STORMWATER MANAGEMENT REPORT

REDEVELOPMENT PROJECT
FOULK ROAD
BRANDYWINE HUNDRED
NEW CASTLE COUNTY, DELAWARE
APPLICATION NO. _____

August 2011

Prepared for:

DNREC, Sediment & Stormwater Program
89 Kings Highway
Dover, Delaware 19901

Prepared by:

Duffield Associates, Inc.
5400 Limestone Road
Wilmington, Delaware 19808

William J. Mather, P.E.
Senior Project Manager

Project No. 9151.CA

DELAWARE SEDIMENT & STORMWATER PROGRAM

Preliminary Sediment & Stormwater Management Plan Review Checklist

DATE RECEIVED: _____ **PROJECT NUMBER:** _____

PROJECT NAME: REDEVELOPMENT

General Information:

1. N/A Completed application signed by the owner, review fee, one set of plans and reports, and a completed checklist must be submitted for review. Electronic plan and report program files (i.e., AutoCAD, Microstation, DURMM, HydroCAD, and/or equal/similar) shall be transmitted upon agency request.
2. N/A Provide a copy of the notice to DelDOT, a municipality, or a private entity (i.e., neighboring Homeowner's Association) for the intent to discharge or connect to their stormwater system. The notice shall indicate the proposed condition and that any comments regarding the discharge shall be returned within 30 calendar days, and if no comments are received than consent to discharge is assumed. If directly copied on the notice, indicate the date of the notice and the reviewer copied: _____.
3. ✓ Hydraulic and Hydrology computations shall reflect the proposed site conditions.
4. ✓ All plans should be submitted on 24" x 36" (minimum) sheets unless otherwise approved.
5. N/A When two (2) or more sheets are used to illustrate the plan view, an index sheet is required, illustrating the entire project on one (1) 24" x 36" (minimum) sheet.
6. ✓ Provide a north arrow on all plans.
7. ✓ Provide all plan views to a defined scale with a scale bar.
8. ✓ Provide names of adjacent property owners on all plans.
9. ✓ Provide existing and proposed contours (if provided) based on NAVD 88 vertical datum at one (1) foot intervals (2 foot intervals can be provided for offsite drainage information based on the latest Lidar information).
10. N/A For small projects less than ½ acre of disturbance, provide existing and proposed spot elevations based on NAVD 88 vertical datum on a fifty-foot grid system. Include high and low points.
11. ✓ Locate the site in NAD83 horizontal datum.
12. ✓ Provide the contact information for the person or entity responsible for preparing the plans and report, including name, company, address and telephone number. Locate on both the plans and report.
13. N/A Provide the seal of a Licensed Professional in the State of Delaware on all submitted plans and reports.
14. ✓ Provide the Preliminary Sediment and Stormwater Management plans in the following order and title. The sheet list is to appear on the Coversheet, and on each plan sheet shall be respectively titled (include the title of the plan within the title block or lower righthand corner of the sheet):
    a. ✓ Coversheet
    b. N/A Schematic Pre-Construction Site Stormwater Management Plan
    c. N/A Schematic Construction Site Stormwater Management Plan
    d. N/A Contributing Drainage Area Plan
    e. ✓ Pre-Limit of Disturbance Drainage Area Plan
    f. ✓ Post Limit of Disturbance Drainage Area Plan

Coversheet:

15. ✓ Project Header (to duplicate in the title block on each sheet):
    a. ✓ Project Name (and Phase, if applicable).
    b. ✓ Title of Plan Set: Preliminary Sediment and Stormwater Management Plans
    c. ✓ Project Location (including watershed, hundred, town, county, etc., as applicable).
    d. ✓ Project tax map identification number(s).
16. ✓ Legend indicating plan symbols and lines, including but not limited to, soils, drainage area information, grading and site information.
17. ✓ Provide a vicinity map with a scale either at 1" = ½ mile or 1" = 1 mile, depending on project size, and indicate the site boundary within the map. The map shall be no smaller than 4"x4" in size.
18. ✓ Project Notes:
    a. Parcel Data:
        i. ✓ Tax Map Number(s)
        ii. N/A PLUS Number (if applicable)
        iii. ✓ DNREC Sediment and Stormwater Program [or relevant Delegated Agency] Number
        iv. ✓ Site Address (or Nearest Intersecting Street and Distance between)
        v. ✓ Latitude and Longitude State Plane coordinates, with approximate geographical location (ie, Benchmark #1, Northeast Site Corner, etc). Provide in ~~degree-decimal format.~~ STATE PLANE IS IN FEET
        vi. ✓ Existing Site Area
        vii. ✓ Proposed Site Area
        viii. ✓ Existing Wetland Area NONE
        ix. ✓ Proposed Discharge Location(s)
        x. ✓ Proposed Total Limit of Disturbance per Discharge Location
    b. Contact Data:

i. Owner's Name, Title:	N/A Owner	N/A Land Developer	✓ Designer
ii. Company/LLC:	Owner	Land Developer	✓ Designer
iii. Full Street Address:	Owner	Land Developer	✓ Designer
iv. Phone Number:	Owner	Land Developer	✓ Designer
v. Fax Number:	Owner	Land Developer	✓ Designer

19. ✓ Include a Site Designer Certification that states "I hereby certify that this plan has been prepared under my supervision and to the best of my knowledge complies with the applicable state and local regulations and ordinances." ~~This shall be signed in ink or an original reproducible.~~
20. ✓ Provide a list of all sheets and their corresponding sheet number for all Preliminary Sediment and Stormwater Management Plans.

Schematic Construction Site Stormwater Management Plans:

The purpose of the Schematic Construction Site Stormwater Management Plan is to provide a preliminary design of the site's phasing in relation to the site's existing conditions and it's construction and stormwater facility locations. It will eventually be further developed into the Pre-Construction and Construction Site Stormwater Management Plan for the full plan submittal.

21. N/A Schematic Pre-Construction Site Stormwater Management Plan (if required, as determined at the SAS review meeting):
    - a. ___ Include the entire site boundary in an existing conditions plan view (i.e., site boundary, existing contours, wetlands, treelines, existing structures/utilities to remain or to be removed, etc).
    - b. ___ Indicate the approximate limit of disturbance per phase of construction. Provide a legend indicating the total disturbed acreage per limit of construction.
    - c. ___ Indicate the location of all perimeter controls, stockpile locations, sediment trapping facilities, and other construction stormwater management controls needed for demolition and bulk grading (i.e., silt fence, stabilized construction entrances, temporary swales, sediment basins, etc).
    - d. ___ Proposed contours are not required.
    - e. ___ Provide a legend indicating the lines and symbols used to define the site and construction stormwater controls.
22. N/A Schematic Construction Site Stormwater Management Plan:
    - a. ___ Include the entire site boundary in an existing conditions plan view (i.e., site boundary, existing contours, wetlands, treelines, existing structures to remain, etc).
    - b. ___ Include a preliminary site plan view overlaid with the existing conditions. Include all lot and/or building outlines; right-of-ways and/or paved areas (whichever is less constrictive); and proposed stormwater locations including facilities, structures and pipes.
    - c. ___ Indicate the approximate limit of disturbance per phase of construction. Provide a legend indicating the total disturbed acreage per limit of construction.
    - d. ___ Indicate the location of all construction site stormwater controls, including perimeter controls, sediment controls, water controls, and pollution prevention controls. (i.e., silt fence, stabilized construction entrances, temporary swales, sediment basins, etc).
    - e. ___ Proposed contours are not required, but should be included when available. If not flow arrows showing the drainage intent can suffice.
    - f. ___ Provide a legend indicating the lines and symbols used to define the site and construction stormwater controls.

