

***Stormwater Management Report
For
“Clearview”
At
“66 Park Hill Avenue”
Millbury, MA***



***Date: March 20, 2020
Revised: June 8, 2020***

Prepared For:
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TPE-1014

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Narrative:

The project proponent intends to construct 142 duplex units off of Park Hill Avenue in the town of Millbury. The project will also consist of the construction of 6,666 linear feet of roadway that will service the development. The project will also consist of extending the existing water main from North Main Street to the new development. Proposed sewer will be installed for the project and proposed sewer will be brought into the site off of Park Hill Avenue. The Proposed drainage will consist of drain manhole to catch basin design and will also have 3 open infiltration basins throughout the proposed development. Development of the property will be performed in compliance with the local Zoning By-Laws.

The itemized report that follows will document design compliance with the Massachusetts Stormwater Management Standards 1-10.

Date



Peter M. Lavoie

SITE LOCATION & DESCRIPTION

The site is located at 66 Park Hill Avenue. as shown on Figure, 1 in town of Millbury.

The project locus is a 117.46 acre parcel and is located at 66 Park Hill Avenue in Millbury Ma. The property consists of an existing golf course with club house, maintenance building, single family house, parking lot and golf course. The rest of the parcel is undeveloped and wooded.

PROJECT DESCRIPTION

The project proponent proposes to construct 142 duplex units, which consists of 71 buildings, 6,666 linear feet of proposed roadway consisting of 20-foot-wide and 24-foot-wide roadways with sidewalk on one side of the roadway. The project will also consist of installation all utilities in the proposed roadway, which are water, sewer, gas and underground electric, cable and phone. The developments drainage system will consist of catch basins to drain manholes, forebays, infiltration basins and settling basins.

DESCRIPTION OF PRE-DEVELOPMENT CONDITIONS

In its present condition the runoff from the site has 4 interest points. The Drainage analysis consists of four drainage area in the Pre-Development Conditions.

1. Drainage area E-1 is made up of a portion of the golf course and portion of Park Hill Avenue, which flows toward Park Hill Avenue toward the north. Please refer to the Pre-Development Plan.
2. Drainage Area E-2 is made up of a portion of golf course and portion of Park Hill Avenue that flows south.
3. Drainage Area E-3 is made up of golf course and wooded area that flows directly into the wetlands located toward the rear of the property.
4. Drainage Area E-4 is made up of portion of golf course that flow toward the abutters property line located toward the south of the project.

DESCRIPTION OF POST-DEVELOPMENT CONDITIONS

In the "Post Development" conditions there will be 7 general drainage areas. They are as follows:

1. Drainage Area P-1, with a total area of 517,758 sf and consists of grass, pavement, building and wooded areas. Area (P-1) will be graded so the runoff generated will be collected by Pond 1. The discharge of Pond 1 will be directed by a grass channel toward the wetlands located in the rear of the property.
2. Drainage Area P-2, with a total area of 741,585 sf and is made up of wooded, pavement, building and grass area. Area (P-2) will be graded so that the runoff generated will flow into Pond 2. The discharge of the Pond 2 will be directed into a settling basin prior to entering into wetlands that is located in the rear of the property.
3. Drainage Area P-3, with a total area of 435,541 sf. is made up of wooded, pavement, building and grass area. Area (P-3) will be graded so that the runoff generated will flow into Pond 3. The discharge of the Pond 3 will be directed into a grass channel prior to entering into wetlands that is located in the rear of the property.
4. Drainage Area P-4, with a total area of 108,220 s.f. is made up of roof area and grass area. The runoff generated will flow directly toward Park Hill Avenue.

5. Drainage Area P-5, with a total area of 211,392 sf. is made up a grass play field area. This area will flow directly into a grass channel that will collect runoff generated by the area and direct the runoff toward the wetlands located in the rear of property.
6. Drainage Area P-6, with a total area of 483,759 sf and is made up of wooded area and grass area. The runoff generated from this area will flow directly into the wetlands.
7. Drainage Area P-7, with a total area of 13,414 sf and is made up of paved area and grass area. The runoff generated from this area will flow directly down Park Hill avenue.

CALCULATION PROCEDURE

Procedures developed by the U. S. Department of Agriculture Soil Conservation Service (SCS) as found in Technical Release 20 (TR20), were used to determine the rates and volumes of runoff generated by the study area. Calculations were performed using the computer program "HydroCAD" by Applied Microcomputer Systems, which has incorporated these SCS procedures.

Calculations were completed utilizing the Two (2), Ten (10), Twenty-Five (25), and One Hundred-(100) Year storm events. Rainfall depths used for these storms were 3.4, 4.9, 5.6, 6.1 and 8.5 inches respectively. Calculation summaries are attached to this report.

SOIL MAPS

The SCS has also performed soil mapping of the Worcester County South. The soils mapping indicate that the site is located within Hydrologic Soil Group B & C. See the Pre & Post Development Plans and included in Appendix of this report.

POLLUTANT REMOVAL

This project will incorporate facilities that will collect stormwater pollutants. Treatment of pollutants will be accomplished by:

a. Forebay	25%
b. Infiltration Basins	80%
c. Settling Basin	25%
d. Catch Basins with 4-foot sumps	25%
e. Grass Swales with check dams	50%

(Refer to attached worksheets)

Standard 1: No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. --See Appendix-A for riprap cales.

Proposed – All new outfalls discharge stormwater treated in compliance with Standards 4 through 6. Evaluated at a 100-year 24-hour storm event (non-erosive to proposed receiving surface). In addition, the receiving surfaces of all new outfalls are to be armored with riprap stone as shown on the plan(s).

Standard 2: Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

To meet Standard 2, the post-development peak discharge rate must be equal to or less than pre-development rates to prevent storm damage and downstream and offsite flooding from the 2-year and the 10-year 24-hour storm events.

In summary of the detailed calculations attached, the peak discharge rates in cubic feet per second (cfs) are as follows;

See Appendix B for Summary of runoff to interest points during construction and when it is fully developed.

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

Hydrologic Group	Volume to Recharge x Total Impervious Area
A	0.60 inches of runoff
B	0.35 inches of runoff
C	0.25 inches of runoff
D	0.10 inches of runoff

Soils underlying the site are defined as map unit 420C, 102E, 102C, hydrologic soil group “B & C”. (*USDA/NRCS Soil Survey of Worcester County) - See Appendix C

The required volume of recharge for Full Build out of post-development conditions is calculated as follows;

Impervious area (B soils) = 497,011 sf

Required Recharge Volume

0.35 in. x 497,011 sf ÷ 12 in. = 14,496 cf

Total Recharge Volume = 14,496 cf

The volume of recharge provided for post-development conditions was calculated based on the "Static" method and is as follows;

Recharge is provided below the outlet of the infiltration basins. See Appendix D for infiltration calcs.

Recharge Volume Provided = Basin#1 = 22,890 c.f., Basin#2 = 5,972 c.f. and Basin#3=25,751 cf

Soils

"1982 Rawls Rates"

Loamy Sand – 1.02 in/hr

Calculations show that during a 100-year storm event, Basin#1 thru Basin#4 will completely dewater within 30 & 42 hours. This is in compliance with the maximum of 72 hours. Hydrocad Calculation in Appendix E.

At least 44% of the TSS must be removed prior to discharge to an infiltration basin if the discharge is within an area with a rapid infiltration rate (greater than 1.2 inches per hour). The area is not subject to rapid infiltration.

A groundwater mounding analysis is required when the vertical separation from the bottom of the exfiltration system to the seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm. The proposed detention basin have a separation to groundwater, greater than four (4) feet. A groundwater mounding analysis is not required.

Standard 4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

- a) *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
- b) *Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and*
- c) *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

The required Water Quality Volume, the runoff volume requiring 80% TSS removal, is calculated as follows:

The required water quality volume equals 0.5 inches of runoff times the total impervious area of the post-development site.

Total proposed impervious area = 384,011 sf

$$0.5 \text{ in.} \times 384,011 \text{ sf} \div 12 \text{ in.} = \underline{16,000 \text{ cubic feet Water Quality Volume required}}$$

$$\underline{\text{WQV treatment required} = 80\% \text{ TSS Removal}}$$

$$\underline{\text{and Basin\#1} = 7,391 \text{ cf, Basin\#2} = 4,863 \text{ cf, Basin\#3} = 8,318 \text{ cf}}$$

WQV is provided in Infiltration Basin
catch basin + 4' sump in manhole + forebay + Infiltration Basin + settling basin =
See table in Appendix F.

Standard 4 requires the development and implementation of suitable practices for source control and pollution prevention. These measures must be identified in a long-term pollution prevention plan.

The long-term pollution prevention plan is incorporated into the Operation and Maintenance Plan required by Standard 9. See Appendix G.

Standard 5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

The proposed project is NOT a use with higher potential pollutant loads.

Standard 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

The subject property does not discharge stormwater within the Zone II or Interim Wellhead Protection Area of a public water supply or to any other critical area.

Standard 7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable:

N/A – not a redevelopment project.

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

During land disturbance and construction activities, project proponents must implement controls that prevent erosion, control sediment movement, and stabilize exposed soils to prevent pollutants from moving offsite or entering wetlands or waters. Land disturbance activities include demolition, construction, clearing, excavation, grading, filling, and reconstruction.
Standard 8.

A. Names of Persons or Entity Responsible for Plan Compliance

Applicant: Eastland Partners, Inc.
4 Charlesview Road
Hopedale, MA 01747

B. Construction Period Pollution Prevention Measures

1. Inventory materials to be present on-site during construction.
2. Train employees and subcontractors in prevention and clean up procedures.
3. All materials stored on site will be stored in their appropriate containers and if possible, under a roof or covered.
4. Follow manufacturer's recommendation for disposal of used containers.
5. Store only enough product on site to do the job.
6. On site equipment, fueling and maintenance measures:
 - a. Inspect on-site vehicles and equipment daily for leaks.
 - b. Conduct all vehicle and equipment maintenance and refueling in front of building, away from storm drains.
 - c. Perform major repairs and maintenance off site.
 - d. Use drip pans, drip cloths or absorbent pads when replacing spent fuels.
 - e. Collect spent fuels and remove from site, per Local and State regulations.
 - f. Maintain a clean construction entrance where truck traffic is frequent to reduce soil compaction constant sweeping is required and limit tracking of sediment into streets, sweeping street when silt is observed on street.
7. Stock pile materials, and maintain Erosion Control around the materials where it can easily be accessed. Maintain easy access to clean up materials to include brooms, mops, rags gloves, goggles, sand, sawdust, plastic and metal trash containers.
8. Clean up spills.
 - a. Never hose down "dirty" pavement or impermeable surfaces where fluids have spilled. Use dry clean up methods (sawdust, cat litter and/or rags and absorbent pads).
 - b. Sweep up dry materials immediately. Never wash them away or bury them.
 - c. Clean up spills on dirt areas by digging up and properly disposing of contaminated soil in a certified container and notify a certified hauler for removal.
 - d. Report significant spills to the Fire Department.
9. It is the responsibility of the site superintendent or employees designated by the Applicant to inspect erosion control and repair as needed, also to inspect all on site vehicles for leaks and check all containers on site that may contain hazardous materials daily.

C. Erosion and Sedimentation Control Plan (Future and During Construction of Pad Sites);

1. See "Erosion Control Plans" for Clearview Estates, by Turning Point Engineering.

D. Site Development Plans (Future and During Construction of Pad Sites);

1. See "Grading Plans" for Clearview Estates prepared by Turning Point Engineering.

E. Construction Plans

1. Construction Sequencing
 - a. Prior to any work on the site including tree/brush clearing, the approved limit of clearing as well as the location of the proposed erosion control devices (such as silt fence/straw bales, etc.) must be staked on the ground under the direction of a Massachusetts registered Professional Land Surveyor.
 - b. Install silt fence/hay bales at locations
 - c. Strip off top and subsoil. Stockpile material to be reused away from the wetland, remove excess material from the site. Install and maintain erosion control barrier around stockpile.
 - d. Rough grade site, maintaining a temporary low area/sediment trap away from the wetland.

- e. Construct drainage outfalls and stilling basin. Stabilize side slopes with loam, seed and mulch.
 - f. Install underground utilities; protect all open drainage structures with erosion/siltation control devices.
 - g. Maintain all erosion control devices until site is stabilized.
 - h. The Contractor shall be responsible to schedule any required inspections of his/her work.
2. Construction Waste Management Plan
- a. Dumpster for trash and bulk waste collection shall be provided separately for construction.
 - b. Recycle materials whenever possible (paper, plaster cardboard, metal cans). Separate containers for material are recommended.
 - c. Segregate and provide containers for disposal options for waste.
 - d. Do not bury waste and debris on site.
 - e. Certified haulers will be hired to remove the dumpster container waste as needed. Recycling products will also be removed off site weekly.

F. Operation and Maintenance of Erosion and Sedimentation Controls

The operation and maintenance of sedimentation control shall be the responsibility of the contractor. The inspection and maintenance of the stormwater component shall be performed as noted below. The contractor shall have erosion control in place at all times. The contractor, based on future weather reports, shall prepare and inspect all erosion control devices; cleaning, repairing and upgrading is a priority so that the devices perform as per design. Inspect the site during rain events. Don't stay away from the site. At a minimum there should be inspection to assure the devices are not clogged or plugged, or that devices have not been destroyed or damaged during the rain event. After a storm event inspection is required to clean and repair any damage components. Immediate repair is required.

G. Inspection and Maintenance Schedules

- 1. Inspection must be conducted at least once every 7 days and within 24 hours of the end of a storm event 0.5 inches or greater.
- 2. Inspection frequency can be reduced to once a month if:
 - a. The site is temporarily stabilized.
 - b. Runoff is unlikely due to winter conditions, when site is covered with snow or ice.
- 3. Inspections must be conducted by qualified personnel, "qualified personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls and who possess the skills to assess the conditions and take measures to maintain and ensure proper operation, also to conclude if the erosion control methods selected are effective.
- 4. For each inspection, the inspection report must include: (See attached inspection and maintenance log)
 - a. The inspection date.
 - b. Names, titles of personnel making the inspection.
 - c. Weather information for the period since the last inspection.
 - d. Weather information at the time of the inspection.
 - e. Locations of discharges of sediment from the site, if any.
 - f. Locations of BMP's that need to be maintained.
 - g. Locations where additional BMP's may be required.
- 5. The owner, or their representative, such as the contractor, shall inspect the following in-place work;

Inspection Schedule:

Erosion Control	Weekly
Catch Basins (along front of Site)	Weekly
Temporary Sedimentation Traps/Basins	Weekly
Street Sweeping	Weekly

Please Note: Special inspections shall also be made after a significant rainfall event.

Maintenance Schedule

Erosion Control Devices Failure	Immediately
Catch Basins (along front of Site)	Sump 1/4 full of sediment
Street Sweeping	14 days minimum and prior to any significant rain event.

Please Note: Special maintenance shall also be made after a significant rainfall event.

H. Inspection and Maintenance Log Form, (Log Form Follows)

Standard 9: A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The following shall serve as the (O&M) Plan required by Standard 9, as well as the Long-Term Pollution Prevention Plan required by Standard 4. See Appendix H.

A. Names of Persons or Entity Responsible for Plan Compliance:

Applicant: Eastland Partners, Inc.
4 Charlesview Road
Hopedale, MA 01747

B. Good housekeeping practices

1. Maintain site, landscaping and vegetation.
2. Sweep and pick up litter on pavements and grounds.
3. Deliveries shall be monitored by owners or representative to ensure that if any spillage occurs, it shall be contained and cleaned up immediately.
4. Maintain pavement and curbing in good repair.

C. Requirements for routine inspections and maintenance of stormwater BMPs

1. Plans: The stormwater Operation and Maintenance Plan shall consist of all Plans, documents and all local state and federal approvals as required for the subject property.
2. Record Keeping:
 - a. Maintain a log of all operation and maintenance activities for at least three years following construction, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location);
 - b. Make this log available to MassDEP and the Conservation Commission upon request; and
 - c. Allow MassDEP and the Conservation Commission to inspect each BMP to determine whether the responsible party is implementing the Operation and Maintenance Plan.
3. Descriptions and Designs: The Best Management Practices (BMP) incorporated into the design include the following;

- a. Street Sweeping – Stipulated within the Construction Period Pollution Prevention Plan, the Long-Term Pollution Prevention Plan, and the Operation and Maintenance Plan. As the amount of TSS removal is discretionary, no credit was taken within the calculations for this BMP.
- b. Deep sump catch basins with hoods installed to promote TSS Removal of solids and control floatable pollutants. This BMP has a design rate of 25% TSS Removal.
- c. Sediment Forebay to promote TSS Removal of solids and control floatable pollutants. This BMP has a design rate of 25% TSS Removal.
- d. Infiltration basin to provide the required recharge as well as provide an additional 80% TSS Removal. Refer to TSS Removal Worksheet in Standard 4 for treatment train.
- e. Settling Basin with level spreader to promote TSS Removal of solids and control floatable pollutants. This BMP has a design rate of 25% TSS Removal
- 4. BMP Maintenance: After construction it is the responsibility of the owner to perform maintenance. The cleaning of the components of the stormwater management system shall generally be as follows:
 - a. Catch Basin: Shall be cleaned by excavating, pumping or vacuuming. The sediment shall be disposed of off-site by the Owner. Inspect quarterly, remove silt when $\frac{1}{4}$ full.
 - b. Forebay & Settling Basin: Shall be cleaned by excavating, pumping or vacuuming. The sediment shall be disposed of off-site by the Owner. Inspect quarterly, remove silt when $\frac{1}{4}$ full.
 - c. Infiltration Basin: Inspect twice per year and after every major event for the first few months.
- 5. Access Provisions: All of the components of the storm water system will be accessible by the Owner

D. Spill prevention and response plans

- 1. Inventory materials to be present on site during construction.
- 2. Train employees and subcontractors in prevention and clean up procedures.
- 3. All materials stored on site will be stored in their appropriate containers under a roof.
- 4. Follow manufacturers recommendation for disposal of used containers.
- 5. Store only enough product on site to do the job.
- 6. On site equipment, fueling and maintenance measures:
 - a. Inspect on-site vehicles and equipment daily for leaks.
 - b. Conduct all vehicle and equipment maintenance and refueling in one location, away from storm drains.
 - c. Perform major repairs and maintenance off site.
 - d. Use drip pans, drip cloths or absorbent pads when replacing spent fuels.
 - e. Collect spent fuels and remove from site.
- 7. Clean up spills.
 - a. Never hose down “dirty” pavement or impermeable surfaces where fluids have spilled. Use dry clean up methods (sawdust, cat litter and/or rags and absorbent pads).
 - b. Sweep up dry materials immediately. Never wash them away or bury them.
 - c. Clean up spills on dirt areas by digging up and properly disposing of contaminated soil.
 - d. Report significant spills to the Fire Department, Conservation Commission and Board of Health.

- E. Provisions for maintenance of lawns, gardens, and other landscaped areas
Use only organic fertilizer. Dispose of clippings outside of the 100 foot buffer zone to the adjacent wetland.
- F. Requirements for storage and use of herbicides, and pesticides
The application of herbicides or pesticides will be done by professional certified contractor.
- G. Provisions for operation and management of septic system
The system shall be inspected and maintained according to the schedule noted on the approved Board of Health plan.
- H. Provisions for solid waste management
1. Waste Management Plan
a. Dumpster for trash and bulk waste collection shall be stored inside or under a roof.
b. Recycle materials whenever possible (paper, plaster cardboard, metal cans).
Separate containers for material is recommended.
c. Do not bury waste and debris on site.
d. Certified haulers will be hired to remove the dumpster container waste as needed.
Recycling products will also be removed off site weekly.
- I. Snow disposal and plowing plans relative to Wetland Resource Areas
Snow storage is adequate around the site for large storm events.
- J. Winter Road Salt and/or Sand Use and Storage restrictions
No sand, salt, or chemicals for de-icing will be stored outside.
- K. Street sweeping schedules
Sweeping, the act of cleaning pavement can be done by mechanical sweepers, vacuum sweeper or hand sweeper. The quantity of sand is a direct correlation with the treatment of ice and snow and the types of chemicals and spreaders that are being used on site to manage snow. If a liquid de-icer such as calcium chloride is used as a pretreatment to new events the amount of sand is minimized. Sweeping for this site should be done semi-annually at a minimum. Collecting the particulate before it enters the catch basins is cheaper and more environmentally friendly than in a catch basin mixing with oils and greases in the surface water runoff in catch basins.
- L. Provisions for prevention of illicit discharges to the stormwater management system
The discharge into the stormwater system is not being violated, see attachment for illicit discharges compliance.
- M. Training the staff/personnel involved with implementing Long-Term Pollution Prevention Plan
The owner shall develop policies and procedures for containing the illicit spilling of oils, soda, beer, paper and litter. These wastes provide a degrading of the water quality. The placement of signs and trash barrels with lids around the site would contribute to a clean water quality site condition.
- N. List of Emergency contacts for implementing Long-Term Pollution Prevention Plan:
Eastland Partners, Inc.
4 Charlesview Road
Hopedale, MA 01747

Standard 10: All illicit discharges to the stormwater management system are prohibited. Standard 10 prohibits illicit discharges to stormwater management systems. The stormwater management system is the system for conveying, treating, and infiltrating stormwater on site, including stormwater best management practices and any pipes intended to transport stormwater to the ground water, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated ground water, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

Proponents of projects within Wetlands jurisdiction must demonstrate compliance with this requirement by submitting to the issuing authority an Illicit Discharge Compliance Statement verifying that no illicit discharges exist on the site and by including in the pollution prevention plan measures to prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease. The Illicit Discharge Compliance Statement may be filed with the Notice of Intent. If the Illicit Discharge Compliance Statement has not been filed, the Final Order of Conditions shall require the submission of an Illicit Discharge Compliance Statement prior to the start of construction. The issuing authority should not issue a Certificate of Compliance until it has determined that the Illicit Discharge Compliance Statement has been submitted, has reviewed the Illicit Discharge Compliance Statement, and has verified that there are no illicit discharges at the site.

See Appendix I

Appendix A
Stormwater Checklist



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

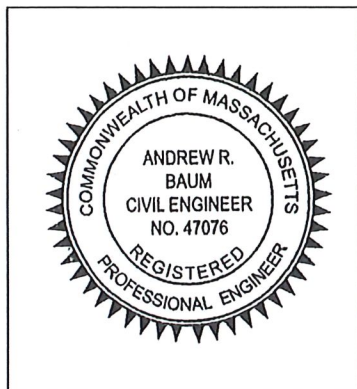
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

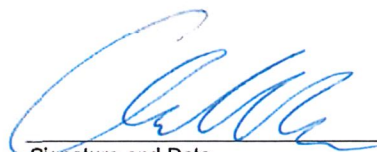
A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



 3/20/20
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☒ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
 - ☐ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☒ Water Quality Swale
- ☒ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Infiltration Basin

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☒ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
 - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☒ Description and delineation of public safety features;
 - ☒ Estimated operation and maintenance budget; and
 - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Appendix B
Summary at Reaches

SUMMARY REACH IP#1
(Park Hill Ave North)

Storm Event	Pre-Development	Post-Dev.
2 yr.	8.66 cfs	4.02 cfs
10 yr.	17.21 cfs	7.42 cfs
25 yr.	24.58 cfs	10.27 cfs
100 yr.	39.88 cfs	16.07 cfs

SUMMARY REACH IP#2
(Park Hill Ave South)

Storm Event	Pre-Development	Post-Dev.
2 yr.	11.31 cfs	0.27 cfs
10 yr.	22.91 cfs	0.39 cfs
25 yr.	32.98 cfs	0.49 cfs
100 yr.	54.01 cfs	0.69 cfs

SUMMARY REACH IP#3
(Wetlands to rear of Property)

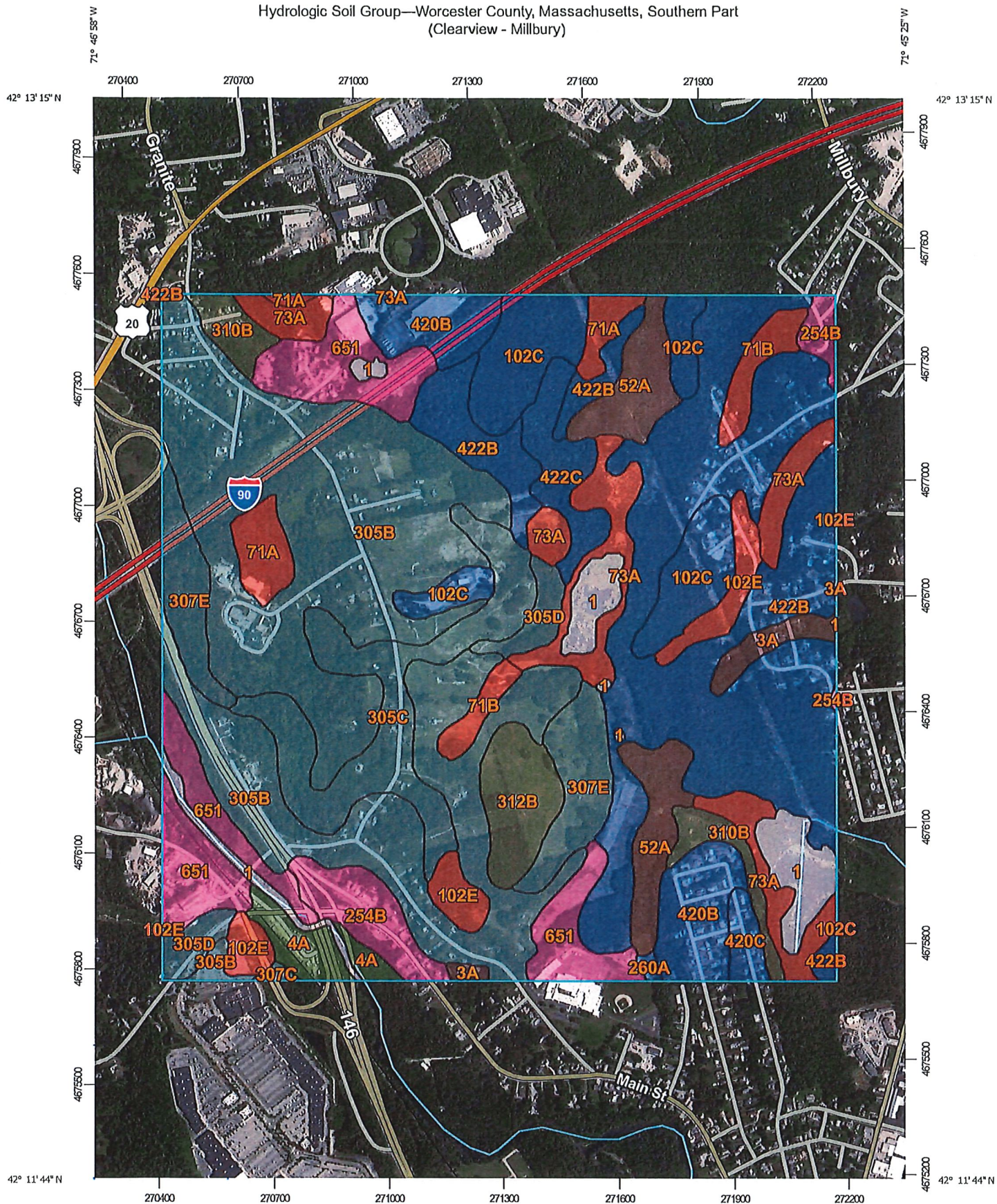
Storm Event	Pre-Development	Post-Dev.
2 yr.	48.27 cfs	40.75 cfs
10 yr.	99.81 cfs	94.74 cfs
25 yr.	144.85 cfs	134.51 cfs
100 yr.	239.37 cfs	233.47 cfs

SUMMARY REACH IP#4
(Abutters Property South)

Storm Event	Pre-Development	Post-Dev.
2 yr.	7.73 cfs	0.0 cfs
10 yr.	15.04 cfs	0.0 cfs
25 yr.	21.29 cfs	0.0 cfs
100 yr.	34.19 cfs	0.0 cfs

Appendix C
Soil Reports

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part (Clearview - Millbury)



Map Scale: 1:13,600 if printed on A portrait (8.5" x 11") sheet.

0 200 400 800 1200 Meters
0 500 1000 2000 3000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

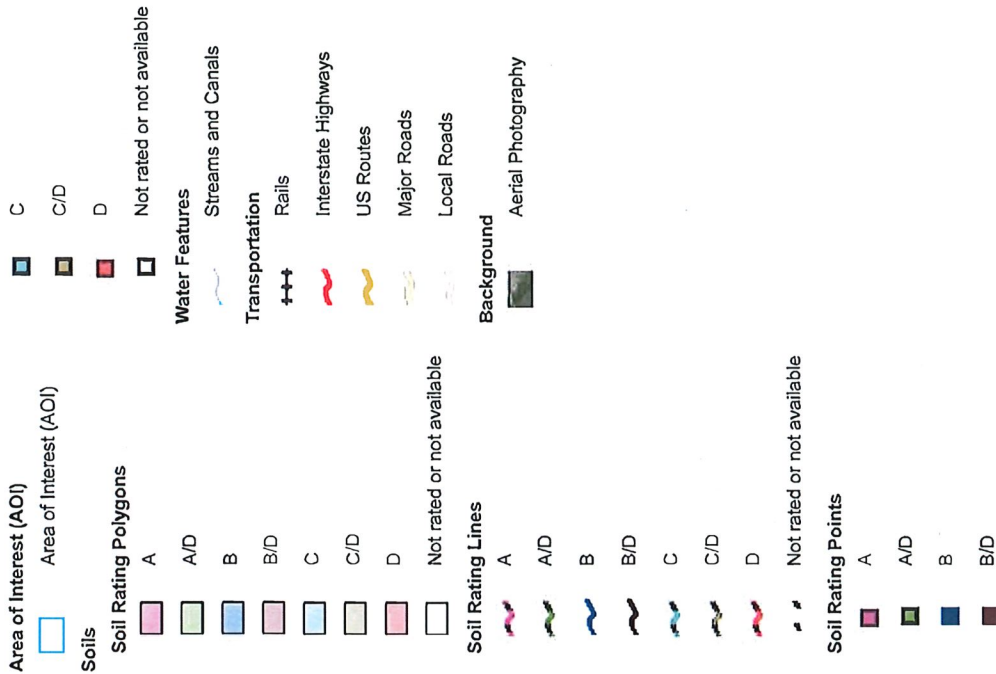


Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/31/2020
Page 1 of 5

MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 12, Sep 12, 2019

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

Date(s) aerial images were photographed: Jul 26, 2019—Oct 5, 2019

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		22.8	2.9%
3A	Scarboro and Walpole soils, 0 to 3 percent slopes	B/D	6.7	0.9%
4A	Rippowam fine sandy loam, 0 to 3 percent slopes	A/D	9.9	1.3%
52A	Freetown muck, 0 to 1 percent slopes	B/D	26.0	3.4%
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	D	12.9	1.7%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	11.3	1.5%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	38.0	4.9%
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	B	41.3	5.3%
102E	Chatfield-Hollis-Rock outcrop complex, 15 to 35 percent slopes	D	16.4	2.1%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	17.8	2.3%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	B	0.8	0.1%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	206.4	26.6%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	44.4	5.7%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	10.6	1.4%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	0.8	0.1%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
307E	Paxton fine sandy loam, 15 to 35 percent slopes, extremely stony	C	28.4	3.7%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	12.9	1.7%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	16.3	2.1%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	29.6	3.8%
420C	Canton fine sandy loam, 8 to 15 percent slopes	B	4.8	0.6%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	151.8	19.6%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	B	13.5	1.7%
651	Udorthents, smoothed	A	51.9	6.7%
Totals for Area of Interest			775.7	100.0%

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.

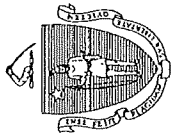
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Clearview Estates

Owner Name

Park Hill Avenue

Street Address

Millbury

City

Ma

State

Map/Lot #

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No

If yes: online
Source

422B

none

Soil Limitations

Soil Map Unit

3. Surficial Geological Report Available? ☐ Yes ☒ No

If yes:

Year Published/Source

Publication Scale

Map Unit

Geologic/Parent Material

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? ☒ Yes ☐ No

Within the 100-year flood boundary? ☒ Yes ☐ No

Within the 500-year flood boundary? ☐ Yes ☒ No

Within a velocity zone? ☐ Yes ☒ No

5. Wetland Area: Wetlands Conservancy Program Map

Map Unit

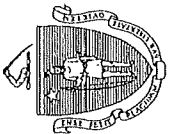
Name

6. Current Water Resource Conditions (USGS):

April 2019
Month/Year

Range: ☐ Above Normal ☒ Normal ☐ Below Normal

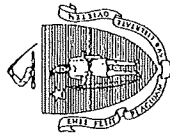
7. Other references reviewed:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number:		Pond 4-1	4/4/19	1:00	clear
			Date	Time	Weather
1. Location	Ground Elevation at Surface of Hole:		526.0	Location (identify on plan):	
				See Plan	
2. Land Use	Golf Course	some	6	Slope (%)	
	(e.g., woodland, agricultural field, vacant lot, etc.)	Surface Stones			
	grass	ground moraine		See Plan	
	Vegetation	Landform		Position on Landscape (attach sheet)	
3. Distances from:	Open Water Body	n/a	n/a	Possible Wet Area	n/a
	Property Line	n/a	n/a	Other	feet
	glacial till				feet
4. Parent Material:	Unsuitable Materials Present:		☐ Yes	☒ No	
If Yes:	☐ Disturbed Soil	☐ Fill Material	☐ Impervious Layer(s)	☐ Weathered/Fractured Rock	☐ Bedrock
5. Groundwater Observed:	☐ Yes	☒ No	If yes:	n/a	Depth Standing Water in Hole
Estimated Depth to High Groundwater:	none at 120.0	516.0	elevation	n/a	Depth Weeping from Pit
	inches				



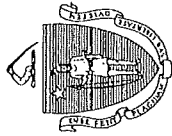
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Pond4 dth#1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	10YR4/4	n/a			Sandy Loam					
4-12	B	10YR4/6	n/a			Sandy Loam					
12-120	C	5Y7/2	n/a			Med. Sand	45	45			

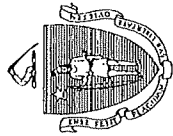
Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number:		Pond 4-2	4/4/19	2:00	clear 60
			Date	Time	Weather
1. Location	see plan				
Ground Elevation at Surface of Hole:	521.00				
2. Land Use	Golf Course	some	Surface Stones	6	Slope (%)
	(e.g., woodland, agricultural field, vacant lot, etc.)				
	grass	ground moraine		see plan	
	Vegetation	Landform		Position on Landscape (attach sheet)	
3. Distances from:	Open Water Body	n/a	Drainage Way	n/a	Possible Wet Area
	Property Line	n/a	Drinking Water Well	n/a	Other
	glacial till				
4. Parent Material:	Unsuitable Materials Present: ☐ Yes ☒ No				
If Yes:	☐ Disturbed Soil	☐ Fill Material	☐ Impervious Layer(s)	☐ Weathered/Fractured Rock	☐ Bedrock
5. Groundwater Observed:	☐ Yes	☒ No	If yes:	n/a	Depth Standing Water in Hole
Estimated Depth to High Groundwater:	None at 120		511.0	n/a	Depth Weeping from Pit
	inches		elevation		



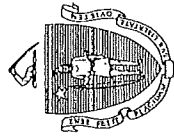
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Pond 4 - dth2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	10YR4/4	n/a			Sandy Loam					
4-12	B	10YR4/6	n/a			Sandy Loam					
12-120	C	5Y6/2	n/a			Med. Sand	45	45			

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- ☐ Depth observed standing water in observation hole
A. _____ inches B. _____ inches
- ☐ Depth weeping from side of observation hole
A. _____ inches B. _____ inches
- ☐ Depth to soil redoximorphic features (mottles)
A. _____ inches B. _____ inches
- ☐ Groundwater adjustment (USGS methodology)
A. _____ inches B. _____ inches

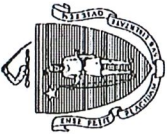
2.

Index Well Number _____ Reading Date _____ Index Well Level _____
Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
☒ Yes ☐ No
- b. If yes, at what depth was it observed?
Upper boundary: $\frac{4}{\text{inches}}$ Lower boundary: $\frac{120}{\text{inches}}$



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Peter Lavoie SE#1332

Typed or Printed Name of Soil Evaluator / License #

4/4/19

Date

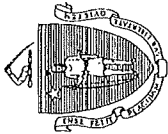
4/97

Date of Soil Evaluator Exam

Name of Board of Health Witness

Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).



