STORMWATER MANAGEMENT PLAN

FOR

BENCHMARK TRADING OF MONROE LTD

912, 918, 926, & 928 MAIN STREET

MONROE, CONNECTICUT

JUNE 8, 2022
Revised August 11, 2022

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PROJECT NARRATIVE

This project consists of a 15.29-acre portion of a parcel located at 912, 918, 926, and 928 Main Street in Monroe, CT. It is proposed to develop the site as a 98,000 SF warehouse and office building. Proposed supporting improvements include vehicle parking areas, utility services, a wastewater disposal system, and stormwater management facilities.

Upland soils in the proposed development area consist of Hinckley Loamy Sand (HSG A), Charlton-Chatfield Complex (HSG B), and Haven Silt Loam (HSG B) soil types. The wetland soils consist primarily of Rippowam Fine Sandy Loam (HSG B/D) soils. The proposed development of the site will create a total of 3.91 acres of impervious area.

The drainage study area consists of 15.29 acres. The study area flows into a large wetland at the east side of the site. This wetland drains to the south in the West Branch of the Pequonnock River.

The storm water management system will consist of 2 stormwater systems. System 1 consists of 32 units of 4'x4'x4' concrete galleries which will collect and treat the runoff from 10,000 square feet of the building roof. System 2 will collect the runoff from the majority of the development area. This system will include a Hydrodynamic separator unit for primary treatment and a water quality detention basin. Each catch basin will have a 2' minimum sump with the last basin in the system equipped with a hooded trap.

The drainage analysis for the project was performed using the HydroCAD computer model using NOAA IDF data. Storm frequencies of 2, 10, 25 and 100 years have been evaluated. The emergency spillway outlet has been sized to handle a 100 year storm.

STORM WATER QUALITY CALCULATIONS

Water Quality Volume

This volume represents the amount of storm water runoff that should be captured and treated in order to remove the majority pollutants on an average annual basis. The study area includes the total project site along with any offsite area passing through. The building runoff will be collected separately and discharged to an infiltration system.

WQV = (1")(R)(A)/12
R = (0.05) + (0.009)(% impervious)

WQ Basin	Area	Imperv. Area	% Imperv.	R	WQV Required (cf)	WQV Proposed (cf)
1	15.29	3.91	25.57	.28	15,540	50,883

Ground Water Recharge Volume
This requirement is intended to maintain pre-development annual groundwater recharge volume by capturing and infiltrating the storm water runoff.
Ground water recharge will be provided through the water quality basin

GWV = DxAxI/12

Soil recharge depth calculation:
Soil group A =0.40

Area	% Imperv.	GWV Required (cf)	GWV Proposed (cf)
15.29	25.57%	5677	50,883

Stream Channel Protection
The design criteria will be to limit the 2 year 24 hour post development flow rate to 50% of the pre development 2 year 24 hour flow rate.

WQ Basin	2yr Exist	2yr Prop
1	0.00	0.00

Outlet Protection
The water quality basin outlet will be protected with a rip rap pad sized in accordance with the Connecticut Erosion Control guidelines

Outlet FE#8
24" pipe
Q 10yr =32.03cfs
Pad length (La) =(1.7)(Q)/Do2/3 +8Do =(1.7)(32.03)/(1.33) + 8(2) =57'
Pad width =3D +La =3(2) + 57 =63'

Outlet SW basin
12" pipe
Q 10yr =0.25cfs
Pad length (La) =(1.7)(Q)/Do2/3 +8Do =(1.7)(0.25)/(0.66) + 8(.66) =6'
Pad width =3D +La =3(1) + 6 =9'

Conveyance Protection
In accordance with the Monroe land use regulations, all project drainage improvements have been designed to handle a minimum 25 year storm event with outlet overflow from the basin designed to handle a 100 year storm. Reference is made to complete drainage report for supporting documentation. An overflow from the parking area to the WQ basins has been provided to assure that the 100 year storm event will flow through the basin.

Peak Runoff Attenuation
The storm management system for this project will control post development peak runoff for the 2, 10, 25 and 100 year storm events to levels less than or equal to the pre development rates...

Emergency Outlet Protection
The emergency outlet control have been designed to handle a 100 year storm event. See Drainage Summary Addendum attached to this report as well as the complete Drainage Report for supporting documentation.

Downstream Analysis
The drainage study for this project has also looked at the overall project impact to downstream off site water courses. Peak runoff from the total site will not exceed pre development levels. See Drainage Summary Addendum attached to this report as well as the complete Drainage Report for supporting documentation.

SUMMARY TOTAL STUDY AREA

	2 YR EXIST	**2 YR PROP**	10 YR EXIST	**10 YR PROP**	25 YR EXIST	**25 YR PROP**	100 YR EXIST	**100 YR PROP**
Q	0.00	**0.00**	0.40	**0.38**	1.69	**1.36**	5.84	**5.33**

ADDENDUM #1
EROSION AND SEDIMENT CONTROL PLAN

A. GENERAL STATEMENT

1. Work on this project is expected to commence upon approval by the Planning and Zoning Commission. Final stabilization shall be completed as soon as possible after completion of work. In all cases disturbed areas shall be stabilized by the end of the growing season so that grass cover can be established. Construction shall be completed in accordance with the attached schedule.

2. The Storm Pollution control program for this site shall include the following as shown on the approved map:

a. Installation of a filter fence as shown on the plan.
b. Installation of anti-tracking apron on the driveways and at entrance to the roads.
c. Installation of detention/sediment basins and traps

3. Prior to any construction on the site, a pre-construction meeting shall be held with the owner, contractor, design engineer, and the authorized town official to review the site and the required erosion/ sedimentation and storm pollution control program.

4. The approved site plans, erosion control plan, engineering report and land use applications are considered part of this plan.

B. SCHEDULING OF GRADING AND CONSTRUCTION ACTIVITIES

Prior to starting construction on the site, all erosion and sediment control measures shall be installed as directed by the design engineer, permittee and/or authorized town agent. Detailed plans have been provided. Detailed construction sequencing has been included on the sheet for each phase.

Construction sequence:
A detailed construction sequence has been included on the Erosion Control Plan.

C. MEASURES TO BE USED DURING CONSTRUCTION

1. SILT FENCE

Silt fence consists of wooden post and filter fabric. Fences will be secured in place by wood posts set a maximum of five feet on-center. The filter fabric will be three feet in height. Fabric at the base of the fence will be buried at least six inches into the ground. Twine will be used to secure the fence on the uphill side to prevent overturning. The purpose of silt fences is to intercept and detain sediment contained in overland runoff from disturbed areas of limited extent. (Envirofence by Mirafi Inc. is an acceptable alternative to the system described above.)

Installation and Maintenance shall conform to the following:

Sediment will be removed from behind silt fences when sediment has accumulated to 50% of original height of the fence.

2. ANTI-TRACKING APRON

A ramp of crushed stone extending a minimum distance of 50 feet will be installed at the point of ingress and egress to the site. The purpose of the device is to minimize the potential of tracking mud from the site onto public right-of-way.

Installation and Maintenance shall conform to the following:
Minimum length will be 50 feet.

Stone size will meet CT DOT standards for two inch crushed gravel.
Stone will be placed upon the full width of the entrance roads.
Thickness of stone will be four inches or greater.
All sediment spilled, dropped, washed, or tracked onto public right-of-way will be removed immediately.

3. TEMPORARY WATER BREAKS

This temporary device consists of a swale constructed across proposed roadways. The purpose of this device is to direct runoff away from the road surface and minimize sediment from entering the drainage system. This shortens the length of disturbed slope by intercepting runoff and diverting it away from the roadway catch basins.

Installation and Maintenance shall conform to the following:
Swales will be placed across roads, which are to be constructed in fill:
Every 200 feet on slopes of 5-10%
Every 300 feet on slopes less than 5%
Contributory drainage areas, which are less than five acres.
Swales drain to hay bale check dams.