Drainage Area Plans:

The drainage area plans shall provide a graphic portrayal of the information that is contained with the DURMM worksheets. Any additional hydraulic or hydrologic computations that are required to show compliance with the *Delaware Sediment and Stormwater Regulations* may require additional drainage area or watershed plans (i.e., to satisfy the Cv and Fv requirements). These plans are not prescribed below, but shall follow similar guidelines, clearly indicate the parameters used within the calculations, and be contained within the plan Sediment and Stormwater Management Plan set.

23. N/A Contributing Drainage Area Plan
    - a. N/A Provide a plan correlating to the Contributing Area RCN worksheet (post development model for the entire drainage area) for each subarea (subareas may be combined onto the same sheet, so long as they are clearly distinguishable).
    - b. ____ Provide soils mapping on the plan, using the latest NRCS soil information, with a general description of each soil.
    - c. ____ Indicate the LOD and the OLOD contributing areas, separated per their respective land cover and soil type classification. Provide the area of each designation.
    - d. ____ Provide a legend indicating the various landuse covers (a hatch shall be provided for each type of landuse).
    - e. ____ Provide a summary table indicating the sub-areas and their respective point of analysis, total area, and RCN.
    - f. ____ Show the Tc path for the area outside the LOD as used in the OLOD worksheet.
    - g. ____ Show the Tc path for any other areas that require further analysis using other H&H software.
24. ✓ Pre-Limit of Disturbance Drainage Area Plan
    - a. ✓ Provide a plan correlating to the Pre LOD information requested in the LOD worksheet (location of woods and meadow condition within the LOD per sub-area prior to disturbance) for each subarea (subareas may be combined onto the same sheet, so long as they are clearly distinguishable).
    - b. ✓ Provide soils mapping on the plan, using the latest NRCS soil information, with a general description of each soil.
    - c. N/A Indicate the areas of woods and/or meadow condition per soil type classification. Provide the area of each designation. NONE
    - d. ✓ Provide a legend indicating the various landuse covers (a hatch shall be provided for each type of landuse).
    - e. ✓ Provide a summary table indicating the sub-areas and their respective point of analysis, total area, and RCN.
25. ✓ Post Limit of Disturbance Drainage Area Plan
    - a. ✓ Provide a plan correlating to the Post LOD information requested in the LOD worksheet (location of all impervious areas). This should only be done if the LOD and OLOD cannot be shown on the Contributing Area Plan due to sizing.
    - b. ✓ Provide soils mapping on plan, using the latest NRCS soil information, with a general description of each soil.
    - c. ✓ Indicate the impervious area with the subarea. Provide the area of each designation.
    - d. ✓ Provide a legend indicating the various landuse covers (a hatch shall be provided for each type of landuse).
    - e. ✓ Provide a summary table indicating the sub-areas and their respective point of analysis, total area, and RCN.

Stormwater Management Report:

26. ✓ Provide information in the report in the following order:
    a. ✓ Coverpage
    b. ✓ Table of Contents
    c. ✓ Site Narrative:
        a. ✓ Introduction
        b. ✓ Existing Conditions describing the drainage patterns, landuse(s), and existing features. Include 2007 site aerial, photos of site conditions and at all discharge locations.
        c. ✓ Existing Soils description per the NRCS Web Soil Survey including the hydrologic soil group; and soil testing results from on-site soil testing.
        d. ✓ Post Development Conditions, including summary of the proposed development, the proposed drainage system, indication of why the standards or performance approach was utilized, methods for RPv, Cv, and Fv compliance, requests for waivers and/or offsets, etc.
        e. ✓ Construction Site Conditions, describing methods to prevent sediment and pollution discharge and illicit transportation.
        f. ✓ Conclusion
    d. ✓ DURMM computations
    e. ✓ Additional hydraulic and hydrologic computations, such as pond and discharge pipe/swale routings.
    f. N/A Supplementary Construction Site computations (i.e., temporary sediment basin design worksheet, anti-seep collar sizing, forebay sizing, etc).
    g. N/A Soil report(s) including boring locations and log reports.
    h. N/A Appendix containing any supplemental information (information previously included within the Stormwater Assessment Study report does not need to be duplicated).
27. ✓ Provide drainage calculations for the RPv, Cv, and Fv events using the latest DURMM model and other approved H&H software as required.
28. ✓ All inputted data must be supported by surveys, Lidar information, photos, aerials, maps, etc. and shall be referenced in the report and/or drainage area plans. Information previously included within the Stormwater Assessment Study submittal is acceptable and does not need to be duplicated.
29. ✓ All hydrologic computations shall be accomplished using the most recent version of USDA, Soil Conservation Service TR-20 or TR-55. The storm duration for computational purposes shall be the 24-hour rainfall event. For projects south of the Chesapeake and Delaware (C&D) Canal, the Delmarva Unit Hydrograph shall be used.
30. ✓ The pre-development condition shall be based off of the 2007 aerial photography provided by the State of Delaware, through the Delaware DataMIL and online GIS mapping. This may not directly correlate to current site conditions if the landuse has changed; however, the 2007 landuse shall be used regardless if more or less conservative than the current landuse.
31. ✓ The pre-development peak discharge rate shall be computed assuming that all land uses in the site to be developed are in good hydrologic conditions.

TABLE OF CONTENTS

APPENDICES

I. PURPOSE

This report summarizes the stormwater management design for the proposed Redevelopment Plan for Foulk Road – Branch Drive-In Bank, New Castle County Application No. _____. This land development application is proposed as a redevelopment project under the provisions of Section 40.08.130 of the New Castle County Unified Development Code (UDC) and Section 5.6 of the Final Draft Delaware Sediment and Stormwater Regulations: June 2011 (DSSR).

The site consists of two (2) existing properties located at the intersection of Foulk Road and Silverside Road. There is an existing, abandoned Getty Service Station and an existing Retail Store located on the two (2) properties. This application proposes to remove both existing buildings, along with the station appurtenances (gasoline pumps, canopy, underground fuel tanks, etc.).