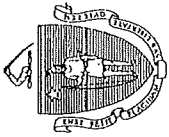
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Clearview Estates
Owner Name
Park Hill Avenue
Street Address
Millbury
City
Ma
State
Map/Lot #
Zip Code

B. Site Information

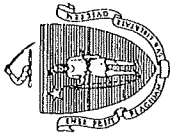
- (Check one) ☒ New Construction ☐ Upgrade ☐ Repair
Soil Survey Available? ☒ Yes ☐ No
If yes: online Source
none
Soil Limitations
Soil Name 305B
Soil Map Unit
- Surficial Geological Report Available? ☐ Yes ☒ No
If yes: Year Published/Source Publication Scale Map Unit
Geologic/Parent Material
Landform
- Flood Rate Insurance Map
Above the 500-year flood boundary? ☒ Yes ☐ No
Within the 500-year flood boundary? ☐ Yes ☒ No
Within the 100-year flood boundary? ☒ Yes ☐ No
Within a velocity zone? ☐ Yes ☒ No
- Wetland Area: Wetlands Conservancy Program Map
Map Unit Name
- Current Water Resource Conditions (USGS):
Range: ☐ Above Normal ☒ Normal ☐ Below Normal
April 2019
Month/Year
- Other references reviewed:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number:		Pond 3-1	4/4/19	11:00	clear
		Date	Time	Weather	
1. Location	Ground Elevation at Surface of Hole:		510.0	Location (identify on plan):	
				See Plan	
2. Land Use	Golf Course	Vegetation	some	Surface Stones	Slope (%)
	(e.g., woodland, agricultural field, vacant lot, etc.)	grass	ground moraine		6
			Landform		
3. Distances from:	Open Water Body	n/a	Drainage Way	n/a	Possible Wet Area
	Property Line	n/a	Drinking Water Well	n/a	n/a
	glacial till				Other
4. Parent Material:	Unsuitable Materials Present:		☐ Yes	☒ No	
If Yes:	☐ Disturbed Soil	☐ Fill Material	☐ Impervious Layer(s)	☐ Weathered/Fractured Rock	☐ Bedrock
5. Groundwater Observed:	☐ Yes	☒ No	If yes:	n/a	Depth Standing Water in Hole
Estimated Depth to High Groundwater:	none at 144"		498.0	n/a	Depth Weeping from Pit
	inches		elevation		



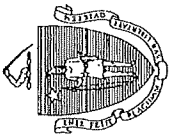
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Pond3 dth#1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	10YR4/4	n/a			Sandy Loam					
4-8	B	10YR4/6	n/a			Sandy Loam					
8-144	C	5Y7/2	n/a			Loamy Sand	45	45			

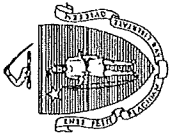
Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number:		Pond 3-2	4/4/19	12:30	clear 60
			Date	Time	Weather
1. Location	Location (identify on plan): see plan				
Ground Elevation at Surface of Hole:	508.00				
2. Land Use	Golf Course	some	Surface Stones	6	Slope (%)
	(e.g., woodland, agricultural field, vacant lot, etc.)				
	grass	ground moraine		see plan	
	Vegetation	Landform		Position on Landscape (attach sheet)	
3. Distances from:	Open Water Body	n/a	Drainage Way	n/a	Possible Wet Area
	Property Line	n/a	Drinking Water Well	n/a	Other
	glacial till				
4. Parent Material:	Unsuitable Materials Present: ☒ Yes ☐ No				
If Yes:	☒ Disturbed Soil	☐ Fill Material	☐ Impervious Layer(s)	☐ Weathered/Fractured Rock	☐ Bedrock
5. Groundwater Observed:	☒ Yes	☐ No	If yes:	n/a	Depth Standing Water in Hole
Estimated Depth to High Groundwater:	None at 144" inches		496.0	n/a	Depth Weeping from Pit
			elevation		



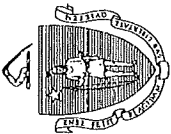
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Pond 3 - dth2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	10YR4/4	n/a			Sandy Loam		50			
4-12	B	10YR4/6	n/a			Sandy Loam					
12-144	C	5Y6/2	n/a			Loamy Sand	45	45			

Additional Notes:



Commonwealth of Massachusetts
City/Town of Millbury
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- | | | |
|--|-----------------|-----------------|
| ☐ Depth observed standing water in observation hole | A. _____ inches | B. _____ inches |
| ☐ Depth weeping from side of observation hole | A. _____ inches | B. _____ inches |
| ☐ Depth to soil redoximorphic features (mottles) | A. _____ inches | B. _____ inches |
| ☐ Groundwater adjustment (USGS methodology) | A. _____ inches | B. _____ inches |

2.

- | | | |
|-------------------------|----------------------------------|------------------------|
| Index Well Number _____ | Reading Date _____ | Index Well Level _____ |
| Adjustment Factor _____ | Adjusted Groundwater Level _____ | |

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? ☒ Yes ☐ No
- b. If yes, at what depth was it observed? Upper boundary: $\frac{4}{\text{inches}}$ Lower boundary: $\frac{144}{\text{inches}}$



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

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Signature of Soil Evaluator

Peter Lavoie SE#1332

Typed or Printed Name of Soil Evaluator / License #

4/4/19

Date

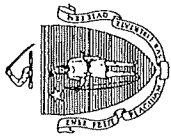
4/97

Date of Soil Evaluator Exam

Name of Board of Health Witness

Board of Health

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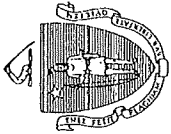
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Clearview Estates
Owner Name _____
Park Hill Avenue
Street Address _____ Map/Lot # _____
Millbury
City _____ Ma _____ State _____ Zip Code _____

B. Site Information

- (Check one) ☒ New Construction ☐ Upgrade ☐ Repair
Soil Survey Available? ☒ Yes ☐ No If yes: online Source _____ Soil Map Unit _____
305C
Soil Name _____ none
Soil Limitations _____
- Surficial Geological Report Available? ☐ Yes ☒ No If yes: _____ Year Published/Source _____ Publication Scale _____ Map Unit _____
Geologic/Parent Material _____ Landform _____
- Flood Rate Insurance Map
Above the 500-year flood boundary? ☒ Yes ☐ No Within the 100-year flood boundary? ☒ Yes ☐ No
Within the 500-year flood boundary? ☐ Yes ☒ No Within a velocity zone? ☐ Yes ☒ No
- Wetland Area: Wetlands Conservancy Program Map Map Unit _____ Name _____
- Current Water Resource Conditions (USGS): April 2019
Month/Year _____ Range: ☐ Above Normal ☒ Normal ☐ Below Normal
- Other references reviewed: _____



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number:		Pond 2-1	4/4/19	8:00	clear
			Date	Time	Weather

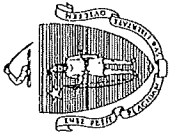
1. Location	Location (identify on plan): See Plan				
Ground Elevation at Surface of Hole:	520.0				

2. Land Use	Golf Course (e.g., woodland, agricultural field, vacant lot, etc.)	some	Surface Stones	6	Slope (%)
	grass Vegetation	ground moraine Landform			

3. Distances from:	Open Water Body	n/a feet	Drainage Way	n/a feet	Possible Wet Area	n/a feet
	Property Line	n/a feet	Drinking Water Well	n/a feet	Other	feet

4. Parent Material:	glacial till	Unsuitable Materials Present: ☐ Yes ☒ No			
If Yes:	☐ Disturbed Soil	☐ Fill Material	☐ Impervious Layer(s)	☐ Weathered/Fractured Rock	☐ Bedrock

5. Groundwater Observed:	☐ Yes	☒ No	If yes:	n/a	Depth Standing Water in Hole
Estimated Depth to High Groundwater:	none at 96" inches		512.0 elevation	n/a	Depth Weeping from Pit



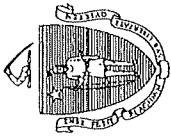
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Pond2 dth#1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR4/4	n/a			Sandy Loam					
6-26	B	10YR4/6	n/a			Sandy Loam					
26-96	C	5Y7/2	n/a			Loamy Sand	45	45			

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Pond 2-2 Date: 4/4/19 Time: 8:30 Weather: clear 60

1. Location

Ground Elevation at Surface of Hole: 522.00 Location (identify on plan): see plan

2. Land Use
Golf Course some Surface Stones 6 Slope (%) 6
(e.g., woodland, agricultural field, vacant lot, etc.)
grass ground moraine
Vegetation Landform

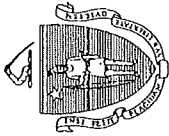
3. Distances from:
Open Water Body n/a feet Drainage Way n/a feet Possible Wet Area n/a feet
Property Line n/a feet Drinking Water Well n/a feet Other feet

4. Parent Material: glacial till Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 96" Depth Weeping from Pit n/a Depth Standing Water in Hole

Estimated Depth to High Groundwater: 96" inches 514.0 elevation



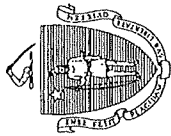
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Pond2 - dth2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Consistence (Moist)	Soil Structure	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-60	A	10YR4/4	n/a			Sandy Loam		50			
60-72	B	10YR4/6	n/a			Sandy Loam					
72-120	C	5Y6/2	96"	10YR5/8	45	Loamy Sand	45	45			

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

☐ Depth observed standing water in observation hole

A. _____ inches
B. _____ inches

☐ Depth weeping from side of observation hole

A. _____ inches
B. _____ inches

☒ Depth to soil redoximorphic features (mottles)

A. none
B. 96 inches

☐ Groundwater adjustment (USGS methodology)

A. _____ inches
B. _____ inches

2.

Index Well Number _____

Reading Date _____

Index Well Level _____

Adjustment Factor _____

Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed?

Upper boundary: 30 inches
Lower boundary: 120 inches



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Peter Lavoie SE#1332

Typed or Printed Name of Soil Evaluator / License #

4/4/19

Date

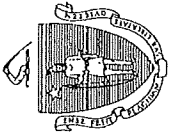
4/97

Date of Soil Evaluator Exam

Name of Board of Health Witness

Board of Health

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Commonwealth of Massachusetts
City/Town of Millbury

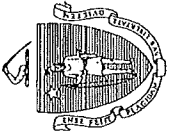
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Cleerview Estates
Owner Name
Park Hill Avenue
Street Address
Millbury
City
Ma
State
Map/Lot #
Zip Code

B. Site Information

- (Check one) ☒ New Construction ☐ Upgrade ☐ Repair
2. Soil Survey Available? ☒ Yes ☐ No
305C
Soil Name
If yes: online Source
none
Soil Limitations
If yes: Year Published/Source Publication Scale Map Unit
- Surficial Geological Report Available? ☐ Yes ☒ No
Geologic/Parent Material
Landform
- Flood Rate Insurance Map
Above the 500-year flood boundary? ☒ Yes ☐ No
Within the 500-year flood boundary? ☐ Yes ☒ No
Within the 100-year flood boundary? ☒ Yes ☐ No
Within a velocity zone? ☐ Yes ☒ No
- Wetland Area: Wetlands Conservancy Program Map
Map Unit Name
- Current Water Resource Conditions (USGS): April 2019
Month/Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal
- Other references reviewed:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number: Pond 1-1 Date 4/4/19 Time 8:00 clear Weather

1. Location

Ground Elevation at Surface of Hole: 564.0 Location (identify on plan): See Plan

2. Land Use Golf Course (e.g., woodland, agricultural field, vacant lot, etc.) some Surface Stones 6 Slope (%)
grass Vegetation ground moraine Landform See Plan Position on Landscape (attach sheet)

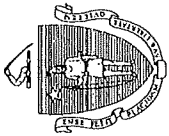
3. Distances from: Open Water Body n/a feet Drainage Way n/a feet Possible Wet Area n/a feet
Property Line 92 feet Drinking Water Well n/a feet Other n/a feet

4. Parent Material: glacial till Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 64 Depth Weeping from Pit n/a Depth Standing Water in Hole

Estimated Depth to High Groundwater: 60 inches 559.00 elevation



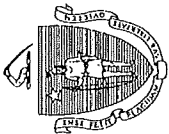
Commonwealth of Massachusetts
City/Town of Millbury
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: _____ Pond1 dth#1 _____

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Consistence (Moist)	Soil Structure	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10YR4/4	n/a			Sandy Loam					
8-30	B	10YR4/6	n/a			Sandy Loam					
30-84	C	5Y7/2	60"	10YR5/8	50	Loamy Sand	45	45			

Additional Notes:



Commonwealth of Massachusetts
City/Town of Millbury
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 2 4/4/19 8:30 clear 60
Date Time Weather

1. Location

Ground Elevation at Surface of Hole: 568.00 Location (identify on plan): see plan

2. Land Use Golf Course some 6
(e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)
grass ground moraine see plan
Vegetation Landform Position on Landscape (attach sheet)

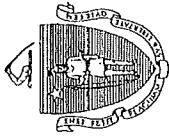
3. Distances from: Open Water Body n/a n/a n/a
Property Line 70 n/a Possible Wet Area n/a
glacial till Drinking Water Well Other feet feet

4. Parent Material:

Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: n/a n/a
Estimated Depth to High Groundwater: none at 120 558.00 Depth Weeping from Pit Depth Standing Water in Hole
inches elevation



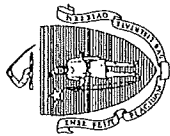
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR4/4	n/a			Sandy Loam					
6-26	B	10YR4/6	n/a			Sandy Loam					
26-120	C	5Y6/2	n/a			Loamy Sand	45	45			

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- ☐ Depth observed standing water in observation hole
- ☐ Depth weeping from side of observation hole
- ☒ Depth to soil redoximorphic features (mottles)
- ☐ Groundwater adjustment (USGS methodology)

A.	inches	B.	inches
A.	inches	B.	inches
A.	60"	B.	none
A.	inches	B.	inches
A.	inches	B.	inches

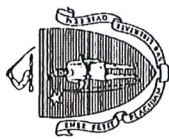
2.

Index Well Number	Reading Date	Index Well Level
Adjustment Factor	Adjusted Groundwater Level	

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
- ☒ Yes ☐ No
- b. If yes, at what depth was it observed?
- Upper boundary: 30 inches Lower boundary: 120 inches



Commonwealth of Massachusetts
City/Town of Millbury

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

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4/4/19

Signature of Soil Evaluator

Date

Peter Lavoie SE#1332

4/97

Typed or Printed Name of Soil Evaluator / License #

Date of Soil Evaluator Exam

Name of Board of Health Witness

Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Appendix D
Basin Volume Calculations & Summary

Basin Summary Table II

Basins – Post-Development Conditions

<u>BASIN</u>	<u>UNITS</u>	<u>100 YR.</u>	<u>25 YR.</u>	<u>10 YR.</u>	<u>2 YR</u>
1	Q _{in} = CFS	80.09	46.02	32.32	16.15
	Q _{out} = CFS	51.36	36.06	26.59	10.15
	ELEV. = FT	520.62	519.17	518.54	517.69
	VOL. ST. = cf	25,753	15,484	11,660	7,114
2	Q _{in} = CFS	108.66	69.40	50.13	27.14
	Q _{out} = CFS	89.57	60.97	44.41	23.95
	ELEV. = FT	505.47	504.57	504.14	503.57
	VOL. ST. = cf	24,410	15,087	11,322	6,991
3	Q _{in} = CFS	74.02	47.02	33.80	18.10
	Q _{out} = CFS	31.16	10.26	2.41	0.33
	ELEV. = FT	524.53	523.46	522.91	521.75
	VOL. ST. = cf	81,786	63,408	54,754	37,753

STAGE-STORAGE WORKSHEET					
DATE:		6/8/2020		CLIENT:	
PROJECT NUMBER:		1014		CALCULATED BY:	
BASIN NUMBER:		1		CHECKED BY:	
LOCATION:		RECHARGE			
ELEVATION	AREA	AVERAGE	VERTICAL	VOLUME	VOLUME
(FEET)	(FT ²)	AREA	INTERVAL	INCREMENTAL	CUMULATIVE
		(FT ²)	(FT)	(FT ³)	(FT ³)
516.0	4358				0
518.0	7087	5723	4	22890	22890

STAGE-STORAGE WORKSHEET					
DATE:		6/8/2020		CLIENT:	
PROJECT NUMBER:		1014		CALCULATED BY:	
BASIN NUMBER:		2		CHECKED BY:	
LOCATION:		RECHARGE			
ELEVATION	AREA	AVERAGE	VERTICAL	VOLUME	VOLUME
(FEET)	(FT ²)	AREA	INTERVAL	INCREMENTAL	CUMULATIVE
		(FT ²)	(FT)	(FT ³)	(FT ³)
502.0	5504				0
503.0	6440	5972	1	5972	5972

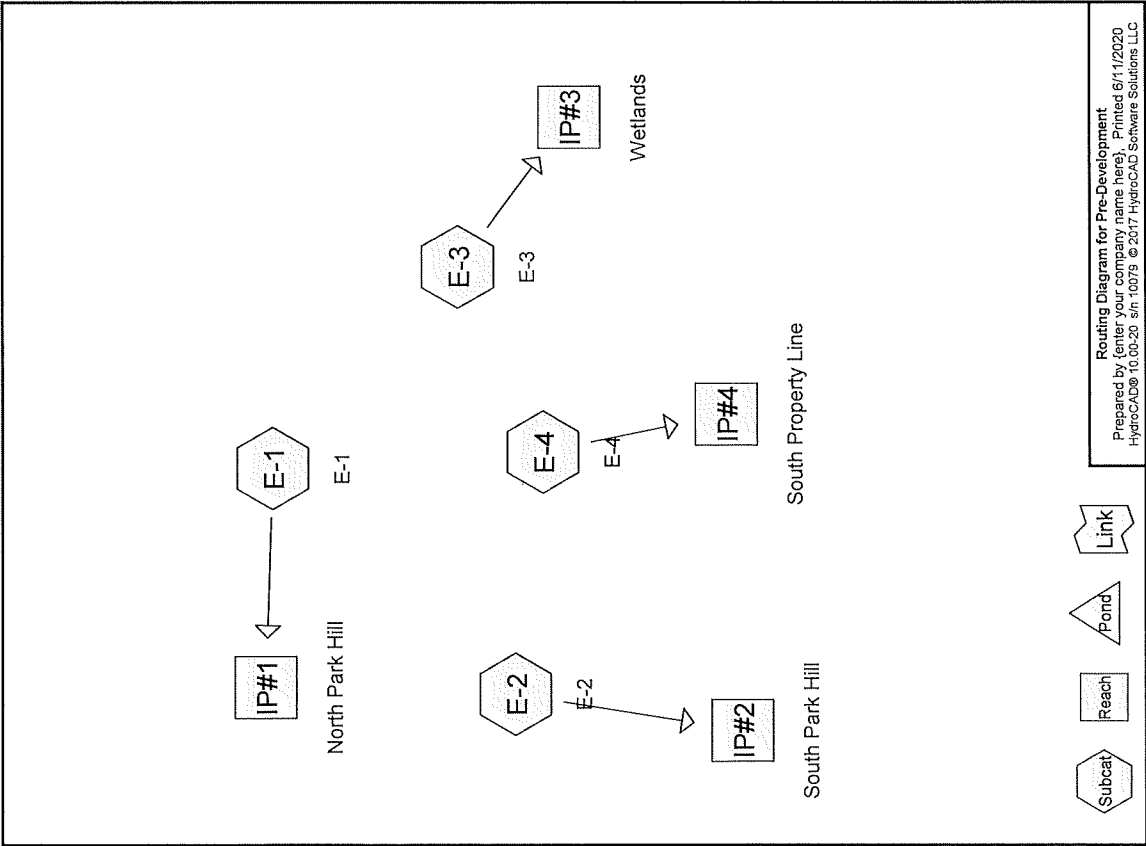
STAGE-STORAGE WORKSHEET					
DATE:		6/8/2020	CLIENT:		
PROJECT NUMBER:		1014	CALCULATED BY:		
BASIN NUMBER:		#3	CHECKED BY:		
LOCATION:		RECHARGE			
		AVERAGE	VERTICAL	VOLUME	VOLUME
ELEVATION	AREA	AREA	INTERVAL	INCREMENTAL	CUMULATIVE
(FEET)	(FT ²)	(FT ²)	(FT)	(FT ³)	(FT ³)
518.0	4358				0
522.5	7087	5723	5	25751	25751

STAGE-STORAGE WORKSHEET					
	DATE:	2/13/2020		CLIENT:	
	PROJECT NUMBER:	1014		CALCULATED BY:	
	BASIN NUMBER:	#1		CHECKED BY:	
	LOCATION:	FORBAY			
		AVERAGE	VERTICAL	VOLUME	VOLUME
ELEVATION	AREA	AREA	INTERVAL	INCREMENTAL	CUMULATIVE
(FEET)	(FT ²)	(FT ²)	(FT)	(FT ³)	(FT ³)
526.0	1431				0
529.0	3496	2464	3	7391	7391

STAGE-STORAGE WORKSHEET					
	DATE:	2/13/2020		CLIENT:	
	PROJECT NUMBER:	1014		CALCULATED BY:	
	BASIN NUMBER:	#2		CHECKED BY:	
	LOCATION:	FORBAY			
		AVERAGE	VERTICAL	VOLUME	VOLUME
ELEVATION	AREA	AREA	INTERVAL	INCREMENTAL	CUMULATIVE
(FEET)	(FT ²)	(FT ²)	(FT)	(FT ³)	(FT ³)
502.0	1525				0
503.0	3338	2432	2	4863	4863

STAGE-STORAGE WORKSHEET					
DATE:		6/8/2020	CLIENT:		
PROJECT NUMBER:		1014	CALCULATED BY:		
BASIN NUMBER:		#3	CHECKED BY:		
LOCATION:		Forbay			
		AVERAGE	VERTICAL	VOLUME	VOLUME
ELEVATION	AREA	AREA	INTERVAL	INCREMENTAL	CUMULATIVE
(FEET)	(FT ²)	(FT ²)	(FT)	(FT ³)	(FT ³)
520.0	3342				0
522.0	4976	3935	2	8318	8318

Appendix E
HydroCAD Computations



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.079	61	>75% Grass cover, Good, HSG B (E-2, E-3, E-4)
40.304	74	>75% Grass cover, Good, HSG C (E-1, E-2, E-3, E-4)
0.912	80	>75% Grass cover, Good, HSG D (E-3)
2.470	98	Paved parking, HSG B (E-1, E-2, E-3, E-4)
1.610	55	Woods, Good, HSG B (E-3)
8.347	70	Woods, Good, HSG C (E-3)
1.942	77	Woods, Good, HSG D (E-3)

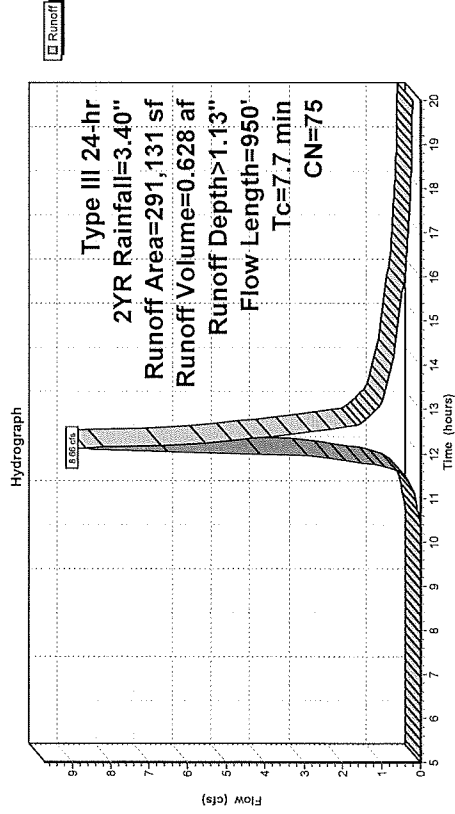
Summary for Subcatchment E-1: E-1

Runoff = 8.66 cfs @ 12.12 hrs, Volume= 0.628 af, Depth> 1.13"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
8,225	98	Paved parking, HSG B
282,906	74	>75% Grass cover, Good, HSG C
291,131	75	Weighted Average
282,906		97.17% Pervious Area
8,225		2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
4.8	800	0.0300	2.79		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
0.9	120	0.0200	2.28		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
7.7	950	Total			

Subcatchment E-1: E-1



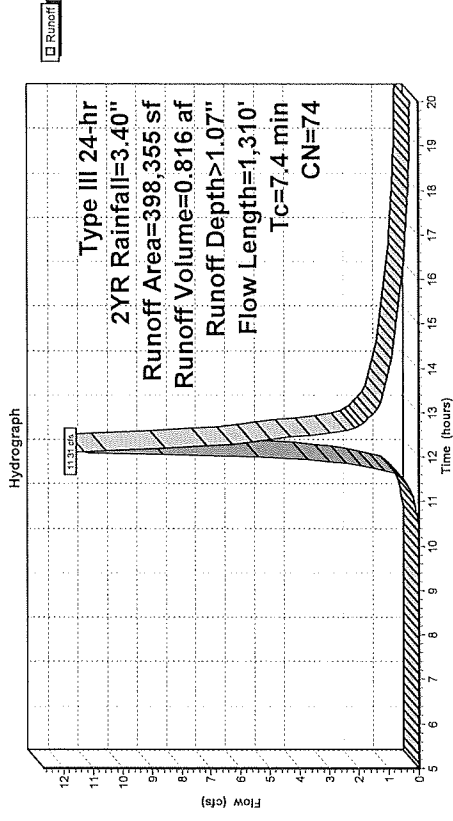
Summary for Subcatchment E-2: E-2

Runoff = 11.31 cfs @ 12.12 hrs, Volume= 0.816 af, Depth> 1.07"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
38,359	98	Paved parking, HSG B
289,774	74	>75% Grass cover, Good, HSG C
70,222	61	>75% Grass cover, Good, HSG B
398,355	74	Weighted Average
359,996		90.37% Pervious Area
38,359		9.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
5.4	1,280	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.4	1,310	Total			

Subcatchment E-2: E-2



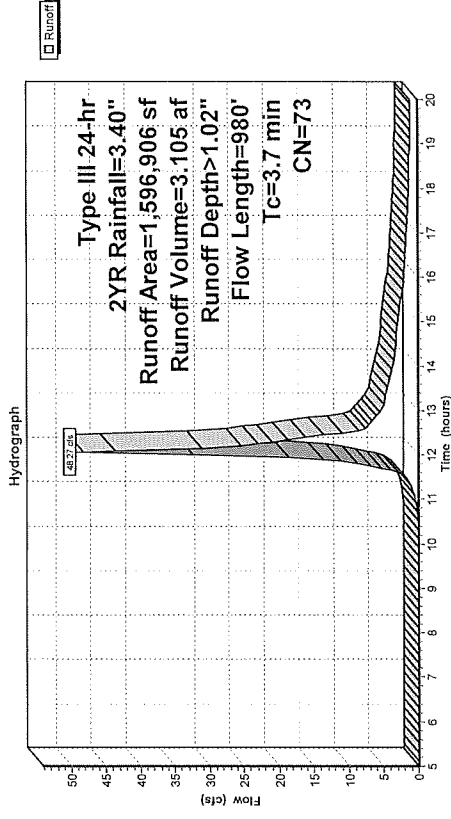
Summary for Subcatchment E-3: E-3

Runoff = 48.27 cfs @ 12.06 hrs, Volume= 3,105 af, Depth> 1.02"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
37,787	98	Paved parking, HSG B
998,192	74	>75% Grass cover, Good, HSG C
276,489	70	Woods, Good, HSG C
39,707	80	>75% Grass cover, Good, HSG D
89,988	61	>75% Grass cover, Good, HSG B
70,141	55	Woods, Good, HSG B
84,602	77	Woods, Good, HSG D
1,596,906	73	Weighted Average
1,559,119		97.63% Pervious Area
37,787		2.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B
					Smooth surfaces n= 0.011 P2= 3.20"
0.4	130	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Paved Kv= 20.3 fps
1.8	640	0.1400	6.02		Shallow Concentrated Flow, TRAVEL PATH C TO D
					Unpaved Kv= 16.1 fps
1.1	160	0.2500	2.50		Shallow Concentrated Flow, TRAVEL PATH D TO E
					Woodland Kv= 5.0 fps
3.7	980	Total			

Subcatchment E-3: E-3

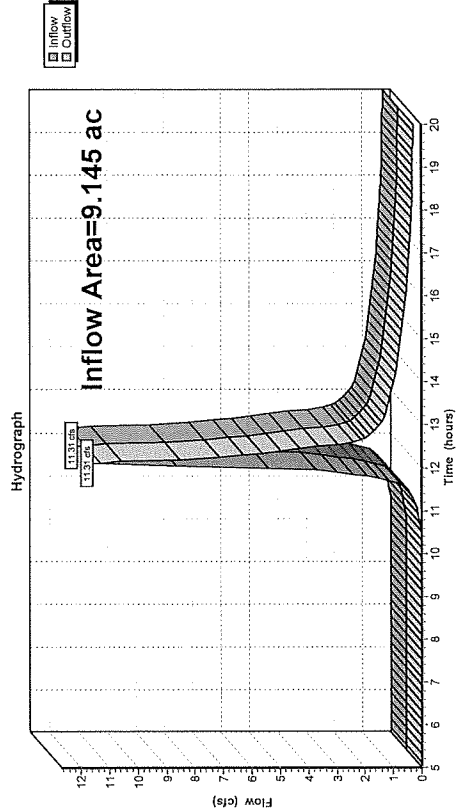


Summary for Reach IP#2: South Park Hill

Inflow Area = 9.145 ac, 9.63% Impervious, Inflow Depth > 1.07" for 2YR event
Inflow = 11.31 cfs @ 12.12 hrs, Volume= 0.816 af
Outflow = 11.31 cfs @ 12.12 hrs, Volume= 0.816 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

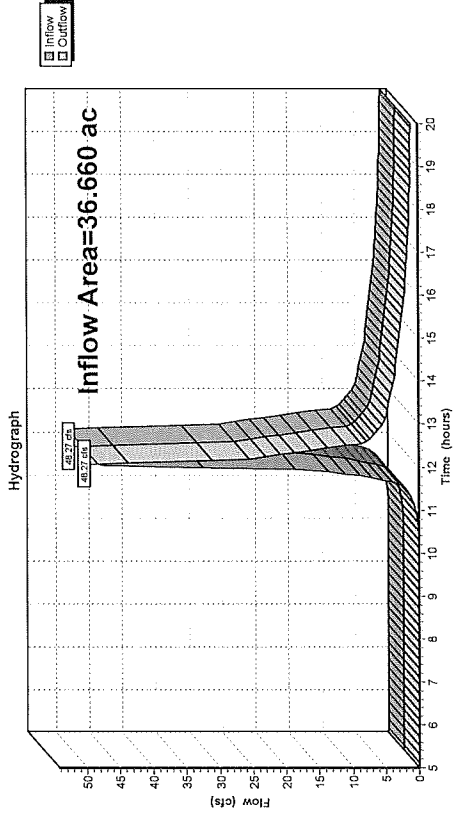


Summary for Reach IP#3: Wetlands

Inflow Area = 36.660 ac, 2.37% Impervious, Inflow Depth > 1.02" for 2YR event
Inflow = 48.27 cfs @ 12.06 hrs, Volume= 3.105 af
Outflow = 48.27 cfs @ 12.06 hrs, Volume= 3.105 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands



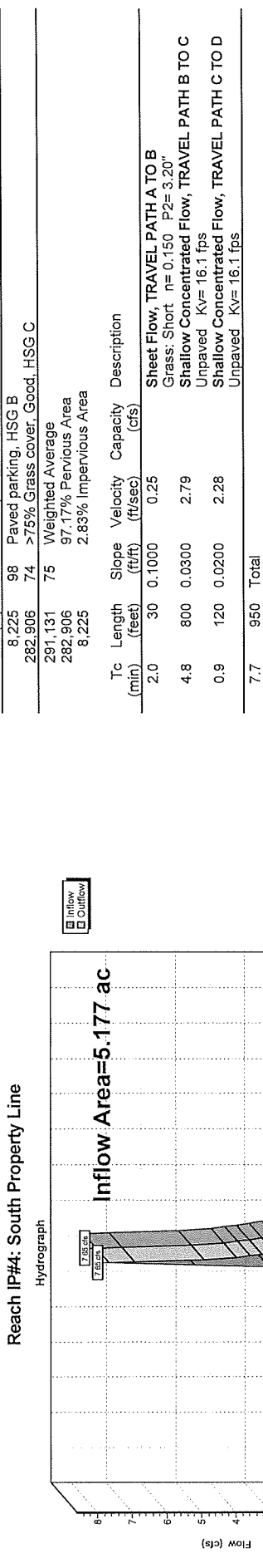
Summary for Reach IP#4: South Property Line

Inflow Area = 5.177 ac, 10.30% Impervious, Inflow Depth > 1.13" for 2YR event

Inflow = 7.65 cfs @ 12.06 hrs, Volume= 0.487 af

Outflow = 7.65 cfs @ 12.06 hrs, Volume= 0.487 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

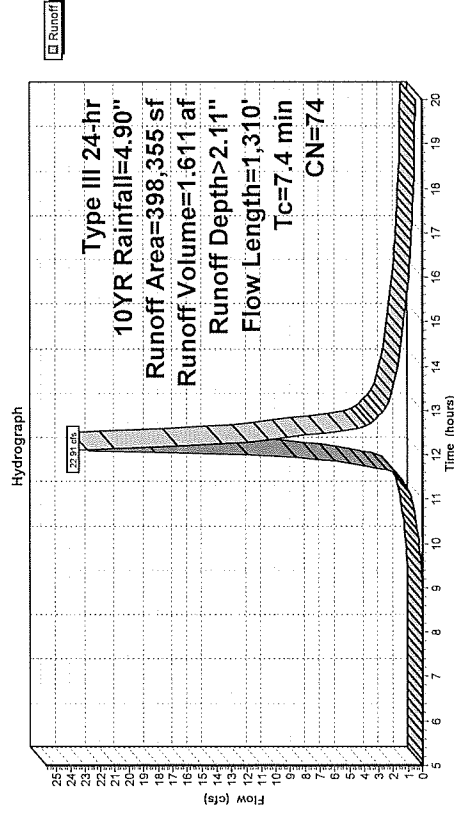


Summary for Subcatchment E-2: E-2

Runoff = 22.91 cfs @ 12.11 hrs, Volume= 1.611 af, Depth> 2.11"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description			
38,359	98	Paved parking, HSG B			
289,774	74	>75% Grass cover, Good, HSG C			
70,222	61	>75% Grass cover, Good, HSG B			
398,355	74	Weighted Average			
359,996		90.37% Pervious Area			
38,359		9.63% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
5.4	1,280	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.4	1,310	Total			

Subcatchment E-2: E-2

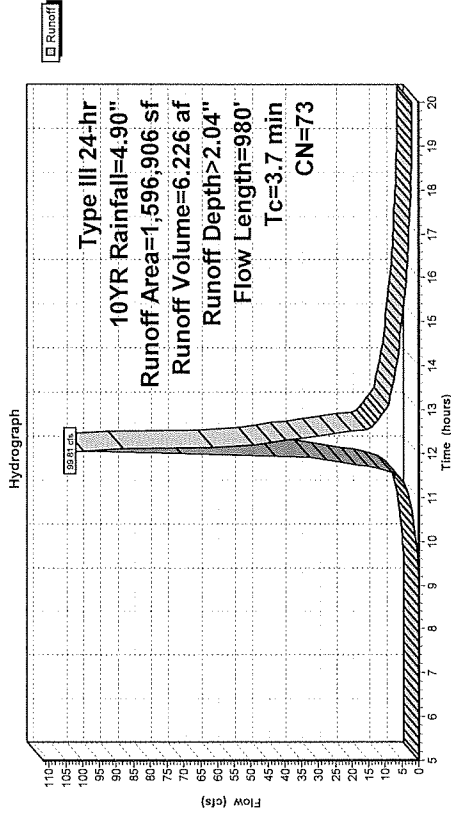


Summary for Subcatchment E-3: E-3

Runoff = 99.81 cfs @ 12.06 hrs, Volume= 6.226 af, Depth> 2.04"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description			
37,787	98	Paved parking, HSG B			
998,192	74	>75% Grass cover, Good, HSG C			
276,489	70	Woods, Good, HSG C			
39,707	80	>75% Grass cover, Good, HSG D			
89,988	61	>75% Grass cover, Good, HSG B			
70,141	55	Woods, Good, HSG B			
84,602	77	Woods, Good, HSG D			
1,596,906	73	Weighted Average			
1,559,119		97.63% Pervious Area			
37,787		2.37% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
0.4	130	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps
1.8	640	0.1400	6.02		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
1.1	160	0.2500	2.50		Shallow Concentrated Flow, TRAVEL PATH D TO E Woodland Kv= 5.0 fps
3.7	980	Total			

Subcatchment E-3: E-3



Summary for Subcatchment E-4: E-4

Runoff = 15.17 cfs @ 12.06 hrs, Volume= 0.948 af, Depth> 2.20"

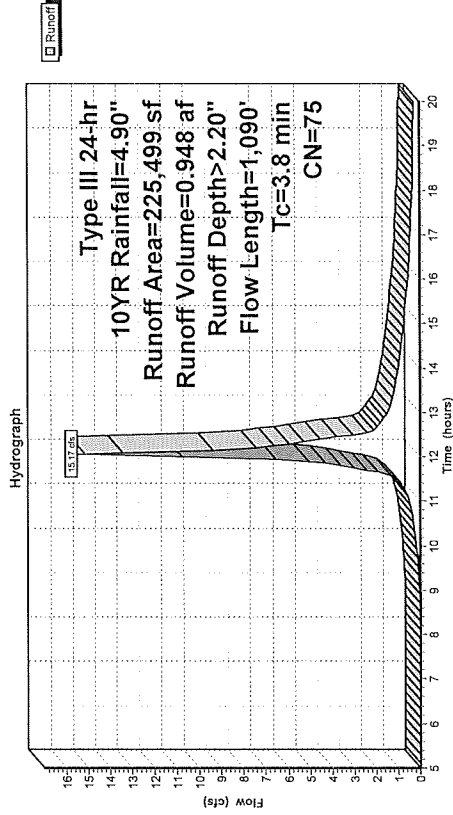
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
23,233	98	Paved parking, HSG B
184,782	74	>75% Grass cover, Good, HSG C
17,484	61	>75% Grass cover, Good, HSG B

225,499	75	Weighted Average
202,266		89.70% Pervious Area
23,233		10.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
0.9	280	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps
2.5	760	0.1000	5.09		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
3.8	1,090	Total			

Subcatchment E-4: E-4

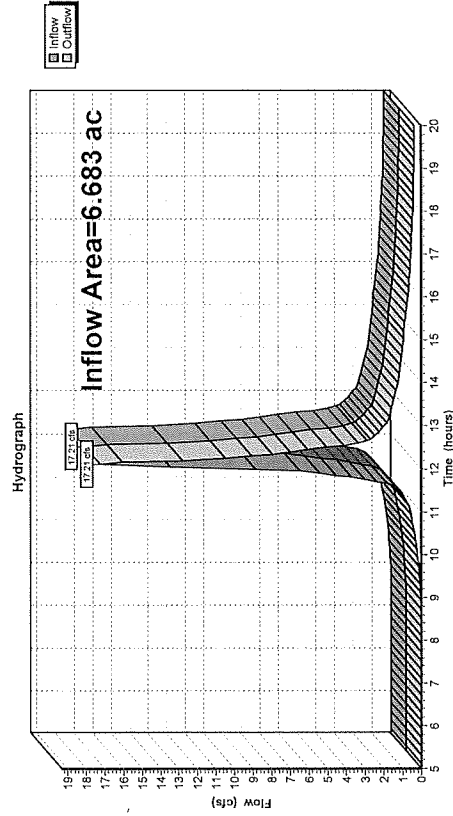


Summary for Reach IP#1: North Park Hill

Inflow Area = 6.683 ac, 2.83% Impervious, Inflow Depth > 2.19" for 10YR event
Inflow = 17.21 cfs @ 12.11 hrs, Volume= 1.223 af
Outflow = 17.21 cfs @ 12.11 hrs, Volume= 1.223 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