4. HAY BALE CHECK DAMS

Hay bale check dams of tightly bound, steel pin anchored, hay bales embedded four inches below grade in drainage swales adjacent to roadways or at the toe of an exposed slope. The purpose of a hay bale check dam is to reduce runoff velocity, and promote deposition and filtering of sediment from runoff. Hay bale check dams will be used where the runoff velocities will be less than three feet per second.

Installation and Maintenance shall conform to the following:
Compacted backfill will be placed against the up slope side of the Hay bales to a height of 4" above the ground.
Check dams will be placed in drainage swales:
Every 100 feet on slopes greater than 10%
Every 200 feet on slopes 5-10%
Every 300 feet on slopes less than 5%
Sediment shall be removed from hay bale check dams when sediment has accumulated to 50% of the original height.

5. TEMPORARY SEDIMENT TRAPS

Runoff collected in roadway interceptor swales or other swales will be directed to a sediment trap. The trap consists of a small excavation and/or embankment. The purpose of the trap is to collect runoff, promote settling of sediment, and de-concentrate and distribute clean runoff overland through natural vegetation before it enters existing watercourses and wetlands.

Installation and Maintenance shall conform to the following:
Contributory drainage areas that are less than or equal to five acres.
Utilized as part of swales prior to discharge to natural slopes.
Traps will be placed such that runoff discharging from the trap will flow at least 30 feet overland through natural vegetation before entering stream channels or wetlands.
Traps will be designed before construction.
Trap sides shall be compacted during construction.
The trap outlet shall have crushed stone rip-rap hand placed for energy dissipation.
Traps will be cleaned when sediment has accumulated to 50% of design volume.
Remove sediment deposited upland and treat to reduce potential erosion.

6. CATCH BASIN FILTERS

Temporary catch basin filters will be utilized to prevent the deposition of sediment into the storm

sewer system prior to the stabilization of exposed areas with vegetation and/or pavement. These filters will consist of tightly bound, pin-anchored hay bales embedded four inches below grade, surrounding each catch basin inlet.

Installation and Maintenance shall conform to the following:
Placed around each catch basin inlet prior to paving or stabilization with vegetation.
Sediment shall be removed from the filters when sediment has accumulated to 50% of the filter's original height.

7. TEMPORARY GRADE TO DRAINS
This is a temporary raised berm of compacted soil, placed across a disturbed slope that intercepts runoff from disturbed areas and directs it to an appropriate outlet. This device will be used mostly on steep slopes above deep excavations.

Installation and Maintenance shall conform to the following:
Temporary grade to drains may be placed on cut and fill slopes exceeding 10 feet in height.
Contributory drainage area should not be greater than one acre.
Runoff will be diverted overland by the berms to sediment traps, sedimentation basins, swales, or check dams.
On slopes over 5%, additional stabilization is required in the form of stone rip-rap eight inches vertically up the upslope side of the berm and seven feet upslope from the upslope toe of the berm.
Top width of berm will be two feet. Side slopes will be 2:1 or flatter.
All berms shall be machine compacted.

8. RIP-RAP OUTFALL PROTECTION
As a permanent erosion control measure to protect the soil surface from the erosive forces and to slow the velocity of concentrated runoff while enhancing the potential for infiltration, velocity reducers in the form of crushed stone rip-rap will be used at the outfalls of all drainage structures that discharge to wetlands or other sensitive areas. The minimum thickness of the rip-rap layer will be 1.5 times the maximum stone diameter but not less than six inches. Sizing the stone and determining the dimensions of the rip-rap pads will be completed upon further design of the project using the methods described in the Connecticut Guidelines for Soil Erosion and Sediment Control.

9. Names, addresses and phone numbers of all persons and organizations that will be responsible for the installation and maintenance of the erosion and sedimentation devices will be provided prior to any earth moving or any other construction activity.

10. Construction area to be kept clean from all litter, debris and other building materials collected and disposed of offsite in approved manner. All fuels, oils and other controlled chemicals to be stored in approved areas. Such areas to be bermed as necessary to prevent spills from entering open watercourses. Fueling of equipment shall not be allowed in other than approved areas. In the event of a fuel or chemical spill, immediate measures to be taken to control damage and local and state officials are to be notified immediately.

11. Where construction activities have permanently ceased or have temporarily been suspended for more than seven days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within three days. Areas that remain disturbed but inactive for at least thirty days shall receive temporary seeding in accordance with the guidelines.

D. MAINTENANCE PROGRAM DURING CONSTRUCTION

1. The designated site monitor will inspect disturbed areas of the construction activity that have not been finally stabilized, structural control measures, and locations where vehicles enter or exit the site at

least once every seven calendar days and within 24 hours of the end of a storm that is 0.1 inches or grater. Where sites have been temporarily or finally stabilized, such inspection shall be conducted at least once every month for three months.

2. Additional control measures will be installed and the plan revised as appropriate as soon as practicable after such inspection. Such modifications shall provide for timely implementation of any changes to the site within 24 hours and implementation of any changes to the plan with 3 calendar days following the inspection. The plan shall be revised and the site controls updated in accordance with sound engineering practices, and applicable state and local regulations.

3. All control measures shall be maintained in effective working condition throughout the construction period.

4. Control measures found to be in disrepair shall be repaired or replaced immediately.

5. Sediment removed from control structures will be disposed of in a neat manner and disposed of in areas designated by the authorized town official or design engineer.

6. A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Stormwater Pollution Control Plan, and actions taken shall be made and retained as part of the Plan for at least three years after the date of inspection. The permittee, or his authorized representative shall sign the report.

7. The owner, or his designated agent is assigned the responsibility for implementing this erosion and storm pollution control plan. This responsibility includes site inspections, preparation of reports, the installation and maintenance of control measures, informing all parties engaged on the construction site of the requirements and objectives of the plan, notifying the Planning and Zoning Commission of any transfer of this responsibility, and for conveying a copy of the Erosion and Sediment Control Plan and the Implementation Schedule for Erosion and Sedimentation Control if the title to the land is transferred.

E. POST-CONSTRUCTION STORM MANAGEMENT

1. After completion of site disturbance and satisfactory stabilization, all permanent control structures including detention basins, storm water ditches, and catch basins to be cleaned of all sediment and debris. At time of transfer of ownership and/or responsibility for controls, the new owner or designated agent shall be advised of the sedimentation control maintenance requirements for the project.

MAINTENANCE PROGRAM

Seasonal Site Inspection/Maintenance

1. In the spring sweep sand deposits from the driveway areas and deposit at

approved site. Inspect the water quality areas for excessive sediment buildup and remove as required.

2. In the fall, remove leaf debris from the site to avoid excessive loading of the water quality areas and rain gardens. Mow area, as required eliminating unwanted plant species.

3. All catchbasins to be inspected and cleaned yearly.

4. The infiltration gallery system to be inspected yearly. If there is significant sediment accumulation in sytem, the cleaning schedule for the catchbasins to be increased to 2 times per year.

F. REPORTING AND RECORD KEEPING REQUIREMENTS

1. The permittee shall retain copies of Stormwater Pollution Control Plans and all reports required by this general permit, and records of all data used to complete the registration to be authorized by this general permit, for a period of at least three years from the date that construction at the site is completed unless the commissioner specifies another time period in writing.

2. The permittee shall retain an updated copy of the Stormwater Pollution Control Plan required by this general permit at the construction site from the date construction is initiated at the site until the date construction at the site is completed.

3. Upon completion of construction, for sites authorized by the General Permit for the Discharge of Stormwater Associated with Commercial Activity or the General Permit for the Discharge of Stormwater Associated with Industrial Activity, the Stormwater Pollution Control Plan shall be kept as an appendix to the Stormwater Management Plan or Stormwater Pollution Prevention Plan (as applicable) for a period of at least three years from the date of completion of construction. A notice of termination form shall be completed by the permittee and forwarded to DEP upon completion of all site construction.