Proposed construction includes a 3,934-square-foot branch drive-in bank building with new parking and drive-in banking facilities, along with reutilization of the existing site entrances on the approximate 1.00-acre site.

Duffield Associates, Inc. (Duffield Associates) has identified the applicable stormwater management requirements of the DSSR for this project as follows:

- Redeveloped areas within the project limit of disturbance shall employ runoff reduction practices to achieve a 50% reduction in the effective imperviousness based on the existing condition;
- No increase to the rate, volume or duration of flow to a new or existing point of discharge during the Conveyance Event; and
- No increase to the rate, volume or duration of flow to a new or existing point of discharge during the Flooding Event.

The entire system has been modeled to reflect the currently acceptable rainfall intensities. The current regulatory storm events are published by the State of Delaware, Department of Natural Resources and Environmental Control (DNREC) in the table "Rainfall Depths for Delaware," Ref: NOAA Atlas 14 Volume 2, Version 3; effective date January 1, 2007. The 1-, 10-, and 100-year frequency storm events for New Castle County are 2.7 inches, 4.8 inches, and 8.0 inches, respectively.

II. NARRATIVE

A. LOCATION

The site is situated at the southeast corner of the intersection of Foulk Road (Delaware Route 261) and Silverside Road, in Brandywine Hundred, New Castle County, Delaware. The property is bound to the west by Foulk Road and to the north by Silverside Road. The existing Chatham residential development adjoins the property to the east. The site is located within the Shellpot Creek Watershed. Please refer to Appendix A for the Site Location Sketch.

B. PRE-DEVELOPMENT CONDITION

The property is currently developed with an existing, abandoned Getty Service Station on the first parcel and an existing Retail Store on the second parcel. The land cover in the 2007 aerial photograph appears similar to the surveyed condition. The first parcel, situated on the corner of Foulk Road and Silverside Road, is paved to the right-of-way lines. There is an area of lawn cover located behind the service station building, and a tree row located along the rear property line adjoining Chatham. Most of the second parcel of land cover is either building or existing pavement. No stormwater quantity or quality management facilities currently exist on the subject site. There is a current drainage issue at the back of the second parcel, where water ponds across a large area of the pavement surface behind the existing building. Please refer to Appendix A for the Location Sketch and Aerial Photograph Sketch.

The underlying soil types, according to the Soil Survey for New Castle County, are NtB - Neshaminy-Talleyville Urban Land Complex, a hydrologic soil group 'B' classified soil. Please refer to Appendix A for the Soil Survey Sketch detailing the location of the parcel.

The site generally drains from middle of the property to the street line or to the back of the site, with most of the Retail Store parcel draining toward the back of the site. Three (3) point-of-interests (POIs) have been identified for stormwater management. The first POI consists of surface runoff toward Foulk Road. The second POI consists of surface runoff toward Silverside Road. Under current conditions, runoff from the site drains in sheet flow into the public street and is intercepted by existing road storm inlets.

The third POI consists of surface runoff toward the rear of the property. Drainage from this area is routed toward two (2) existing inlets; one located within the paved area on 1708 Foulk Road near the rear property line, and a second located near the common property corner with Tax Parcel Nos. 06-054.00-072 and 06-054.00-073. Reportedly, the area around the first inlet is frequently ponded.

Appendix C contains computations detailing the hydrologic and hydraulic model of the existing site contributing surface runoff to each POI.

C. POST-DEVELOPMENT CONDITION

The proposed development includes the demolition of the existing service station building and appurtenances (gasoline pumps, canopy, underground fuel tanks, etc.). Demolition activities will be conducted under the State Brownfield Program. Redevelopment of the property includes construction of a 3,934-square-foot branch bank building with three (3) drive-in banking teller lanes, associated parking, and sidewalk pedestrian access facilities. The three (3) POIs remain the same as in the pre-development condition. However, the first inlet at POI 3 is proposed to be removed.

The total proposed impervious coverage under post-development conditions is approximately 0.686 acre. Existing impervious cover is approximately 0.748 acre, so the proposed development of the property will reduce the impervious cover by approximately 8.3%, which will result in a reduction of the rate and quantity of stormwater runoff from the site for all design storm events. Therefore, no adverse impact is anticipated to the downstream conveyance.

Runoff reduction practices to reduce the effective imperviousness to 50% in the Runoff Protection Volume (RPv) include a treatment train of grass filter strips flowing as sheet flow to turf open space.

Quality Management

Appendix B contains Delaware Urban Runoff Management Model (DURMM) 2.0 computations for RPv runoff reduction and DURMM 1.0 computations for sizing of the filter strips.

Each BMP treats an area where the land use cover changes from building to pavement/sidewalk or from lawn to impervious, as well as additional "non-change" impervious surface. Table 1 summarizes the land cover changes and total impervious treated by each BMP, demonstrating Water Quality Management is provided in accordance with DSSR requirements.

Table 1
Water Quality Management Cover Changes and Treatment

Point of Interest	Cover Change	Area
Area 1 (FS1)	Building to Pavement/Sidewalk	1,408 sf
	Lawn to Building/Impervious	0 sf
	Total Change	1,408 sf
	Total Impervious Treated	6,145 sf > 1,408
Area 2 (FS 2)	Building to Pavement/Sidewalk	1,418 sf
	Lawn to Building	314 sf
	Lawn to Impervious	637 sf
	Total Change	2,369 sf
	Total Impervious Treated	5,820 sf > 2,369
Area 3 (FS 3/4)	Building to Pavement/Sidewalk	610 sf
	Lawn to Building	653 sf
	Lawn to Impervious	4,051 sf
	Total Change	5,314 sf
	Total Impervious Treated	5,846 sf > 5,314

Quantity Management

Appendix D contains computations detailing the hydrologic and hydraulic model of the post-development condition contributing surface runoff to the POIs. Table 2 summarizes peak discharge rates and runoff volumes to each POI in the pre-development and post-development conditions. The combined runoff to the DelDOT drainage system (POI # 1 & 2)

Table 2
Peak Discharge Rates and Runoff Volumes

Storm Event	Peak Discharge at POI # 1	
	Pre-Development	Post Development *
Cv (10-Year)	1.82 cfs	1.48 cfs
Fv (100-Year)	3.05 cfs	2.85 cfs

Storm Event	Peak Discharge at POI # 2	
	Pre-Development	Post Development *
Cv (10-Year)	1.85 cfs	1.77 cfs
Fv (100-Year)	3.16 cfs	3.22 cfs

Negligible increase for POI 2 at 100-year event, effectively 3.2 cfs each

Storm Event	Peak Discharge at POI # 1 & 2	
	Pre-Development	Post Development *
Cv (10-Year)	3.67 cfs	3.25 cfs
Fv (100-Year)	6.20 cfs	6.07 cfs

Storm Event	Peak Discharge at POI No. 3 (On-Site)	
	Pre-Development	Post Development *
Cv (10-Year)	2.76 cfs	2.64 cfs
Fv (100-Year)	5.30 cfs	5.15 cfs

Storm Event	Peak Discharge at POI No. 3 (On- and Off-Site)	
	Pre-Development	Post Development *
Cv (10-Year)	4.52 cfs	4.43 cfs
Fv (100-Year)	10.65 cfs	10.51 cfs

As depicted in the table above, the post-development stormwater runoff peak rates have been attenuated to be equal to, or less than, the pre-development rates, in accordance with the DSSR and New Castle County Drainage Code, with the Flooding event at POI No. 2 rounded to the nearest 0.1 cfs at 3.2 cfs pre and post. When POI Nos. 1 and 2 are combined at the common inlet located within Foulk Road, all peak rates are attenuated.