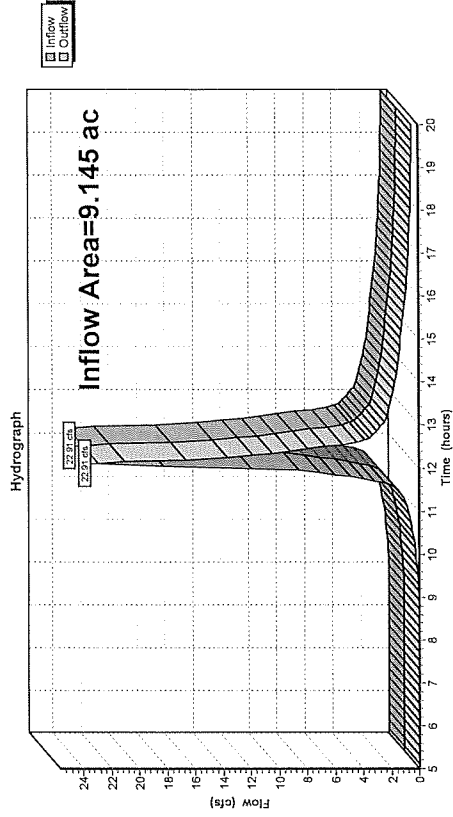


Summary for Reach IP#2: South Park Hill

Inflow Area = 9.145 ac, 9.63% Impervious, Inflow Depth > 2.11" for 10YR event
Inflow = 22.91 cfs @ 12.11 hrs, Volume= 1.611 af
Outflow = 22.91 cfs @ 12.11 hrs, Volume= 1.611 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

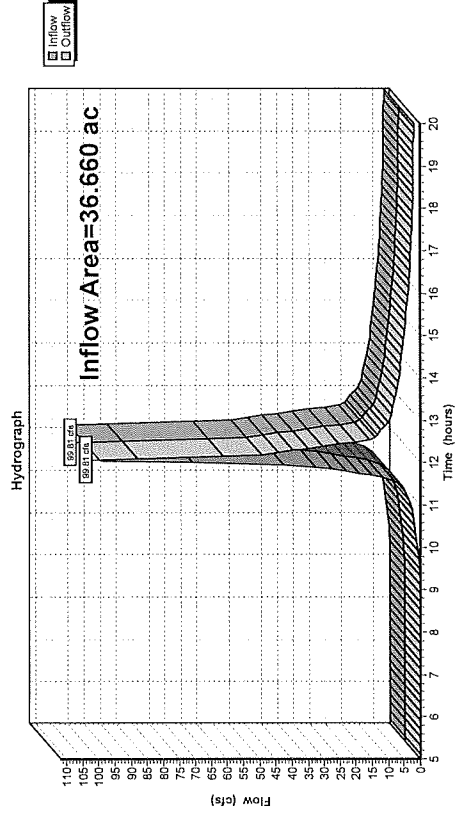


Summary for Reach IP#3: Wetlands

Inflow Area = 36.660 ac, 2.37% Impervious, Inflow Depth > 2.04" for 10YR event
Inflow = 99.81 cfs @ 12.06 hrs, Volume= 6.226 af
Outflow = 99.81 cfs @ 12.06 hrs, Volume= 6.226 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands

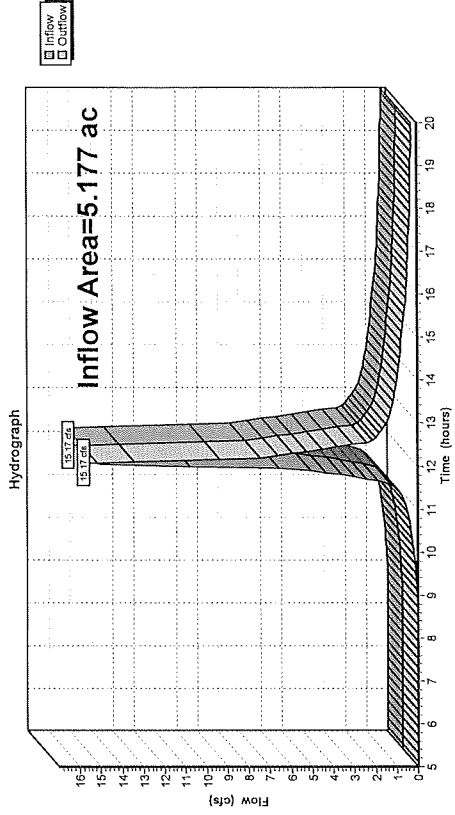


Summary for Reach IP#4: South Property Line

Inflow Area = 5.177 ac, 10.30% Impervious, Inflow Depth > 2.20" for 10YR event
Inflow = 15.17 cfs @ 12.06 hrs, Volume= 0.948 af
Outflow = 15.17 cfs @ 12.06 hrs, Volume= 0.948 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#4: South Property Line



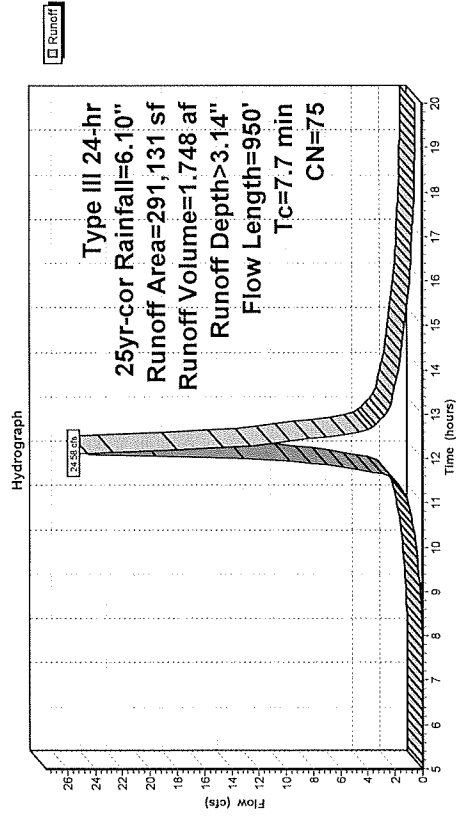
Summary for Subcatchment E-1: E-1

Runoff = 24.58 cfs @ 12.11 hrs, Volume= 1,748 af, Depth> 3.14"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25yr-cor Rainfall=6.10"

Area (sf)	CN	Description
8,225	98	Paved parking, HSG B
282,906	74	>75% Grass cover, Good, HSG C
291,131	75	Weighted Average
282,906		97.17% Pervious Area
8,225		2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
4.8	800	0.0300	2.79		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
0.9	120	0.0200	2.28		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
7.7	950	Total			

Subcatchment E-1: E-1



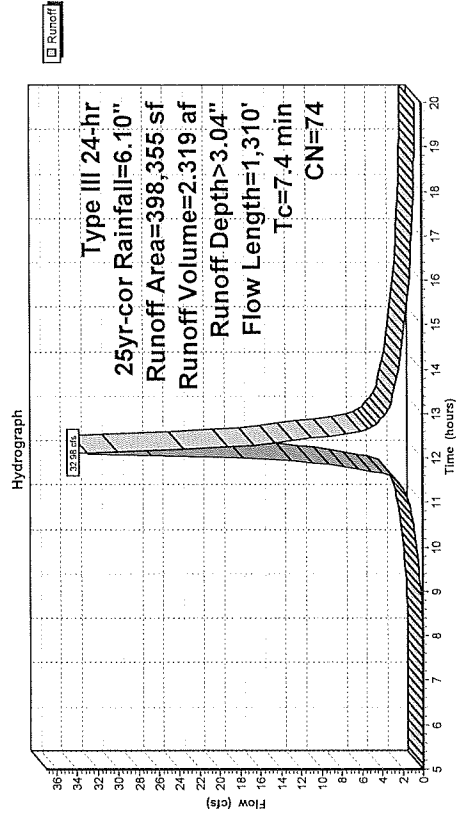
Summary for Subcatchment E-2: E-2

Runoff = 32.98 cfs @ 12.11 hrs, Volume= 2,319 af, Depth> 3.04"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25yr-cor Rainfall=6.10"

Area (sf)	CN	Description
38,359	98	Paved parking, HSG B
289,774	74	>75% Grass cover, Good, HSG C
70,222	61	>75% Grass cover, Good, HSG B
398,355	74	Weighted Average
359,996		90.37% Pervious Area
38,359		9.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
5.4	1,280	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.4	1,310	Total			

Subcatchment E-2: E-2



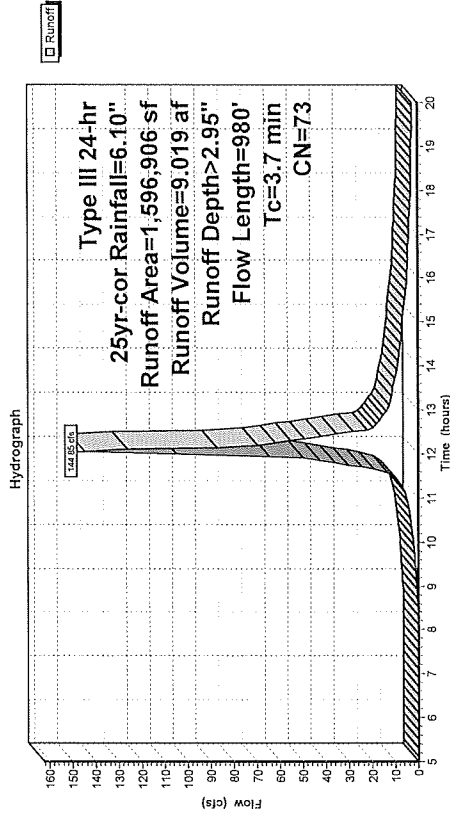
Summary for Subcatchment E-3: E-3

Runoff = 144.85 cfs @ 12.06 hrs, Volume= 9,019 af, Depth> 2.95"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25yr-cor Rainfall=6.10"

Area (sf)	CN	Description
37,787	98	Paved parking, HSG B
998,192	74	>75% Grass cover, Good, HSG C
276,489	70	Woods, Good, HSG C
39,707	80	>75% Grass cover, Good, HSG D
89,988	61	>75% Grass cover, Good, HSG B
70,141	55	Woods, Good, HSG B
84,602	77	Woods, Good, HSG D
1,596,906	73	Weighted Average
1,559,119		97.63% Pervious Area
37,787		2.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B
					Smooth surfaces n= 0.011 P2= 3.20"
0.4	130	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Paved Kv= 20.3 fps
1.8	640	0.1400	6.02		Shallow Concentrated Flow, TRAVEL PATH C TO D
					Unpaved Kv= 16.1 fps
1.1	160	0.2500	2.50		Shallow Concentrated Flow, TRAVEL PATH D TO E
					Woodland Kv= 5.0 fps
3.7	980	Total			

Subcatchment E-3: E-3



Summary for Subcatchment E-4: E-4

Runoff

=

21.64 cfs @ 12.06 hrs, Volume= 1,355 af, Depth> 3.14"

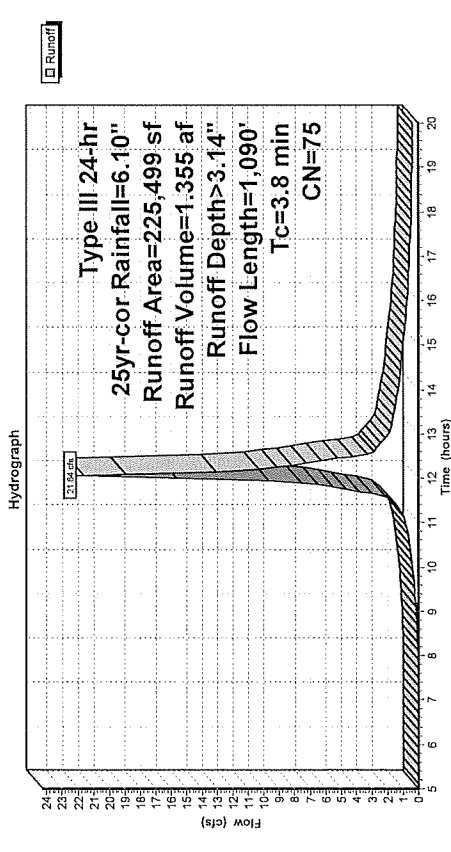
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Type III 24-hr 25yr-cor Rainfall=6.10"

Area (sf)	CN	Description
23,233	98	Paved parking, HSG B
184,782	74	>75% Grass cover, Good, HSG C
17,484	61	>75% Grass cover, Good, HSG B
225,499	75	Weighted Average
202,266		89.70% Pervious Area
23,233		10.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
0.9	280	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps
2.5	760	0.1000	5.09		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
3.8	1,090	Total			

Subcatchment E-4: E-4



Summary for Reach IP#1: North Park Hill

Inflow Area =

6.683 ac, 2.83% Impervious, Inflow Depth > 3.14" for 25yr-cor event

Inflow =

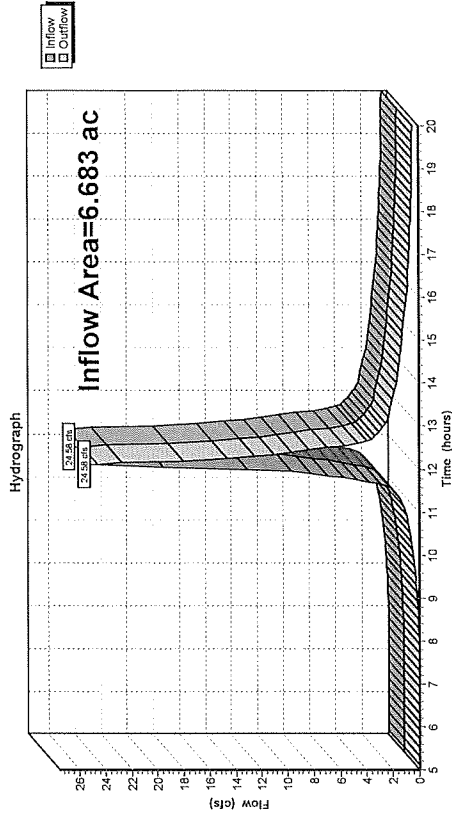
24.58 cfs @ 12.11 hrs, Volume= 1,748 af

Outflow =

24.58 cfs @ 12.11 hrs, Volume= 1,748 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

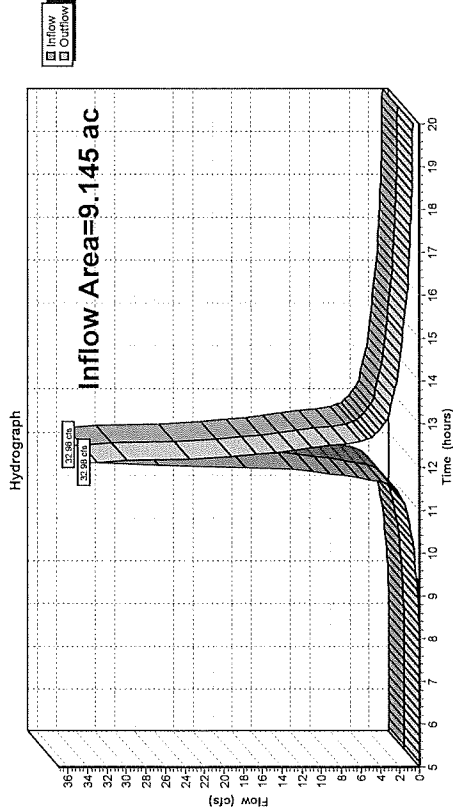


Summary for Reach IP#2: South Park Hill

Inflow Area =	9.145 ac,	9.63% Impervious,	Inflow Depth > 3.04"	for 25yr-cor event
Inflow =	32.98 cfs @	12.11 hrs,	Volume=	2.319 af
Outflow =	32.98 cfs @	12.11 hrs,	Volume=	2.319 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

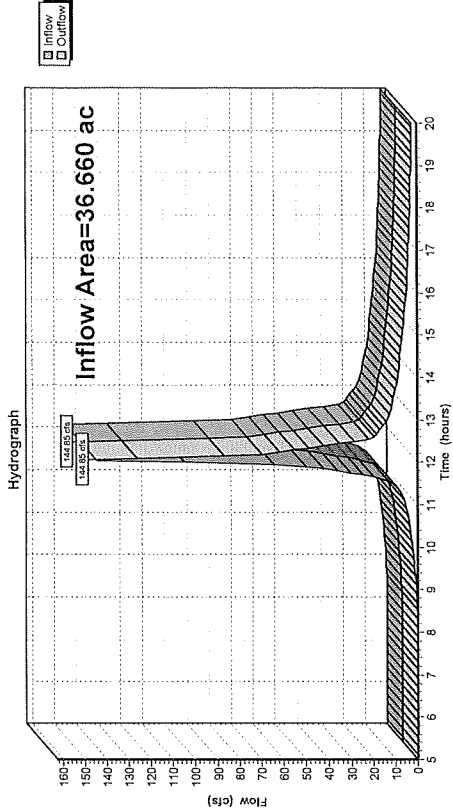


Summary for Reach IP#3: Wetlands

Inflow Area =	36.660 ac,	2.37% Impervious,	Inflow Depth > 2.95"	for 25yr-cor event
Inflow =	144.85 cfs @	12.06 hrs,	Volume=	9.019 af
Outflow =	144.85 cfs @	12.06 hrs,	Volume=	9.019 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands

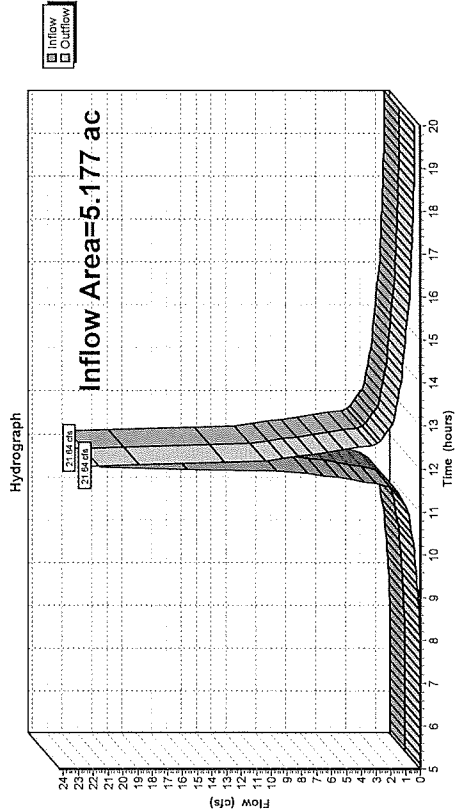


Summary for Reach IP#4: South Property Line

Inflow Area = 5.177 ac, 10.30% Impervious, Inflow Depth > 3.14" for 25yr-cor event
Inflow = 21.64 cfs @ 12.06 hrs, Volume= 1.355 af
Outflow = 21.64 cfs @ 12.06 hrs, Volume= 1.355 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#4: South Property Line



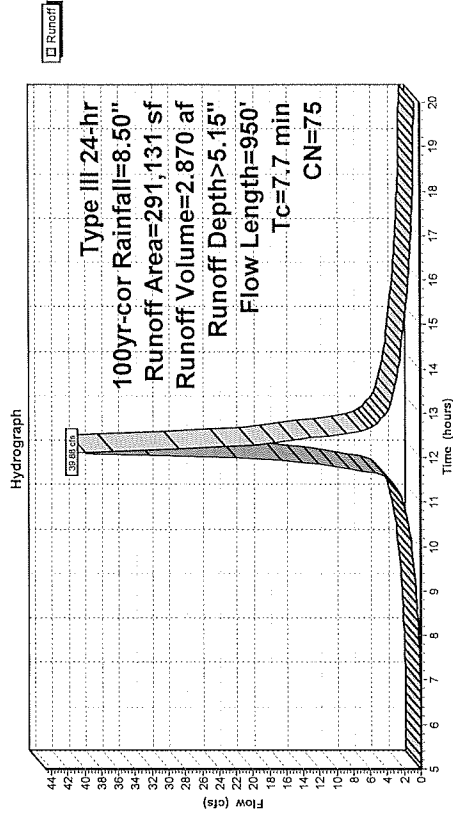
Summary for Subcatchment E-1: E-1

Runoff = 39.88 cfs @ 12.11 hrs, Volume= 2.870 af, Depth> 5.15"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr-cor Rainfall=8.50"

Area (sf)	CN	Description
8,225	98	Paved parking, HSG B
282,906	74	>75% Grass cover, Good, HSG C
291,131	75	Weighted Average
282,906		97.17% Pervious Area
8,225		2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B
					Grass: Short n= 0.150 P2= 3.20"
4.8	800	0.0300	2.79		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Unpaved Kv= 16.1 fps
0.9	120	0.0200	2.28		Shallow Concentrated Flow, TRAVEL PATH C TO D
					Unpaved Kv= 16.1 fps
7.7	950	Total			

Subcatchment E-1: E-1



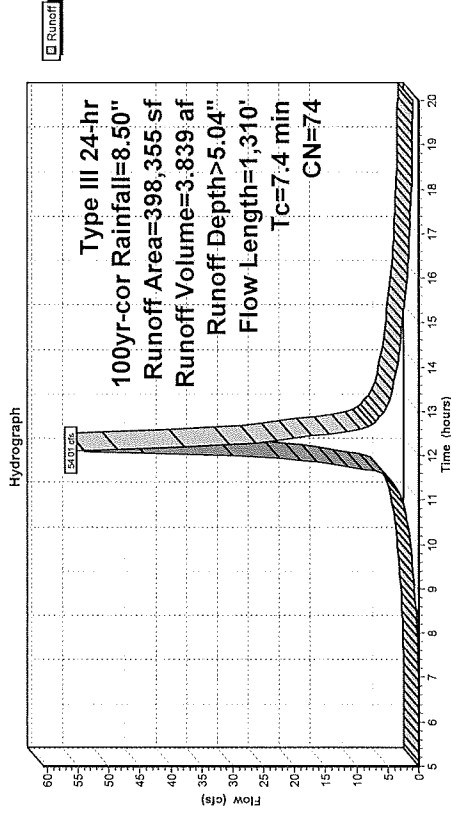
Summary for Subcatchment E-2: E-2

Runoff = 54.01 cfs @ 12.11 hrs, Volume= 3,839 af, Depth> 5.04"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr-cor Rainfall=8.50"

Area (sf)	CN	Description
38,359	98	Paved parking, HSG B
289,774	74	>75% Grass cover, Good, HSG C
70,222	61	>75% Grass cover, Good, HSG B
398,355	74	Weighted Average
359,996		90.37% Pervious Area
38,359		9.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
5.4	1,280	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.4	1,310	Total			

Subcatchment E-2: E-2



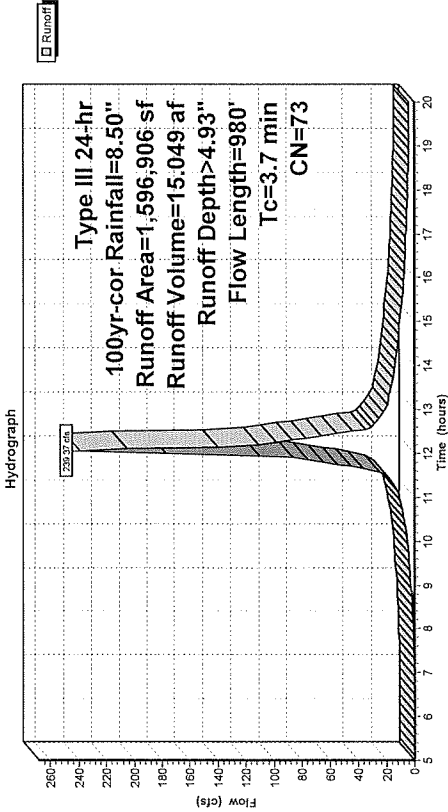
Summary for Subcatchment E-3: E-3

Runoff = 239.37 cfs @ 12.06 hrs, Volume= 15,049 af, Depth> 4.93"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr-cor Rainfall=8.50"

Area (sf)	CN	Description
37,787	98	Paved parking, HSG B
998,192	74	>75% Grass cover, Good, HSG C
276,489	70	Woods, Good, HSG C
39,707	80	>75% Grass cover, Good, HSG D
89,988	61	>75% Grass cover, Good, HSG B
70,141	55	Woods, Good, HSG B
84,602	77	Woods, Good, HSG D
1,596,906	73	Weighted Average
1,559,119		97.63% Pervious Area
37,787		2.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
0.4	130	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps
1.8	640	0.1400	6.02		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
1.1	160	0.2500	2.50		Shallow Concentrated Flow, TRAVEL PATH D TO E Woodland Kv= 5.0 fps
3.7	980	Total			

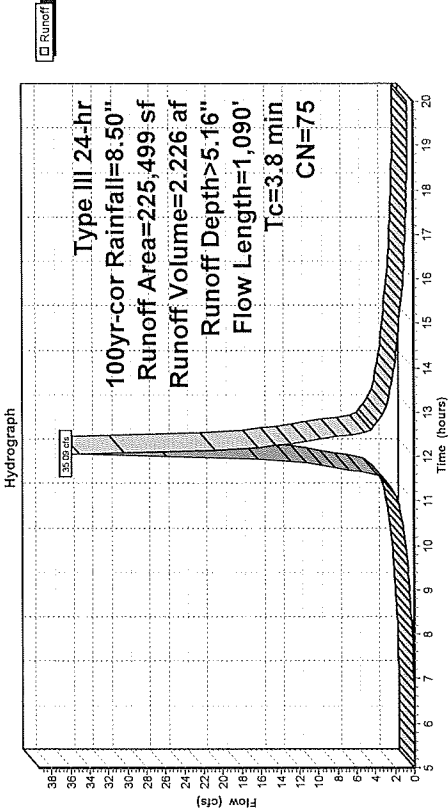
Subcatchment E-3: E-3



Summary for Subcatchment E-4: E-4

Runoff	=	35.09 cfs @ 12.06 hrs,	Volume= 2.226 af,	Depth> 5.16"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs				
Type III 24-hr 100yr-cor Rainfall=8.50"				
Area (sf)	CN	Description		
23,233	98	Paved parking, HSG B		
184,782	74	>75% Grass cover, Good, HSG C		
17,484	61	>75% Grass cover, Good, HSG B		
225,499	75	Weighted Average		
202,266		89.70% Pervious Area		
23,233		10.30% Impervious Area		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)
0.4	50	0.0640	1.91	
0.9	280	0.0640	5.14	
2.5	760	0.1000	5.09	
3.8	1,090	Total		
Sheet Flow, TRAVEL PATH A TO B				
Smooth surfaces n= 0.011 P2= 3.20"				
Shallow Concentrated Flow, TRAVEL PATH B TO C				
Paved Kv= 20.3 fps				
Shallow Concentrated Flow, TRAVEL PATH C TO D				
Unpaved Kv= 16.1 fps				

Subcatchment E-4: E-4

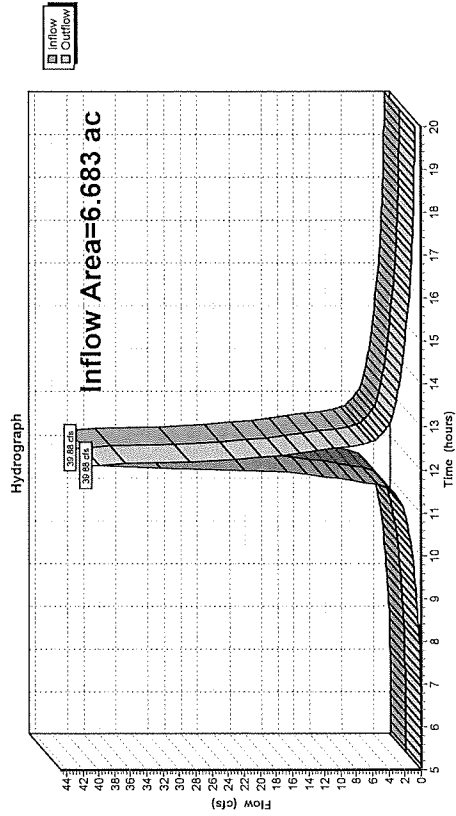


Summary for Reach IP#1: North Park Hill

Inflow Area = 6.683 ac, 2.83% Impervious, Inflow Depth > 5.15" for 100yr-cor event
Inflow = 39.88 cfs @ 12.11 hrs, Volume= 2.870 af
Outflow = 39.88 cfs @ 12.11 hrs, Volume= 2.870 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

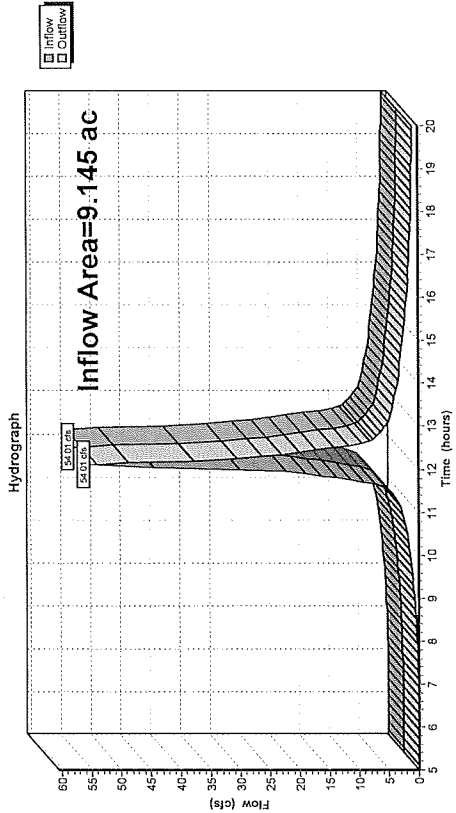


Summary for Reach IP#2: South Park Hill

Inflow Area = 9.145 ac, 9.63% Impervious, Inflow Depth > 5.04" for 100yr-cor event
Inflow = 54.01 cfs @ 12.11 hrs, Volume= 3.839 af
Outflow = 54.01 cfs @ 12.11 hrs, Volume= 3.839 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

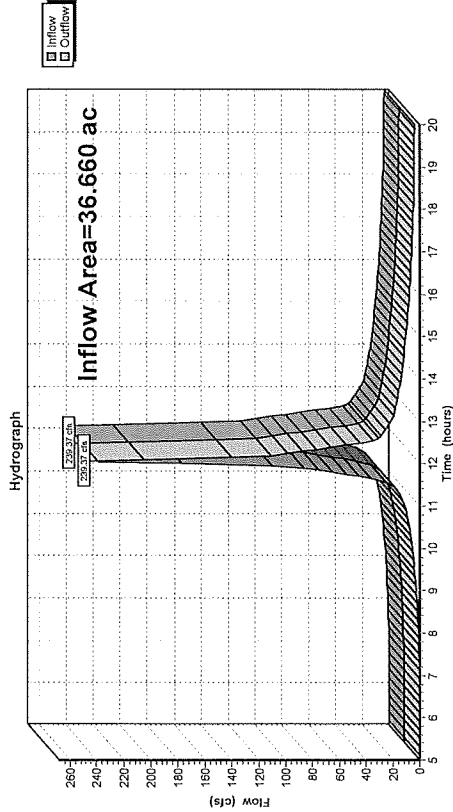


Summary for Reach IP#3: Wetlands

Inflow Area = 36.660 ac, 2.37% Impervious, Inflow Depth > 4.93" for 100yr-cor event
Inflow = 239.37 cfs @ 12.06 hrs, Volume= 15.049 af
Outflow = 239.37 cfs @ 12.06 hrs, Volume= 15.049 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands

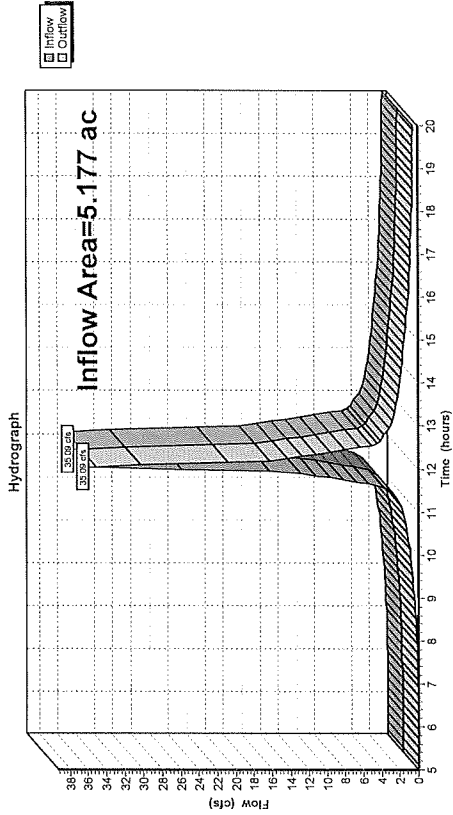


Summary for Reach IP#4: South Property Line

Inflow Area = 5.177 ac, 10.30% Impervious, Inflow Depth > 5.16" for 100yr-cor event
Inflow = 35.09 cfs @ 12.06 hrs, Volume= 2.226 af
Outflow = 35.09 cfs @ 12.06 hrs, Volume= 2.226 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#4: South Property Line



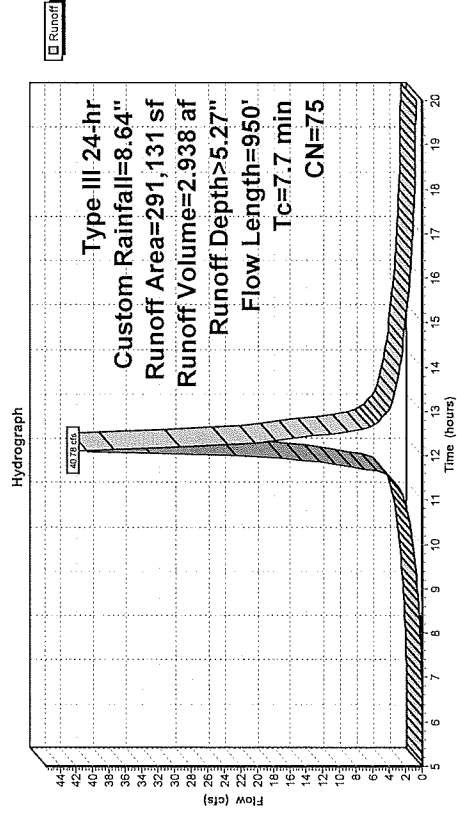
Summary for Subcatchment E-1: E-1

Runoff = 40.78 cfs @ 12.11 hrs, Volume= 2,938 af, Depth> 5.27"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
8,225	98	Paved parking, HSG B
282,906	74	>75% Grass cover, Good, HSG C
291,131	75	Weighted Average
282,906		97.17% Pervious Area
8,225		2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
4.8	800	0.0300	2.79		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
0.9	120	0.0200	2.28		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
7.7	950	Total			

Subcatchment E-1: E-1



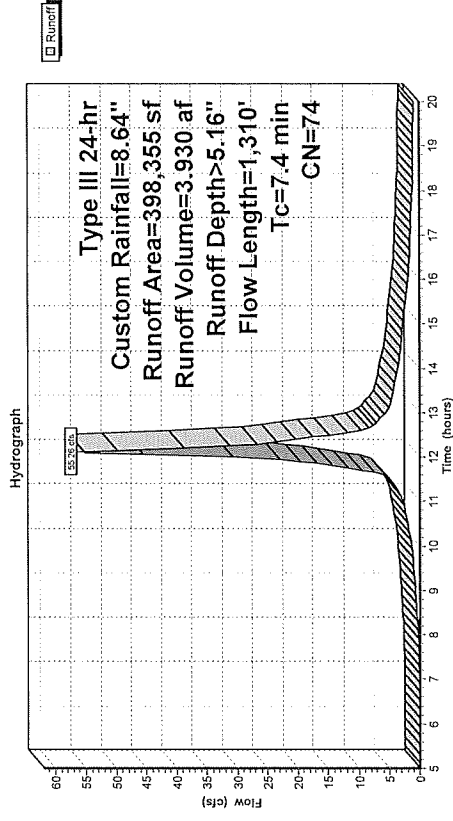
Summary for Subcatchment E-2: E-2

Runoff = 55.26 cfs @ 12.11 hrs, Volume= 3,930 af, Depth> 5.16"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
38,359	98	Paved parking, HSG B
289,774	74	>75% Grass cover, Good, HSG C
70,222	61	>75% Grass cover, Good, HSG B
398,355	74	Weighted Average
359,996		90.37% Pervious Area
38,359		9.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	30	0.1000	0.25		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
5.4	1,280	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.4	1,310	Total			

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

Runoff = 244.97 cfs @ 12.05 hrs, Volume= 15,413 af, Depth> 5.05"

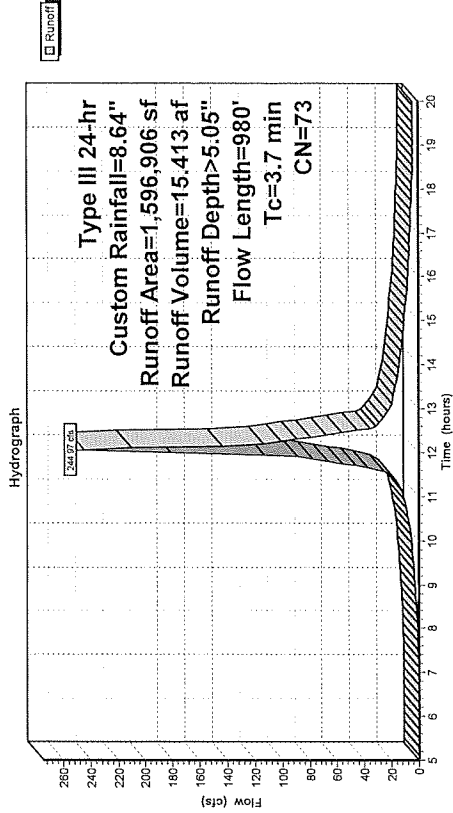
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
37,787	98	Paved parking, HSG B
998,192	74	>75% Grass cover, Good, HSG C
276,489	70	Woods, Good, HSG C
39,707	80	>75% Grass cover, Good, HSG D
89,988	61	>75% Grass cover, Good, HSG B
70,141	55	Woods, Good, HSG B
84,602	77	Woods, Good, HSG D
1,596,906	73	Weighted Average
1,559,119		97.63% Pervious Area
37,787		2.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
0.4	130	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps
1.8	640	0.1400	6.02		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
1.1	160	0.2500	2.50		Shallow Concentrated Flow, TRAVEL PATH D TO E Woodland Kv= 5.0 fps
3.7	980	Total			