ADDENDUM #2
DRAINGE ANALYSIS

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQ Storm	Type II 24-hr		Default	24.00	1	1.00	2
2	2 YR	Type II 24-hr		Default	24.00	1	3.59	2
3	10 YR	Type II 24-hr		Default	24.00	1	5.57	2
4	25YR	Type II 24-hr		Default	24.00	1	6.81	2
5	100YR	Type II 24-hr		Default	24.00	1	8.72	2

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDITIONS Runoff Area=666,129 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,950' Tc=61.7 min CN=36 Runoff=0.00 cfs 0 cf

Subcatchment 2S: BYPASS BASIN Runoff Area=434,974 sf 0.00% Impervious Runoff Depth=0.00"
Tc=61.7 min CN=36 Runoff=0.00 cfs 0 cf

Subcatchment 3S: Q TO WQ BASIN Runoff Area=221,155 sf 72.47% Impervious Runoff Depth=0.11"
Tc=5.0 min CN=82 Runoff=0.74 cfs 2,104 cf

Subcatchment 4S: Q TO WQ BASIN Runoff Area=10,000 sf 100.00% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=98 Runoff=0.30 cfs 659 cf

Pond 5P: STORMWATER BASIN Peak Elev=430.65' Storage=2,592 cf Inflow=0.89 cfs 2,592 cf
Outflow=0.00 cfs 0 cf

Pond 6P: 4X4 DETENTION GALLERIES Peak Elev=433.26' Storage=0.007 af Inflow=0.30 cfs 659 cf
Outflow=0.16 cfs 488 cf

Link 7L: POC A Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,332,258 sf Runoff Volume = 2,763 cf Average Runoff Depth = 0.02"
87.22% Pervious = 1,161,982 sf 12.78% Impervious = 170,276 sf

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDITIONS Runoff Area=666,129 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,950' Tc=61.7 min CN=36 Runoff=0.00 cfs 4 cf

Subcatchment 2S: BYPASS BASIN Runoff Area=434,974 sf 0.00% Impervious Runoff Depth=0.00"
Tc=61.7 min CN=36 Runoff=0.00 cfs 2 cf

Subcatchment 3S: Q TO WQ BASIN Runoff Area=221,155 sf 72.47% Impervious Runoff Depth=1.86"
Tc=5.0 min CN=82 Runoff=16.93 cfs 34,227 cf

Subcatchment 4S: Q TO WQ BASIN Runoff Area=10,000 sf 100.00% Impervious Runoff Depth=3.36"
Tc=5.0 min CN=98 Runoff=1.18 cfs 2,797 cf

Pond 5P: STORMWATER BASIN Peak Elev=432.38' Storage=36,851 cf Inflow=17.47 cfs 36,851 cf
Outflow=0.00 cfs 0 cf

Pond 6P: 4X4 DETENTION GALLERIES Peak Elev=434.08' Storage=0.017 af Inflow=1.18 cfs 2,797 cf
Outflow=0.61 cfs 2,624 cf

Link 7L: POC A Inflow=0.00 cfs 2 cf
Primary=0.00 cfs 2 cf

Total Runoff Area = 1,332,258 sf Runoff Volume = 37,030 cf Average Runoff Depth = 0.33"
87.22% Pervious = 1,161,982 sf 12.78% Impervious = 170,276 sf

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDITIONS Runoff Area=666,129 sf 0.00% Impervious Runoff Depth=0.21"
Flow Length=1,950' Tc=61.7 min CN=36 Runoff=0.40 cfs 11,381 cf

Subcatchment 2S: BYPASS BASIN Runoff Area=434,974 sf 0.00% Impervious Runoff Depth=0.21"
Tc=61.7 min CN=36 Runoff=0.26 cfs 7,432 cf

Subcatchment 3S: Q TO WQ BASIN Runoff Area=221,155 sf 72.47% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=82 Runoff=32.03 cfs 66,228 cf

Subcatchment 4S: Q TO WQ BASIN Runoff Area=10,000 sf 100.00% Impervious Runoff Depth=5.33"
Tc=5.0 min CN=98 Runoff=1.84 cfs 4,444 cf

Pond 5P: STORMWATER BASIN Peak Elev=433.51' Storage=63,213 cf Inflow=32.75 cfs 70,297 cf
Outflow=0.25 cfs 10,163 cf

Pond 6P: 4X4 DETENTION GALLERIES Peak Elev=434.81' Storage=0.026 af Inflow=1.84 cfs 4,444 cf
Outflow=0.83 cfs 4,069 cf

Link 7L: POC A Inflow=0.38 cfs 17,594 cf
Primary=0.38 cfs 17,594 cf

Total Runoff Area = 1,332,258 sf Runoff Volume = 89,485 cf Average Runoff Depth = 0.81"
87.22% Pervious = 1,161,982 sf 12.78% Impervious = 170,276 sf

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDITIONS Runoff Area=666,129 sf 0.00% Impervious Runoff Depth=0.50"
Flow Length=1,950' Tc=61.7 min CN=36 Runoff=1.69 cfs 27,954 cf

Subcatchment 2S: BYPASS BASIN Runoff Area=434,974 sf 0.00% Impervious Runoff Depth=0.50"
Tc=61.7 min CN=36 Runoff=1.11 cfs 18,254 cf

Subcatchment 3S: Q TO WQ BASIN Runoff Area=221,155 sf 72.47% Impervious Runoff Depth=4.74"
Tc=5.0 min CN=82 Runoff=41.63 cfs 87,326 cf

Subcatchment 4S: Q TO WQ BASIN Runoff Area=10,000 sf 100.00% Impervious Runoff Depth=6.57"
Tc=5.0 min CN=98 Runoff=2.25 cfs 5,476 cf

Pond 5P: STORMWATER BASIN Peak Elev=434.05' Storage=76,818 cf Inflow=42.45 cfs 92,176 cf
Outflow=0.39 cfs 20,549 cf

Pond 6P: 4X4 DETENTION GALLERIES Peak Elev=435.31' Storage=0.033 af Inflow=2.25 cfs 5,476 cf
Outflow=0.95 cfs 4,850 cf

Link 7L: POC A Inflow=1.36 cfs 38,803 cf
Primary=1.36 cfs 38,803 cf

Total Runoff Area = 1,332,258 sf Runoff Volume = 139,010 cf Average Runoff Depth = 1.25"
87.22% Pervious = 1,161,982 sf 12.78% Impervious = 170,276 sf

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EXISTING CONDITIONS Runoff Area=666,129 sf 0.00% Impervious Runoff Depth=1.16"
Flow Length=1,950' Tc=61.7 min CN=36 Runoff=5.84 cfs 64,534 cf

Subcatchment 2S: BYPASS BASIN Runoff Area=434,974 sf 0.00% Impervious Runoff Depth=1.16"
Tc=61.7 min CN=36 Runoff=3.81 cfs 42,140 cf

Subcatchment 3S: Q TO WQ BASIN Runoff Area=221,155 sf 72.47% Impervious Runoff Depth=6.55"
Tc=5.0 min CN=82 Runoff=56.43 cfs 120,637 cf