The post-development runoff volumes have been attenuated to be equal to, or less than, the pre-development rates. Therefore, the proposed site stormwater discharges are not expected to adversely impact the drainage conditions on or adjacent to the site.

Analysis Point #3 is an existing BDWM Type 1 Inlet located within a shallow sump on the adjoining residential properties. Both On-Site and Off-Site contributory areas draining to the inlet have been delineated and incorporated into the HydroCAD model. Analysis results provided in Table 1 show a reduction in both peak discharge and runoff volume to the inlet for each design storm event, corresponding to a post-development ponding elevation that matches or is slightly reduced from the pre-development elevation. The ponding area is situated at least 10 feet away from the existing dwellings located on the adjacent properties and from the proposed bank building. Therefore, the requirements of Section 12.04.001.E.1 of the New Castle County Drainage Code are met.

D. METHODOLOGY

Peak Discharge Management

HydroCAD Stormwater Modeling System, Version 8.00, was used to complete the hydrologic computations, including calculation of composite CNs (unless noted otherwise),Tc, sub-area hydrographs, and hydraulic analysis by routing sub-area

hydrographs through associated reaches and pond reservoirs. HydroCAD is DNREC-approved software that uses U.S. Department of Agriculture (USDA) – Natural Resource Conservation Service (NRCS) methodology to model a drainage area and compute the amount of run-off given a specific rainfall event. Rainfall Depths for Delaware, published by DNREC, effective date January 1, 2007, were taken from NOAA Atlas 14, Volume 2, Version 3. The HydroCAD input and output data is provided in Appendix C for pre-development and in Appendix D for post-development conditions.

Quality Management

The proposed parking areas are designed to flow across grass filter strips to provide stormwater quality management through Green Technology BMPs, in accordance with the DSSR. The design and modeling of each filter strip was performed based on the DNREC publication *"Green Technology: The Delaware Urban Runoff Management Approach – A Technical Manual for Designing Nonstructural BMPs To Minimize Stormwater Impacts From Land Development,"* dated January 2004.

The DURMM 1.0 spreadsheet was used to design the stormwater quality management for the proposed filter strips based on a minimum 80% TSS removal rate.

The hydrologic and hydraulic data for each of the sub-drainage areas was input into a separate DURMM spreadsheet for each sub-drainage area. Hydrologic data used includes the individual areas of land cover (impervious surfaces and pervious areas) and segments of the Tc path. The SCS Soil-Cover Complex hydrology method is built into the DURMM. This is used to calculate run-off volumes for the sub-drainage area based on the supplied hydrologic data input. Typical pollutant concentration data for a select group of pollutant constituents of stormwater runoff is also built into the DURMM, yielding a total pollutant loading for the sub-drainage area.

The DURMM model incorporates selected BMP stormwater management devices for pollutant removal. Each BMP has specific removal properties for the selected pollutant constituents. These removal properties may vary, based on relative ratios of facility surface area to sub-drainage area and influent pollutant concentration.

The DURMM Water Quality Computations are provided in Appendix B.

Time of Concentration (Tc) Rationale

The National Engineering Handbook, Chapter 4, defines Tc as "the time it takes for run-off to travel from the hydraulically most distant part of the storm area to the watershed outlet or other point of reference." The DURMM model uses this methodology, but specifies whether runoff originating from impervious or pervious surfaces is most representative of the true Tc. SCS methodology divides Tc path

into three (3) types of surface flow: sheet flow; shallow concentrated flow; and channel flow, as applicable for the actual path in question. The length, slope, and cover type all factor into the calculation of the Tc.

Runoff Curve Number (CN) Rationale

The CN is a run-off factor that takes into account land use and soil types. The CN indicates the run-off potential of a given area of land. The CNs developed for use in the NRCS Technical Release 55 "Urban Hydrology for Small Watersheds" (TR-55) are the values used in most circumstances. However, the values presented in the TR-55 manual do not take into account the disconnection of impervious surfaces resulting from the use of Green Technology BMPs throughout the site.

The "Post-Development" condition for the site provides for the disconnection of impervious surfaces through the use of filter strips and swales. The DURMM model calculates a weighted CN for each drainage area that incorporates a Green Technology BMP. It is Duffield Associates' opinion that it is appropriate to model the post-development runoff with DURMM generated CNs, as these values better represent the low impact development style of the project design. DURMM calculates adjusted CN values for the RPv, Cv and Fv events, which were used in the HydroCAD model.

Off-Site Drainage Areas

The existing site sets higher than the existing grades along the perimeter of the property. Also, while a large part of the Retail Store property drains toward the back of the site, the existing entrance is sloped toward Foulk Road. All drainage flows from the interior of the site toward the property boundaries. Drainage along the existing street frontages is maintained within a gutter line along the curbline and across each existing entrance. Therefore, the site receives no off-site drainage.

E. INSPECTION AND MAINTENANCE.

Filter Strip

There should be semi-annual regular inspections of the facility, once before new growth emerges in the spring and once at seed dispersal in the fall. The filter strip should also be inspected after severe storm events. Visible accumulations of sediment at the lip of the filter strip should be removed with a flat shovel every spring and after large storms. Filter strips should be mowed regularly to maintain a dense stand. A mulching mower should be used to ensure that nutrients are recycled and that excessive clippings do not build up. Mow no lower than 3 inches to promote a healthy dense turf. For warm season grasses, cut down standing stalks to no lower than 12 inches in spring, just before new growth emerges. During the peak growing season, the grass filter strip should be mowed once a week. The soil

should be tested annually to ensure proper pH and fertility. For more information, see Chapter 2.3 of the DNREC Green Technology Guidance Manual.

F. CONSTRUCTION SITE CONDITIONS

Erosion and sediment control measures are designed to capture any sediment-laden runoff, prior to it leaving the site, and are in accordance with the DSSR and the DNREC Erosion and Sediment Control Handbook. A Pre-Bulk and Post-Bulk phasing is proposed. Super silt fence, stabilized construction entrances, temporary seeding and mulching, and permanent vegetative cover are the key elements of the erosion and sedimentation control practices for this project.