Subcatchment E-3: E-3



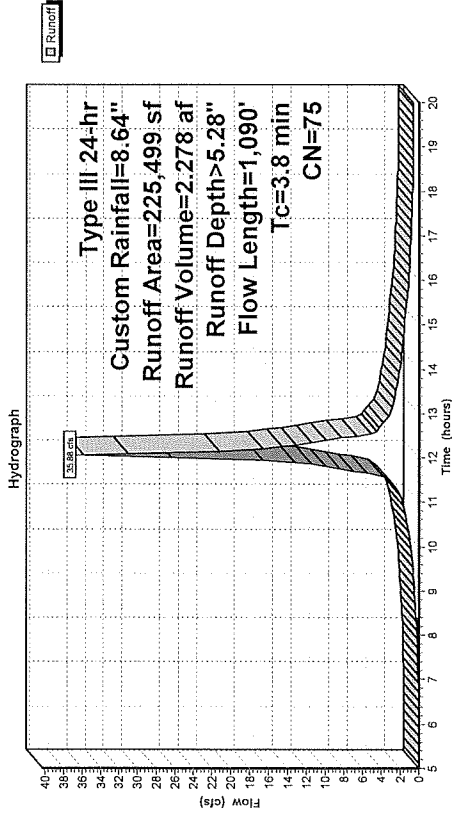
Summary for Subcatchment E-4: E-4

Runoff = 35.88 cfs @ 12.06 hrs, Volume= 2.278 af, Depth> 5.28"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
23,233	98	Paved parking, HSG B
184,782	74	>75% Grass cover, Good, HSG C
17,484	61	>75% Grass cover, Good, HSG B
225,499	75	Weighted Average
202,266		89.70% Pervious Area
23,233		10.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0640	1.91		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
0.9	280	0.0640	5.14		Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps
2.5	760	0.1000	5.09		Shallow Concentrated Flow, TRAVEL PATH C TO D Unpaved Kv= 16.1 fps
3.8	1,090	Total			

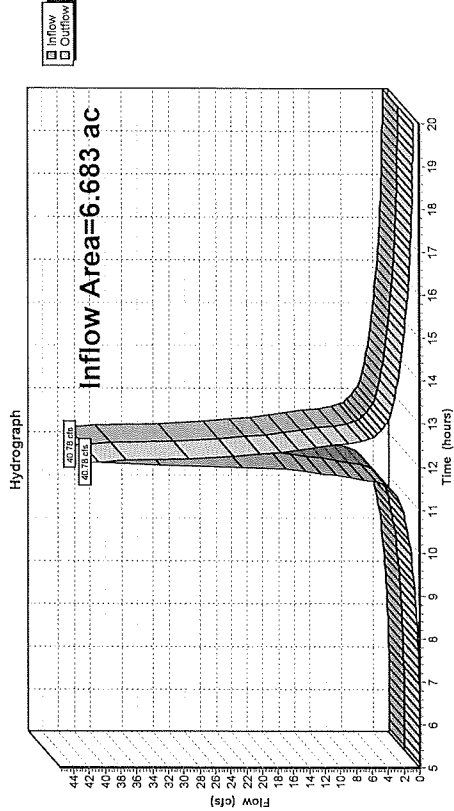
Subcatchment E-4: E-4



Summary for Reach IP#1: North Park Hill

Inflow Area = 6.683 ac, 2.83% Impervious, Inflow Depth > 5.27" for Custom event
 Inflow = 40.78 cfs @ 12.11 hrs, Volume= 2.938 af
 Outflow = 40.78 cfs @ 12.11 hrs, Volume= 2.938 af, Atten= 0%, Lag= 0.0 min
 Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

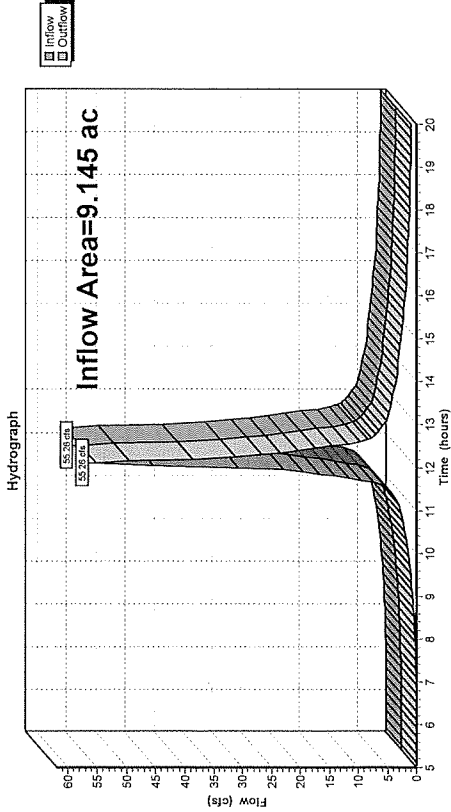


Summary for Reach IP#2: South Park Hill

Inflow Area = 9.145 ac, 9.63% Impervious, Inflow Depth > 5.16" for Custom event
Inflow = 55.26 cfs @ 12.11 hrs, Volume= 3.930 af
Outflow = 55.26 cfs @ 12.11 hrs, Volume= 3.930 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

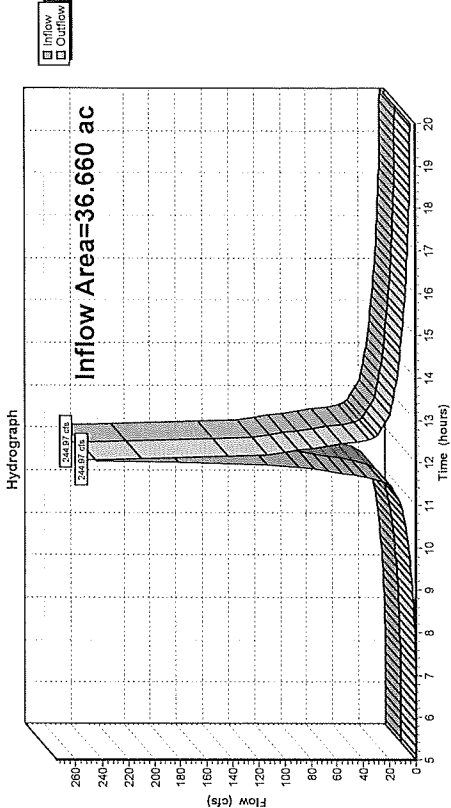


Summary for Reach IP#3: Wetlands

Inflow Area = 36.660 ac, 2.37% Impervious, Inflow Depth > 5.05" for Custom event
Inflow = 244.97 cfs @ 12.06 hrs, Volume= 15.413 af
Outflow = 244.97 cfs @ 12.06 hrs, Volume= 15.413 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands

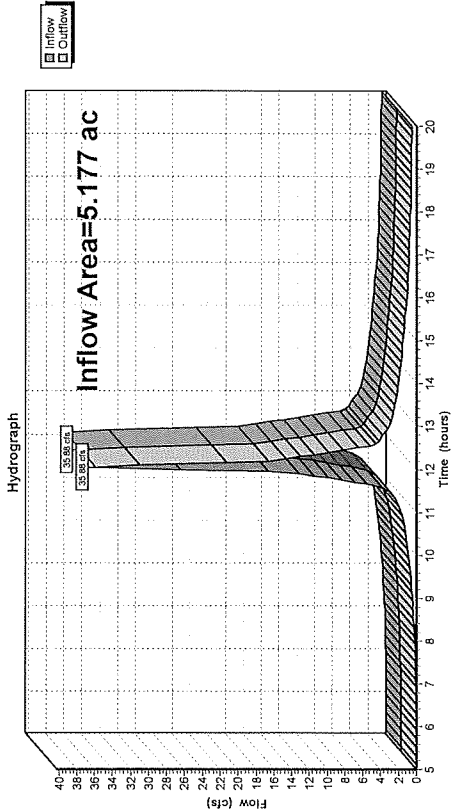


Summary for Reach IP#4: South Property Line

Inflow Area = 5.177 ac, 10.30% Impervious, Inflow Depth > 5.28" for Custom event
Inflow = 35.88 cfs @ 12.06 hrs, Volume= 2.278 af
Outflow = 35.88 cfs @ 12.06 hrs, Volume= 2.278 af, Atten= 0%, Lag= 0.0 min

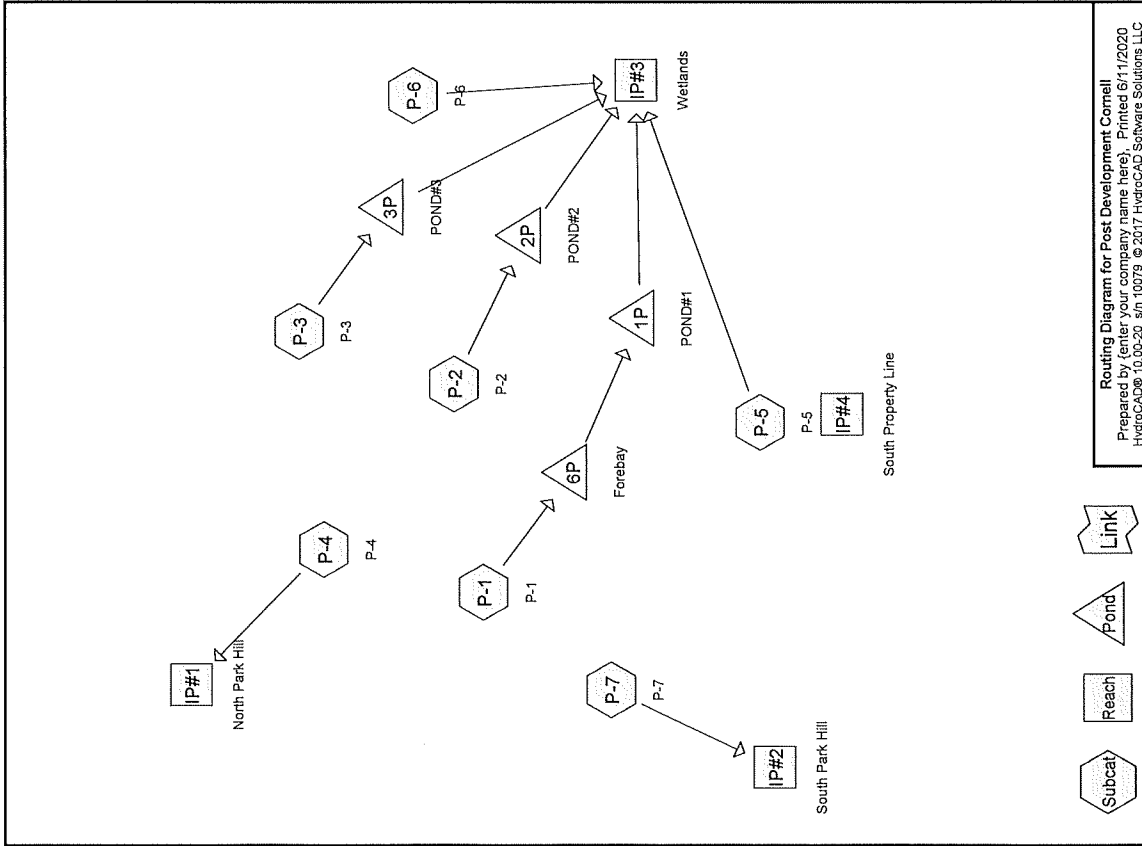
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach IP#4: South Property Line



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
14.078	61	>75% Grass cover, Good, HSG B (P-1, P-2, P-3, P-5, P-6)
27.890	74	>75% Grass cover, Good, HSG C (P-1, P-2, P-3, P-4, P-6, P-7)
1.046	80	>75% Grass cover, Good, HSG D (P-3, P-6)
11.027	98	Paved parking, HSG B (P-1, P-2, P-3, P-4, P-5)
0.146	98	Paved parking, HSG C (P-6, P-7)
1.746	55	Woods, Good, HSG B (P-6)
1.701	70	Woods, Good, HSG C (P-6)



Post Development Cornell

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
26.851	HSG B	P-1, P-2, P-3, P-4, P-5, P-6
29.537	HSG C	P-1, P-2, P-3, P-4, P-6, P-7
1.046	HSG D	P-3, P-6
0.000	Other	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P-1	0.00	0.00	1,875.0	0.0400	0.010	18.0	0.0	0.0
2	P-2	0.00	0.00	1,460.0	0.0600	0.010	15.0	0.0	0.0
3	P-3	0.00	0.00	640.0	0.0500	0.010	15.0	0.0	0.0
4	P-5	0.00	0.00	1,250.0	0.0600	0.010	12.0	0.0	0.0

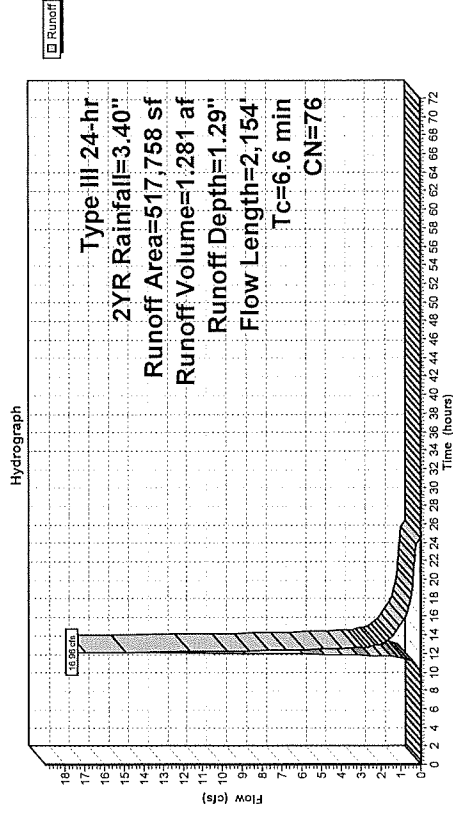
Summary for Subcatchment P-1: P-1

Runoff = 16.96 cfs @ 12.10 hrs, Volume= 1.281 af, Depth= 1.29"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
140,755	98	Paved parking, HSG B
188,280	74	>75% Grass cover, Good, HSG C
188,723	61	>75% Grass cover, Good, HSG B
517,758	76	Weighted Average
377,003		72.81% Pervious Area
140,755		27.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
1.0	229	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
2.0	1,875	0.0400	15.46	27.31	Pipe Channel, TRAVEL PATH C TO D 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
6.6	2,154	Total			

Subcatchment P-1: P-1



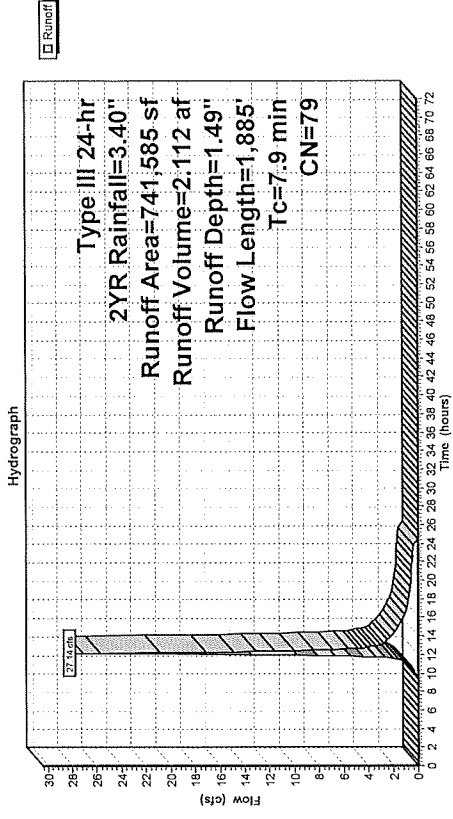
Summary for Subcatchment P-2: P-2

Runoff = 27.14 cfs @ 12.12 hrs, Volume= 2.112 af, Depth= 1.49"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
189,269	98	Paved parking, HSG B
484,425	74	>75% Grass cover, Good, HSG C
67,891	61	>75% Grass cover, Good, HSG B
741,585	79	Weighted Average
552,316		74.48% Pervious Area
189,269		25.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0300	0.17		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
1.6	375	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
1.5	1,460	0.0600	16.76	20.57	Pipe Channel, TRAVEL PATH C TO D 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
7.9	1,885	Total			

Subcatchment P-2: P-2



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Type III 24-hr 2YR Rainfall=3.40"

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Type III 24-hr 2YR Rainfall=3.40"

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Summary for Subcatchment P-3: P-3

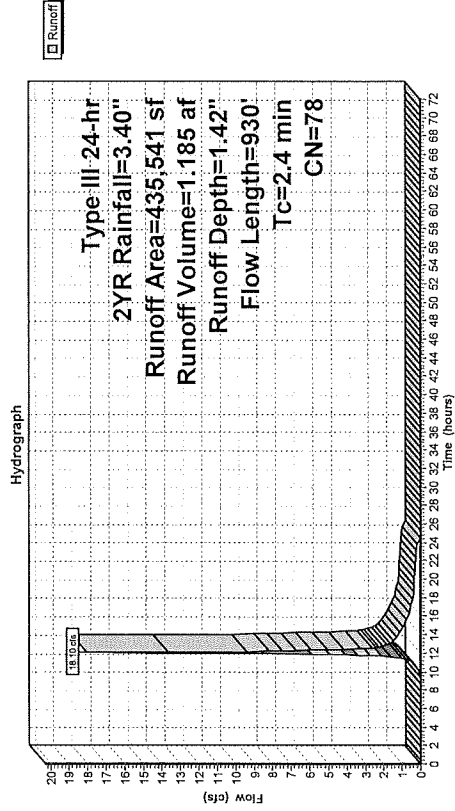
Runoff = 18.10 cfs @ 12.05 hrs, Volume= 1.185 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
108,837	98	Paved parking, HSG B
245,328	74	>75% Grass cover, Good, HSG C
75,499	61	>75% Grass cover, Good, HSG B
5,876	80	>75% Grass cover, Good, HSG D
435,541	78	Weighted Average
326,704		75.01% Pervious Area
108,837		24.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B
1.1	240	0.0300	3.52		Smooth surfaces n= 0.011 P2= 3.20"
0.7	640	0.0500	15.30	18.78	Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps Pipe Channel, TRAVEL PATH C TO D 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
2.4	930	Total			

Subcatchment P-3: P-3



Summary for Subcatchment P-4: P-4

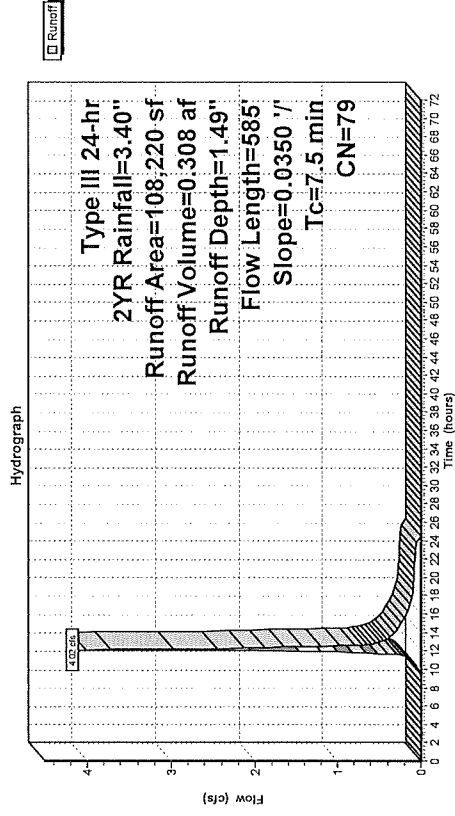
Runoff = 4.02 cfs @ 12.11 hrs, Volume= 0.308 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
21,220	98	Paved parking, HSG B
87,000	74	>75% Grass cover, Good, HSG C
108,220	79	Weighted Average
87,000		80.39% Pervious Area
21,220		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
3.0	535	0.0350	3.01		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.5	585	Total			

Subcatchment P-4: P-4



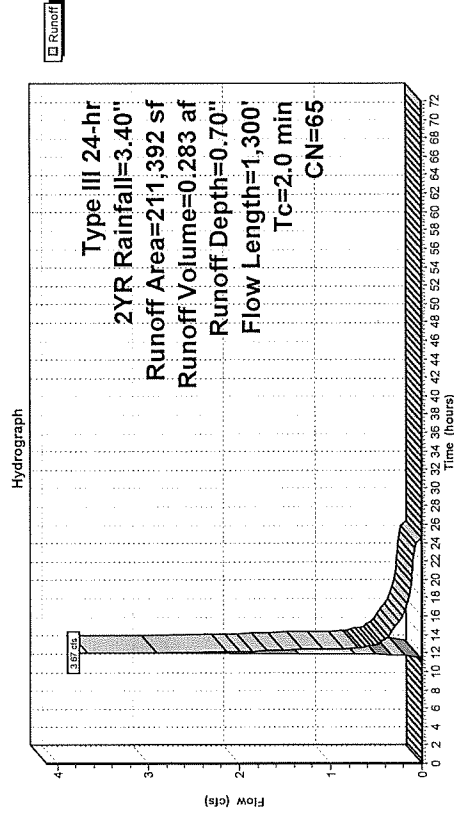
Summary for Subcatchment P-5: P-5

Runoff = 3.67 cfs @ 12.05 hrs, Volume= 0.283 af, Depth= 0.70"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
20,267	98	Paved parking, HSG B
191,125	61	>75% Grass cover, Good, HSG B
211,392	65	Weighted Average
191,125		90.41% Pervious Area
20,267		9.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
1.4	1,250	0.0600	14.45	11.35	Pipe Channel, TRAVEL PATH B TO C 12.0" Round Area= 0.8 sf Perim= 3.1' n= 0.25'
2.0	1,300	Total			

Subcatchment P-5: P-5



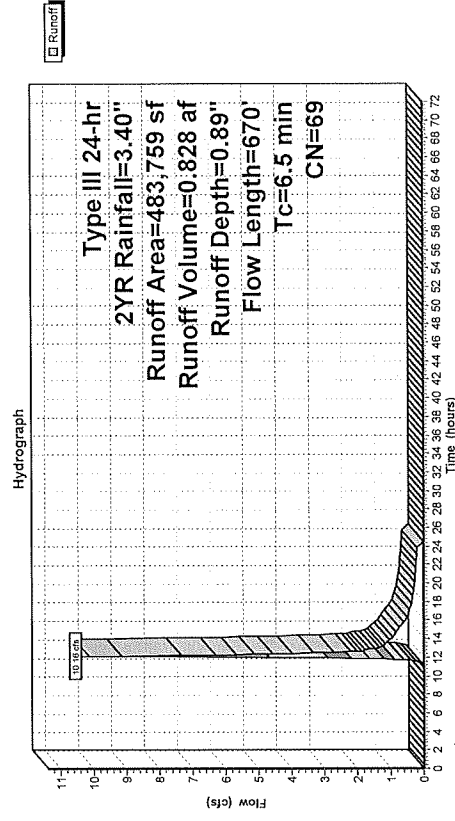
Summary for Subcatchment P-6: P-6

Runoff = 10.16 cfs @ 12.11 hrs, Volume= 0.828 af, Depth= 0.89"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
2,860	98	Paved parking, HSG C
201,050	74	>75% Grass cover, Good, HSG C
74,105	70	Woods, Good, HSG C
89,988	61	>75% Grass cover, Good, HSG B
39,707	80	>75% Grass cover, Good, HSG D
76,049	55	Woods, Good, HSG B
483,759	69	Weighted Average
480,899		99.41% Pervious Area
2,860		0.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
2.0	620	0.1000	5.09		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
6.5	670	Total			

Subcatchment P-6: P-6



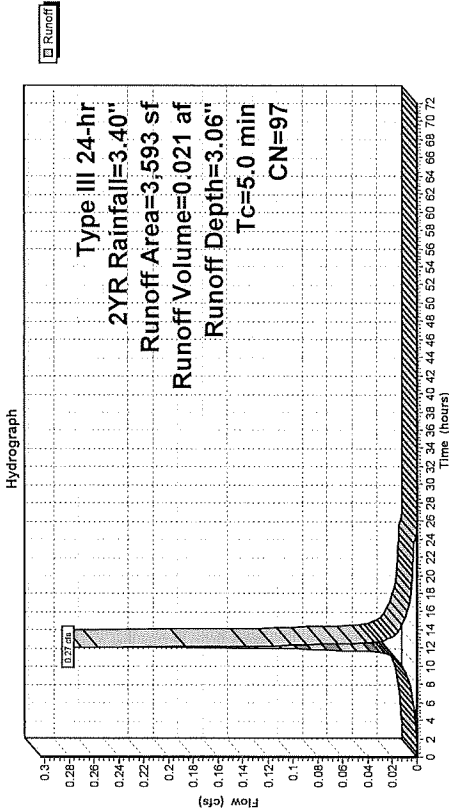
Summary for Subcatchment P-7: P-7

Runoff = 0.27 cfs @ 12.07 hrs, Volume= 0.021 af, Depth= 3.06"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2YR Rainfall=3.40"

Area (sf)	CN	Description
80	74	>75% Grass cover, Good, HSG C
3,513	98	Paved parking, HSG C
3,593	97	Weighted Average
80		2.23% Pervious Area
3,513		97.77% Impervious Area

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

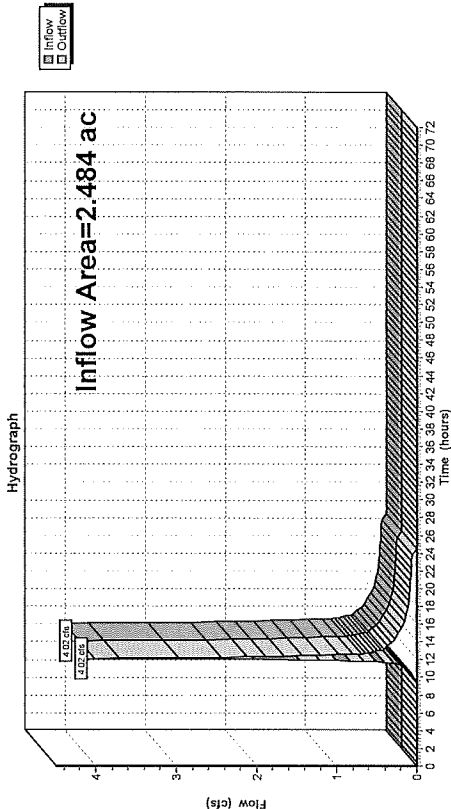
Subcatchment P-7: P-7



Summary for Reach IP#1: North Park Hill

Inflow Area = 2.484 ac, 19.61% Impervious, Inflow Depth = 1.49" for 2YR event
 Inflow = 4.02 cfs @ 12.11 hrs, Volume= 0.308 af
 Outflow = 4.02 cfs @ 12.11 hrs, Volume= 0.308 af, Atten= 0%, Lag= 0.0 min
 Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

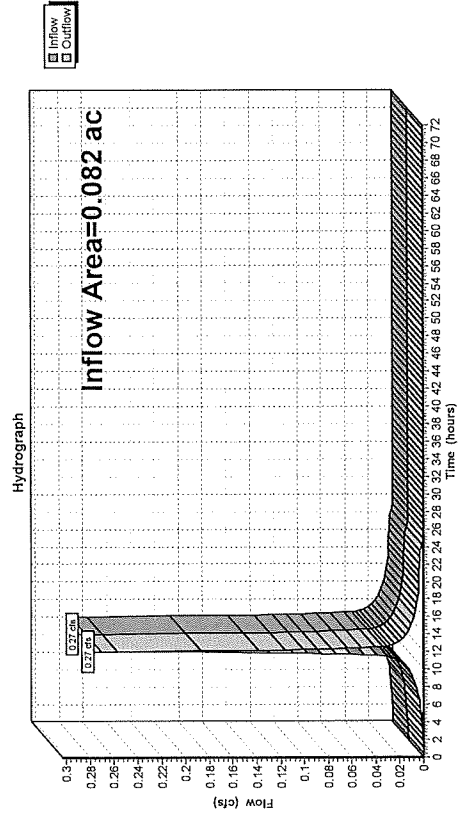


Summary for Reach IP#2: South Park Hill

Inflow Area = 0.082 ac, 97.77% Impervious, Inflow Depth = 3.06" for 2YR event
Inflow = 0.27 cfs @ 12.07 hrs, Volume= 0.021 af
Outflow = 0.27 cfs @ 12.07 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

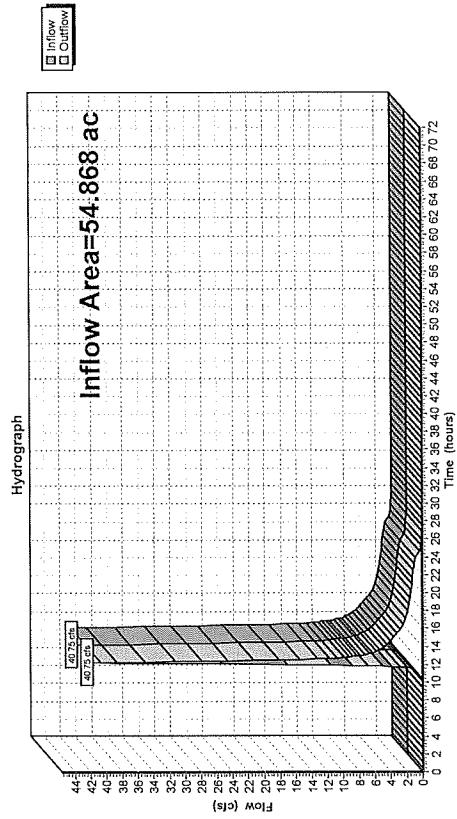


Summary for Reach IP#3: Wetlands

Inflow Area = 54.868 ac, 19.33% Impervious, Inflow Depth = 0.92" for 2YR event
Inflow = 40.75 cfs @ 12.20 hrs, Volume= 4.229 af
Outflow = 40.75 cfs @ 12.20 hrs, Volume= 4.229 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands



Summary for Reach IP#4: South Property Line

Summary for Pond 1P: POND#1

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 1.29" for 2YR event
Inflow = 16.15 cfs @ 12.14 hrs, Volume= 1.281 af
Outflow = 10.15 cfs @ 12.27 hrs, Volume= 1.281 af, Atten= 37%, Lag= 8.2 min
Discarded = 0.12 cfs @ 12.27 hrs, Volume= 0.177 af
Primary = 10.03 cfs @ 12.27 hrs, Volume= 1.104 af

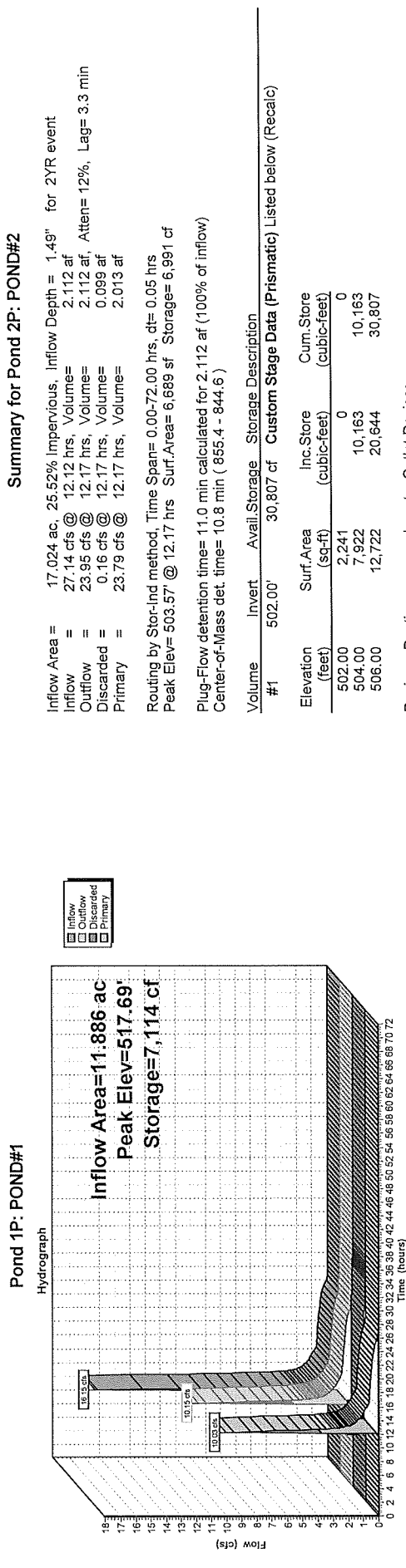
Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dI= 0.05 hrs
Peak Elev= 517.69' @ 12.27 hrs Surf.Area= 4,952 sf Storage= 7,114 cf
Plug-Flow detention time= 58.4 min calculated for 1.280 af (100% of inflow)
Center-of-Mass det. time= 58.4 min (990.3 - 931.8)

Volume					Storage Description		
#1	Invert	Avail	Storage	36,491 cf	Custom Stage Data (Prismatic) Listed below (Recalc)		
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)				
516.00	3,443	0	0				
518.00	5,224	8,667	8,667				
520.00	7,290	12,514	21,181				
522.00	8,020	15,310	36,491				

Device		Routing		Invert		Outlet Devices	
#1	Discarded	516.00'	1.020 in/hr	Exfiltration over Surface area			
#2	Primary	516.50'	24.0"	Vert. Orifice/Grate	C= 0.600		
#3	Primary	517.00'	24.0"	Vert. Orifice/Grate	C= 0.600		

Discarded OutFlow Max=0.12 cfs @ 12.27 hrs HW=517.68' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=9.82 cfs @ 12.27 hrs HW=517.68' (Free Discharge)
2=Orifice/Grate (Orifice Controls 7.16 cfs @ 3.70 fps)
3=Orifice/Grate (Orifice Controls 2.66 cfs @ 2.81 fps)



Summary for Pond 2P: POND#2

Inflow Area = 17.024 ac, 25.52% Impervious, Inflow Depth = 1.49" for 2YR event
Inflow = 27.14 cfs @ 12.12 hrs, Volume= 2.112 af
Outflow = 23.95 cfs @ 12.17 hrs, Volume= 2.112 af, Atten= 12%, Lag= 3.3 min
Discarded = 0.16 cfs @ 12.17 hrs, Volume= 0.099 af
Primary = 23.79 cfs @ 12.17 hrs, Volume= 2.013 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 503.57' @ 12.17 hrs Surf.Area= 6,689 sf Storage= 6,991 cf

Plug-Flow detention time= 11.0 min calculated for 2.112 af (100% of inflow)
Center-of-Mass det time= 10.8 min (855.4 - 844.6)

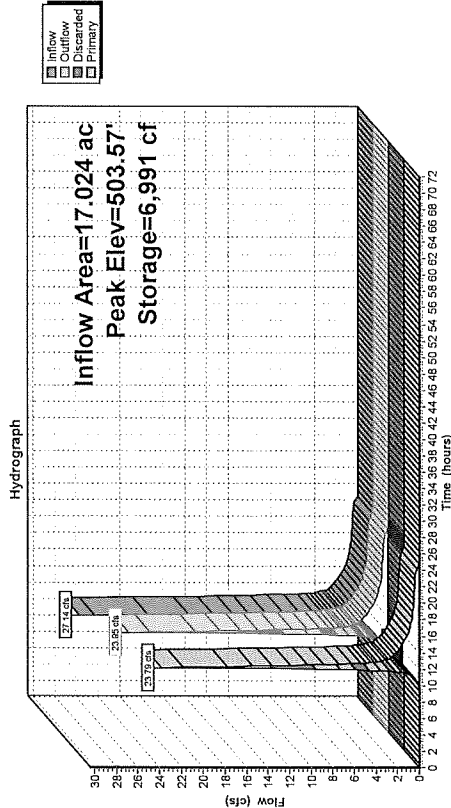
Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	30,807 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	2,241	0	0
504.00	7,922	10,163	10,163
506.00	12,722	20,644	30,807

Device	Routing	Invert	Outlet Devices
#1	Discarded	502.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	502.50'	36.0" Vert. Orifice/Grate C= 0.600
#3	Primary	502.00'	36.0" Vert. Orifice/Grate C= 0.600

Discarded Outflow Max=0.16 cfs @ 12.17 hrs HW=503.55' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.16 cfs)

Primary Outflow Max=23.28 cfs @ 12.17 hrs HW=503.55' (Free Discharge)
2=Orifice/Grate (Orifice Controls 7.88 cfs @ 3.49 fps)
3=Orifice/Grate (Orifice Controls 15.60 cfs @ 4.24 fps)

Pond 2P: POND#2



Summary for Pond 3P: POND#3

Inflow Area = 9.999 ac, 24.99% Impervious, Inflow Depth = 1.42" for 2YR event
Inflow = 18.10 cfs @ 12.05 hrs, Volume= 1.185 af
Outflow = 0.33 cfs @ 20.16 hrs, Volume= 1.185 af, Atten= 98%, Lag= 487.1 min
Discarded = 0.33 cfs @ 20.16 hrs, Volume= 1.185 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 521.75' @ 20.16 hrs Surf.Area= 13,784 sf Storage= 37,753 cf
Plug-Flow detention time= 1,281.2 min calculated for 1.185 af (100% of inflow)
Center-of-Mass det. time= 1,281.1 min (2,123.7 - 842.6)

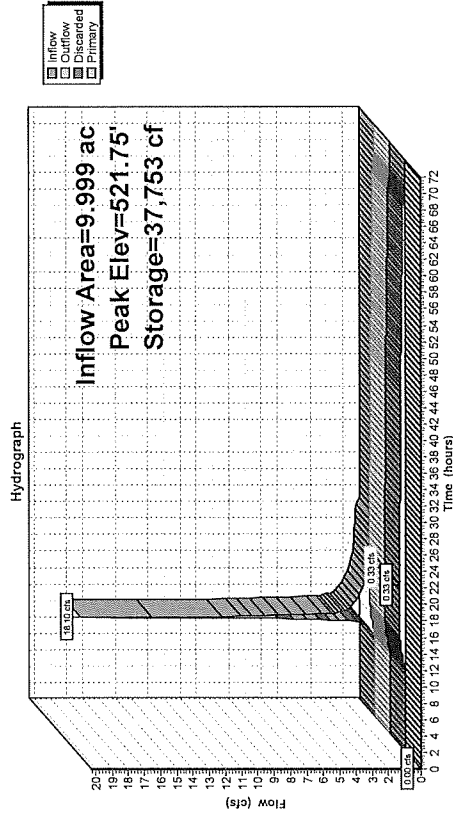
Volume				Storage Description	
#1	Invert	Avail.Storage	Custom Stage Data (Prismatic)	Listed below (Recalc)	
	518.00'	109,920 cf			
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)		
518.00	4,370	0	0		
520.00	11,380	15,750	15,750		
522.00	14,130	25,510	41,260		
524.00	17,110	31,240	72,500		
526.00	20,310	37,420	109,920		