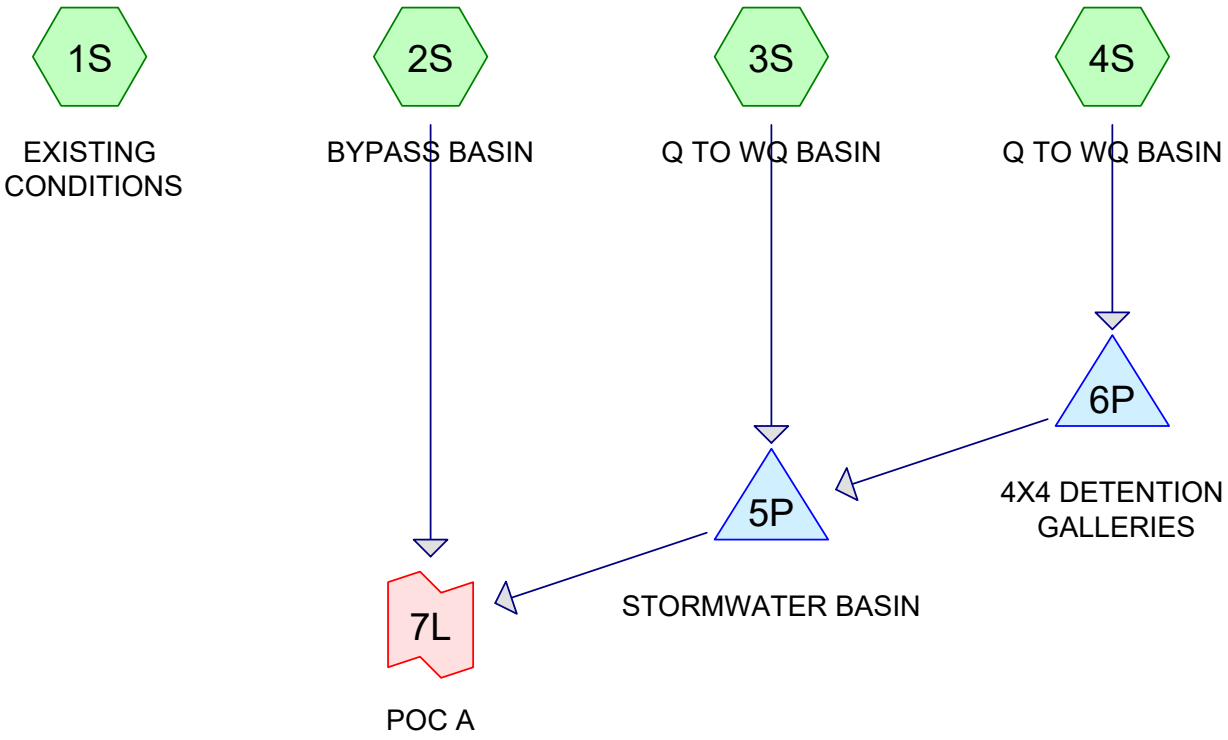
Subcatchment 4S: Q TO WQ BASIN Runoff Area=10,000 sf 100.00% Impervious Runoff Depth=8.48"
Tc=5.0 min CN=98 Runoff=2.89 cfs 7,066 cf

Pond 5P: STORMWATER BASIN Peak Elev=434.46' Storage=87,850 cf Inflow=57.38 cfs 126,943 cf
Outflow=2.17 cfs 48,916 cf

Pond 6P: 4X4 DETENTION GALLERIES Peak Elev=436.13' Storage=0.043 af Inflow=2.89 cfs 7,066 cf
Outflow=1.08 cfs 6,306 cf

Link 7L: POC A Inflow=5.33 cfs 91,056 cf
Primary=5.33 cfs 91,056 cf

Total Runoff Area = 1,332,258 sf Runoff Volume = 234,377 cf Average Runoff Depth = 2.11"
87.22% Pervious = 1,161,982 sf 12.78% Impervious = 170,276 sf



Subcat Reach Pond Link

Routing Diagram for 8682 BENCHMARK 081022
Prepared by {enter your company name here}, Printed 8/12/2022

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
60,879	39	>75% Grass cover, Good, HSG A (3S)
170,276	98	Unconnected pavement, HSG A (3S, 4S)
1,101,103	36	Woods, Fair, HSG A (1S, 2S)

Summary for Subcatchment 1S: EXISTING CONDITIONS

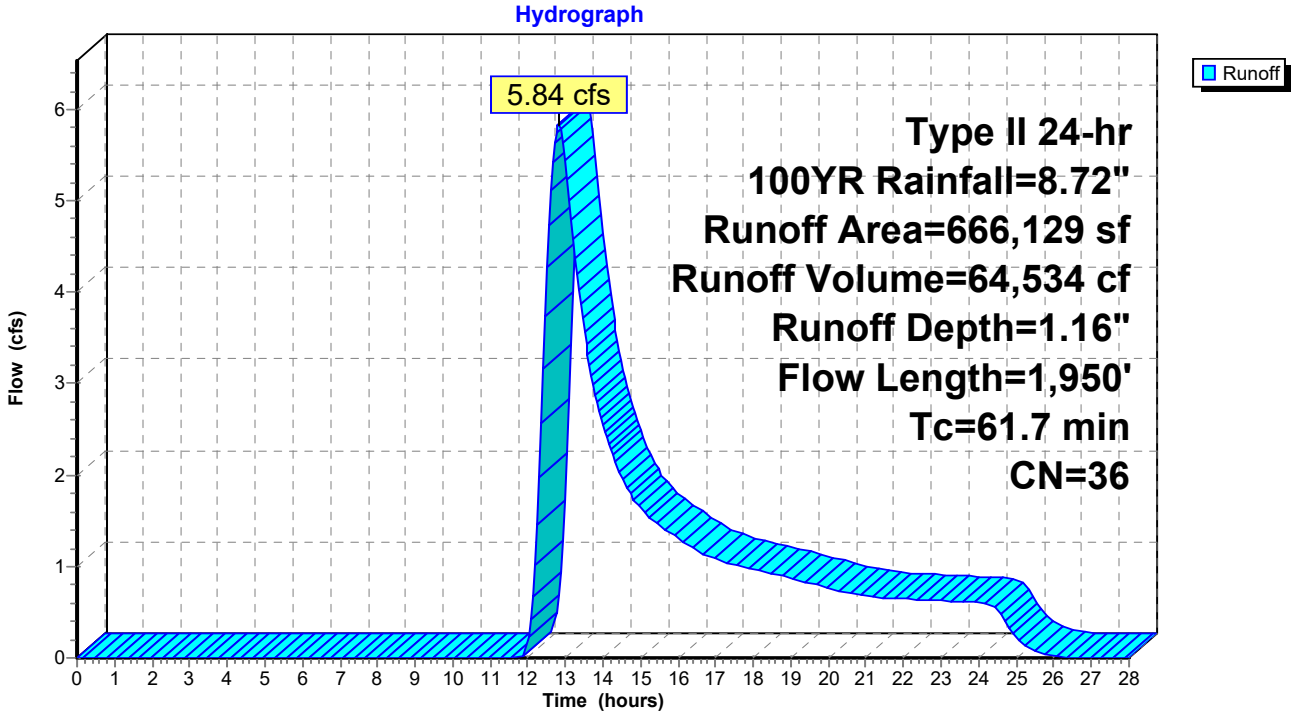
Runoff = 5.84 cfs @ 12.82 hrs, Volume= 64,534 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type II 24-hr 100YR Rainfall=8.72"

Area (sf)	CN	Description
666,129	36	Woods, Fair, HSG A
666,129		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.0	150	0.0200	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.59"
11.8	700	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.9	1,100	0.0020	0.84	4.19	**Channel Flow,** Area= 5.0 sf Perim= 10.0' r= 0.50' n= 0.050 Sluggish weedy reaches w/pools
61.7	1,950	Total			

