td>75</td>
<td>0.30</td>
<td>90</td>
<td>0.40</td>
</tr>
<tr>
<td>48</td>
<td>0.23</td>
<td>65</td>
<td>0.23</td>
<td>80</td>
<td>0.35</td>
<td>95</td>
<td>0.45</td>
</tr>
<tr>
<td>52</td>
<td>0.43</td>
<td>70</td>
<td>0.30</td>
<td>90</td>
<td>0.50</td>
<td>100</td>
<td>0.60</td>
</tr>
</tbody>
</table>

**Exhibit 4-11:** Unit peak discharge \( q_u \) for NRCS (SCS) type III rainfall distribution
APPENDIX D:

STORMWATER FACILITIES MAINTENANCE PLAN
Stormwater Facilities Maintenance Plan
Proposed Site Development
65 Oenoke Ridge, New Canaan, CT

Scope:

The purpose of the Stormwater Facility Maintenance Plan is to insure that the proposed stormwater components installed at 65 Oenoke Ridge in New Canaan, CT are maintained in operational condition throughout the life of the project. The service procedures associated with this plan shall be performed as required by the parties legally responsible for their maintenance.

Recommended Frequency of Service:

All of the stormwater components installed for this property should be checked periodically and kept in full working order. Ultimately the frequency of inspection and service cleaning depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, trash, etc.); however it is recommended that each facility be inspected and cleaned a minimum of two times a year. The guidelines for the timing of service include early spring after the winter season and late fall after the leaves have fallen from the trees.

Service Procedures:

1. Catch Basins, Yard Drains & Trench Drains: All drainage basins shall be inspected and cleaned twice a year during the spring and fall service inspections. The cleaning shall include both removal of sediment from the sumps and removal of any trash and/or debris from the grate.

2. Roof Leaders: Roof drains shall be inspected twice a year during the spring and fall service inspections to ensure that roof leaders are kept free of leaves and debris. At a minimum, leaves should be cleaned from the roof drains during the fall service inspection.

3. Hydrodynamic Separators: The hydrodynamic separators shall be inspected twice a year during the spring and fall service inspections. Maintenance shall be conducted per the manufacturer’s specifications. The units shall be pumped clean with a vacuum truck when the level of sediment has reached 75% of capacity in the isolated sump.

4. Underground Detention System: The underground detention system shall be inspected twice a year during the spring and fall service inspections. Sediment load to the system should be minimized through proper maintenance of the upstream roof leaders and catch basins. These components should be maintained as described above, but more frequent maintenance may be required if excessive accumulation of sediment is observed. Sediment within the detention system should be removed with a vacuum truck when accumulation exceeds 3” in depth.

5. Manholes: All manholes shall be inspected and cleaned twice a year during the spring and fall service inspections. The cleaning shall include both removal of sediment and insuring that storm water can still effectively be routed through the inlet and outlet pipes.