Device		Routing	Invert	Outlet Devices	
#1	Discarded		518.00'	1.020 in/hr	Exfiltration over Surface area
#2	Primary		522.50'	24.0" Vert. Orifice/Grate	X 2.00 C= 0.600
#3	Primary		525.00'	15.0" long x 1.0' breadth	Broad-Crested Rectangular Weir
				Head (feet)	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
				Coef. (English)	2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
					3.30 3.31 3.32

Discarded OutFlow Max=0.33 cfs @ 20.16 hrs HW=521.75' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=518.00' (Free Discharge)
2=Orifice/Grate (Controls 0.00 cfs)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: POND#3



Summary for Pond 6P: Forebay

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 1.29" for 2YR event
Inflow = 16.96 cfs @ 12.10 hrs, Volume= 1.281 af
Outflow = 16.15 cfs @ 12.14 hrs, Volume= 1.281 af, Atten= 5%, Lag= 1.9 min
Primary = 16.15 cfs @ 12.14 hrs, Volume= 1.281 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 529.43' @ 12.14 hrs Surf.Area= 3,882 sf Storage= 8,890 cf

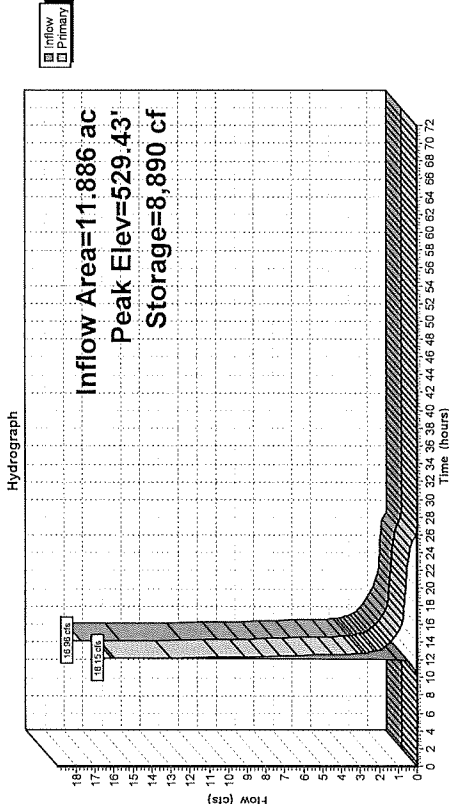
Plug-Flow detention time= 78.8 min calculated for 1,280 af (100% of inflow)
Center-of-Mass det. time= 79.2 min (931.8 - 852.6)

Volume	Invert	Avail.Storage	Storage Description
#1	526.00'	11,231 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
526.00	1,431	0	0
528.00	2,730	4,161	4,161
530.00	4,340	7,070	11,231

Device	Routing	Invert	Outlet Devices
#1	Primary	529.00'	20.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
			3.30 3.31 3.32
#2	Primary	526.00'	4.0" Vert. Orifice/Grate C= 0.600

Primary Outflow Max=15.75 cfs @ 12.14 hrs HW=529.42' (Free Discharge)
1-Broad-Crested Rectangular Weir (Weir Controls 14.99 cfs @ 1.77 fps)
2-Orifice/Grate (Orifice Controls 0.76 cfs @ 8.69 fps)

Pond 6P: Forebay



Summary for Subcatchment P-1: P-1

Runoff = 32.95 cfs @ 12.10 hrs, Volume= 2,430 af, Depth= 2.45"

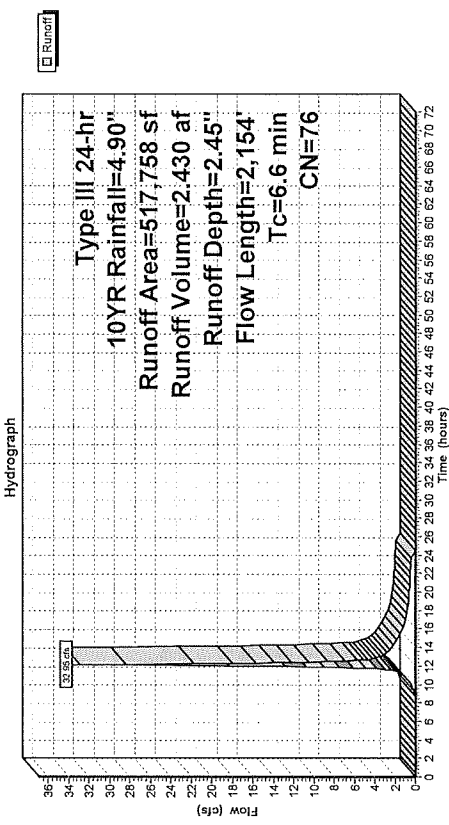
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
140,755	98	Paved parking, HSG B
188,280	74	>75% Grass cover, Good, HSG C
188,723	61	>75% Grass cover, Good, HSG B
517,758	76	Weighted Average
377,003		72.81% Pervious Area
140,755		27.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		Sheet Flow, TRAVEL PATH A TO B
1.0	229	0.0600	3.94		Grass: Short n= 0.150 P2= 3.20"
2.0	1,875	0.0400	15.46	27.31	Shallow Concentrated Flow, TRAVEL PATH B TO C
					Unpaved Kv= 16.1 fps
					Pipe Channel, TRAVEL PATH C TO D
					18.0" Round, Area= 1.8 sf, Perim= 4.7' r= 0.38'
					n= 0.010 PVC, smooth interior
6.6	2,154	Total			

Subcatchment P-1: P-1



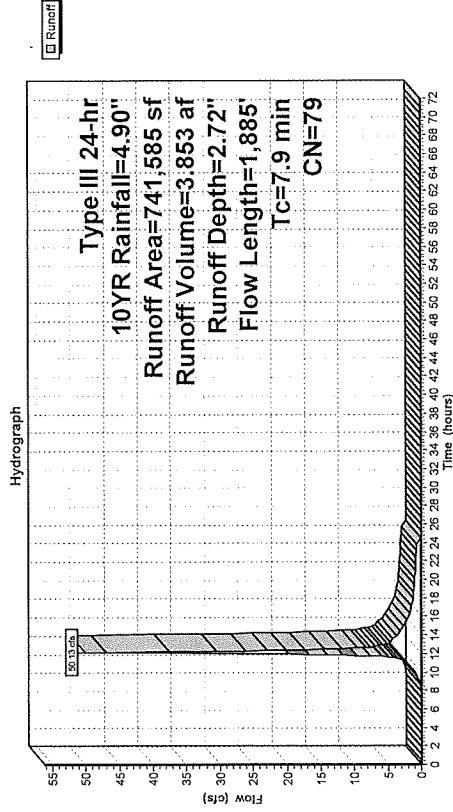
Summary for Subcatchment P-2: P-2

Runoff = 50.13 cfs @ 12.11 hrs, Volume= 3.853 af, Depth= 2.72"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
189,269	98	Paved parking, HSG B
484,425	74	>75% Grass cover, Good, HSG C
67,891	61	>75% Grass cover, Good, HSG B
741,585	79	Weighted Average
552,316		74.48% Pervious Area
189,269		25.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0300	0.17		Sheet Flow, TRAVEL PATH A TO B
					Grass: Short n= 0.150 P2= 3.20"
1.6	375	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Unpaved Kv= 16.1 fps
1.5	1,460	0.0600	16.76	20.57	Pipe Channel, TRAVEL PATH C TO D
					15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'
					n= 0.010
7.9	1,885	Total			

Subcatchment P-2: P-2



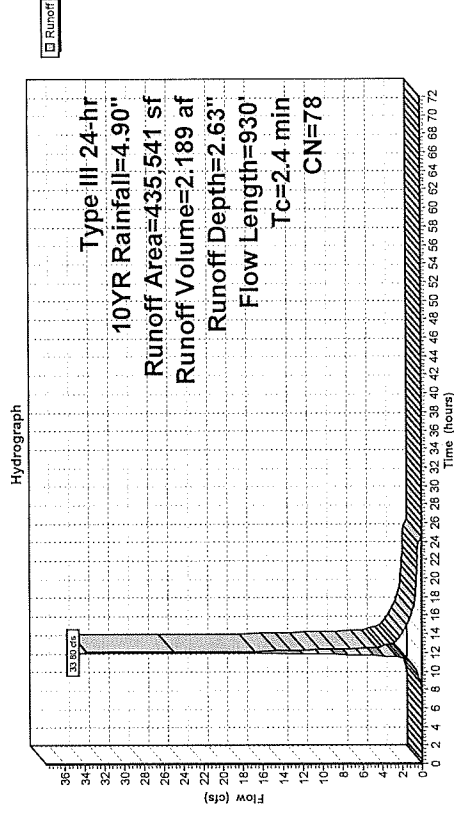
Summary for Subcatchment P-3: P-3

Runoff = 33.80 cfs @ 12.04 hrs, Volume= 2.189 af, Depth= 2.63"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
108,837	98	Paved parking, HSG B
245,329	74	>75% Grass cover, Good, HSG C
75,499	61	>75% Grass cover, Good, HSG B
5,876	80	>75% Grass cover, Good, HSG D
435,541	78	Weighted Average
326,704		75.01% Pervious Area
108,837		24.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B
					Smooth surfaces n= 0.011 P2= 3.20"
1.1	240	0.0300	3.52		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Paved Kv= 20.3 fps
0.7	640	0.0500	15.30	18.78	Pipe Channel, TRAVEL PATH C TO D
					15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'
					n= 0.010
2.4	930	Total			

Subcatchment P-3: P-3



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Type III 24-hr 10YR Rainfall=4.90"

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Summary for Subcatchment P-4: P-4

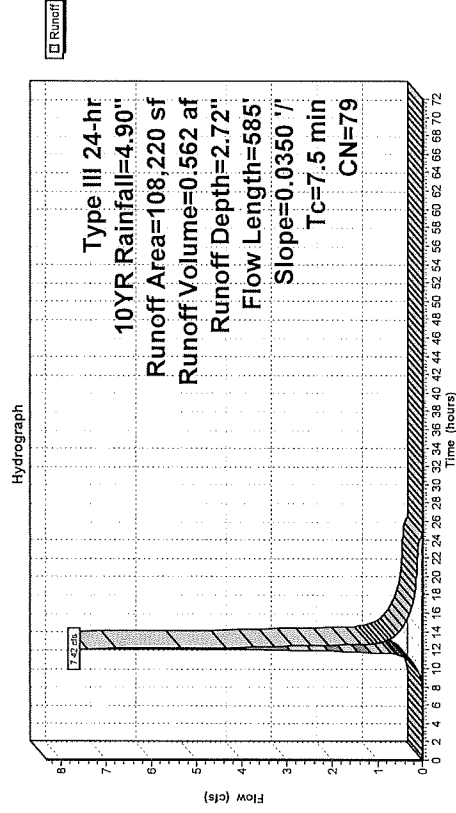
Runoff = 7.42 cfs @ 12.11 hrs, Volume= 0.562 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
21,220	98	Paved parking, HSG B
87,000	74	>75% Grass cover, Good, HSG C
108,220	79	Weighted Average
87,000		80.39% Pervious Area
21,220		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
3.0	535	0.0350	3.01		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.5	585	Total			

Subcatchment P-4: P-4



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Type III 24-hr 10YR Rainfall=4.90"

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Summary for Subcatchment P-5: P-5

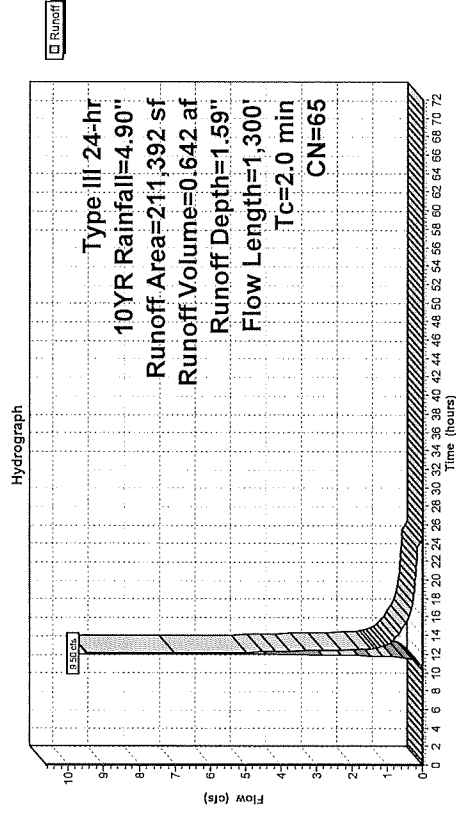
Runoff = 9.50 cfs @ 12.04 hrs, Volume= 0.642 af, Depth= 1.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
20,267	98	Paved parking, HSG B
191,125	61	>75% Grass cover, Good, HSG B
211,392	65	Weighted Average
191,125		90.41% Pervious Area
20,267		9.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
1.4	1,250	0.0600	14.45	11.35	Pipe Channel, TRAVEL PATH B TO C 12.0" Round Area= 0.8 sf Perim= 3.1' n= 0.010
2.0	1,300	Total			

Subcatchment P-5: P-5



Summary for Subcatchment P-6: P-6

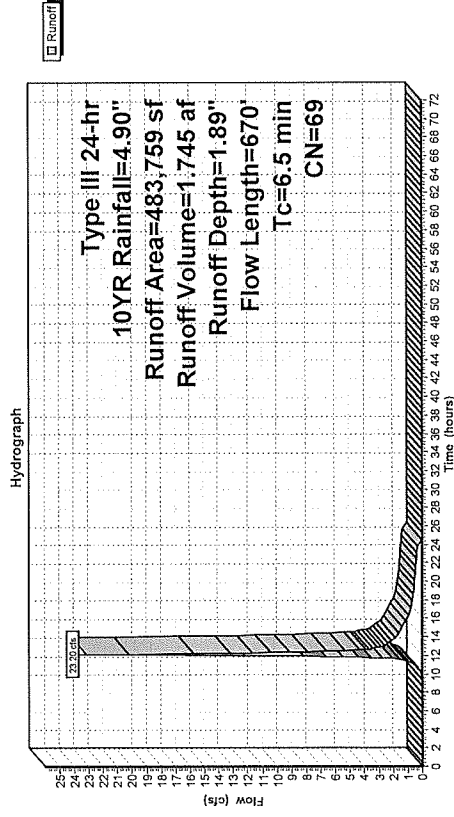
Runoff = 23.20 cfs @ 12.10 hrs, Volume= 1.745 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
2,860	98	Paved parking, HSG C
201,050	74	>75% Grass cover, Good, HSG C
74,105	70	Woods, Good, HSG C
89,988	61	>75% Grass cover, Good, HSG B
39,707	80	>75% Grass cover, Good, HSG D
76,049	55	Woods, Good, HSG B
483,759	69	Weighted Average
480,899		99.41% Pervious Area
2,860		0.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
2.0	620	0.1000	5.09		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
6.5	670	Total			

Subcatchment P-6: P-6



Summary for Subcatchment P-7: P-7

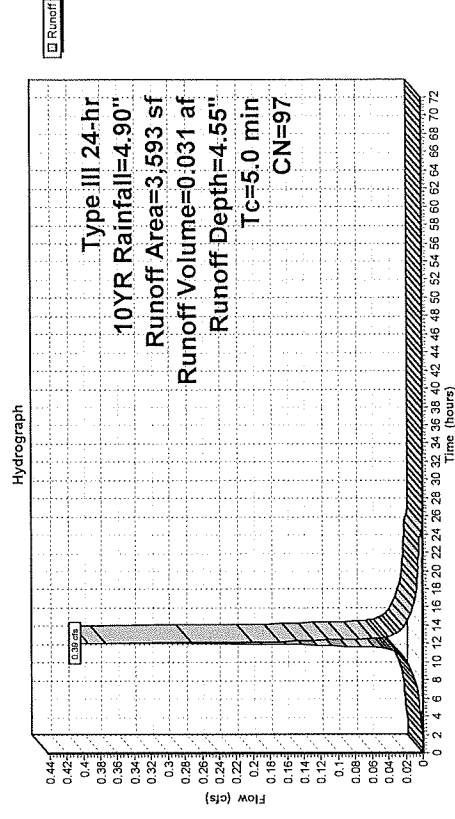
Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.031 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10YR Rainfall=4.90"

Area (sf)	CN	Description
80	74	>75% Grass cover, Good, HSG C
3,513	98	Paved parking, HSG C
3,593	97	Weighted Average
80		2.23% Pervious Area
3,513		97.77% Impervious Area

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

Subcatchment P-7: P-7

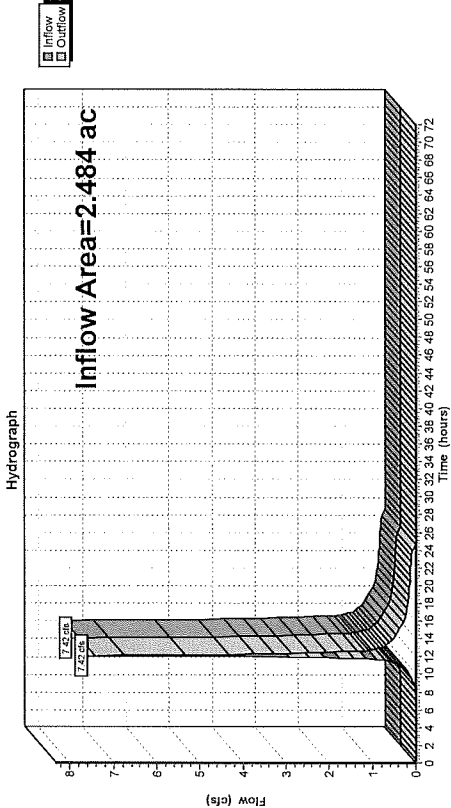


Summary for Reach IP#1: North Park Hill

Inflow Area = 2.484 ac, 19.61% Impervious, Inflow Depth = 2.72" for 10YR event
Inflow = 7.42 cfs @ 12.11 hrs, Volume= 0.562 af
Outflow = 7.42 cfs @ 12.11 hrs, Volume= 0.562 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

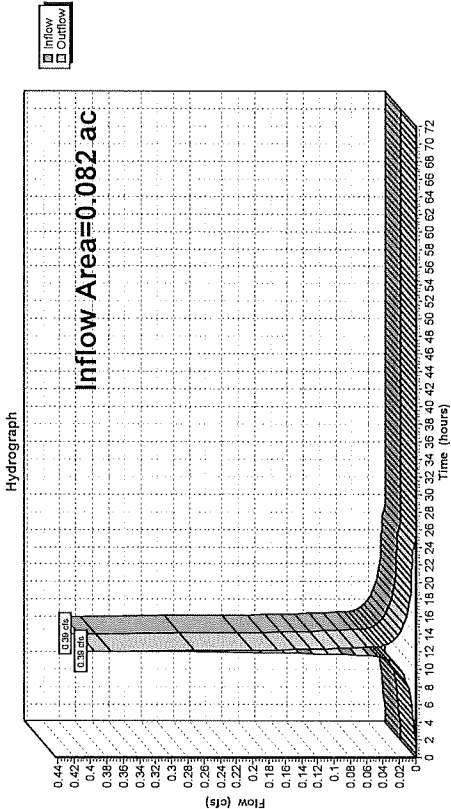


Summary for Reach IP#2: South Park Hill

Inflow Area = 0.082 ac, 97.77% Impervious, Inflow Depth = 4.55" for 10YR event
Inflow = 0.39 cfs @ 12.07 hrs, Volume= 0.031 af
Outflow = 0.39 cfs @ 12.07 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill



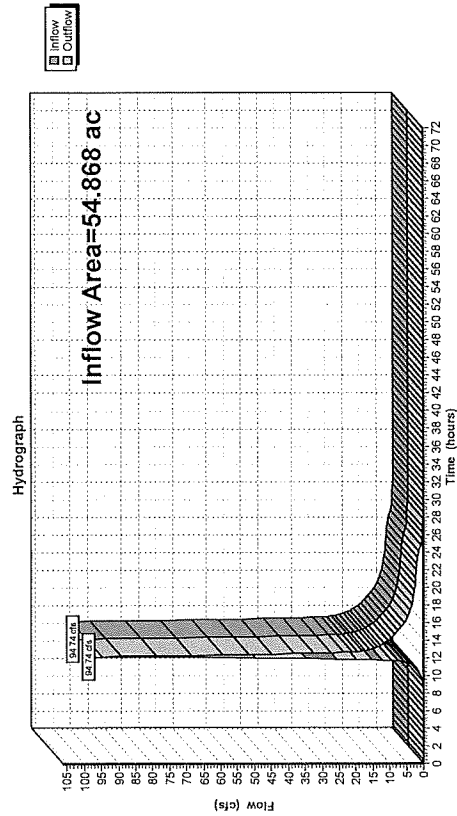
Summary for Reach IP#4: South Property Line

Summary for Reach IP#3: Wetlands

Inflow Area = 54.868 ac, 19.33% Impervious, Inflow Depth = 1.97" for 10YR event
Inflow = 94.74 cfs @ 12.15 hrs, Volume= 9.009 af
Outflow = 94.74 cfs @ 12.15 hrs, Volume= 9.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands



Summary for Pond 1P: POND#1

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 2.45" for 10YR event
Inflow = 32.32 cfs @ 12.12 hrs, Volume= 2.430 af
Outflow = 26.59 cfs @ 12.19 hrs, Volume= 2.430 af, Atten= 18%, Lag= 4.1 min
Discarded = 0.14 cfs @ 12.19 hrs, Volume= 0.202 af
Primary = 26.45 cfs @ 12.19 hrs, Volume= 2.228 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 518.54' @ 12.19 hrs Surf.Area= 5,786 sf Storage= 11,660 cf

Plug-Flow detention time= 38.2 min calculated for 2.428 af (100% of inflow)
Center-of-Mass det. time= 38.3 min (929.0 - 890.7)

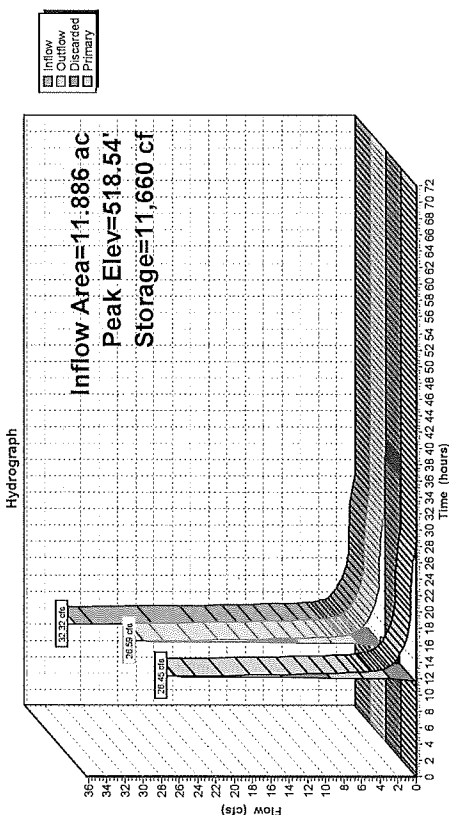
Volume		Invert	Avail Storage	Storage Description
#1	516.00'		36,491 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)	
516.00	3,443	0	0	
518.00	5,224	8,667	8,667	
520.00	7,290	12,514	21,181	
522.00	8,020	15,310	36,491	

Device Routing		Invert	Outlet Devices
#1	Discarded	516.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	516.50'	24.0" Vert. Orifice/Grate C= 0.600
#3	Primary	517.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded Outflow Max=0.14 cfs @ 12.19 hrs HW=518.53' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.14 cfs)

Primary Outflow Max=26.18 cfs @ 12.19 hrs HW=518.53' (Free Discharge)
2=Orifice/Grate (Orifice Controls 15.34 cfs @ 4.88 fps)
3=Orifice/Grate (Orifice Controls 10.84 cfs @ 4.21 fps)

Pond 1P: POND#1



Summary for Pond 2P: POND#2

Inflow Area = 17.024 ac, 25.52% Impervious, Inflow Depth = 2.72" for 10YR event
Inflow = 50.13 cfs @ 12.11 hrs, Volume= 3.853 af
Outflow = 44.41 cfs @ 12.17 hrs, Volume= 3.853 af, Atten= 11%, Lag= 3.2 min
Discarded = 0.20 cfs @ 12.17 hrs, Volume= 0.117 af
Primary = 44.22 cfs @ 12.17 hrs, Volume= 3.735 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 504.14' @ 12.17 hrs Surf.Area= 8,266 sf Storage= 11,322 cf

Plug-Flow detention time= 8.8 min calculated for 3.850 af (100% of inflow)
Center-of-Mass det. time= 8.9 min (836.0 - 827.1)

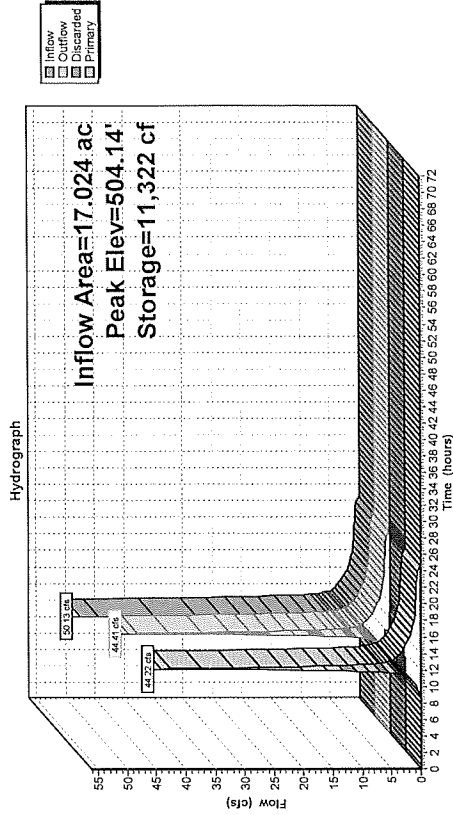
Volume	Invert	Avail Storage	Storage Description
#1	502.00'	30,807 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	2,241	0	0
504.00	7,922	10,163	10,163
506.00	12,722	20,844	30,807

Device	Routing	Invert	Outlet Devices
#1	Discarded	502.00'	1.020 m/hr Exfiltration over Surface area
#2	Primary	502.50'	36.0" Vert. Orifice/Grate C= 0.600
#3	Primary	502.00'	36.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.19 cfs @ 12.17 hrs HW=504.12' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=43.39 cfs @ 12.17 hrs HW=504.12' (Free Discharge)
2=Orifice/Grate (Orifice Controls 16.89 cfs @ 4.34 fps)
3=Orifice/Grate (Orifice Controls 26.49 cfs @ 4.96 fps)

Pond 2P: POND#2



Summary for Pond 3P: POND#3

Inflow Area = 9.999 ac, 24.99% Impervious, Inflow Depth = 2.63" for 10YR event
Inflow = 33.80 cfs @ 12.04 hrs, Volume= 2.189 af
Outflow = 2.41 cfs @ 13.49 hrs, Volume= 2.130 af, Atten= 93%, Lag= 86.5 min
Discarded = 0.37 cfs @ 13.49 hrs, Volume= 1.471 af
Primary = 2.05 cfs @ 13.49 hrs, Volume= 0.659 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 522.91' @ 13.49 hrs Surf.Area= 15,488 sf Storage= 54,754 cf

Plug-Flow detention time= 1,042.9 min calculated for 2.129 af (97% of inflow)
Center-of-Mass det. time= 1,028.9 min (1,853.6 - 824.7)

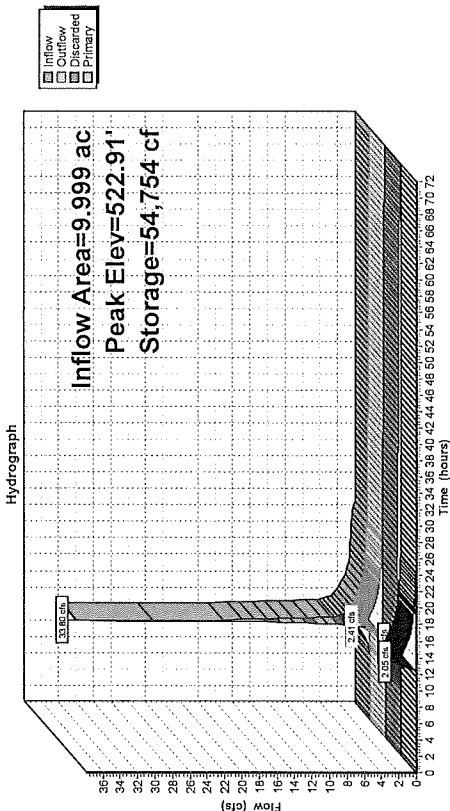
Volume		Avail.Storage		Storage Description	
#1	518.00'	109,920 cf	Custom Stage Data (Prismatic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)		
518.00	4,370	0	0		
520.00	11,380	15,750	15,750		
522.00	14,130	25,510	41,260		
524.00	17,110	31,240	72,500		
526.00	20,310	37,420	109,920		

Device	Routing	Invert	Outlet Devices
#1	Discarded	518.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	522.50'	24.0" Vert. Orifice/Grate X 2.00 C= 0.600
#3	Primary	525.00'	15.0' long x 1.0' breadth Broad-Crested Rectangular Weir
		Head (feet)	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
		2.50 3.00	
		Coef. (English)	2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
		3.30 3.31 3.32	

Discarded OutFlow Max=0.37 cfs @ 13.49 hrs HW=522.91' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=2.03 cfs @ 13.49 hrs HW=522.91' (Free Discharge)
2=Orifice/Grate (Orifice Controls 2.03 cfs @ 2.18 fps)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: POND#3



Summary for Pond 6P: Forebay

Inflow Area = 11,886 ac, 27.19% Impervious, Inflow Depth = 2.45" for 10YR event
Inflow = 32.95 cfs @ 12.10 hrs, Volume= 2,430 af
Outflow = 32.32 cfs @ 12.12 hrs, Volume= 2,430 af, Atten= 2%, Lag= 1.0 min
Primary = 32.32 cfs @ 12.12 hrs, Volume= 2,430 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 529.68' @ 12.12 hrs Surf.Area= 4,086 sf Storage= 9,900 cf

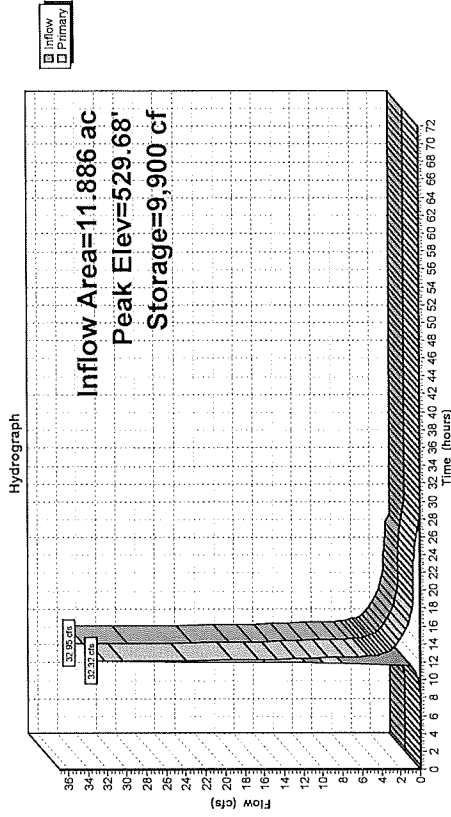
Plug-Flow detention time= 57.5 min calculated for 2,430 af (100% of inflow)
Center-of-Mass det. time= 56.8 min (890.7 - 833.8)

Volume		Invert	Avail. Storage	Storage Description
#1	526.00'		11,231 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)	
526.00	1,431	0	0	
528.00	2,730	4,161	4,161	
530.00	4,340	7,070	11,231	

Device		Routing	Invert	Outlet Devices
#1	Primary	529.00'		20.0' long x 1.0' breadth Broad-Crested Rectangular Weir
				Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
				2.50 3.00
				Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
				3.30 3.31 3.32
#2	Primary	526.00'		4.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=31.29 cfs @ 12.12 hrs HW=529.67' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 30.51 cfs @ 2.28 fps)
2=Orifice/Grate (Orifice Controls 0.79 cfs @ 9.01 fps)

Pond 6P: Forebay



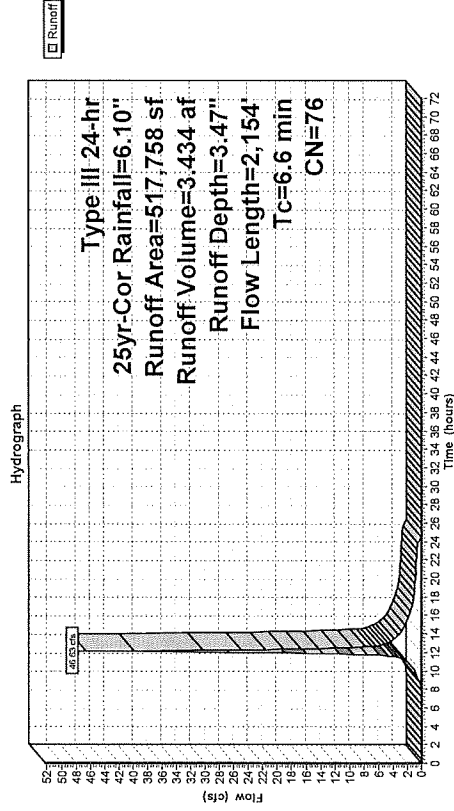
Summary for Subcatchment P-1: P-1

Runoff = 46.63 cfs @ 12.10 hrs, Volume= 3.434 af, Depth= 3.47"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr-Cor Rainfall=6.10"

Area (sf)	CN	Description
140,755	98	Paved parking, HSG B
188,280	74	>75% Grass cover, Good, HSG C
188,723	61	>75% Grass cover, Good, HSG B
517,758	76	Weighted Average
377,003		72.81% Pervious Area
140,755		27.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		Sheet Flow, TRAVEL PATH A TO B
					Grass: Short n= 0.150 P2= 3.20"
1.0	229	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Unpaved Kv= 16.1 fps
2.0	1,875	0.0400	15.46	27.31	Pipe Channel, TRAVEL PATH C TO D
					18.0" Round, Area= 1.8 sf Perim= 4.7' r= 0.38'
					n= 0.010 PVC, smooth interior
6.6	2,154				Total

Subcatchment P-1: P-1



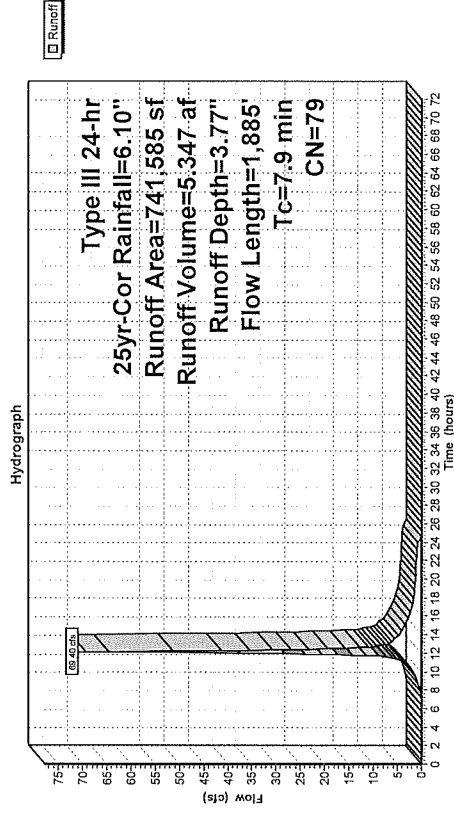
Summary for Subcatchment P-2: P-2

Runoff = 69.40 cfs @ 12.11 hrs, Volume= 5.347 af, Depth= 3.77"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr-Cor Rainfall=6.10"

Area (sf)	CN	Description
189,269	98	Paved parking, HSG B
484,425	74	>75% Grass cover, Good, HSG C
67,891	61	>75% Grass cover, Good, HSG B
741,585	79	Weighted Average
552,316		74.48% Pervious Area
189,269		25.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0300	0.17		Sheet Flow, TRAVEL PATH A TO B
					Grass: Short n= 0.150 P2= 3.20"
1.6	375	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Unpaved Kv= 16.1 fps
1.5	1,460	0.0600	16.76	20.57	Pipe Channel, TRAVEL PATH C TO D
					15.0" Round, Area= 1.2 sf Perim= 3.9' r= 0.31'
					n= 0.010
7.9	1,885				Total

Subcatchment P-2: P-2



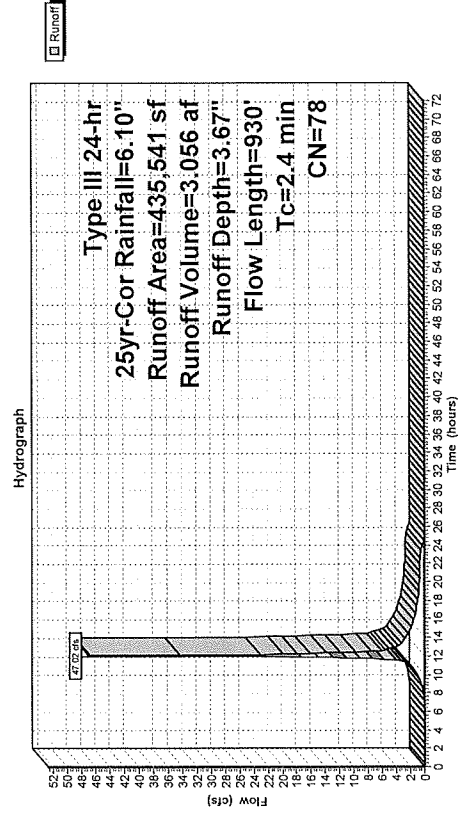
Summary for Subcatchment P-3: P-3

Runoff = 47.02 cfs @ 12.04 hrs, Volume= 3.056 af, Depth= 3.67"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25yr-Cor Rainfall=6.10"

Area (sf)	CN	Description
108,837	98	Paved parking, HSG B
245,329	74	>75% Grass cover, Good, HSG C
75,499	61	>75% Grass cover, Good, HSG B
5,876	80	>75% Grass cover, Good, HSG D
435,541	78	Weighted Average
326,704		75.01% Pervious Area
108,837		24.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B
1.1	240	0.0300	3.52		Smooth surfaces n= 0.011 P2= 3.20"
0.7	640	0.0500	15.30	18.78	Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps Pipe Channel, TRAVEL PATH C TO D 15.0' Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
2.4	930	Total			