Subcatchment 1S: EXISTING CONDITIONS



Summary for Subcatchment 2S: BYPASS BASIN

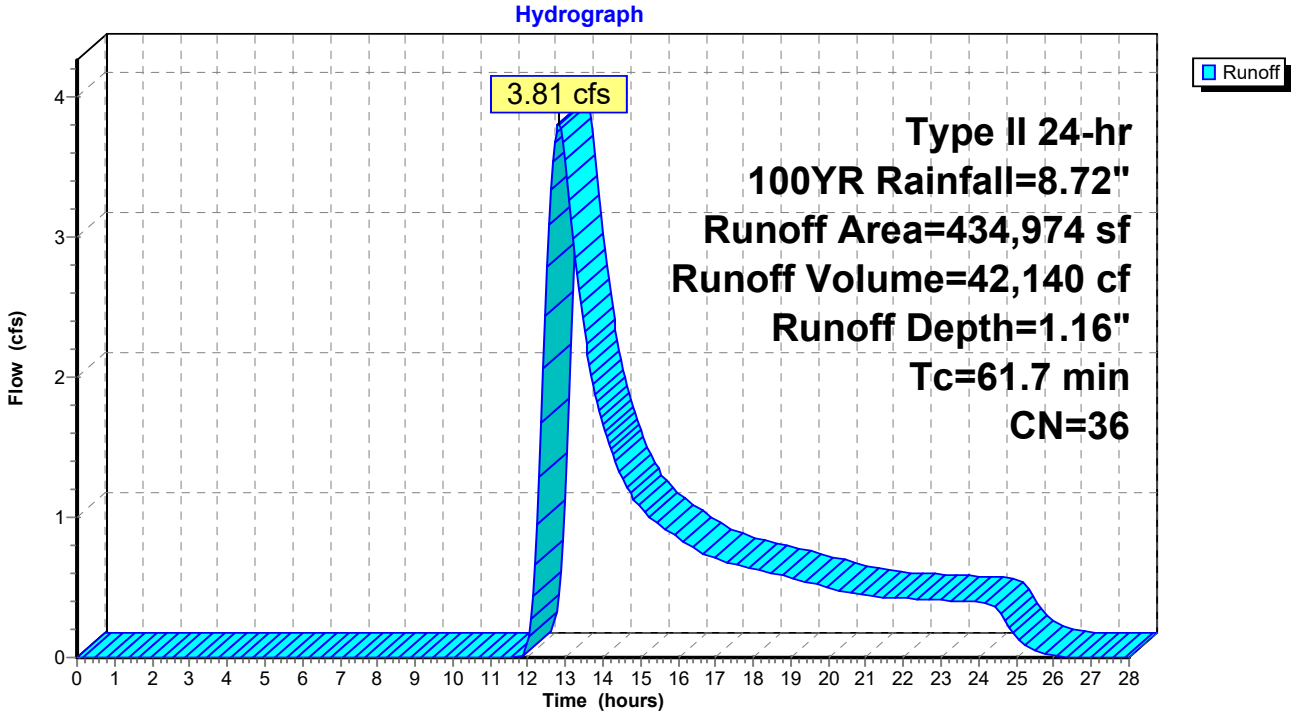
Runoff = 3.81 cfs @ 12.82 hrs, Volume= 42,140 cf, Depth= 1.16"
Routed to Link 7L : POC A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type II 24-hr 100YR Rainfall=8.72"

Area (sf)	CN	Description
434,974	36	Woods, Fair, HSG A
434,974		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
61.7					**Direct Entry, SAME AS EXISTING**

Subcatchment 2S: BYPASS BASIN



Summary for Subcatchment 3S: Q TO WQ BASIN

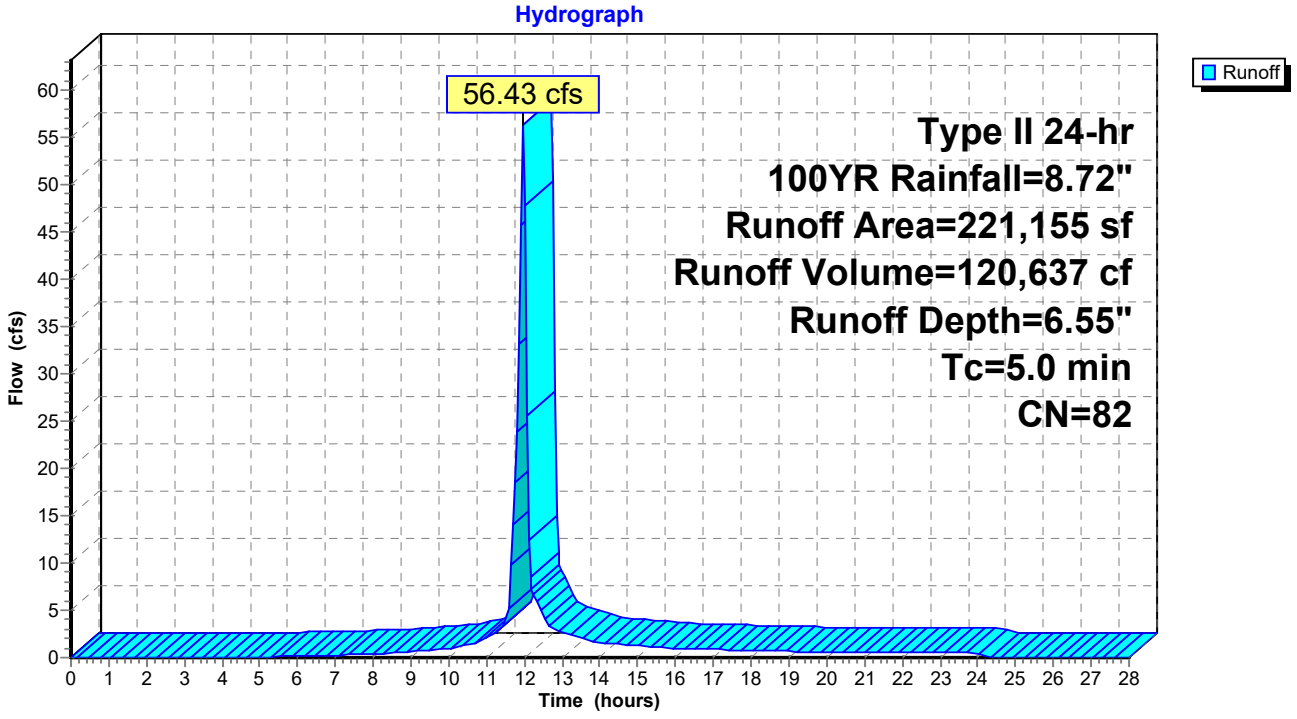
Runoff = 56.43 cfs @ 11.95 hrs, Volume= 120,637 cf, Depth= 6.55"
Routed to Pond 5P : STORMWATER BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type II 24-hr 100YR Rainfall=8.72"

Area (sf)	CN	Description
160,276	98	Unconnected pavement, HSG A
60,879	39	>75% Grass cover, Good, HSG A
221,155	82	Weighted Average
60,879		27.53% Pervious Area
160,276		72.47% Impervious Area
160,276		100.00% Unconnected