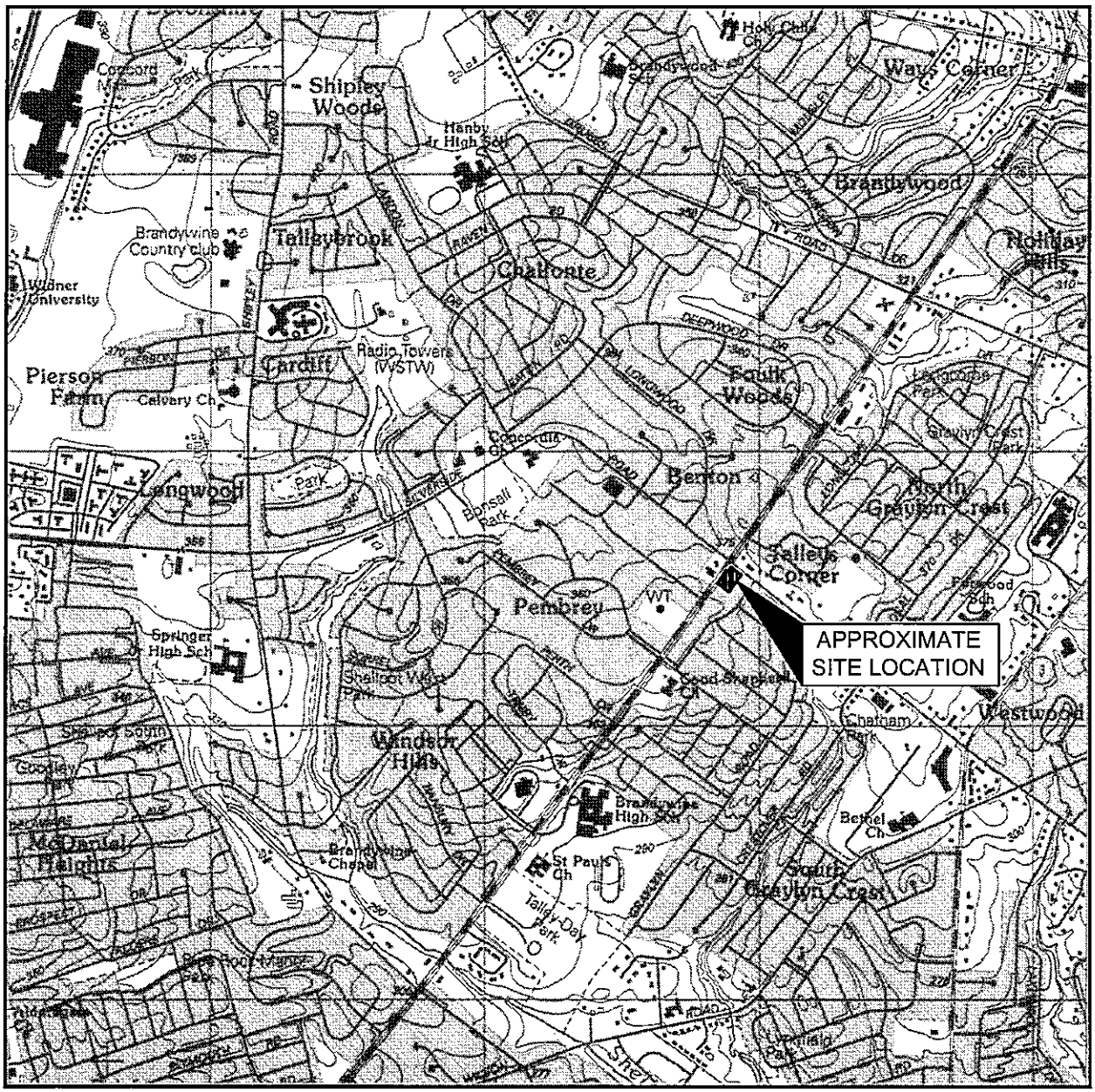
G. CONCLUSION

Runoff reduction practices include a treatment train of grass filter strips flowing as sheet flow to turf open space. The effective imperviousness is less than 50% in the Runoff Protection Volume (RPv) and the overall reduction in imperviousness will result in a reduction of the rate and quantity of stormwater runoff from the site for all design storm events. Therefore, no adverse impact is anticipated on this redevelopment project.

\9151CA.0830-SWM-R0.RPT

APPENDIX A

SITE INFORMATION
SITE LOCATION SKETCH
SOIL SURVEY SKETCH



NOTE:
THIS LOCATION SKETCH IS ADAPTED FROM THE U.S.G.S. TOPOGRAPHIC MAP, 7.5 MINUTE SERIES, FOR WILMINGTON NORTH, DELAWARE, 1993.

DATE: 1 JULY 2009	SITE LOCATION SKETCH	DESIGNED BY: MFP	DUFFIELD ASSOCIATES Consultants in the Geosciences 5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL: (302)239-6634 FAX (302)239-8485 OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY E-MAIL: DUFFIELD@ATTNET.COM
SCALE: 1"=2000'	**REDEVELOPMENT PROJECT FOULK ROAD**	DRAWN BY: MFP	
PROJECT NO. 9151.CA		CHECKED BY: CMK	
SHEET: FIGURE 1	WILMINGTON ~ NEW CASTLE COUNTY ~ DELAWARE	FILE: A9151CA-Loc	

NOTE:
THIS LOCATION SKETCH IS ADAPTED FROM A SOIL SURVEY FOR NEW CASTLE COUNTY, DELAWARE PUBLISHED BY UNITED STATED DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ON SHEET 3, 4, 7 AND 8.

DATE: 1 JULY 2009	SOILS SURVEY SKETCH	DESIGNED BY: MFP	DUFFIELD ASSOCIATES Consultants in the Geosciences 5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. (302)239-6634 FAX (302)239-8485 OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY E-MAIL: DUFFIELD@DUDNET.COM
SCALE: 1" = 2000'	**REDEVELOPMENT PROJECT FOULK ROAD**	DRAWN BY: MFP	
PROJECT NO. 9151.CA		CHECKED BY: CMK	
SHEET: FIGURE 2	WILMINGTON ~ NEW CASTLE COUNTY ~ DELAWARE	FILE: A9151CA-Loc	

Effective April 2016

NORTH

NOTE:
THIS LOCATION SKETCH IS ADAPTED FROM 2007 AERIAL PHOTOGRAPHY BY STATE OF DELAWARE, USGS, KENT COUNTY, SUSSEX COUNTY, NEW CASTLE COUNTY AND THE CITY OF DOVER, AS PUBLISHED BY THE DELAWARE DATAMIL.