Subcatchment P-3: P-3



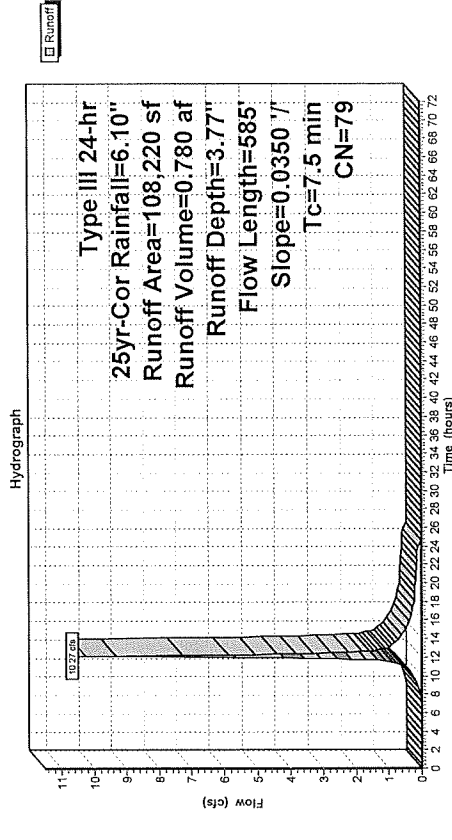
Summary for Subcatchment P-4: P-4

Runoff = 10.27 cfs @ 12.11 hrs, Volume= 0.780 af, Depth= 3.77"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25yr-Cor Rainfall=6.10"

Area (sf)	CN	Description
21,220	98	Paved parking, HSG B
87,000	74	>75% Grass cover, Good, HSG C
108,220	79	Weighted Average
87,000		80.39% Pervious Area
21,220		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B
3.0	535	0.0350	3.01		Grass: Short n= 0.150 P2= 3.20"
7.5	585	Total			Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps

Subcatchment P-4: P-4



Post Development Cornell

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Type III 24-hr 25yr-Cor Rainfall=6.10"

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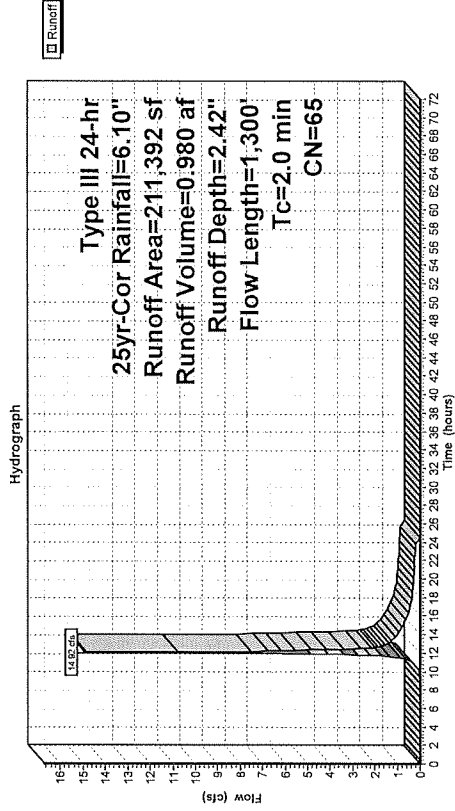
Summary for Subcatchment P-5: P-5

Runoff = 14.92 cfs @ 12.04 hrs, Volume= 0.980 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr-Cor Rainfall=6.10"

Area (sf)	CN	Description			
20,267	98	Paved parking, HSG B			
191,125	61	>75% Grass cover, Good, HSG B			
211,392	65	Weighted Average			
191,125		90.41% Pervious Area			
20,267		9.59% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B
					Smooth surfaces n= 0.011 P2= 3.20"
1.4	1,250	0.0600	14.45	11.35	Pipe Channel, TRAVEL PATH B TO C
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010

Subcatchment P-5: P-5



Post Development Cornell

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Type III 24-hr 25yr-Cor Rainfall=6.10"

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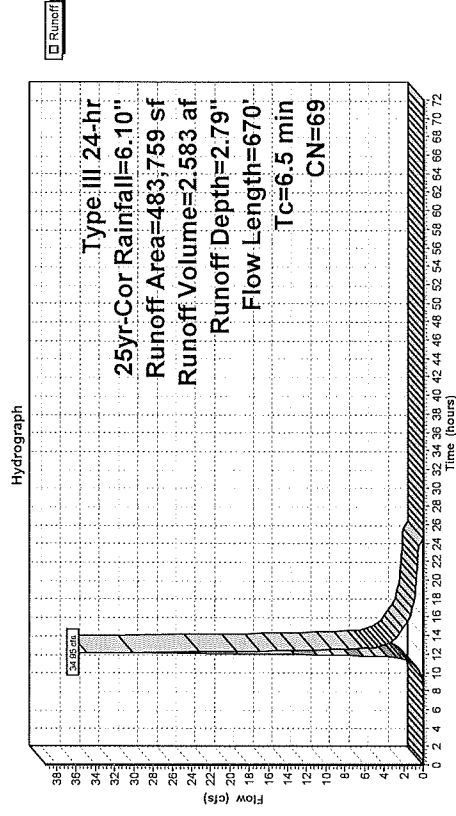
Summary for Subcatchment P-6: P-6

Runoff = 34.95 cfs @ 12.10 hrs, Volume= 2.583 af, Depth= 2.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr-Cor Rainfall=6.10"

Area (sf)	CN	Description	
2,860	98	Paved parking, HSG C	
201,050	74	>75% Grass cover, Good, HSG C	
74,105	70	Woods, Good, HSG C	
89,988	61	>75% Grass cover, Good, HSG B	
39,707	80	>75% Grass cover, Good, HSG D	
76,049	55	Woods, Good, HSG B	
483,759	69	Weighted Average	
480,899		99.41% Pervious Area	
2,860		0.59% Impervious Area	
Tc (min)	Length (feet)	Slope (ft/ft) Velocity (ft/sec) Capacity (cfs) Description	
4.5	50	0.0350 0.19	Sheet Flow, TRAVEL PATH A TO B
			Grass: Short n= 0.150 P2= 3.20"
2.0	620	0.1000 5.09	Shallow Concentrated Flow, TRAVEL PATH B TO C
			Unpaved Kv= 16.1 fms

Subcatchment P-6: P-6



Summary for Subcatchment P-7: P-7

Runoff

=

0.49 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 5.74"

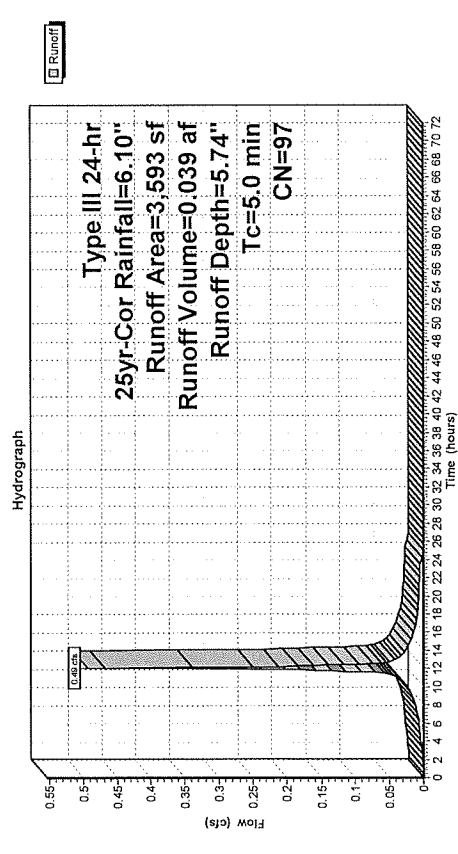
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Type III 24-hr 25yr-Cor Rainfall=6.10"

Area (sf)		CN	Description
80	74	>75% Grass cover, Good, HSG C	
3,513	98	Paved parking, HSG C	
3,593	97	Weighted Average	
80		2.23% Pervious Area	
3,513		97.77% Impervious Area	

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

Subcatchment P-7: P-7



Summary for Reach IP#1: North Park Hill

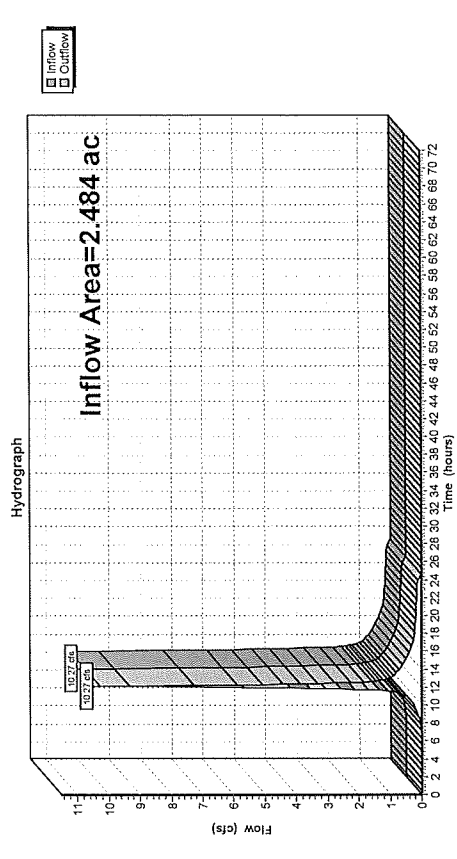
Inflow Area = 2.484 ac, 19.61% Impervious, Inflow Depth = 3.77"

Inflow = 10.27 cfs @ 12.11 hrs, Volume= 0.780 af

Outflow = 10.27 cfs @ 12.11 hrs, Volume= 0.780 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

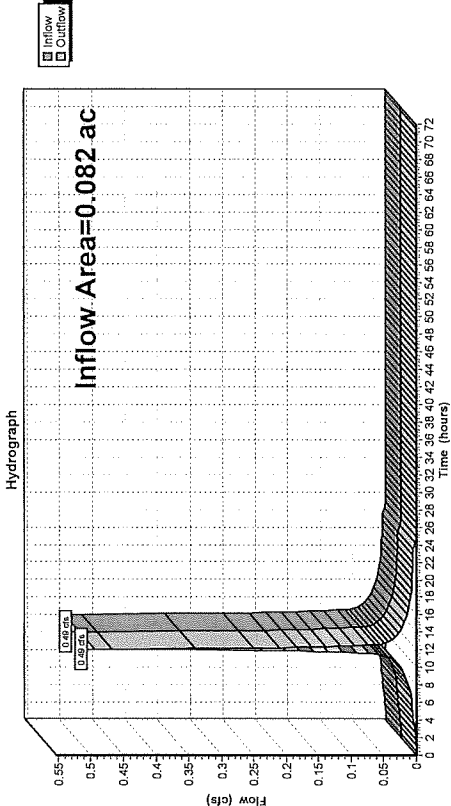


Summary for Reach IP#2: South Park Hill

Inflow Area = 0.082 ac, 97.77% Impervious, Inflow Depth = 5.74" for 25yr-Cor event
Inflow = 0.49 cfs @ 12.07 hrs, Volume= 0.039 af
Outflow = 0.49 cfs @ 12.07 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

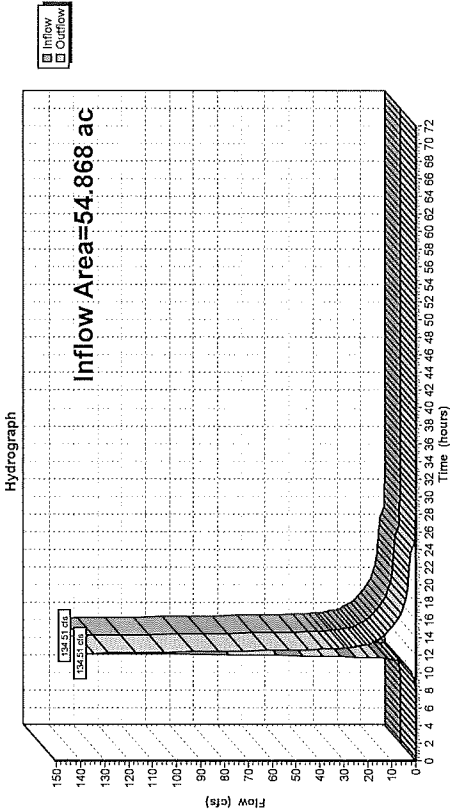


Summary for Reach IP#3: Wetlands

Inflow Area = 54.868 ac, 19.33% Impervious, Inflow Depth = 2.95" for 25yr-Cor event
Inflow = 134.51 cfs @ 12.15 hrs, Volume= 13.491 af
Outflow = 134.51 cfs @ 12.15 hrs, Volume= 13.491 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands



Summary for Reach IP#4: South Property Line

Summary for Pond 1P: POND#1

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 3.47" for 25yr-Cor event
Inflow = 46.02 cfs @ 12.11 hrs, Volume= 3.434 af
Outflow = 36.06 cfs @ 12.19 hrs, Volume= 3.434 af, Atten= 22%, Lag= 4.6 min
Discarded = 0.15 cfs @ 12.19 hrs, Volume= 0.217 af
Primary = 35.91 cfs @ 12.19 hrs, Volume= 3.217 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 519.17' @ 12.19 hrs Surf.Area= 6,432 sf Storage= 15,484 cf

Plug-Flow detention time= 30.8 min calculated for 3.431 af (100% of inflow)
Center-of-Mass det. time= 31.0 min (900.8 - 869.8)

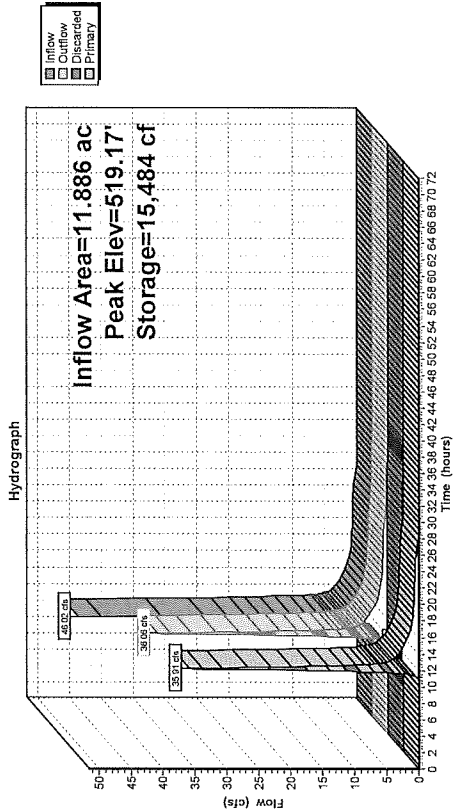
Volume				Avail.Storage		Storage Description	
#1	Invert	Surf.Area	Inc.Store	36,491 cf		Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation	Invert	Surf.Area	Inc.Store				
(feet)		(sq-ft)	(cubic-feet)				
516.00	3.443	0	0				
518.00	5,224	8,667	8,667				
520.00	7,290	12,514	21,181				
522.00	8,020	15,310	36,491				

Device		Routing	Invert	Outlet Devices	
#1	Discarded	516.00'	1.020 in/hr	Exfiltration over Surface area	
#2	Primary	516.50'	24.0" Vert.	Orifice/Grate C= 0.600	
#3	Primary	517.00'	24.0" Vert.	Orifice/Grate C= 0.600	

Discarded Outflow Max=0.15 cfs @ 12.19 hrs HW=519.15' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.15 cfs)

Primary Outflow Max=35.67 cfs @ 12.19 hrs HW=519.15' (Free Discharge)
2=Orifice/Grate (Orifice Controls 19.44 cfs @ 6.19 fps)
3=Orifice/Grate (Orifice Controls 16.23 cfs @ 5.17 fps)

Pond 1P: POND#1



Summary for Pond 2P: POND#2

Inflow Area = 17.024 ac, 25.52% Impervious, Inflow Depth = 3.77" for 25yr-Cor event
Inflow = 69.40 cfs @ 12.11 hrs, Volume= 5.347 af
Outflow = 60.87 cfs @ 12.17 hrs, Volume= 5.347 af, Atten= 12%, Lag= 3.3 min
Discarded = 0.22 cfs @ 12.17 hrs, Volume= 0.130 af
Primary = 60.75 cfs @ 12.17 hrs, Volume= 5.217 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 504.57' @ 12.17 hrs Surf.Area= 9,295 sf Storage= 15,087 cf

Plug-Flow detention time= 8.0 min calculated for 5.343 af (100% of inflow)
Center-of-Mass det. time= 8.0 min (825.8 - 817.7)

Volume		Invert	Avail.Storage	Storage Description
#1	502.00'		30,807 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

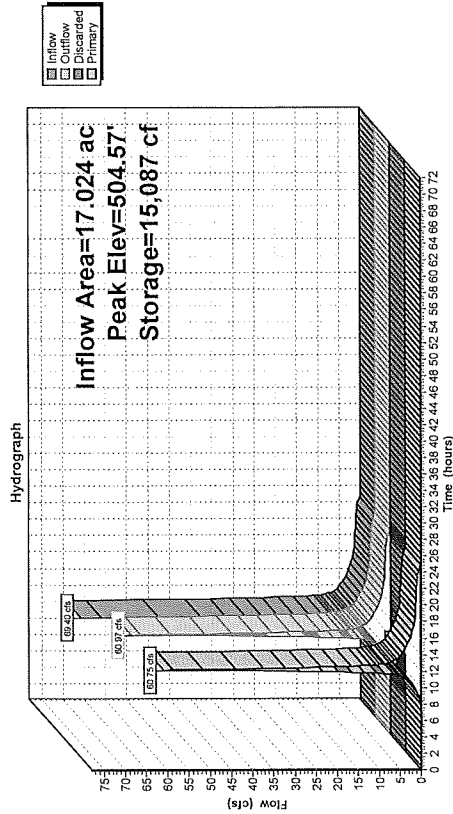
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	2,241	0	0
504.00	7,922	10,163	10,163
506.00	12,722	20,644	30,807

Device		Routing	Invert	Outlet Devices
#1	Discarded	502.00'	1.020 in/hr	Exfiltration over Surface area
#2	Primary	502.50'	36.0"	Vert. Orifice/Grate C= 0.600
#3	Primary	502.00'	36.0"	Vert. Orifice/Grate C= 0.600

Discarded Outflow Max=0.22 cfs @ 12.17 hrs HW=504.54' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.22 cfs)

Primary Outflow Max=59.70 cfs @ 12.17 hrs HW=504.54' (Free Discharge)
2=Orifice/Grate (Orifice Controls 24.98 cfs @ 4.87 fps)
3=Orifice/Grate (Orifice Controls 34.72 cfs @ 5.43 fps)

Pond 2P: POND#2



Summary for Pond 3P: POND#3

Inflow Area = 9.99 ac, 24.99% Impervious, Inflow Depth = 3.67" for 25yr-Cor event
Inflow = 47.02 cfs @ 12.04 hrs, Volume= 3.056 af
Outflow = 10.26 cfs @ 12.44 hrs, Volume= 2.993 af, Atten= 78%, Lag= 23.8 min
Discarded = 0.38 cfs @ 12.44 hrs, Volume= 1.498 af
Primary = 9.87 cfs @ 12.44 hrs, Volume= 1.494 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 523.46' @ 12.44 hrs Surf.Area= 16,299 sf Storage= 63,408 cf

Plug-Flow detention time= 760.9 min calculated for 2.990 af (98% of inflow)
Center-of-Mass det. time= 750.1 min (1,565.3 - 815.1)

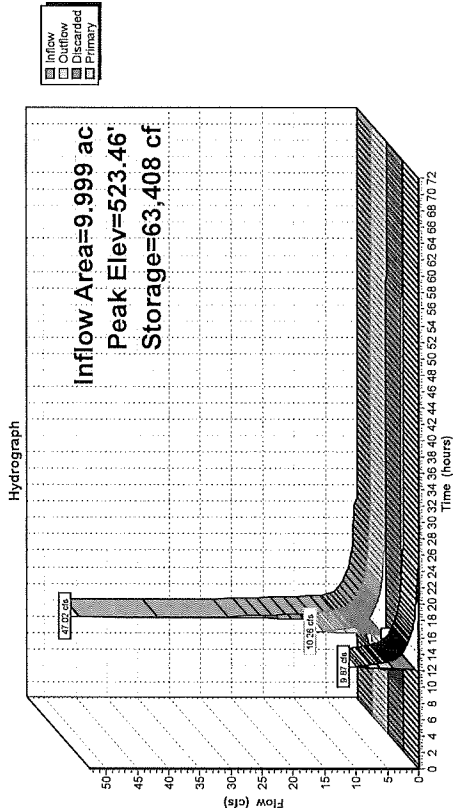
Volume				Storage Description	
#1	Invert	Avail.Storage	109,920 cf	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)		
518.00	4,370	0	0		
520.00	11,380	15,750	15,750		
522.00	14,130	25,510	41,260		
524.00	17,110	31,240	72,500		
526.00	20,310	37,420	109,920		

Device	Routing	Invert.	Outlet Devices												
#1	Discarded	518.00'	1.020 in/hr	Exfiltration over Surface area											
#2	Primary	522.50'	24.0" Vert.	Office/Grate X 2.00	C= 0.600										
#3	Primary	525.00'	15.0' long	x 1.0' breadth Broad-Crested Rectangular Weir											
			Head (feet)	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00		
				2.50 3.00											
			Coef. (English)	2.69	2.72	2.75	2.85	2.98	3.08	3.20	3.28	3.31			
				3.30 3.31 3.32											

Discarded OutFlow Max=0.38 cfs @ 12.44 hrs HW=523.45' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=9.83 cfs @ 12.44 hrs HW=523.45' (Free Discharge)
2=Orifice/Grate (Orifice Controls 9.83 cfs @ 3.33 fps)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: POND#3



Summary for Pond 6P: Forebay

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 3.47" for 25yr-Cor event
Inflow = 46.63 cfs @ 12.10 hrs, Volume= 3.434 af
Outflow = 46.02 cfs @ 12.11 hrs, Volume= 3.434 af, Atten= 1%, Lag= 0.8 min
Primary = 46.02 cfs @ 12.11 hrs, Volume= 3.434 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 529.85' @ 12.11 hrs Surf.Area= 4,220 sf Storage= 10,593 cf
Plug-Flow detention time= 46.7 min calculated for 3.434 af (100% of inflow)
Center-of-Mass det. time= 46.0 min (869.8 - 823.9)

Volume		Invert	Avail. Storage	Storage Description	
#1	526.00'		11,231 cf	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)		
526.00	1,431	0	0		
528.00	2,730	4,161	4,161		
530.00	4,340	7,070	11,231		

Device		Routing	Invert	Outlet Devices	
#1	Primary		529.00'	20.0' long x 1.0' breadth Broad-Crested Rectangular Weir	
				Head (feet)	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
					2.50 3.00
#2	Primary		526.00'	Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31	
				3.30 3.31 3.32	
				4.0" Vert. Orifice/Grate C= 0.600	

Primary OutFlow Max=44.72 cfs @ 12.11 hrs HW=529.84' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 43.91 cfs @ 2.63 fps)
2=Orifice/Grate (Orifice Controls 0.80 cfs @ 9.22 fps)

Pond 6P: Forebay

Hydrograph

Inflow

Primary

Inflow Area=11,886 ac

Peak Elev=529.85'

Storage=10,593 cf

Runoff = 74.86 cfs @ 12.10 hrs, Volume= 5.562 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Type III 24-hr 100yr Cor Rainfall=8.50"

Area (sf)

CN

Description

140,755

98

Paved parking, HSG B

188,280

74

>75% Grass cover, Good, HSG C

188,723

61

>75% Grass cover, Good, HSG B

517,758

76

Weighted Average

377,003

72.81% Pervious Area

140,755

27.19% Impervious Area

Tc

Length (feet)

Slope (ft/ft)

Velocity (ft/sec)

Capacity (cfs)

Description

3.6

50

0.0600

0.23

Sheet Flow, TRAVEL PATH A TO B

1.0

229

0.0600

3.94

Grass: Short n= 0.150 P2= 3.20"

2.0

1,875

0.0400

15.46

Shallow Concentrated Flow, TRAVEL PATH B TO C

6.6

2,154

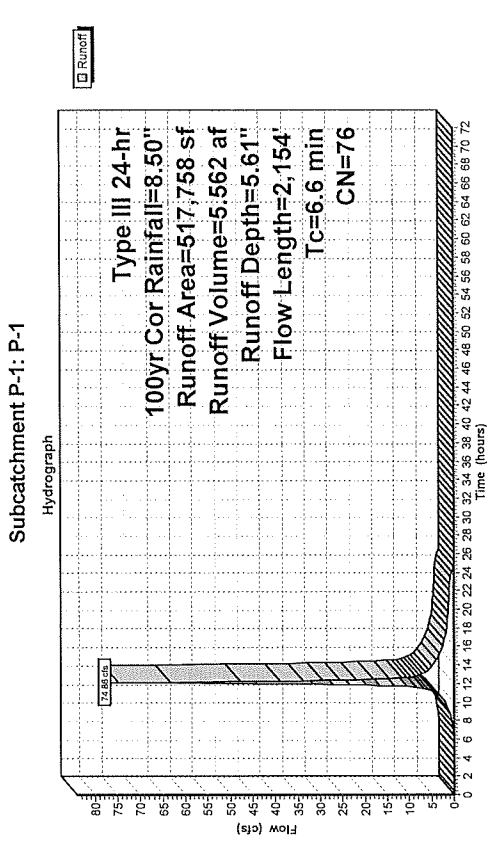
Total

Unpaved Kv= 16.1 fps

Pipe Channel, TRAVEL PATH C TO D

18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'

n= 0.010 PVC, smooth interior



Summary for Subcatchment P-2: P-2

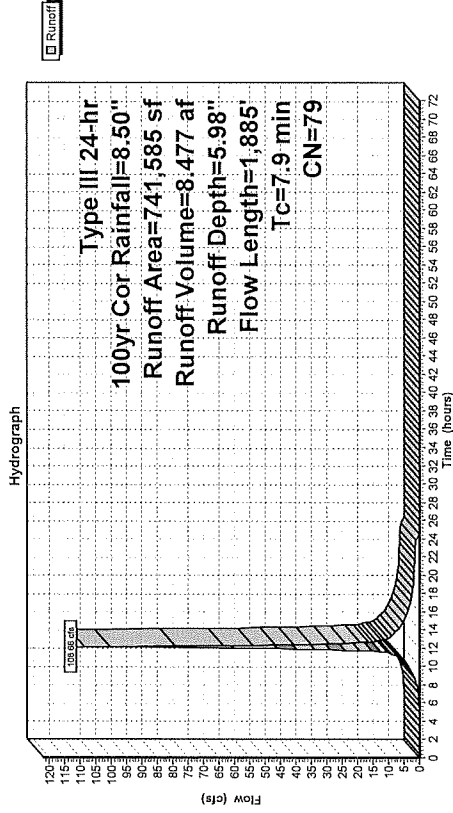
Runoff = 108.66 cfs @ 12.11 hrs, Volume= 8.477 af, Depth= 5.98"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr Cor Rainfall=8.50"

Area (sf)	CN	Description
189,269	98	Paved parking, HSG B
484,425	74	>75% Grass cover, Good, HSG C
67,891	61	>75% Grass cover, Good, HSG B
741,585	79	Weighted Average
552,316		74.48% Pervious Area
189,269		25.52% Impervious Area

Tc	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0300	0.17		Sheet Flow, TRAVEL PATH A TO B
					Grass: Short n= 0.150 P2= 3.20"
1.6	375	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Unpaved Kv= 16.1 fps
1.5	1,460	0.0600	16.76	20.57	Pipe Channel, TRAVEL PATH C TO D
					15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'
					n= 0.010

7.9	1,885	Total
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Subcatchment P-2: P-2



Summary for Subcatchment P-3: P-3

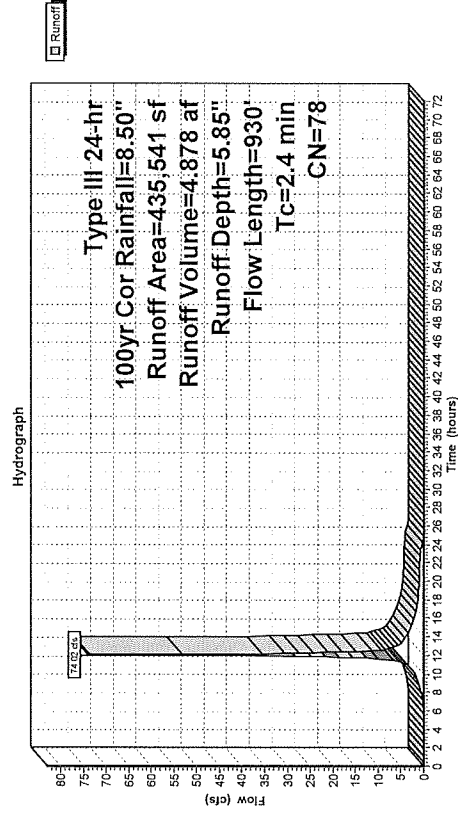
Runoff = 74.02 cfs @ 12.04 hrs, Volume= 4.878 af, Depth= 5.85"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr Cor Rainfall=8.50"

Area (sf)	CN	Description
108,837	98	Paved parking, HSG B
245,329	74	>75% Grass cover, Good, HSG C
75,499	61	>75% Grass cover, Good, HSG B
5,876	80	>75% Grass cover, Good, HSG D
435,541	78	Weighted Average
326,704		75.01% Pervious Area
108,837		24.99% Impervious Area

Tc	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B
					Smooth surfaces n= 0.011 P2= 3.20"
1.1	240	0.0300	3.52		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Paved Kv= 20.3 fps
0.7	640	0.0500	15.30	18.78	Pipe Channel, TRAVEL PATH C TO D
					15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'
					n= 0.010

2.4	930	Total
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Subcatchment P-3: P-3



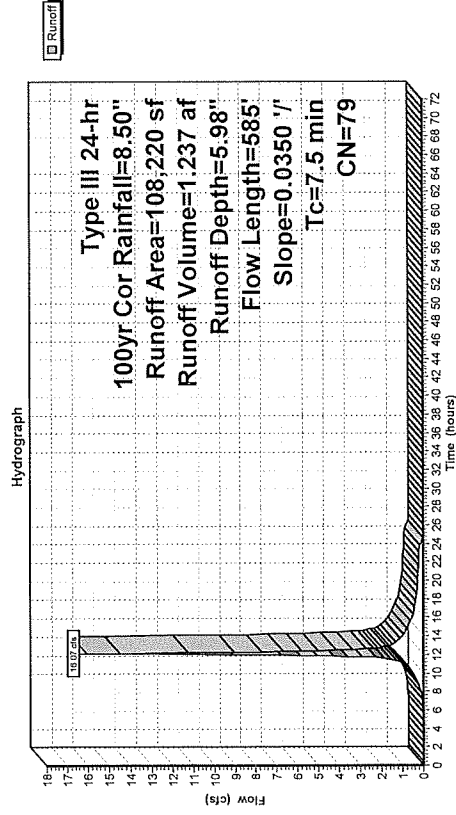
Summary for Subcatchment P-4: P-4

Runoff = 16.07 cfs @ 12.11 hrs, Volume= 1.237 af, Depth= 5.98"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr Cor Rainfall=8.50"

Area (sf)	CN	Description
21,220	98	Paved parking, HSG B
87,000	74	>75% Grass cover, Good, HSG C
108,220	79	Weighted Average
87,000		80.39% Pervious Area
21,220		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
3.0	535	0.0350	3.01		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.5	585	Total			

Subcatchment P-4: P-4



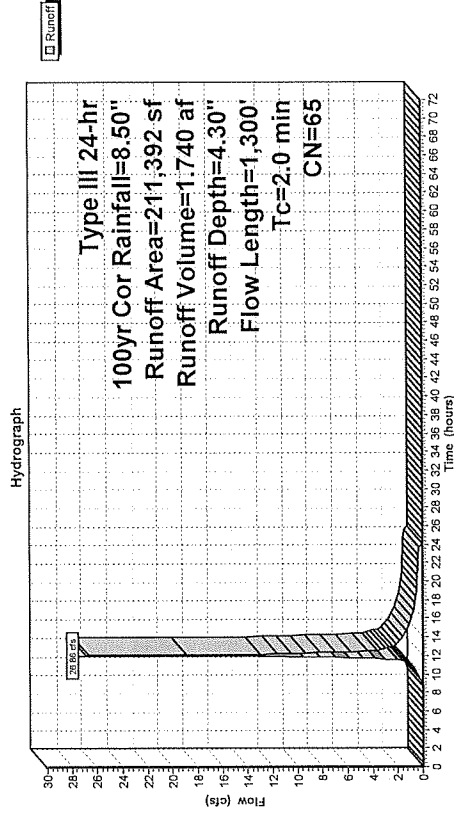
Summary for Subcatchment P-5: P-5

Runoff = 26.86 cfs @ 12.04 hrs, Volume= 1.740 af, Depth= 4.30"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr Cor Rainfall=8.50"

Area (sf)	CN	Description
20,267	98	Paved parking, HSG B
191,125	61	>75% Grass cover, Good, HSG B
211,392	65	Weighted Average
191,125		90.41% Pervious Area
20,267		9.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B Smooth surfaces n= 0.011 P2= 3.20"
1.4	1,250	0.0600	14.45	11.35	Pipe Channel, TRAVEL PATH B TO C 12.0" Round Area= 0.8 sf Perim= 3.1' n= 0.010
2.0	1,300	Total			

Subcatchment P-5: P-5



Summary for Subcatchment P-6: P-6

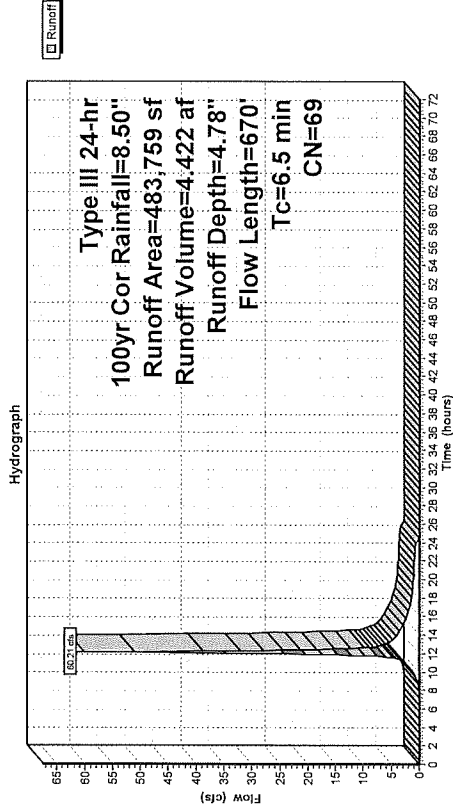
Runoff = 60.21 cfs @ 12.10 hrs, Volume= 4.422 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr Cor Rainfall=8.50"

Area (sf)	CN	Description
2,860	98	Paved parking, HSG C
201,050	74	>75% Grass cover, Good, HSG C
74,105	70	Woods, Good, HSG C
89,988	61	>75% Grass cover, Good, HSG B
39,707	80	>75% Grass cover, Good, HSG D
76,049	55	Woods, Good, HSG B
483,759	69	Weighted Average
480,899		99.41% Pervious Area
2,860		0.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B
					Grass: Short n= 0.150 P2= 3.20"
2.0	620	0.1000	5.09		Shallow Concentrated Flow, TRAVEL PATH B TO C
					Unpaved Kv= 16.1 fps
6.5	670	Total			

Subcatchment P-6: P-6



Summary for Subcatchment P-7: P-7

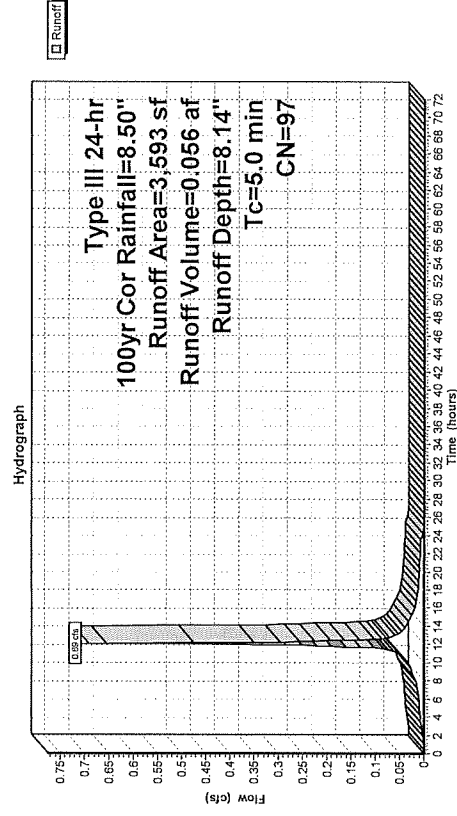
Runoff = 0.69 cfs @ 12.07 hrs, Volume= 0.056 af, Depth= 8.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100yr Cor Rainfall=8.50"

Area (sf)	CN	Description
80	74	>75% Grass cover, Good, HSG C
3,513	98	Paved parking, HSG C
3,593	97	Weighted Average
80		2.23% Pervious Area
3,513		97.77% Impervious Area

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

Subcatchment P-7: P-7

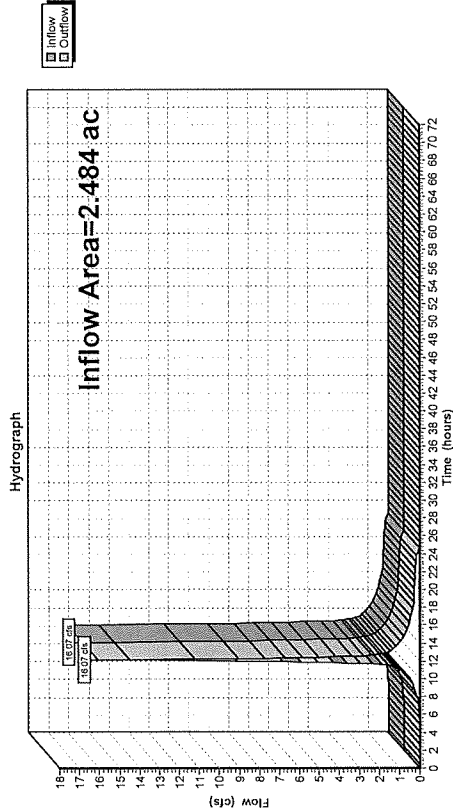


Summary for Reach IP#1: North Park Hill

Inflow Area = 2.484 ac, 19.61% Impervious, Inflow Depth = 5.98" for 100yr Cor event
Inflow = 16.07 cfs @ 12.11 hrs, Volume= 1.237 af
Outflow = 16.07 cfs @ 12.11 hrs, Volume= 1.237 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