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

Subcatchment 3S: Q TO WQ BASIN



Summary for Subcatchment 4S: Q TO WQ BASIN

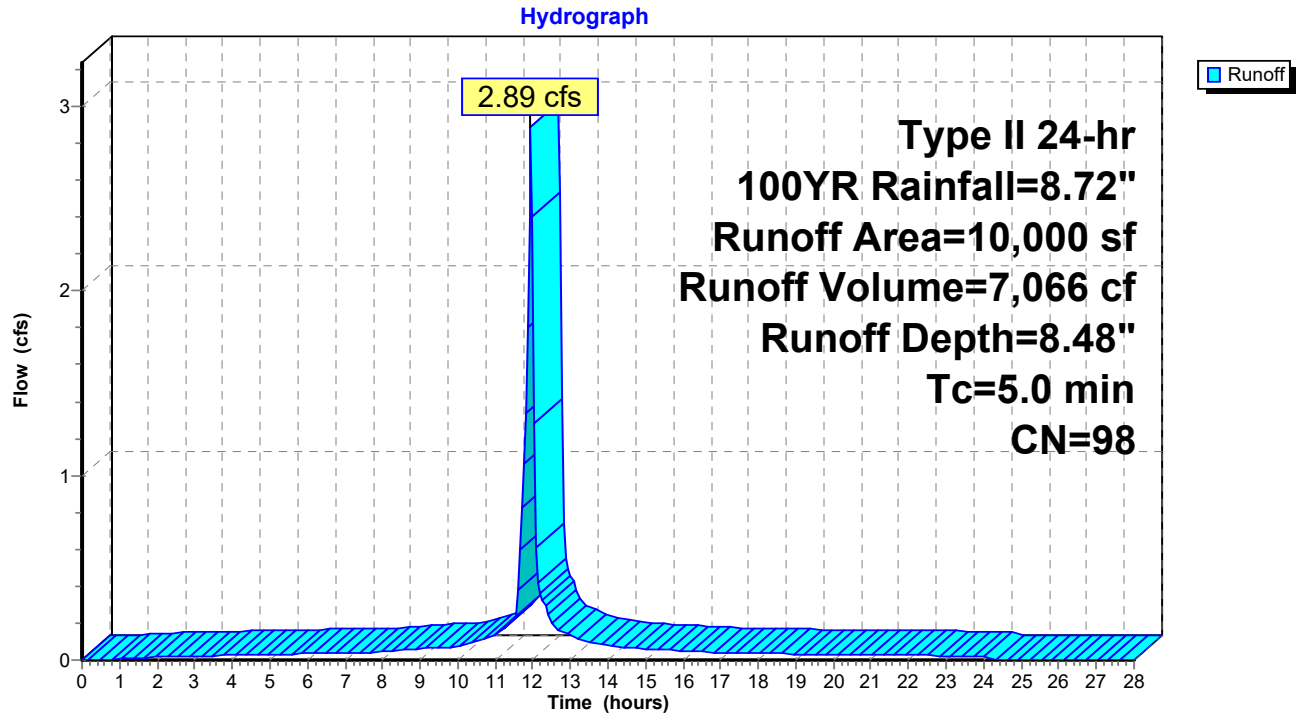
Runoff = 2.89 cfs @ 11.95 hrs, Volume= 7,066 cf, Depth= 8.48"
Routed to Pond 6P : 4X4 DETENTION GALLERIES

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type II 24-hr 100YR Rainfall=8.72"

Area (sf)	CN	Description
10,000	98	Unconnected pavement, HSG A
10,000		100.00% Impervious Area
10,000		100.00% Unconnected

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

Subcatchment 4S: Q TO WQ BASIN



Summary for Pond 5P: STORMWATER BASIN

Inflow Area = 231,155 sf, 73.66% Impervious, Inflow Depth > 6.59" for 100YR event
Inflow = 57.38 cfs @ 11.95 hrs, Volume= 126,943 cf
Outflow = 2.17 cfs @ 13.49 hrs, Volume= 48,916 cf, Atten= 96%, Lag= 92.2 min
Primary = 2.17 cfs @ 13.49 hrs, Volume= 48,916 cf
Routed to Link 7L : POC A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Peak Elev= 434.46' @ 13.49 hrs Surf.Area= 27,151 sf Storage= 87,850 cf

Plug-Flow detention time= 413.7 min calculated for 48,829 cf (38% of inflow)
Center-of-Mass det. time= 287.5 min (1,078.1 - 790.5)

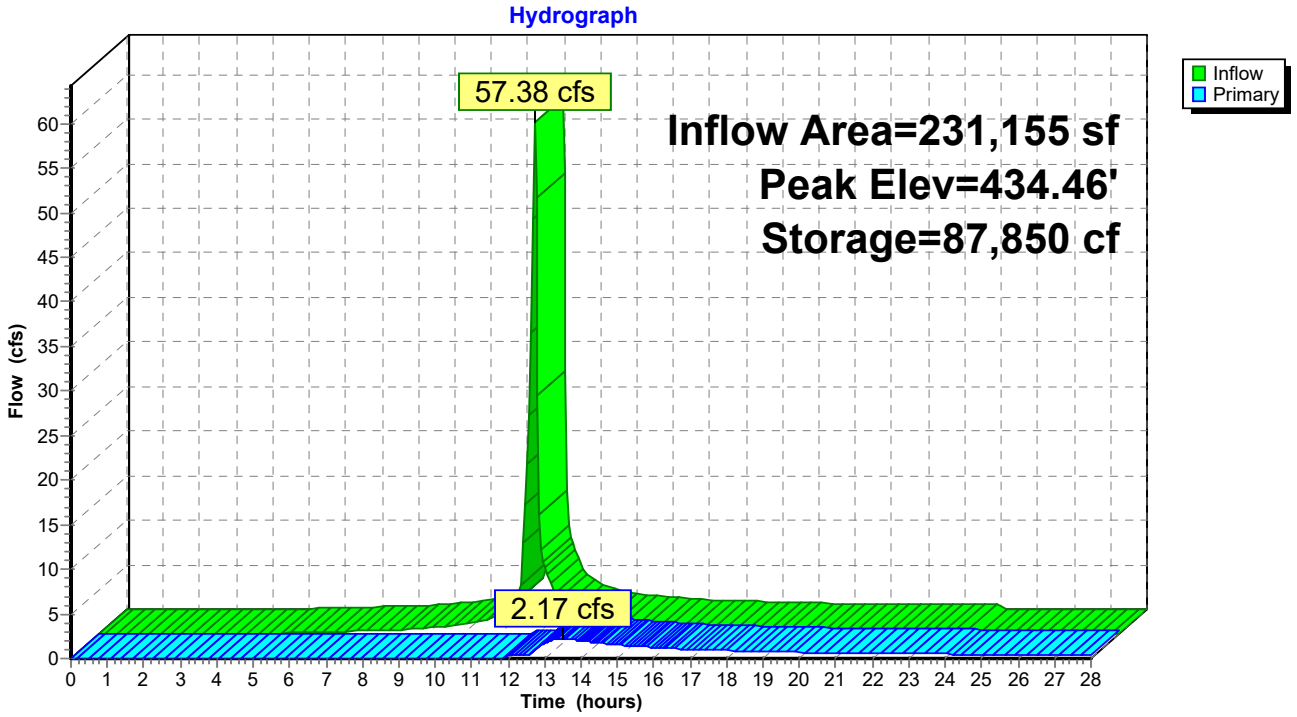
Volume	Invert	Avail.Storage	Storage Description
#1	430.50'	88,898 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
430.50	17,313	0	0
432.50	22,168	39,481	39,481
434.50	27,249	49,417	88,898

Device	Routing	Invert	Outlet Devices
#1	Primary	433.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	434.30'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.17 cfs @ 13.49 hrs HW=434.46' TW=0.00' (Dynamic Tailwater)
1=Orifice/Grate (Orifice Controls 0.48 cfs @ 5.48 fps)
2=Sharp-Crested Rectangular Weir (Weir Controls 1.69 cfs @ 1.31 fps)