DATE: 1 JULY 2009	2007 AERIAL PHOTO SKETCH	DESIGNED BY: MFP	DUFFIELD ASSOCIATES *Consultants in the Geosciences* 5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL: (302)239-6634 FAX (302)239-8485 OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY E-MAIL: DUFFIELD@DUFFIELDNET.COM
SCALE: 1" = 2000'	**REDEVELOPMENT PROJECT FOULK ROAD**	DRAWN BY: MFP	
PROJECT NO. 9151.CA		CHECKED BY: CMK	
SHEET: FIGURE 3	WILMINGTON ~ NEW CASTLE COUNTY ~ DELAWARE	FILE: A9151CA-Loc	

APPENDIX B

WATER QUALITY CALCULATIONS

PROJECT:	REDEVELOPMENT TEST
DRAINAGE SUBAREA ID:	1
TMDL Watershed:	Shellpot Creek, above Rt. 13

DURMM OUTPUT WORKSHEET

DURMM v2.beta.110802

Site Data

Contributing Area to BMPs (ac.)	0.18				
C.A. RCN	90				
Subarea LOD (ac.)	0.18				
Upstream Subarea ID	0	0	0	0	
Upstream Subarea LOD (ac.)	0.00	0.00	0.00	0.00	
Combined LOD with Upstream Areas (ac.)	0.18				
Combined RCN with Upstream Areas (ac.)	89.78				
TMDL-TN (lb/ac/yr)	6.30				
TMDL-TP (lb/ac/yr)	0.43				
TMDL-TSS (lb/ac/yr)	N/A				

BMP Selection	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
	Filter strip	Sheetflow to turf open space	--	--	--

Resource Protection Event (RPV)

RPv for Contributing Area (in.)	1.93					
Req'd RPv Reduction for Contributing Area (in.)	0.57					
Req'd RPv Reduction for Contributing Area (%)	29%					
C.A. allowable discharge rate (cfs)	0.01					
Unmanaged Polluant load, TN (lbs/ac/yr)	12.43					
Unmanaged Polluant load, TP (lbs/ac/yr)	1.68					
Unmanaged Polluant load, TSS (lbs/ac/yr)	373					
BMP Runoff Reduction Performance	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 4**	**BMP 5**	
RPv runoff volume after all reductions (in.)	1.61	1.04	N/A	N/A	N/A	
Total RPv runoff reduction (in.)	0.32	0.89	N/A	N/A	N/A	
Total RPv runoff reduction (%)	17%	0.46	N/A	N/A	N/A	
Req'd runoff reduction met?	No	OK	N/A	N/A	N/A	
BMP TMDL Performance						
Adjusted pollutant load, TN (lb/ac/yr)	9.95	5.97	#N/A	#N/A	#N/A	
Adjusted pollutant load, TP (lb/ac/yr)	1.34	0.81	#N/A	#N/A	#N/A	
Adjusted pollutant load, TSS (lb/ac/yr)	298	179	#N/A	#N/A	#N/A	
Offsets Requirements						
RPv Offset (cu. ft.)	162	N/A	N/A	N/A	N/A	

Conveyance Event (Cv)

Cv runoff volume (in.)	3.66					
Stds-based allowable discharge (cfs)	0.14					
BMP Performance	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 4**	**BMP 5**	
Cv runoff volume after all reductions (in.)	3.59	3.44	#N/A	#N/A	#N/A	

Flooding Event (Fv)

Fv runoff volume (in.)	6.78					
Stds-based allowable discharge (cfs)	0.41					
BMP Performance	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 4**	**BMP 5**	
Fv runoff volume after all reductions (in.)	6.78	6.78	#N/A	#N/A	#N/A	

Adjusted Subarea Data for Downstream DURMM Modeling

Contributing Area (ac.)	0.18
C.A. RCN	90
LOD Area (ac.)	0.18
Weighted Target Runoff (in.)	1.37
Adjusted CN after all reductions	72.79
Adjusted RPv (in.)	1.04
Adjusted Cv (in.)	
Adjusted Fv (in.)	

Adjusted Subarea Data for H&H Modeling	**Rain (in.)**	**RCN**
Resource Protection Event, RPv	2.7	N/A
Conveyance Event, Cv	4.8	87.65
Flooding Event, Fv	8	89.78

Effective April 2016

PROJECT:	REDEVELOPMENT TEST
DRAINAGE SUBAREA ID:	2
TMDL Watershed:	Shellpot Creek, above Rt. 13

DURMM OUTPUT WORKSHEET

DURMM v2.beta.110802

Site Data

Contributing Area to BMPs (ac.)	0.16				
C.A. RCN	91				
Subarea LOD (ac.)	0.16				
Upstream Subarea ID	0	0	0	0	
Upstream Subarea LOD (ac.)	0.00	0.00	0.00	0.00	
Combined LOD with Upstream Areas (ac.)	0.16				
Combined RCN with Upstream Areas (ac.)	88.75				
TMDL-TN (lb/ac/yr)	6.30				
TMDL-TP (lb/ac/yr)	0.43				
TMDL-TSS (lb/ac/yr)	N/A				

BMP Selection	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
	Filter strip	Sheetflow to turf open space	--	--	--

Resource Protection Event (RPV)

RPv for Contributing Area (in.)	1.87				
Req'd RPv Reduction for Contributing Area (in.)	0.51				
Req'd RPv Reduction for Contributing Area (%)	27%				
C.A. allowable discharge rate (cfs)	0.01				
Unmanaged Polluant load, TN (lbs/ac/yr)	11.94				
Unmanaged Polluant load, TP (lbs/ac/yr)	1.61				
Unmanaged Polluant load, TSS (lbs/ac/yr)	358				

BMP Runoff Reduction Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
RPv runoff volume after all reductions (in.)	1.56	1.01	N/A	N/A	N/A
Total RPv runoff reduction (in.)	0.31	0.87	N/A	N/A	N/A
Total RPv runoff reduction (%)	17%	0.46	N/A	N/A	N/A
Req'd runoff reduction met?	No	OK	N/A	N/A	N/A
BMP TMDL Performance					
Adjusted pollutant load, TN (lb/ac/yr)	9.55	5.73	#N/A	#N/A	#N/A
Adjusted pollutant load, TP (lb/ac/yr)	1.29	0.77	#N/A	#N/A	#N/A
Adjusted pollutant load, TSS (lb/ac/yr)	287	172	#N/A	#N/A	#N/A
Offsets Requirements					
RPv Offset (cu. ft.)	113	N/A	N/A	N/A	N/A

Conveyance Event (Cv)

Cv runoff volume (in.)	3.56				
Stds-based allowable discharge (cfs)	0.12				

BMP Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
Cv runoff volume after all reductions (in.)	3.48	3.34	#N/A	#N/A	#N/A

Flooding Event (Fv)

Fv runoff volume (in.)	6.66				
Stds-based allowable discharge (cfs)	0.36				

BMP Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
Fv runoff volume after all reductions (in.)	6.66	6.66	#N/A	#N/A	#N/A

Adjusted Subarea Data for Downstream DURMM Modeling

Contributing Area (ac.)	0.16
C.A. RCN	91
LOD Area (ac.)	0.16
Weighted Target Runoff (in.)	1.37
Adjusted CN after all reductions	71.96
Adjusted RPv (in.)	1.01
Adjusted Cv (in.)	
Adjusted Fv (in.)	