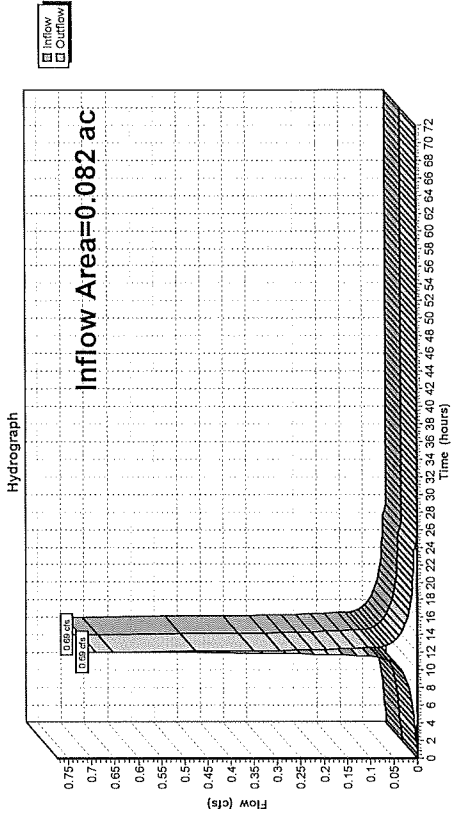


Summary for Reach IP#2: South Park Hill

Inflow Area = 0.082 ac, 97.77% Impervious, Inflow Depth = 8.14" for 100yr Cor event
Inflow = 0.69 cfs @ 12.07 hrs, Volume= 0.056 af
Outflow = 0.69 cfs @ 12.07 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

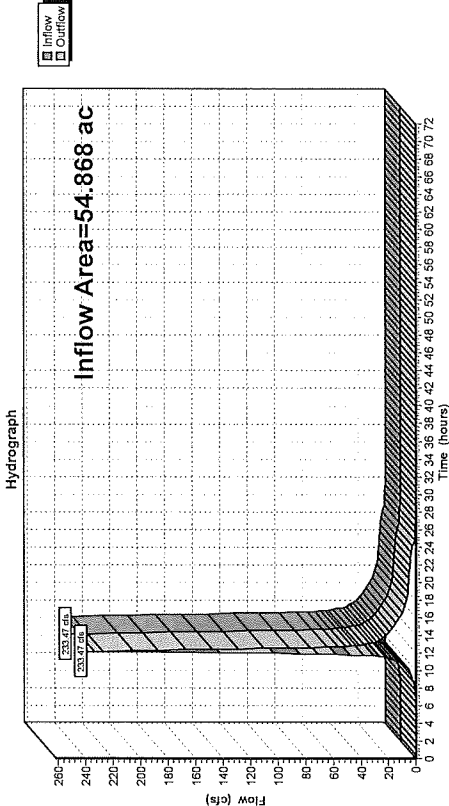


Summary for Reach IP#3: Wetlands

Inflow Area = 54.868 ac, 19.33% Impervious, Inflow Depth = 5.05" for 100yr Cor event
Inflow = 233.47 cfs @ 12.13 hrs, Volume= 23.083 af
Outflow = 233.47 cfs @ 12.13 hrs, Volume= 23.083 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands



Summary for Pond 1P: POND#1

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 5.61" for 100yr Cor event
Inflow = 80.09 cfs @ 12.10 hrs, Volume= 5.562 af
Outflow = 51.36 cfs @ 12.21 hrs, Volume= 5.562 af, Atten= 36%, Lag= 6.3 min
Discarded = 0.18 cfs @ 12.21 hrs, Volume= 0.235 af
Primary = 51.18 cfs @ 12.21 hrs, Volume= 5.327 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 520.62' @ 12.21 hrs Surf.Area= 7,515 sf Storage= 25,753 cf

Plug-Flow detention time= 23.3 min calculated for 5.562 af (100% of inflow)
Center-of-Mass det. time= 23.4 min (865.4 - 841.9)

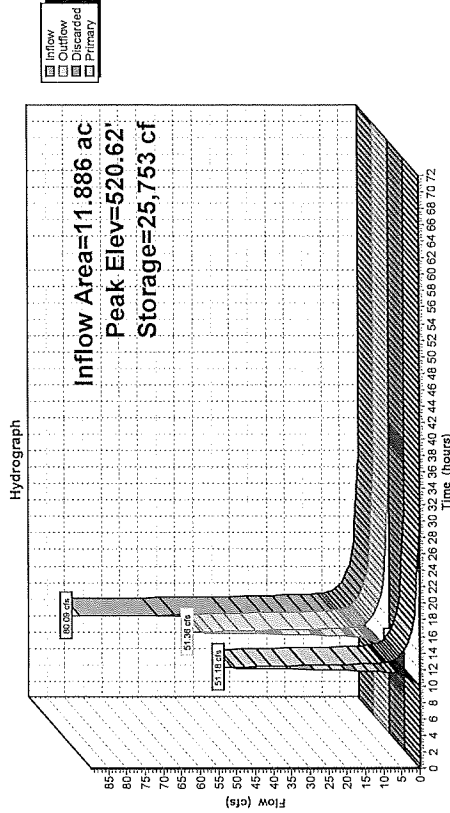
Volume		Invert	Avail.Storage	Storage Description
#1	516.00'		36,491 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
516.00	3,443	0	0	
518.00	5,224	8,667	8,667	
520.00	7,290	12,514	21,181	
522.00	8,020	15,310	36,491	

Device	Routing	Invert	Outlet Devices
#1	Discarded	516.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	516.50'	24.0" Vert. Orifice/Grate C= 0.600
#3	Primary	517.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded Outflow Max=0.18 cfs @ 12.21 hrs HW=520.61' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary Outflow Max=51.09 cfs @ 12.21 hrs HW=520.61' (Free Discharge)
2=Orifice/Grate (Orifice Controls 26.66 cfs @ 8.49 fps)
3=Orifice/Grate (Orifice Controls 24.42 cfs @ 7.77 fps)

Pond 1P: POND#1



Summary for Pond 2P: POND#2

Inflow Area = 17.024 ac, 25.52% Impervious, Inflow Depth = 5.98" for 100yr Cor event
Inflow = 108.66 cfs @ 12.11 hrs, Volume= 8.477 af
Outflow = 89.57 cfs @ 12.18 hrs, Volume= 8.477 af, Atten= 18%, Lag= 4.0 min
Discarded = 0.27 cfs @ 12.18 hrs, Volume= 0.152 af
Primary = 89.30 cfs @ 12.18 hrs, Volume= 8.325 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 505.47' @ 12.18 hrs Surf.Area= 11,452 sf Storage= 24,410 cf

Plug-Flow detention time= 7.3 min calculated for 8.477 af (100% of inflow)
Center-of-Mass det. time= 7.1 min (811.8 - 804.7)

Volume		Invert	Avail Storage	Storage Description
#1	502.00'		30,807 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

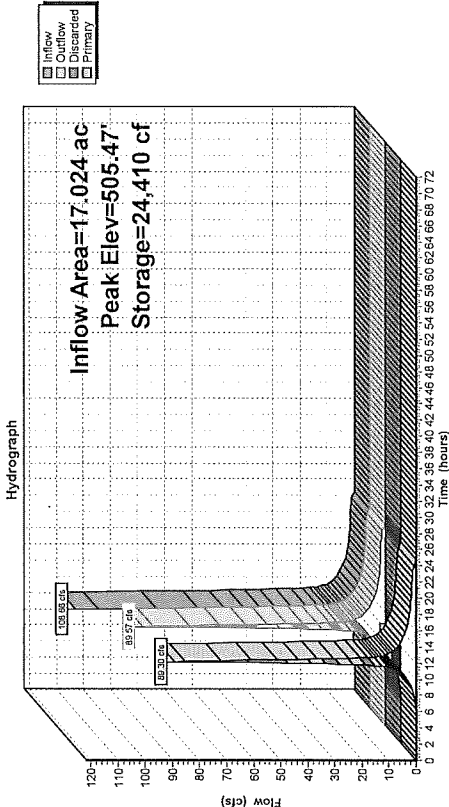
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	2,241	0	0
504.00	7,922	10,163	10,163
506.00	12,722	20,644	30,807

Device	Routing	Invert	Outlet Devices
#1	Discarded	502.00'	1.020 m/hr Exfiltration over Surface area
#2	Primary	502.50'	36.0" Vert. Orifice/Grate C= 0.600
#3	Primary	502.00'	36.0" Vert. Orifice/Grate C= 0.600

Discarded Outflow Max=0.27 cfs @ 12.18 hrs HW=505.44' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.27 cfs)

Primary Outflow Max=88.47 cfs @ 12.18 hrs HW=505.44' (Free Discharge)
2=Orifice/Grate (Orifice Controls 41.07 cfs @ 5.84 fps)
3=Orifice/Grate (Orifice Controls 47.40 cfs @ 6.71 fps)

Pond 2P: POND#2



Summary for Pond 3P: POND#3

Inflow Area = 9.999 ac, 24.99% Impervious, Inflow Depth = 5.85" for 100yr Cor event
Inflow = 74.02 cfs @ 12.04 hrs, Volume= 4.878 af
Outflow = 31.16 cfs @ 12.20 hrs, Volume= 4.811 af, Atten= 58%, Lag= 9.5 min
Discarded = 0.42 cfs @ 12.20 hrs, Volume= 1.541 af
Primary = 30.73 cfs @ 12.20 hrs, Volume= 3.270 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 524.53' @ 12.20 hrs Surf.Area= 17,957 sf Storage= 81,786 cf

Plug-Flow detention time= 491.4 min calculated for 4.807 af (99% of inflow)
Center-of-Mass det. time= 484.5 min (1,286.3 - 801.8)

Volume	Invert	Avail.Storage	Storage Description
#1	518.00'	109,920 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
518.00	4,370	0	0
520.00	11,380	15,750	15,750
522.00	14,130	25,510	41,260
524.00	17,110	31,240	72,500
526.00	20,310	37,420	109,920

Device	Routing	Invert	Outlet Devices
#1	Discarded	518.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	522.50'	24.0" Vert. Orifice/Grate X 2.00 C= 0.600
#3	Primary	525.00'	15.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
			3.30 3.31 3.32

Discarded OutFlow Max=0.42 cfs @ 12.20 hrs HW=524.53' (Free Discharge)

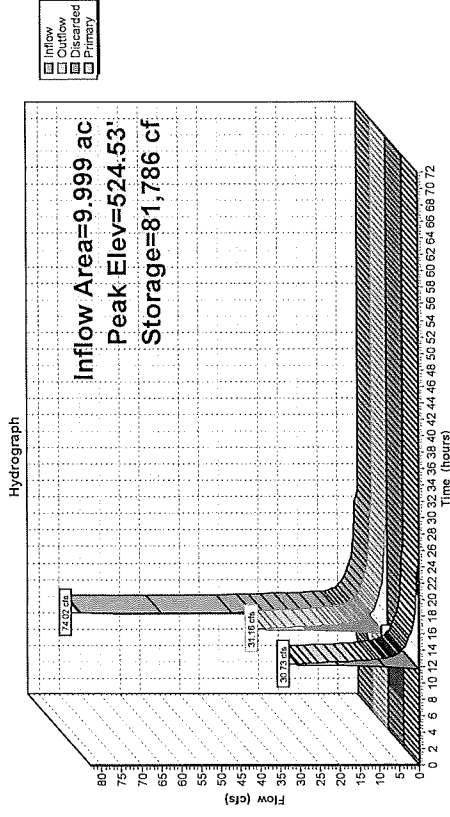
1=Exfiltration (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=30.70 cfs @ 12.20 hrs HW=524.53' (Free Discharge)

2=Orifice/Grate (Orifice Controls 30.70 cfs @ 4.89 fps)

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

Pond 3P: POND#3



Summary for Pond 6P: Forebay

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 5.61" for 100yr Cor event
Inflow = 74.86 cfs @ 12.10 hrs, Volume= 5.562 af
Outflow = 80.09 cfs @ 12.10 hrs, Volume= 5.562 af, Atten= 0%, Lag= 0.1 min
Primary = 80.09 cfs @ 12.10 hrs, Volume= 5.562 af

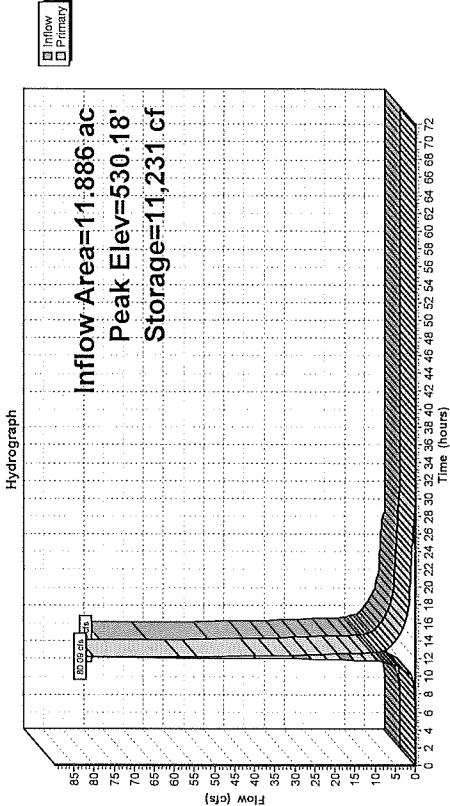
Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 530.18' @ 12.10 hrs Surf.Area= 4,340 sf Storage= 11,231 cf
Plug-Flow detention time= 31.5 min calculated for 5.558 af (100% of inflow)
Center-of-Mass det. time= 31.9 min (841.9 - 810.1)

Volume		Invert	Avail. Storage	Storage Description
#1		526.00'	11,231 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)	
526.00	1,431	0	0	
528.00	2,730	4,161	4,161	
530.00	4,340	7,070	11,231	

Device	Routing	Invert	Outlet Devices
#1	Primary	529.00'	20.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
			3.30 3.31 3.32
#2	Primary	526.00'	4.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=79.91 cfs @ 12.10 hrs HW=530.18' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 79.07 cfs @ 3.34 fps)
2=Orifice/Grate (Orifice Controls 0.84 cfs @ 9.65 fps)

Pond 6P: Forebay



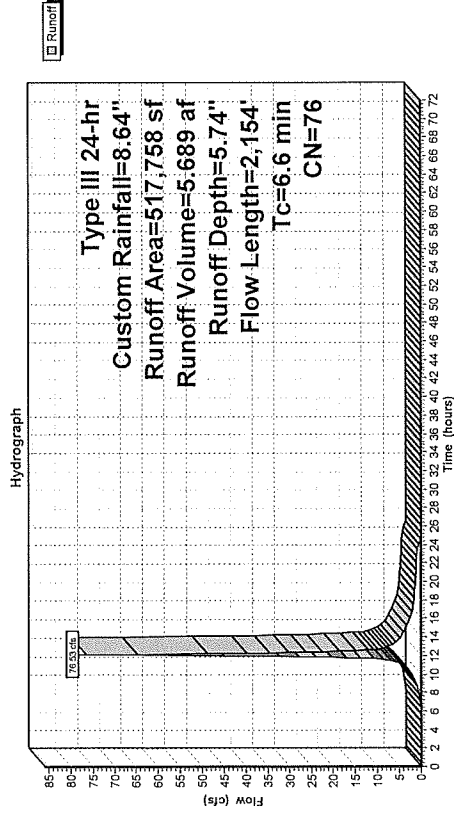
Summary for Subcatchment P-1: P-1

Runoff = 76.53 cfs @ 12.10 hrs, Volume= 5.689 af, Depth= 5.74"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
140,755	98	Paved parking, HSG B
188,280	74	>75% Grass cover, Good, HSG C
188,723	61	>75% Grass cover, Good, HSG B
517,758	76	Weighted Average
377,003		72.81% Pervious Area
140,755		27.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
1.0	229	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 ffs
2.0	1,875	0.0400	15.46	27.31	Pipe Channel, TRAVEL PATH C TO D 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
6.6	2,154	Total			

Subcatchment P-1: P-1



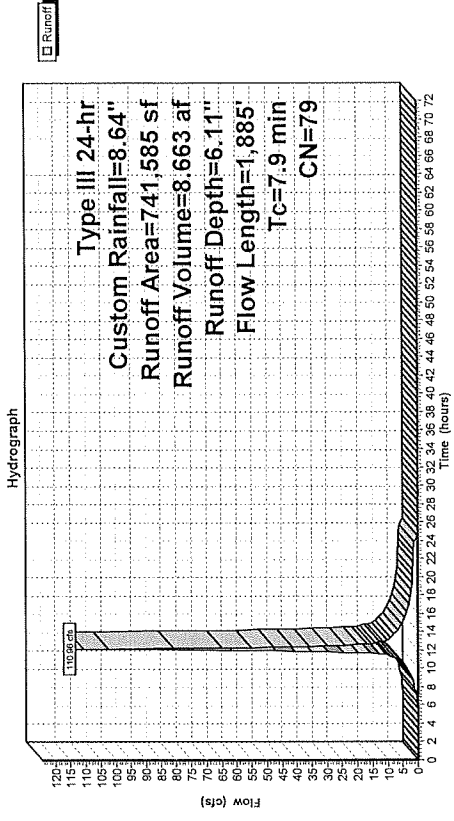
Summary for Subcatchment P-2: P-2

Runoff = 110.96 cfs @ 12.11 hrs, Volume= 8.663 af, Depth= 6.11"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
189,269	98	Paved parking, HSG B
484,425	74	>75% Grass cover, Good, HSG C
67,891	61	>75% Grass cover, Good, HSG B
741,585	79	Weighted Average
552,316		74.48% Pervious Area
189,269		25.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0300	0.17		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
1.6	375	0.0600	3.94		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 ffs
1.5	1,460	0.0600	16.76	20.57	Pipe Channel, TRAVEL PATH C TO D 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
7.9	1,885	Total			

Subcatchment P-2: P-2



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Type III 24-hr Custom Rainfall=8.64"

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Type III 24-hr Custom Rainfall=8.64"

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Summary for Subcatchment P-3: P-3

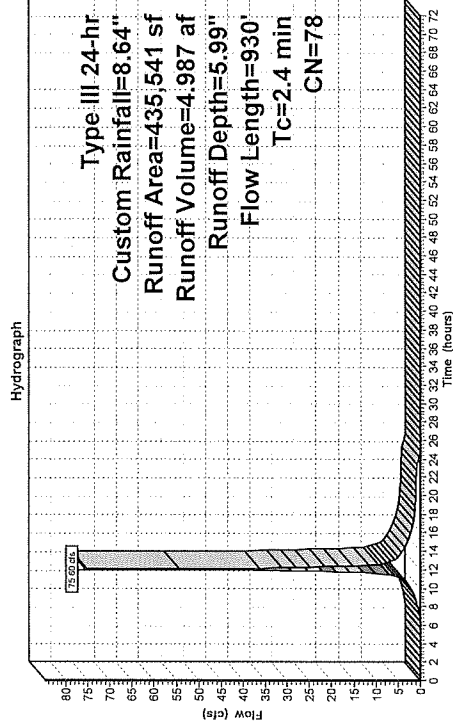
Runoff = 75.60 cfs @ 12.04 hrs, Volume= 4.987 af, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
108,837	98	Paved parking, HSG B
245,329	74	>75% Grass cover, Good, HSG C
75,499	61	>75% Grass cover, Good, HSG B
5,876	80	>75% Grass cover, Good, HSG D
435,541	78	Weighted Average
326,704		75.01% Pervious Area
108,837		24.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.41		Sheet Flow, TRAVEL PATH A TO B
1.1	240	0.0300	3.52		Smooth surfaces, n=0.011 P2= 3.20"
0.7	640	0.0500	15.30	18.78	Shallow Concentrated Flow, TRAVEL PATH B TO C Paved Kv= 20.3 fps Pipe Channel, TRAVEL PATH C TO D 15.0" Round Area= 1.2 sf Petim= 3.9' r= 0.31" n= 0.010
2.4	930	Total			

Subcatchment P-3: P-3



Summary for Subcatchment P-4: P-4

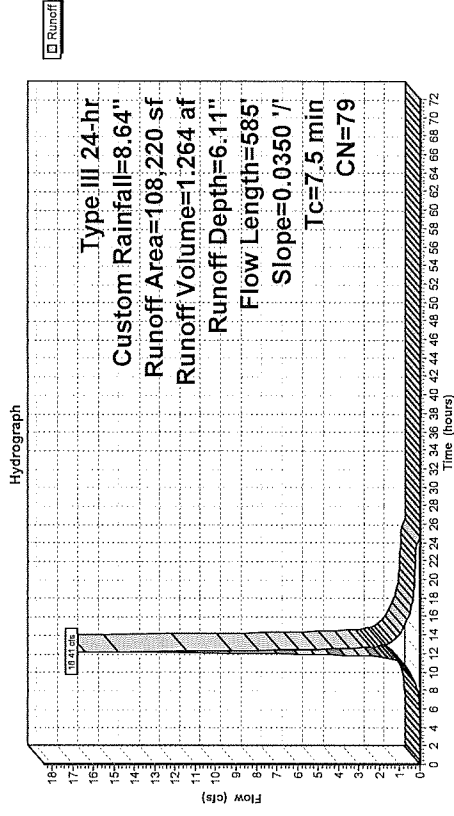
Runoff = 16.41 cfs @ 12.11 hrs, Volume= 1.264 af, Depth= 6.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
21,220	98	Paved parking, HSG B
87,000	74	>75% Grass cover, Good, HSG C
108,220	79	Weighted Average
87,000		80.39% Pervious Area
21,220		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		Sheet Flow, TRAVEL PATH A TO B Grass: Short n= 0.150 P2= 3.20"
3.0	535	0.0350	3.01		Shallow Concentrated Flow, TRAVEL PATH B TO C Unpaved Kv= 16.1 fps
7.5	585	Total			

Subcatchment P-4: P-4

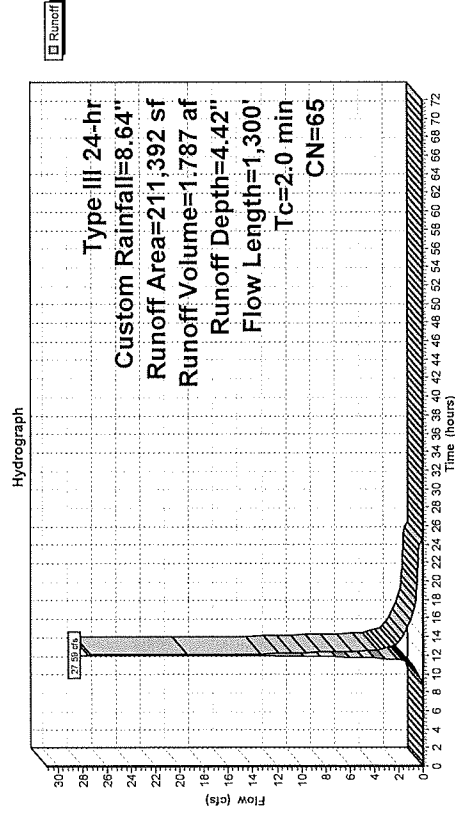


Summary for Subcatchment P-5: P-5

Runoff = 27.59 cfs @ 12.04 hrs, Volume= 1,787 af, Depth= 4.42"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
20,267	98	Paved parking, HSG B
191,125	61	>75% Grass cover, Good, HSG B
211,392	65	Weighted Average
191,125		90.41% Pervious Area
20,267		9.59% Impervious Area
Tc (min)	Length (feet)	Slope (ft/ft) Velocity (ft/sec) Capacity (cfs) Description
0.6	50	0.0300 1.41 Sheet Flow, TRAVEL PATH A TO B
		Smooth surfaces n= 0.011 P2= 3.20"
1.4	1,250	0.0600 14.45 Pipe Channel, TRAVEL PATH B TO C
		12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
		n= 0.010

Subcatchment P-5: P-5

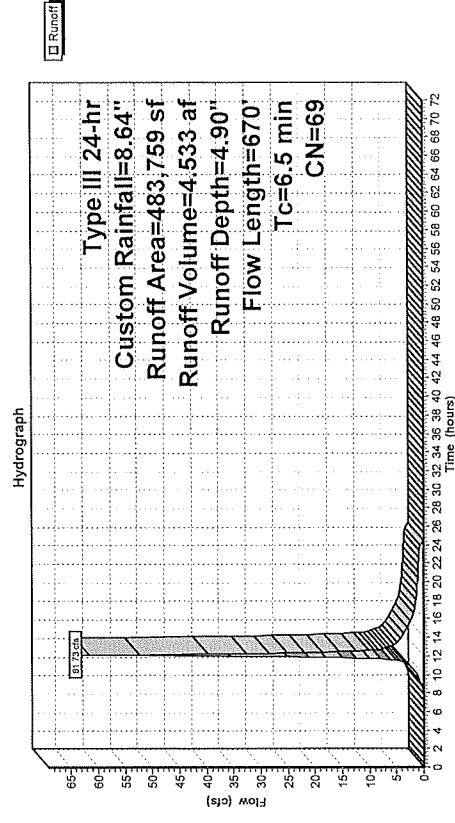


Summary for Subcatchment P-6: P-6

Runoff = 61.73 cfs @ 12.10 hrs, Volume= 4,533 af, Depth= 4.90"
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
2,860	98	Paved parking, HSG C
201,050	74	>75% Grass cover, Good, HSG C
74,105	70	Woods, Good, HSG C
89,988	61	>75% Grass cover, Good, HSG B
39,707	80	>75% Grass cover, Good, HSG D
76,049	55	Woods, Good, HSG B
483,759	69	Weighted Average
480,899		99.41% Pervious Area
2,860		0.59% Impervious Area
Tc	Length	Slope
(min)	(feet)	(ft/ft)
4.5	50	0.0350
		Velocity
		(ft/sec)
		Capacity
		(cfs)
		Description
		Sheet Flow, TRAVEL PATH A TO B
		Grass, Short n= 0.150 P2= 3.20"
2.0	620	0.1000
		5.09
		Shallow Concentrated Flow, TRAVEL PATH B TO C
		Unpaved Kv= 16.1 ffs

Subcatchment P-6: P-6



Summary for Subcatchment P-7: P-7

Runoff = 0.70 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 8.28"

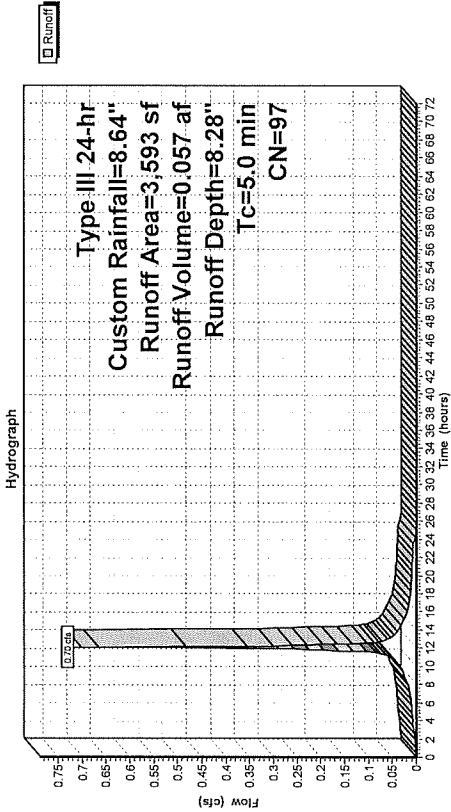
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Type III 24-hr Custom Rainfall=8.64"

Area (sf)	CN	Description
80	74	>75% Grass cover, Good, HSG C
3,513	98	Paved parking, HSG C
3,593	97	Weighted Average
80		2.23% Pervious Area
3,513		97.77% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0				Direct Entry, TRAVEL PATH

Subcatchment P-7: P-7



Summary for Reach IP#1: North Park Hill

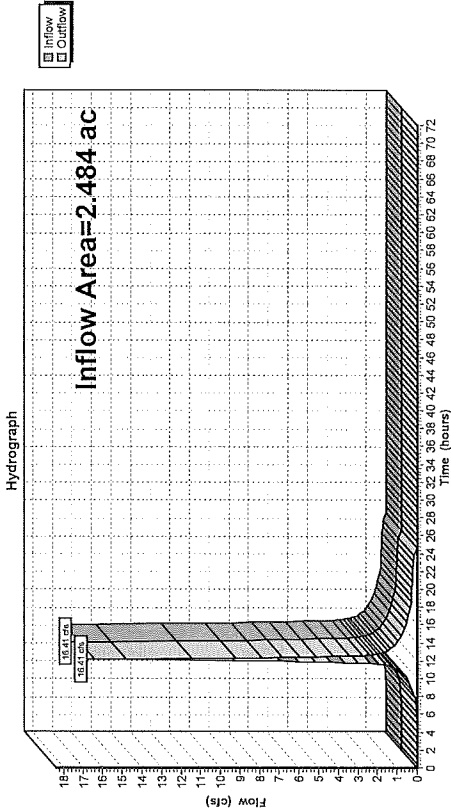
Inflow Area = 2.484 ac, 19.61% Impervious, Inflow Depth = 6.11" for Custom event

Inflow = 16.41 cfs @ 12.11 hrs, Volume= 1.264 af

Outflow = 16.41 cfs @ 12.11 hrs, Volume= 1.264 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#1: North Park Hill

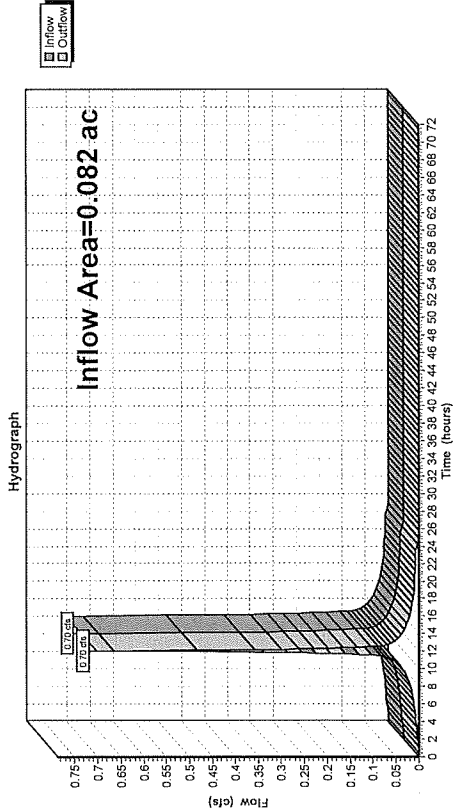


Summary for Reach IP#2: South Park Hill

Inflow Area = 0.082 ac, 97.77% Impervious, Inflow Depth = 8.28" for Custom event
Inflow = 0.70 cfs @ 12.07 hrs, Volume= 0.057 af
Outflow = 0.70 cfs @ 12.07 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#2: South Park Hill

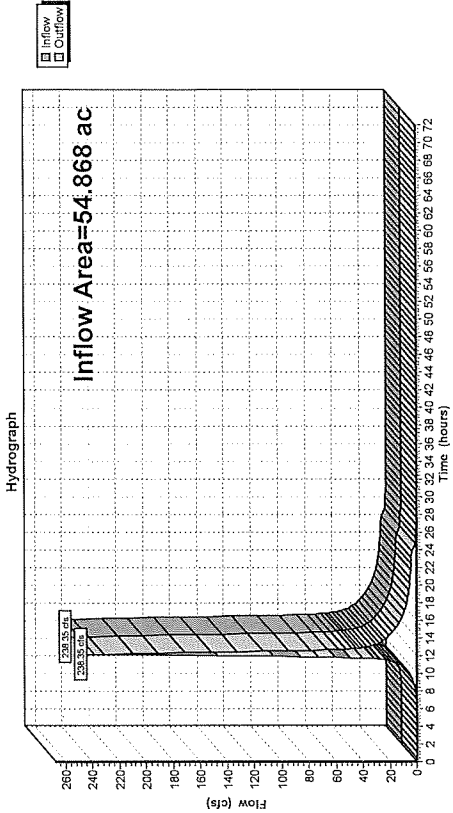


Summary for Reach IP#3: Wetlands

Inflow Area = 54.868 ac, 19.33% Impervious, Inflow Depth = 5.17" for Custom event
Inflow = 238.35 cfs @ 12.13 hrs, Volume= 23.659 af
Outflow = 238.35 cfs @ 12.13 hrs, Volume= 23.659 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach IP#3: Wetlands



Summary for Reach IP#4: South Property Line

Summary for Pond 1P: POND#1

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 5.74" for Custom event
Inflow = 82.17 cfs @ 12.10 hrs, Volume= 5.689 af
Outflow = 52.17 cfs @ 12.21 hrs, Volume= 5.689 af, Atten= 37%, Lag= 6.4 min
Discarded = 0.18 cfs @ 12.21 hrs, Volume= 0.236 af
Primary = 51.99 cfs @ 12.21 hrs, Volume= 5.453 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 520.71' @ 12.21 hrs Surf.Area= 7,549 sf Storage= 26,439 cf

Plug-Flow detention time= 23.1 min calculated for 5.689 af (100% of inflow)
Center-of-Mass det. time= 23.1 min (863.9 - 840.7)

Volume	Invert	Avail.Storage	Storage Description
#1	516.00'	36,491 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

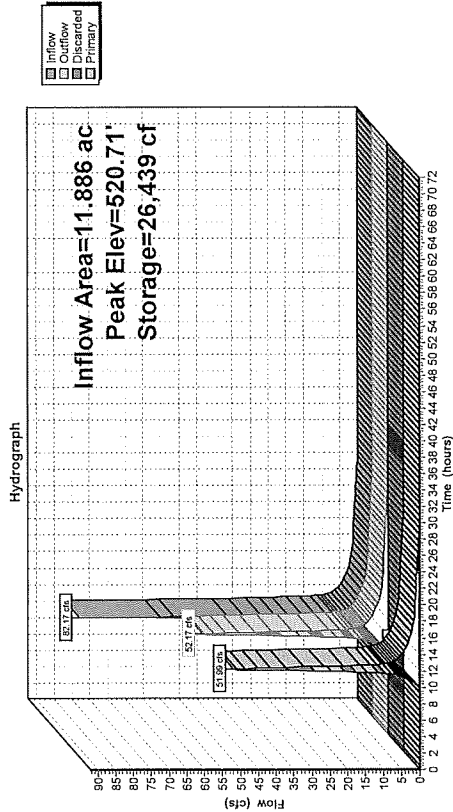
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
516.00	3,443	0	0
518.00	5,224	8,667	8,667
520.00	7,290	12,514	21,181
522.00	8,020	15,310	36,491

Device	Routing	Invert	Outlet Devices
#1	Discarded	516.00'	1,020 in/hr Exfiltration over Surface area
#2	Primary	516.50'	24.0" Vert. Orifice/Grate C= 0.600
#3	Primary	517.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded Outflow Max=0.18 cfs @ 12.21 hrs HW=520.70' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary Outflow Max=51.88 cfs @ 12.21 hrs HW=520.70' (Free Discharge)
2=Orifice/Grate (Orifice Controls 27.04 cfs @ 8.61 fps)
3=Orifice/Grate (Orifice Controls 24.84 cfs @ 7.91 fps)

Pond 1P: POND#1



Summary for Pond 2P: POND#2

Inflow Area = 17.024 ac, 25.52% Impervious, Inflow Depth = 6.11" for Custom event
Inflow = 110.96 cfs @ 12.11 hrs, Volume= 8.663 af
Outflow = 90.91 cfs @ 12.18 hrs, Volume= 8.663 af, Atten= 18%, Lag= 4.1 min
Discarded = 0.27 cfs @ 12.18 hrs, Volume= 0.153 af
Primary = 90.63 cfs @ 12.18 hrs, Volume= 8.510 af

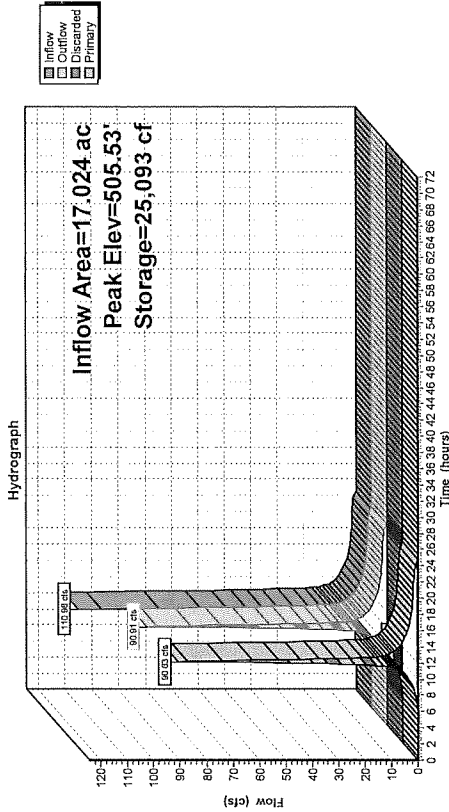
Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 505.53' @ 12.18 hrs Surf.Area= 11,594 sf Storage= 25,093 cf

Plug-Flow detention time= 7.1 min calculated for 8.657 af (100% of inflow)
Center-of-Mass det. time= 7.1 min (811.2 - 804.1)

Volume	Invert	Avail. Storage	Storage Description
#1	502.00'	30,807 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
502.00	2,241	0	0
504.00	7,922	10,163	10,163
506.00	12,722	20,644	30,807

Device	Routing	Invert	Outlet Devices
#1	Discarded	502.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	502.50'	36.0" Vert. Orifice/Grate C= 0.600
#3	Primary	502.00'	36.0" Vert. Orifice/Grate C= 0.600
Discarded Outflow Max=0.27 cfs @ 12.18 hrs HW=505.50' (Free Discharge)			
1=Exfiltration (Exfiltration Controls 0.27 cfs)			
Primary Outflow Max=89.79 cfs @ 12.18 hrs HW=505.50' (Free Discharge)			
2=Orifice/Grate (Orifice Controls 41.68 cfs @ 5.90 fps)			
3=Orifice/Grate (Orifice Controls 48.12 cfs @ 6.81 fps)			