Pond 5P: STORMWATER BASIN



Stage-Discharge for Pond 5P: STORMWATER BASIN

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
430.50	0.00	431.56	0.00	432.62	0.00	433.68	0.30
430.52	0.00	431.58	0.00	432.64	0.00	433.70	0.31
430.54	0.00	431.60	0.00	432.66	0.00	433.72	0.31
430.56	0.00	431.62	0.00	432.68	0.00	433.74	0.32
430.58	0.00	431.64	0.00	432.70	0.00	433.76	0.32
430.60	0.00	431.66	0.00	432.72	0.00	433.78	0.33
430.62	0.00	431.68	0.00	432.74	0.00	433.80	0.33
430.64	0.00	431.70	0.00	432.76	0.00	433.82	0.34
430.66	0.00	431.72	0.00	432.78	0.00	433.84	0.34
430.68	0.00	431.74	0.00	432.80	0.00	433.86	0.35
430.70	0.00	431.76	0.00	432.82	0.00	433.88	0.35
430.72	0.00	431.78	0.00	432.84	0.00	433.90	0.36
430.74	0.00	431.80	0.00	432.86	0.00	433.92	0.36
430.76	0.00	431.82	0.00	432.88	0.00	433.94	0.37
430.78	0.00	431.84	0.00	432.90	0.00	433.96	0.37
430.80	0.00	431.86	0.00	432.92	0.00	433.98	0.38
430.82	0.00	431.88	0.00	432.94	0.00	434.00	0.38
430.84	0.00	431.90	0.00	432.96	0.00	434.02	0.39
430.86	0.00	431.92	0.00	432.98	0.00	434.04	0.39
430.88	0.00	431.94	0.00	433.00	0.00	434.06	0.40
430.90	0.00	431.96	0.00	433.02	0.00	434.08	0.40
430.92	0.00	431.98	0.00	433.04	0.00	434.10	0.41
430.94	0.00	432.00	0.00	433.06	0.01	434.12	0.41
430.96	0.00	432.02	0.00	433.08	0.02	434.14	0.41
430.98	0.00	432.04	0.00	433.10	0.02	434.16	0.42
431.00	0.00	432.06	0.00	433.12	0.03	434.18	0.42
431.02	0.00	432.08	0.00	433.14	0.04	434.20	0.43
431.04	0.00	432.10	0.00	433.16	0.06	434.22	0.43
431.06	0.00	432.12	0.00	433.18	0.07	434.24	0.44
431.08	0.00	432.14	0.00	433.20	0.08	434.26	0.44
431.10	0.00	432.16	0.00	433.22	0.10	434.28	0.44
431.12	0.00	432.18	0.00	433.24	0.11	434.30	0.45
431.14	0.00	432.20	0.00	433.26	0.13	434.32	0.53
431.16	0.00	432.22	0.00	433.28	0.14	434.34	0.66
431.18	0.00	432.24	0.00	433.30	0.15	434.36	0.84
431.20	0.00	432.26	0.00	433.32	0.17	434.38	1.05
431.22	0.00	432.28	0.00	433.34	0.17	434.40	1.29
431.24	0.00	432.30	0.00	433.36	0.18	434.42	1.55
431.26	0.00	432.32	0.00	433.38	0.19	434.44	1.84
431.28	0.00	432.34	0.00	433.40	0.20	434.46	2.15
431.30	0.00	432.36	0.00	433.42	0.21	434.48	2.47
431.32	0.00	432.38	0.00	433.44	0.22	434.50	**2.81**
431.34	0.00	432.40	0.00	433.46	0.23		
431.36	0.00	432.42	0.00	433.48	0.24		
431.38	0.00	432.44	0.00	433.50	0.24		
431.40	0.00	432.46	0.00	433.52	0.25		
431.42	0.00	432.48	0.00	433.54	0.26		
431.44	0.00	432.50	0.00	433.56	0.26		
431.46	0.00	432.52	0.00	433.58	0.27		
431.48	0.00	432.54	0.00	433.60	0.28		
431.50	0.00	432.56	0.00	433.62	0.28		
431.52	0.00	432.58	0.00	433.64	0.29		
431.54	0.00	432.60	0.00	433.66	0.30		

Stage-Area-Storage for Pond 5P: STORMWATER BASIN

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
430.50	17,313	0
430.55	17,434	869
430.60	17,556	1,743
430.65	17,677	2,624
430.70	17,798	3,511
430.75	17,920	4,404
430.80	18,041	5,303
430.85	18,163	6,208
430.90	18,284	7,119
430.95	18,405	8,037
431.00	18,527	8,960
431.05	18,648	9,889
431.10	18,770	10,825
431.15	18,891	11,766
431.20	19,012	12,714
431.25	19,134	13,667
431.30	19,255	14,627
431.35	19,376	15,593
431.40	19,498	16,565
431.45	19,619	17,543
431.50	19,741	18,527
431.55	19,862	19,517
431.60	19,983	20,513
431.65	20,105	21,515
431.70	20,226	22,523
431.75	20,347	23,538
431.80	20,469	24,558
431.85	20,590	25,585
431.90	20,711	26,617
431.95	20,833	27,656
432.00	20,954	28,700
432.05	21,076	29,751
432.10	21,197	30,808
432.15	21,318	31,871
432.20	21,440	32,940
432.25	21,561	34,015
432.30	21,683	35,096
432.35	21,804	36,183
432.40	21,925	37,276
432.45	22,047	38,376
432.50	22,168	39,481
432.55	22,295	40,593
432.60	22,422	41,711
432.65	22,549	42,835
432.70	22,676	43,965
432.75	22,803	45,102
432.80	22,930	46,246
432.85	23,057	47,395
432.90	23,184	48,551
432.95	23,311	49,714
433.00	23,438	50,883
433.05	23,565	52,058
433.10	23,692	53,239
433.15	23,819	54,427
433.20	23,946	55,621
433.25	24,073	56,822
433.30	24,200	58,028
433.35	24,327	59,242
433.40	24,454	60,461
433.45	24,581	61,687
433.50	24,709	62,919
433.55	24,836	64,158
433.60	24,963	65,403
433.65	25,090	66,654
433.70	25,217	67,912
433.75	25,344	69,176
433.80	25,471	70,446
433.85	25,598	71,723
433.90	25,725	73,006
433.95	25,852	74,295
434.00	25,979	75,591
434.05	26,106	76,893
434.10	26,233	78,202
434.15	26,360	79,516
434.20	26,487	80,838
434.25	26,614	82,165
434.30	26,741	83,499
434.35	26,868	84,839
434.40	26,995	86,186
434.45	27,122	87,539
434.50	**27,249**	**88,898**

Summary for Pond 6P: 4X4 DETENTION GALLERIES

Inflow Area = 10,000 sf,100.00% Impervious, Inflow Depth = 8.48" for 100YR event
Inflow = 2.89 cfs @ 11.95 hrs, Volume= 7,066 cf
Outflow = 1.08 cfs @ 12.02 hrs, Volume= 6,306 cf, Atten= 63%, Lag= 4.5 min
Primary = 1.08 cfs @ 12.02 hrs, Volume= 6,306 cf
Routed to Pond 5P : STORMWATER BASIN

Routing by Dyn-Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Peak Elev= 436.13' @ 12.07 hrs Surf.Area= 0.019 ac Storage= 0.043 af

Plug-Flow detention time= 103.0 min calculated for 6,295 cf (89% of inflow)
Center-of-Mass det. time= 48.1 min (783.1 - 735.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	432.50'	0.017 af	**6.40'W x 130.00'L x 4.50'H Field A** 0.086 af Overall - 0.043 af Embedded = 0.043 af x 40.0% Voids
#2A	433.00'	0.033 af	**Concrete Galley 4x4x4** x 32 Inside #1 Inside= 42.0"W x 43.0"H => 12.67 sf x 3.50'L = 44.3 cf Outside= 52.8"W x 48.0"H => 14.72 sf x 4.00'L = 58.9 cf
		0.050 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	433.00'	**8.0" Round Culvert** L= 98.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 433.00' / 428.27' S= 0.0483 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Device 1	433.00'	**5.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	436.50'	**8.0" Horiz. HIGH OVERFLOW** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.01 cfs @ 12.02 hrs HW=435.98' TW=433.60' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.01 cfs of 1.76 cfs potential flow)
└**2=Orifice** (Orifice Controls 1.01 cfs @ 7.42 fps)
└**3=HIGH OVERFLOW** (Controls 0.00 cfs)

Pond 6P: 4X4 DETENTION GALLERIES - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4 (Concrete Galley, UCPI 4x4x4 Galley or equivalent)
Inside= 42.0"W x 43.0"H => 12.67 sf x 3.50'L = 44.3 cf
Outside= 52.8"W x 48.0"H => 14.72 sf x 4.00'L = 58.9 cf

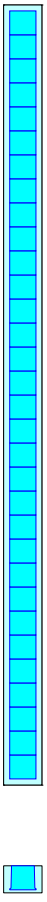
32 Chambers/Row x 4.00' Long = 128.00' Row Length +12.0" End Stone x 2 = 130.00' Base Length
1 Rows x 52.8" Wide + 12.0" Side Stone x 2 = 6.40' Base Width
6.0" Stone Base + 48.0" Chamber Height = 4.50' Field Height