Adjusted Subarea Data for H&H Modeling	Rain (in.)	RCN
Resource Protection Event, RPv	2.7	N/A
Conveyance Event, Cv	4.8	86.65
Flooding Event, Fv	8	88.75

PROJECT:	REDEVELOPMENT TEST
DRAINAGE SUBAREA ID:	3
TMDL Watershed:	Shellpot Creek, above Rt. 13

DURMM OUTPUT WORKSHEET

DURMM v2.beta.110802

Site Data

Contributing Area to BMPs (ac.)	0.1				
C.A. RCN	91				
Subarea LOD (ac.)	0.1				
Upstream Subarea ID	0	0	0	0	
Upstream Subarea LOD (ac.)	0.00	0.00	0.00	0.00	
Combined LOD with Upstream Areas (ac.)	0.10				
Combined RCN with Upstream Areas (ac.)	90.60				
TMDL-TN (lb/ac/yr)	6.30				
TMDL-TP (lb/ac/yr)	0.43				
TMDL-TSS (lb/ac/yr)	N/A				

BMP Selection	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
	Filter strip	Sheetflow to turf open space	--	--	--

Resource Protection Event (RPV)

RPv for Contributing Area (in.)	1.98				
Req'd RPv Reduction for Contributing Area (in.)	0.62				
Req'd RPv Reduction for Contributing Area (%)	31%				
C.A. allowable discharge rate (cfs)	0.01				
Unmanaged Polluant load, TN (lbs/ac/yr)	12.84				
Unmanaged Polluant load, TP (lbs/ac/yr)	1.73				
Unmanaged Polluant load, TSS (lbs/ac/yr)	385				

BMP Runoff Reduction Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
RPv runoff volume after all reductions (in.)	1.66	1.07	N/A	N/A	N/A
Total RPv runoff reduction (in.)	0.33	0.91	N/A	N/A	N/A
Total RPv runoff reduction (%)	17%	0.46	N/A	N/A	N/A
Req'd runoff reduction met?	No	OK	N/A	N/A	N/A
BMP TMDL Performance					
Adjusted pollutant load, TN (lb/ac/yr)	10.27	6.16	#N/A	#N/A	#N/A
Adjusted pollutant load, TP (lb/ac/yr)	1.39	0.83	#N/A	#N/A	#N/A
Adjusted pollutant load, TSS (lb/ac/yr)	308	185	#N/A	#N/A	#N/A
Offsets Requirements					
RPv Offset (cu. ft.)	105	N/A	N/A	N/A	N/A

Conveyance Event (Cv)

Cv runoff volume (in.)	3.75				
Stds-based allowable discharge (cfs)	0.08				

BMP Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
Cv runoff volume after all reductions (in.)	3.67	3.52	#N/A	#N/A	#N/A

Flooding Event (Fv)

Fv runoff volume (in.)	6.88				
Stds-based allowable discharge (cfs)	0.23				

BMP Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
Fv runoff volume after all reductions (in.)	6.88	6.88	#N/A	#N/A	#N/A

Adjusted Subarea Data for Downstream DURMM Modeling

Contributing Area (ac.)	0.10
C.A. RCN	91
LOD Area (ac.)	0.10
Weighted Target Runoff (in.)	1.37
Adjusted CN after all reductions	73.46
Adjusted RPv (in.)	1.07
Adjusted Cv (in.)	
Adjusted Fv (in.)	

Adjusted Subarea Data for H&H Modeling

	Rain (in.)	RCN
Resource Protection Event, RPv	2.7	N/A
Conveyance Event, Cv	4.8	88.45
Flooding Event, Fv	8	90.60

Effective April 2016

PROJECT:	REDEVELOPMENT TEST
DRAINAGE SUBAREA ID:	4
TMDL Watershed:	Shellpot Creek, above Rt. 13

DURMM OUTPUT WORKSHEET

Site Data DURMM v2.beta.110802

Contributing Area to BMPs (ac.)	0.07				
C.A. RCN	87				
Subarea LOD (ac.)	0.07				
Upstream Subarea ID	0	0	0	0	
Upstream Subarea LOD (ac.)	0.00	0.00	0.00	0.00	
Combined LOD with Upstream Areas (ac.)	0.07				
Combined RCN with Upstream Areas (ac.)	87.43				
TMDL-TN (lb/ac/yr)	6.30				
TMDL-TP (lb/ac/yr)	0.43				
TMDL-TSS (lb/ac/yr)	N/A				

BMP Selection	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
	Filter strip	Sheetflow to turf open space	--	--	--

Resource Protection Event (RPV)

RPv for Contributing Area (in.)	1.79				
Req'd RPv Reduction for Contributing Area (in.)	0.43				
Req'd RPv Reduction for Contributing Area (%)	24%				
C.A. allowable discharge rate (cfs)	0.01				
Unmanaged Polluant load, TN (lbs/ac/yr)	11.33				
Unmanaged Polluant load, TP (lbs/ac/yr)	1.53				
Unmanaged Polluant load, TSS (lbs/ac/yr)	340				

BMP Runoff Reduction Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
RPv runoff volume after all reductions (in.)	1.49	0.96	N/A	N/A	N/A
Total RPv runoff reduction (in.)	0.30	0.84	N/A	N/A	N/A
Total RPv runoff reduction (%)	17%	0.47	N/A	N/A	N/A
Req'd runoff reduction met?	No	OK	N/A	N/A	N/A

BMP TMDL Performance					
Adjusted pollutant load, TN (lb/ac/yr)	9.06	5.44	#N/A	#N/A	#N/A
Adjusted pollutant load, TP (lb/ac/yr)	1.22	0.73	#N/A	#N/A	#N/A
Adjusted pollutant load, TSS (lb/ac/yr)	272	163	#N/A	#N/A	#N/A
Offsets Requirements					
RPv Offset (cu. ft.)	32	N/A	N/A	N/A	N/A

Conveyance Event (Cv)

Cv runoff volume (in.)	3.42				
Stds-based allowable discharge (cfs)	0.05				

BMP Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
Cv runoff volume after all reductions (in.)	3.35	3.22	#N/A	#N/A	#N/A

Flooding Event (Fv)

Fv runoff volume (in.)	6.50				
Stds-based allowable discharge (cfs)	0.16				

BMP Performance	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5
Fv runoff volume after all reductions (in.)	6.50	6.50	#N/A	#N/A	#N/A

Adjusted Subarea Data for Downstream DURMM Modeling

Contributing Area (ac.)	0.07
C.A. RCN	87
LOD Area (ac.)	0.07
Weighted Target Runoff (in.)	1.37
Adjusted CN after all reductions	70.89
Adjusted RPv (in.)	0.96
Adjusted Cv (in.)	
Adjusted Fv (in.)	