Pond 2P: POND#2



Summary for Pond 3P: POND#3

Inflow Area = 9.999 ac, 24.99% Impervious, Inflow Depth = 5.99" for Custom event
Inflow = 75.60 cfs @ 12.04 hrs, Volume= 4.987 af
Outflow = 32.18 cfs @ 12.20 hrs, Volume= 4.919 af, Atten= 57%, Lag= 9.2 min
Discarded = 0.43 cfs @ 12.20 hrs, Volume= 1.543 af
Primary = 31.75 cfs @ 12.20 hrs, Volume= 3.376 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 524.60' @ 12.20 hrs Surf.Area= 18,073 sf Storage= 83,088 cf

Plug-Flow detention time= 483.3 min calculated for 4.919 af (99% of inflow)
Center-of-Mass det. time= 474.9 min (1,276.1 - 801.2)

Volume				Storage Description			Custom Stage Data (Prismatic) Listed below (Recalc)	
#1	Invert	Avail.Storage	Surf.Area	Inc.Store	Cum.Store			
	518.00'	109,920 cf	(sq-ft)	(cubic-feet)	(cubic-feet)			
Elevation								
(feet)								
518.00	4,370	0	0	0	0			
520.00	11,380	15,750	15,750	15,750	15,750			
522.00	14,130	25,510	25,510	41,260	41,260			
524.00	17,110	31,240	31,240	72,500	72,500			
526.00	20,310	37,420	37,420	109,920	109,920			

Device		Routing		Invert		Outlet Devices	
#1	Discarded	518.00'	1,020 in/hr	518.00'	1,020 in/hr	Exfiltration over Surface area	
#2	Primary	522.50'	24.0" Vert. Orifice/Grate X 2.00	522.50'	24.0" Vert. Orifice/Grate X 2.00	C= 0.600	
#3	Primary	525.00'	15.0' long x 1.0' breadth	525.00'	15.0' long x 1.0' breadth	Broad-Crested Rectangular Weir	
			Head (feet)	0.20	0.40	0.60	0.80 1.00 1.20 1.40 1.60 1.80 2.00
				2.50	3.00		
			Coef. (English)	2.89	2.72	2.75	2.85 2.98 3.08 3.20 3.28 3.31
				3.30	3.31	3.32	

Discarded OutFlow Max=0.43 cfs @ 12.20 hrs HW=524.60' (Free Discharge)

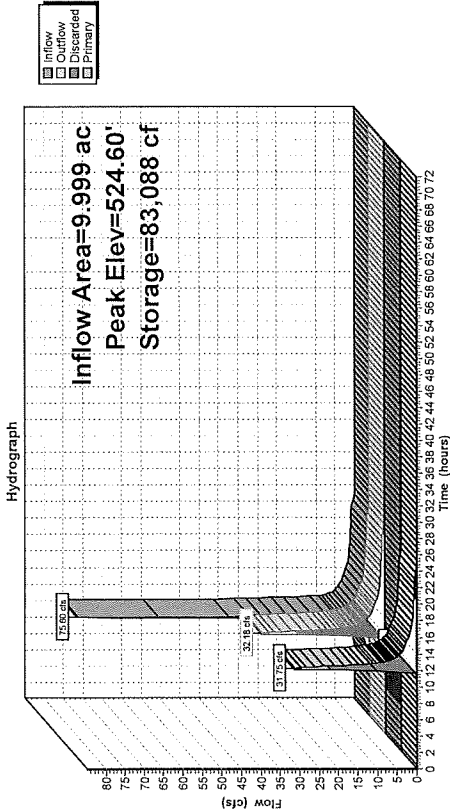
1=Exfiltration (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=31.73 cfs @ 12.20 hrs HW=524.60' (Free Discharge)

2=Orifice/Grate (Orifice Controls 31.73 cfs @ 5.05 fps)

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

Pond 3P: POND#3



Summary for Pond 6P: Forebay

Inflow Area = 11.886 ac, 27.19% Impervious, Inflow Depth = 5.74" for Custom event
Inflow = 76.53 cfs @ 12.10 hrs, Volume= 5.689 af
Outflow = 82.17 cfs @ 12.10 hrs, Volume= 5.689 af, Atten= 0%, Lag= 0.1 min
Primary = 82.17 cfs @ 12.10 hrs, Volume= 5.689 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 530.20' @ 12.10 hrs Surf.Area= 4,340 sf Storage= 11,231 cf

Plug-Flow detention time= 32.1 min calculated for 5.689 af (100% of inflow)

Center-of-Mass det. time= 31.3 min (840.7 - 809.5)

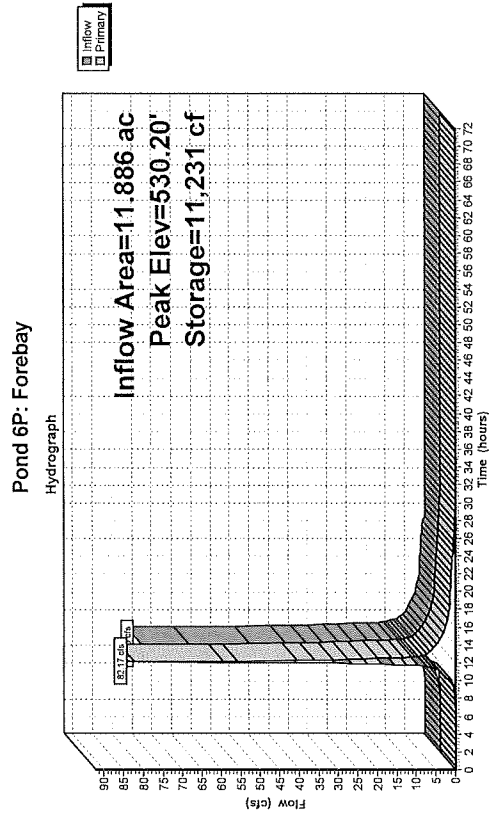
Volume	Invert	Avail.Storage	Storage Description
#1	526.00'	11,231 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
526.00	1,431	0	0
528.00	2,730	4,161	4,161
530.00	4,340	7,070	11,231

Device	Routing	Invert	Outlet Devices
#1	Primary	529.00'	20.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
			3.30 3.31 3.32
#2	Primary	526.00'	4.0" Vert. Orifice/Grate C= 0.600

Primary Outflow Max=81.75 cfs @ 12.10 hrs HW=530.20' (Free Discharge)

1-Broad-Crested Rectangular Weir (Weir Controls 80.91 cfs @ 3.37 fps)

2-Orifice/Grate (Orifice Controls 0.84 cfs @ 9.67 fps)



SUMMARY REACH IP#1
(Park Hill Ave North)

Storm Event	Pre-Development	Post-Dev.
2 yr.	8.66 cfs	4.02 cfs
10 yr.	17.21 cfs	7.42 cfs
25 yr.	24.58 cfs	10.27 cfs
100 yr.	39.88 cfs	16.07 cfs

SUMMARY REACH IP#2
(Park Hill Ave South)

Storm Event	Pre-Development	Post-Dev.
2 yr.	11.31 cfs	0.27 cfs
10 yr.	22.91 cfs	0.39 cfs
25 yr.	32.98 cfs	0.49 cfs
100 yr.	54.01 cfs	0.69 cfs

SUMMARY REACH IP#3
(Wetlands to rear of Property)

Storm Event	Pre-Development	Post-Dev.
2 yr.	48.27 cfs	40.75 cfs
10 yr.	99.81 cfs	94.74 cfs
25 yr.	144.85 cfs	134.51 cfs
100 yr.	239.37 cfs	233.47 cfs

SUMMARY REACH IP#4
(Abutters Property South)

Storm Event	Pre-Development	Post-Dev.
2 yr.	7.73 cfs	0.0 cfs
10 yr.	15.04 cfs	0.0 cfs
25 yr.	21.29 cfs	0.0 cfs
100 yr.	34.19 cfs	0.0 cfs

Basin Summary Table II

Basins – Post-Development Conditions

<u>BASIN</u>	<u>UNITS</u>	<u>100 YR.</u>	<u>25 YR.</u>	<u>10 YR.</u>	<u>2 YR</u>
1	Qin = CFS	80.09	46.02	32.32	16.15
	Qout = CFS	51.36	36.06	26.59	10.15
	ELEV. = FT	520.62	519.17	518.54	517.69
	VOL. ST. = cf	25,753	15,484	11,660	7,114
2	Qin = CFS	108.66	69.40	50.13	27.14
	Qout = CFS	89.57	60.97	44.41	23.95
	ELEV. = FT	505.47	504.57	504.14	503.57
	VOL. ST. = cf	24,410	15,087	11,322	6,991
3	Qin = CFS	74.02	47.02	33.80	18.10
	Qout = CFS	31.16	10.26	2.41	0.33
	ELEV. = FT	524.53	523.46	522.91	521.75
	VOL. ST. = cf	81,786	63,408	54,754	37,753

Appendix F
TSS Removal Calculations

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: P-1 (BASIN#1)

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
Grass Channel	0.50	0.15	0.08	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

93%

Project: Clearview
 Prepared By: Peter Lavoie
 Date: 10/11/2019

*Equals remaining load from previous BMP (E) which enters the BMP

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: **P-2 (BASIN#2)**

TSS Removal Calculation Worksheet					
BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)	
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75	
Infiltration Basin	0.80	0.75	0.60	0.15	
Sediment Forebay	0.25	0.15	0.04	0.11	
	0.00	0.11	0.00	0.11	
	0.00	0.11	0.00	0.11	

Total TSS Removal = **89%**

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Project:	Clearview
Prepared By:	Peter Lavoie
Date:	10/11/2019

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location:

P-3 (BASIN#3)

B

F

E

D

C

BMP¹ TSS Removal Rate¹ Starting TSS Load* Amount Removed (C*D) Remaining Load (D-E)

Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
Sediment Forebay	0.25	0.15	0.04	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

89%

Clearview

Project:

Prepared By: Peter Lavoie

Date: 10/11/2019

*Equals remaining load from previous BMP (E) which enters the BMP

- Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Appendix G
Long-Term Pollution Prevention Plan

WEEKLY
Inspection and Maintenance Log FOR: Clearview
AFTER CONSTRUCTION & After 0.5" Rain

Components	Date
Open Basins#1 (See Final) – twice a year	
Comments during insp.	
Note corrective measures performed & Date	
Open Basin#2(See Final Design) -twice a year	
Comments during insp.	
Note corrective measures performed & date	
Open Basin#3(See Final Design) -twice a year	
Comments during insp.	
Note corrective measures performed & date	
Level Spreaders 1 thru 3(See Final) -twice a year	
Comments during insp.	
Note corrective measures performed & date	
Outlet Control Structure#1 thru 3(typ.) – twice a year	
Comments during insp.	
Note corrective measures performed & date	
_____ Inspector Title Date	
_____ Address Tel#	

WEEKLY
Inspection and Maintenance Log FOR: Clearview
AFTER CONSTRUCTION & After 0.5" Rain

Components	Date
Notify Cons. Comm. Issues effecting Resource Areas	
Comments during insp.	
Note corrective measures performed & date	
Illicit Drainage Discharge –	
Comments during insp.	
Note corrective measures performed & date	
Catch Basins(typ.) – twice a year	
Comments during insp.	
Note corrective measures performed & date	
Any Spill Fuel, Chemical- -as-needed	
Comments during insp.	
Note corrective measures performed & date	
Grass Swales at outlets -Once a year	
Comments during insp.	
Note corrective measures performed & date	
Inverts at Headwalls(typ.) – twice a year	
Comments during insp.	
Note corrective measures performed & date	
_____ Inspector Title Date	

WEEKLY
Inspection and Maintenance Log **FOR: Clearview**
AFTER CONSTRUCTION **& After 0.5" Rain**

Components	Date
Settling Basins After Outlet -twice a year	
Comments during insp.	
Note corrective measures performed & date	
Side Slopes Adjacent to wetlands -As needed	
Comments during insp.	
Note corrective measures performed & date	
Street Sweeping – twice a year	
Comments during insp.	
Note corrective measures performed & date	
Any Spill Fuel, Chemical- -as-needed	
Comments during insp.	
Note corrective measures performed & date	
Outlet pipe of Basins 1-3 -Once a year	
Comments during insp.	
Note corrective measures performed & date	
Inlet pipe of Basins 1-3 – twice a year	
Comments during insp.	
Note corrective measures performed & date	
Inspector Title Date	

Appendix H
Construction Period Pollution Prevention Plan

WEEKLY
Inspection and Maintenance Log
DURING CONSTRUCTION

FOR: Clearview
 66 Park Hill avenue
 & After 0.5" Rain

Components	Date
Erosion Control – Weekly	
Comments during insp.	
Note corrective measures performed & Date	
On Site Pavement Sweeping – as Needed	
Comments during insp.	
Note corrective measures performed & date	
Catch Basin with Silt Sack & Haybales – Monthly	
Comments during insp.	
Note corrective measures performed & date	
Temporary Basin Area as Needed	
Comments during insp.	
Note corrective measures performed & date	
Construction Entrance as Needed	
Comments during insp.	
Note corrective measures performed & date	
_____ Inspector Title Date	
_____ Address Tel#	

WEEKLY
Inspection and Maintenance Log
DURING CONSTRUCTION

FOR: Clearview
 66 Park Hill avenue
 & After 0.5" Rain

Components	Date
Notify Cons. Comm. Issues effecting Resource Areas	
Comments during insp.	
Note corrective measures performed & date	
Silt of Public (Park Hill Ave) Streets – Daily	
Comments during insp.	
Note corrective measures performed & date	
Stockpile Materials Ring with Haybales – Weekly	
Comments during insp.	
Note corrective measures performed & date	
Any Spill Fuel, Chemical- Daily	
Comments during insp.	
Note corrective measures performed & date	
Temporary Ground Cover Area – Weekly	
Comments during insp.	
Note corrective measures performed & date	
Temporary Stone at Access Drive as Needed	
Comments during insp.	
Note corrective measures performed & date	
Inspector _____ Title _____ Date _____	

WEEKLY
Inspection and Maintenance Log
DURING CONSTRUCTION

FOR: Clearview
 66 Park Hill avenue
 & After 0.5" Rain

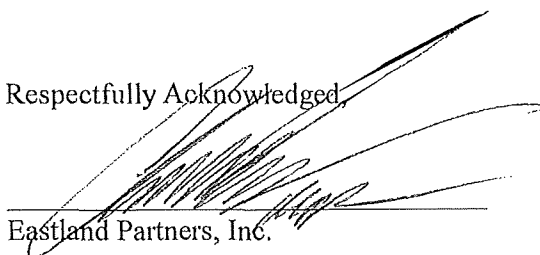
Address Tel#		
Components		Date
Lawn Area / Mulch Area		
Erosion, Washouts		
Comments during insp.		
Note corrective measures performed & date		
Stone Aprons at Street Exit as Needed		
Comments during insp.		
Note corrective measures performed & date		
Forebay as Needed		
Comments during insp.		
Note corrective measures performed & date		
Outlet Control Structures as Needed		
Comments during insp.		
Note corrective measures performed & date		
Illicit Drainage Discharge		
Comments during insp.		
Note corrective measures performed & date		

Appendix I
Illicit Discharge Statement

Attachment
Illicit Discharge Compliance Statement

It is the intent of the Applicant, Eastland Partners, Inc., to control illicit disposal into the storm drainage system. There will be no connection to the storm water system to inadvertently direct other types of liquids, chemicals or solids into the storm drainage system. The Applicant will also promote a clean Green Environment by mitigating spills onto pavements; oils, soda, chemicals, pet waste, debris and litter.

Respectfully Acknowledged,



Eastland Partners, Inc.

Appendix J
Rip-Rap Sizing Calculations

66 Park Hill Ave, Millbury (Clearview)
Project#1014-Millbury
Revised 6-8-20

Riprap Stone Sizing – Drainage Outfalls

Method – ARS Rock Chutes (Slopes 2%-40%)
Reference: National Engineering Handbook, TS14C-8

#1– Rock Apron-Pre-Dev Basin#2 spillway (HydroCAD)

Slope = 0.062 ft/ft

q (100-yr) = 51.36 cfs

$$D_{50} = 12(1.923qS^{1.5})^{0.529}$$

D₅₀ = 8" required

D₅₀ = 8" provided

#2 - Rock Apron- Pre-Dev Basin#3 spillway (HydroCAD)

Slope = 0.04 ft/ft

q (100-yr) = 89.57cfs

$$D_{50} = 12(1.923qS^{1.5})^{0.529}$$

D₅₀ = 8" required

D₅₀ = 8" provided

#3 – Rock Apron-Pre-Dev Basin#4 spillway (HydroCAD)

Slope = 0.02 ft/ft

q (100-yr) = 31.16 cfs

$$D_{50} = 12(1.923qS^{1.5})^{0.529}$$

D₅₀ = 6" required

D₅₀ = 8" provided

Appendix K
72 Hour Drawdown Analysis

Hydrograph for Pond 1P: POND#1

Time (hours)	Inflow (cfs)	Storage (cubic feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	516.00	0.00	0.00	0.00
2.50	0.00	0	516.00	0.00	0.00	0.00
5.00	0.00	0	516.00	0.00	0.00	0.00
7.50	0.14	118	516.03	0.05	0.05	0.00
10.00	094	2,697	516.69	0.33	0.10	0.24
12.50	1957	13,392	518.84	31.54	0.14	31.40
15.00	356	5,003	517.25	3.68	0.11	3.57
17.50	178	4,078	517.04	1.86	0.10	1.76
20.00	123	3,629	516.94	1.26	0.10	1.16
22.50	0.97	3,396	516.89	1.00	0.10	0.90
25.00	0.52	3,044	516.80	0.66	0.10	0.56
27.50	0.28	2,628	516.70	0.35	0.10	0.25
30.00	0.01	1,846	516.50	0.09	0.09	0.00
32.50	0.00	1,101	516.31	0.09	0.09	0.00
35.00	0.00	353	516.10	0.08	0.08	0.00
37.50	0.00	15	516.00	0.01	0.01	0.00
40.00	0.00	2	516.00	0.00	0.00	0.00
42.50	0.00	1	516.00	0.00	0.00	0.00
45.00	0.00	0	516.00	0.00	0.00	0.00
47.50	0.00	0	516.00	0.00	0.00	0.00
50.00	0.00	0	516.00	0.00	0.00	0.00
52.50	0.00	0	516.00	0.00	0.00	0.00
55.00	0.00	0	516.00	0.00	0.00	0.00
57.50	0.00	0	516.00	0.00	0.00	0.00
60.00	0.00	0	516.00	0.00	0.00	0.00
62.50	0.00	0	516.00	0.00	0.00	0.00
65.00	0.00	0	516.00	0.00	0.00	0.00
67.50	0.00	0	516.00	0.00	0.00	0.00
70.00	0.00	0	516.00	0.00	0.00	0.00

Hydrograph for Pond 2P: POND#2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	502.00	0.00	0.00	0.00
2.50	0.00	0	502.00	0.00	0.00	0.00
5.00	0.00	0	502.00	0.00	0.00	0.00
7.50	0.86	649	502.25	0.55	0.07	0.48
10.00	3.33	1,982	502.63	3.16	0.10	3.07
12.50	29.29	9,693	503.94	36.82	0.18	36.63
15.00	5.22	2,683	502.80	5.34	0.11	5.23
17.50	2.59	1,790	502.58	2.66	0.09	2.57
20.00	1.79	1,411	502.48	1.82	0.09	1.74
22.50	1.41	1,204	502.42	1.43	0.08	1.35
25.00	0.00	121	502.05	0.08	0.06	0.02
27.50	0.00	0	502.00	0.00	0.00	0.00
30.00	0.00	0	502.00	0.00	0.00	0.00
32.50	0.00	0	502.00	0.00	0.00	0.00
35.00	0.00	0	502.00	0.00	0.00	0.00
37.50	0.00	0	502.00	0.00	0.00	0.00
40.00	0.00	0	502.00	0.00	0.00	0.00
42.50	0.00	0	502.00	0.00	0.00	0.00
45.00	0.00	0	502.00	0.00	0.00	0.00
47.50	0.00	0	502.00	0.00	0.00	0.00
50.00	0.00	0	502.00	0.00	0.00	0.00
52.50	0.00	0	502.00	0.00	0.00	0.00
55.00	0.00	0	502.00	0.00	0.00	0.00
57.50	0.00	0	502.00	0.00	0.00	0.00
60.00	0.00	0	502.00	0.00	0.00	0.00
62.50	0.00	0	502.00	0.00	0.00	0.00
65.00	0.00	0	502.00	0.00	0.00	0.00
67.50	0.00	0	502.00	0.00	0.00	0.00
70.00	0.00	0	502.00	0.00	0.00	0.00

Hydrograph for Pond 3P: POND#3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	518.00	0.00	0.00	0.00
2.50	0.00	0	518.00	0.00	0.00	0.00
5.00	0.00	0	518.00	0.00	0.00	0.00
7.50	0.36	642	518.14	0.11	0.11	0.00
10.00	133	8,236	519.25	0.21	0.21	0.00
12.50	1146	73,869	524.08	23.19	0.41	22.78
15.00	296	56,098	523.00	3.31	0.37	2.95
17.50	148	53,468	522.83	1.69	0.36	1.32
20.00	1.04	52,213	522.75	1.12	0.36	0.76
22.50	0.81	51,585	522.70	0.89	0.36	0.53
25.00	0.00	49,311	522.55	0.39	0.35	0.04
27.50	0.00	46,124	522.34	0.35	0.35	0.00
30.00	0.00	43,048	522.13	0.34	0.34	0.00
32.50	0.00	40,039	521.91	0.33	0.33	0.00
35.00	0.00	37,093	521.70	0.32	0.32	0.00
37.50	0.00	34,209	521.49	0.32	0.32	0.00
40.00	0.00	31,387	521.28	0.31	0.31	0.00
42.50	0.00	28,627	521.06	0.30	0.30	0.00
45.00	0.00	25,929	520.85	0.30	0.30	0.00
47.50	0.00	23,293	520.64	0.29	0.29	0.00
50.00	0.00	20,720	520.43	0.28	0.28	0.00
52.50	0.00	18,208	520.21	0.28	0.28	0.00
55.00	0.00	15,758	520.00	0.27	0.27	0.00
57.50	0.00	13,419	519.79	0.25	0.25	0.00
60.00	0.00	11,238	519.58	0.23	0.23	0.00
62.50	0.00	9,215	519.36	0.22	0.22	0.00
65.00	0.00	7,350	519.15	0.20	0.20	0.00
67.50	0.00	5,643	518.94	0.18	0.18	0.00
70.00	0.00	4,065	518.73	0.16	0.16	0.00

Appendix L
Pipe Sizing Calculations

DRAINAGE AREA ANALYSIS

Land Use Coefficients "C"

Impervious	0.90
Wetland	0.72
Grass	0.45
Woods	0.35

Drainage Area	Land Use Area				Total (acres)	Weighted "C"	Length (ft)	Flow Path	
	Impervious (acres)	Wetland (acres)	Grass (acres)	Woods (acres)				Slope	Tc (min)
CB6	0.220	0.000	0.050	0.000	0.27	0.82	180	0.010	6.84
CB5	0.360	0.000	0.130	0.000	0.49	0.78	321	0.024	7.69
CB4	0.340	0.000	0.130	0.000	0.47	0.78	321	0.024	7.82
CB3	0.310	0.000	0.240	0.000	0.55	0.70	321	0.024	9.55
CB2	0.100	0.000	0.100	0.000	0.20	0.68	125	0.010	8.55
CB1	0.020	0.000	0.040	0.000	0.06	0.60	125	0.010	10.06
CB34	0.090	0.000	0.200	0.000	0.29	0.59	280	0.010	15.37
CB33	0.420	0.000	0.760	0.000	1.18	0.61	280	0.010	14.75
CB32	0.090	0.000	0.140	0.000	0.23	0.63	250	0.035	8.88
CB31	0.630	0.000	0.740	0.000	1.37	0.66	250	0.035	8.31
CB30	0.050	0.000	0.130	0.000	0.18	0.58	166	0.060	6.70
CB29	0.420	0.000	0.380	0.000	0.80	0.69	166	0.060	5.28
CB28	0.050	0.000	0.020	0.000	0.07	0.77	166	0.060	5.00
CB27	0.220	0.000	0.070	0.000	0.29	0.79	166	0.060	5.00

DRAINAGE AREA ANALYSIS

Land Use Coefficients "C"

Impervious	0.90
Wetland	0.72
Grass	0.45
Woods	0.35

Drainage Area	Land Use Area				Total (acres)	Weighted "C"	Length (ft)	Flow Path	
	Impervious (acres)	Wetland (acres)	Grass (acres)	Woods (acres)				Slope	Tc (min)
CB25	0.170	0.000	0.820	0.000	0.99	0.53	320	0.060	10.15
CB26	0.040	0.000	0.000	0.000	0.04	0.90	150	0.060	5.00
CB23	0.180	0.000	0.530	1.830	2.54	0.41	500	0.080	13.89
CB24	0.140	0.000	0.350	0.000	0.49	0.58	221	0.060	7.68

DESIGN COMPUTATIONS FOR STORM DRAINS

[illegible]

DRAINAGE AREA ANALYSIS

Land Use Coefficients "C"

Impervious	0.90
Wetland	0.72
Grass	0.45
Woods	0.35

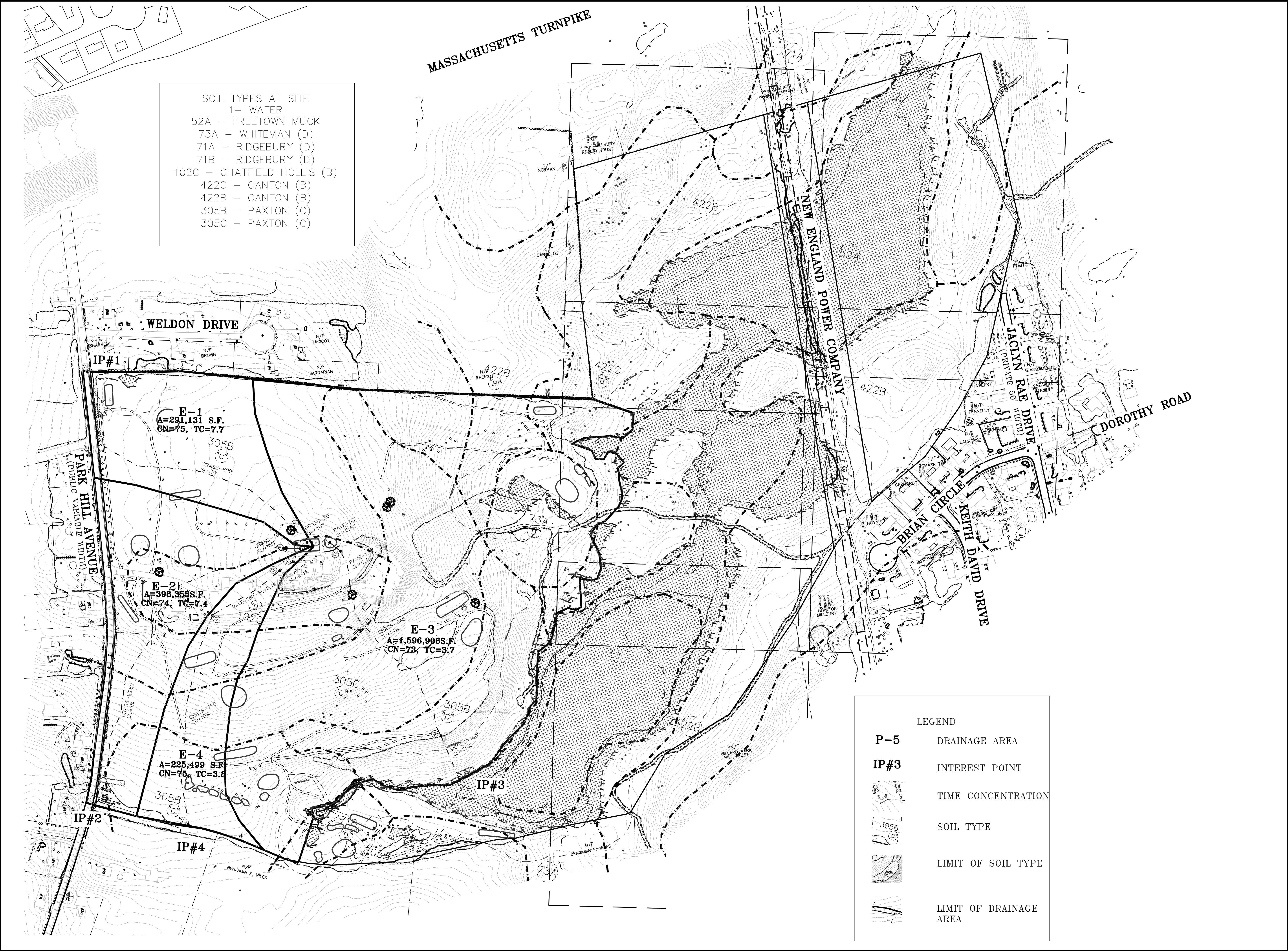
Drainage Area	Land Use Area				Total	Weighted "C"	Length	Flow Path	
	Impervious (acres)	Wetland (acres)	Grass (acres)	Woods (acres)	(acres)		(ft)	Slope	Tc (min)
CB35	0.460	0.000	0.750	0.000	1.21	0.62	294	0.030	10.25
CB36	0.410	0.000	0.580	0.000	0.99	0.64	294	0.030	9.92
CB37	0.400	0.000	0.580	0.000	0.98	0.63	280	0.050	8.21
CB38	0.320	0.000	0.660	0.000	0.98	0.60	280	0.070	7.92
CB39	0.330	0.000	1.470	0.000	1.80	0.53	310	0.070	9.40
CB13	0.150	0.000	0.840	0.000	0.99	0.52	350	0.130	8.33
CB14	0.230	0.000	0.110	0.000	0.34	0.75	166	0.040	5.05
CB15	0.100	0.000	0.490	0.000	0.59	0.53	300	0.130	7.61
CB16	0.230	0.000	0.050	0.000	0.28	0.82	168	0.040	5.00
CB17	0.150	0.000	0.750	0.000	0.90	0.53	420	0.380	6.31
CB18	0.230	0.000	0.290	0.000	0.52	0.65	200	0.040	7.23
CB19	0.360	0.000	1.190	0.000	1.55	0.55	300	0.020	13.50
CB20	0.360	0.000	0.550	0.000	0.91	0.63	300	0.020	11.68
CB26	0.050	0.000	0.040	0.000	0.09	0.70	150	0.040	5.56
CB25	0.180	0.000	0.800	0.000	0.98	0.53	312	0.080	9.02
CB24	0.230	0.000	0.140	0.000	0.37	0.73	150	0.400	5.00
CB23	0.120	0.000	0.440	0.000	0.56	0.55	250	0.080	7.88
CB22	0.230	0.000	0.180	0.000	0.41	0.70	150	0.040	5.52
CB21	0.140	0.000	0.620	0.000	0.76	0.53	200	0.080	7.22
CB42	0.83	0.000	0.470	0.000	1.30	0.74	250	0.030	7.16

DRAINAGE AREA ANALYSIS

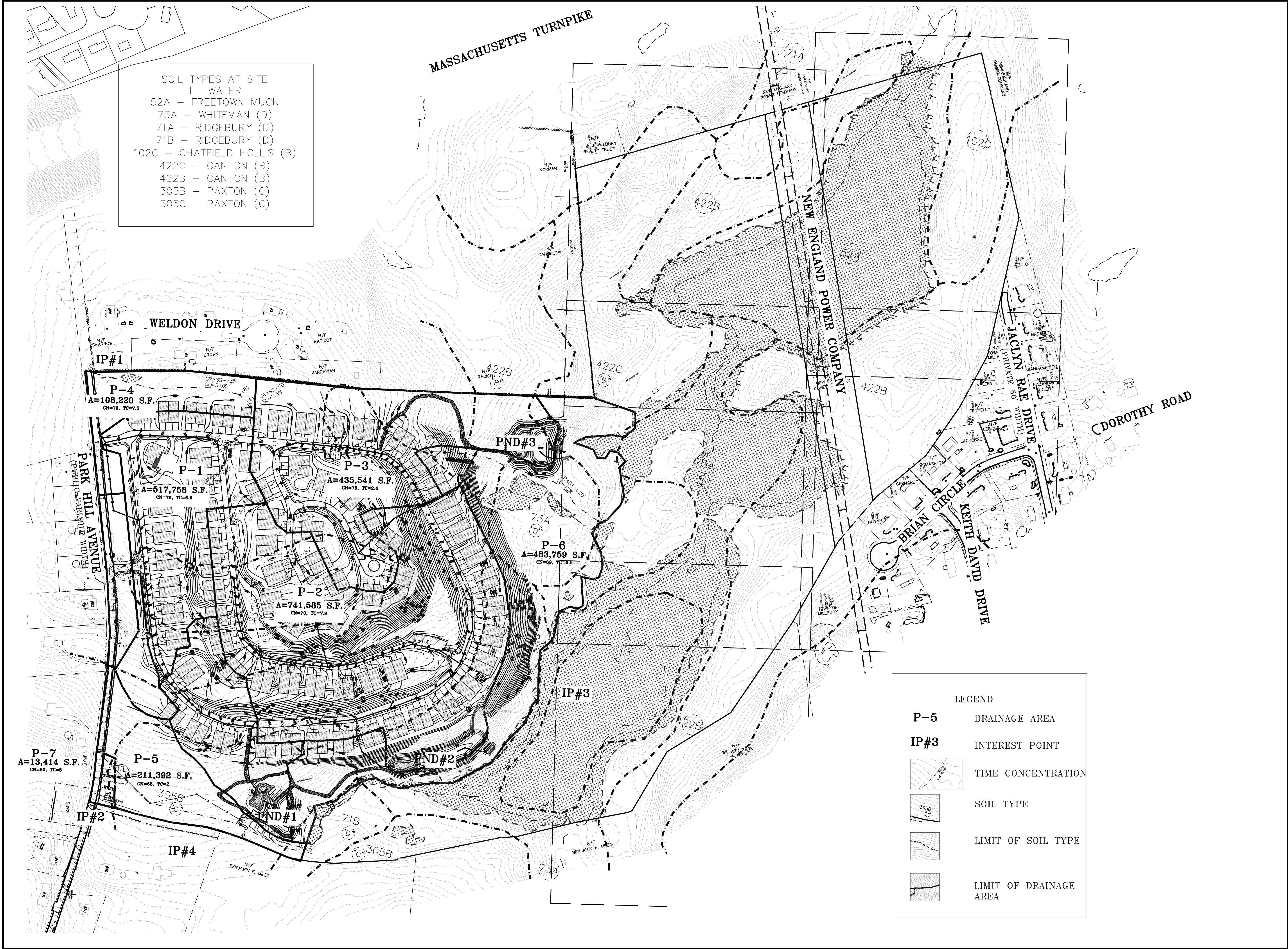
Land Use Coefficients "C"

Impervious	0.90
Wetland	0.72
Grass	0.45
Woods	0.35

Drainage Area	Land Use Area Impervious (acres)	Wetland (acres)	Grass (acres)	Woods (acres)	Total (acres)	Weighted "C"	Length (ft)	Flow Path Slope	Tc (min)
CB40	0.270	0.000	0.220	0.000	0.49	0.70	294	0.030	8.60
CB41	0.230	0.000	0.040	0.000	0.27	0.83	294	0.030	5.71
CB8	0.400	0.000	0.140	0.000	0.54	0.78	330	0.070	5.41
CB7	0.280	0.000	0.480	0.000	0.76	0.62	330	0.070	8.28
CB9	0.070	0.000	0.370	0.000	0.44	0.52	125	0.070	6.09
CB10	0.100	0.000	0.200	0.000	0.30	0.60	125	0.070	5.26
CB11	0.140	0.000	0.500	0.000	0.64	0.55	280	0.070	8.68
CB12	0.140	0.000	0.140	0.000	0.28	0.68	280	0.070	6.69
CB43	0.110	0.000	0.190	0.000	0.30	0.62	211	0.035	8.35
CB44	0.230	0.000	0.120	0.000	0.35	0.75	215	0.035	6.16



P.E.		P.L.S.	
APPROVAL UNDER SITE PLAN REVIEW. MILLBURY PLANNING BOARD BEING A MAJORITY APPROVAL DATE: _____ ENDORSEMENT DATE: _____			
PROJECT NAME		PREPARED FOR	
CLEARVIEW		Eastland	
OPEN SPACE COMMUNITY		Eastland Partners, Inc. 4 Charlesway Road, Suite 1 Popocate, MA 01747	
66 PARK HILL AVENUE MILLBURY, MASSACHUSETTS			
REVISIONS		PROJECT NO. TPE-1014	
REV.	DATE	DESCRIPTION	DESIGN BY PML
1	6/8/20	REVISED PER COMMENT LETTERS.	CHECKED BY SJO
			DATE 11/27/19
			CAD FILE H:\1014-MILLBURY-PR Base.dwg
			PLAN NO.
SHEET TITLE			
PRE-DEVELOPMENT DRAINAGE AREA PLAN			
SHEET 1 OF 1			



SOIL TYPES AT SITE	
1-	WATER
52A	- FREETOWN MUCK
73A	- WHITEMAN (D)
71A	- RIDGEBURY (D)
71B	- RIDGEBURY (D)
102C	- CHATFIELD HOLLIS (B)
422C	- CANTON (B)
422B	- CANTON (B)
305B	- PAXTON (C)
305C	- PAXTON (C)

LEGEND	
P-5	DRAINAGE AREA
IP#3	INTEREST POINT
	TIME CONCENTRATION
	SOIL TYPE
	LIMIT OF SOIL TYPE
	LIMIT OF DRAINAGE AREA

P.E.		P.L.S.	
APPROVAL UNDER SITE PLAN REVIEW. MILLBURY PLANNING BOARD			
BEING A MAJORITY			
APPROVAL DATE: _____			
ENDORSEMENT DATE: _____			
PROJECT NAME		PREPARED FOR	
CLEARVIEW		Eastland Partners, Inc.	
OPEN SPACE COMMUNITY		4 Charlesway Road, Suite 1	
66 PARK HILL AVENUE		MILLBURY, MASSACHUSETTS	
MILLBURY, MASSACHUSETTS		Popocatepetl, WA 01147	
REVISIONS		PROJECT NO. TPE-1014	
REV.	DATE	DESCRIPTION	DESIGN BY PML
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			DATE 11/27/19
			CAD FILE H:\1014-MILLBURY-PR Base.dwg
			PLAN NO.
SHEET TITLE			
POST-DEVELOPMENT DRAINAGE AREA PLAN			
SHEET 1 OF 1			