32 Chambers x 44.3 cf = 1,419.0 cf Chamber Storage
32 Chambers x 58.9 cf = 1,884.0 cf Displacement

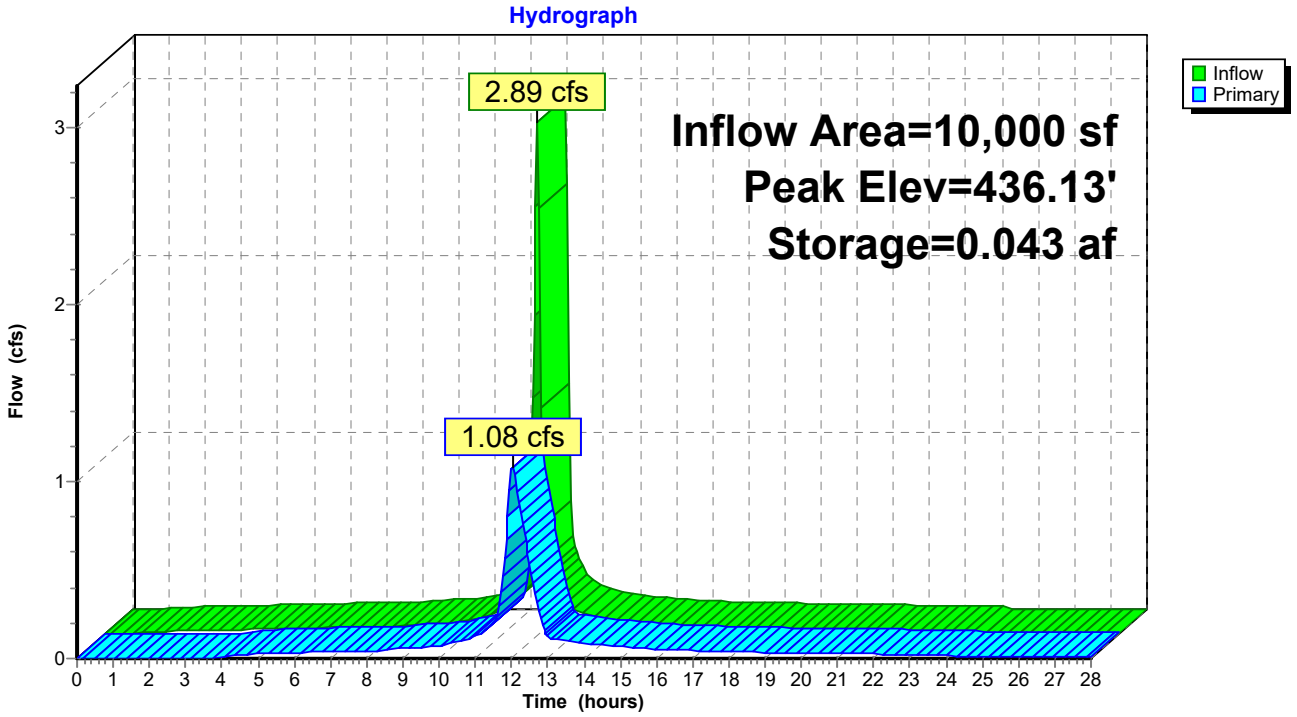
3,744.0 cf Field - 1,884.0 cf Chambers = 1,860.0 cf Stone x 40.0% Voids = 744.0 cf Stone Storage

Chamber Storage + Stone Storage = 2,163.0 cf = 0.050 af
Overall Storage Efficiency = 57.8%
Overall System Size = 130.00' x 6.40' x 4.50'

32 Chambers
138.7 cy Field
68.9 cy Stone



Pond 6P: 4X4 DETENTION GALLERIES



Stage-Discharge for Pond 6P: 4X4 DETENTION GALLERIES

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
432.50	0.00	435.15	0.91
432.55	0.00	435.20	0.93
432.60	0.00	435.25	0.94
432.65	0.00	435.30	0.95
432.70	0.00	435.35	0.96
432.75	0.00	435.40	0.97
432.80	0.00	435.45	0.98
432.85	0.00	435.50	0.99
432.90	0.00	435.55	1.00
432.95	0.00	435.60	1.02
433.00	0.00	435.65	1.03
433.05	0.01	435.70	1.04
433.10	0.03	435.75	1.05
433.15	0.06	435.80	1.06
433.20	0.10	435.85	1.07
433.25	0.15	435.90	1.08
433.30	0.20	435.95	1.09
433.35	0.25	436.00	1.10
433.40	0.29	436.05	1.11
433.45	0.32	436.10	1.12
433.50	0.35	436.15	1.13
433.55	0.38	436.20	1.14
433.60	0.41	436.25	1.15
433.65	0.44	436.30	1.15
433.70	0.46	436.35	1.16
433.75	0.48	436.40	1.17
433.80	0.51	436.45	1.18
433.85	0.53	436.50	1.19
433.90	0.55	436.55	1.28
433.95	0.57	436.60	1.43
434.00	0.58	436.65	1.62
434.05	0.60	436.70	1.84
434.10	0.62	436.75	2.08
434.15	0.64	436.80	2.16
434.20	0.65	436.85	2.25
434.25	0.67	436.90	2.32
434.30	0.69	436.95	2.40
434.35	0.70	437.00	**2.47**
434.40	0.72		
434.45	0.73		
434.50	0.75		
434.55	0.76		
434.60	0.77		
434.65	0.79		
434.70	0.80		
434.75	0.82		
434.80	0.83		
434.85	0.84		
434.90	0.85		
434.95	0.87		
435.00	0.88		
435.05	0.89		
435.10	0.90		

Stage-Area-Storage for Pond 6P: 4X4 DETENTION GALLERIES

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
432.50	0.000	435.15	0.031
432.55	0.000	435.20	0.031
432.60	0.001	435.25	0.032
432.65	0.001	435.30	0.032
432.70	0.002	435.35	0.033
432.75	0.002	435.40	0.034
432.80	0.002	435.45	0.034
432.85	0.003	435.50	0.035
432.90	0.003	435.55	0.036
432.95	0.003	435.60	0.036
433.00	0.004	435.65	0.037
433.05	0.004	435.70	0.037
433.10	0.005	435.75	0.038
433.15	0.006	435.80	0.039
433.20	0.006	435.85	0.039
433.25	0.007	435.90	0.040
433.30	0.007	435.95	0.040
433.35	0.008	436.00	0.041
433.40	0.009	436.05	0.042
433.45	0.009	436.10	0.042
433.50	0.010	436.15	0.043
433.55	0.011	436.20	0.044
433.60	0.011	436.25	0.044
433.65	0.012	436.30	0.045
433.70	0.013	436.35	0.045
433.75	0.013	436.40	0.046
433.80	0.014	436.45	0.047
433.85	0.014	436.50	0.047
433.90	0.015	436.55	0.048
433.95	0.016	436.60	0.048
434.00	0.016	436.65	0.048
434.05	0.017	436.70	0.049
434.10	0.018	436.75	0.049
434.15	0.018	436.80	0.049
434.20	0.019	436.85	0.049
434.25	0.019	436.90	0.049
434.30	0.020	436.95	0.049
434.35	0.021	437.00	**0.050**
434.40	0.021		
434.45	0.022		
434.50	0.022		
434.55	0.023		
434.60	0.024		
434.65	0.024		
434.70	0.025		
434.75	0.026		
434.80	0.026		
434.85	0.027		
434.90	0.027		
434.95	0.028		
435.00	0.029		
435.05	0.029		
435.10	0.030		

Summary for Link 7L: POC A

Inflow Area = 666,129 sf, 25.56% Impervious, Inflow Depth > 1.64" for 100YR event
Inflow = 5.33 cfs @ 12.97 hrs, Volume= 91,056 cf
Primary = 5.33 cfs @ 12.97 hrs, Volume= 91,056 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Link 7L: POC A