Adjusted Subarea Data for H&H Modeling

	Rain (in.)	RCN
Resource Protection Event, RPv	2.7	N/A
Conveyance Event, Cv	4.8	85.37
Flooding Event, Fv	8	87.43

Effective April 2016

DURMM ANALYSIS — POST-DEVELOPMENT SUBAREA

PROJECT:	1712 Foulk Road - Drive In Bank			PREPARED BY	
MUNICIPALITY:		COUNTY:	NEW CASTLE	Duffield Associates, Inc.	
SUBAREA:	SILVERSIDE	HYDROGRAPH		DATE:	
BMP:	FILTER STRIP 1 - NEW PARKING FRONT			February 17, 2010	

DURMM INPUT DATA :

GRADED PERVIOUS	CODE	HSG	AREA	AREA(ac)	IMPERVIOUS		LENGTH/AR.	WIDTH/ NO.	AREA(ac)
LANDSCAPE-GD	9	B	499	0.01	PARKING LOT	21	5,669	1	0.13
LAWNS-GD	11	B	1,188	0.03	SIDEWALKS	26	476	1	0.01
		-	-						
		-	-						
		-	-						
		-	-						
CN & ACRES OF GRADED PERVIOUS			60.7	0.04	CN & ACRES OF IMPERVIOUS			99.4	0.14
NATURAL PERVIOUS	CODE	HSG	AREA	AREA(ac)	TOTAL ACREAGE		0.18	% IMPERV.	78%
					DISCONNECTION ADJUSTMENTS				
					PERCENT IMPERVIOUS			WETTED AREAS	
					WETTED LENGTH			IN SOURCE	
					WETTED WIDTH			IN BMPs	0.03
					% FLOW PATH			TOTAL	0.03
CN & ACRES OF NATURAL PERVIOUS					PERVIOUS CN			%IMPERV.	19%

EVENT	PRECIP.	NATURAL	GRADED	IMPERV.	TO BMPs	FROM BMPs	REDUCTION	RUNOFF(in.)
QUALITY	2.0		27	992	1,019	641	37%	0.85
BANKFULL	3.3		81	1,657	1,738	1,413	19%	1.88
CONVEYANCE	5.2		207	2,627	2,834	2,693	5%	3.58
FLOODING	7.3		406	3,702	4,109	4,147	-1%	5.52

FLOW PATHS	SHEET FLOW PARAMETERS			SWALE FLOW PARAMETERS					
	LENGTH	SLOPE	Manning's n	SURFACE	FLOW %	LENGTH	SLOPE	SIDES	BOTTOM
UPPER	5	0.0083	0.011	1	100%	1	1.0000	1.0	1.0
LOWER	60	0.0083	0.011	1	100%	1	1.0000	1.0	1.0
% RUNOFF IMPERV.	97%	Tc Path	IMPERV						

ROUTING RESULTS:		OK	SHEET TIME (hr.)	DEPTH (ft.)	VELOCITY (fps.)	SWALE TIME (hr.)	TOTAL TIME (min.)	PEAK FLOW (cfs)	CURVE NO
QUALITY	STORAGE	1.62	0.003	0.04	10.79	0.00	1.6	0.32	86.1
	Ia/P	0.162	0.024	0.04	10.79	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
BANKFULL	STORAGE	1.70	0.003	0.06	14.24	0.00	1.3	0.70	85.5
	Ia/P	0.103	0.019	0.06	14.24	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CONVEYANCE	STORAGE	1.72	0.002	0.07	17.93	0.00	1.0	1.35	85.3
	Ia/P	0.066	0.015	0.07	17.93	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
FLOODING	STORAGE	1.79	0.002	0.09	20.89	0.00	0.9	2.09	84.8
	Ia/P	0.049	0.013	0.09	20.89	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

SUBAREA POLLUTANT LOADING

PARAMETER	*TSS*	*PP*	*SP*	*ON*	*NH3*	*NO3*	*Cu*	*Zn*
IMPERVIOUS EMCs (mg/l)	69	0.22	0.06	1.22	0.43	0.30	0.030	0.140
GRADED PERVIOUS EMCs (mg/l)	85	1.05	0.75	1.79	0.49	0.32	0.014	0.075
NATURAL PERVIOUS EMCs (mg/l)								
IMPERVIOUS LOADS (g.)	1,946	6.3	1.6	34.4	12.0	8.4	0.8	3.9
GRADED PERVIOUS LOADS (g.)	65	0.8	0.6	1.4	0.4	0.2	0.0	0.1
NATURAL PERVIOUS LOADS (g.)								
TOTAL SUBAREA LOAD	2,011	7	2	36	12	9	0.8	4.0

DURMM ANALYSIS	BMP DESIGN DATA & RESULTS		
PROJECT:	1712 Foulk Road - Drive In Bank		PREPARED BY
MUNICIPALITY:		COUNTY: NEW CASTLE	Duffield Associates, Inc.
SUBAREA:	SILVERSIDE	HYDROGRAPH	DATE:
BMP:	FILTER STRIP 1 - NEW PARKING FRONT		February 17, 2010

POSTDEVELOPMENT LOAD DATA

PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
INPUT CONCENTRATION	69.7	0.25	0.08	1.24	0.43	0.30	0.029	0.138
INPUT MASS LOADS (g)	2,011	7	2	36	12	9	1	4
INCREASE IN SUBAREA LOAD	2,011	7	2	36	12	9	1	4
% PREDEVELOPMENT LOAD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

BMP DESIGN AND PERFORMANCE

					BIO. OK?	OK	AREA OK?	OK	LOAD OK?	OK
FILTER STRIPS	CN	61	LENGTH	99	WIDTH	12	SLOPE	1%	COVER #	1.00
	INPUT LOAD		2,011	7.1	2.2	35.7	12.4	8.7	0.84	3.99
	OUTPUT CONC .		10.9	0.16	0.07	0.69	0.23	0.28	0.007	0.017
% FLOW	OUTPUT LOAD		198	2.8	1.3	12.5	4.2	5.0	0.14	0.31
100.0%	PERCENT REMOVAL		90%	60%	39%	65%	66%	42%	84%	92%
1188	LINEAR LOAD (cu.ft./ft.)		10.02	TO BMP	1019	FROM BMP	641	RUNOFF REDUCTION		37%
BIO-RETENTION	BUFFER		LENGTH		WIDTH		DEPTH		INF. RATE	
	INPUT LOAD									
	OUTPUT CONC .									
% FLOW	OUTPUT LOAD									
	PERCENT REMOVAL									
	HYDRAULIC LOAD (ft.)			TO BMP		FROM BMP		RUNOFF REDUCTION		
BIOSWALE QUALITY DESIGN	CN		LENGTH		SIDES:1		BOTTOM		SWALE OK?	#DIV/0!
	SLOPE		COVER		#N/A		VELOCITY	#DIV/0!	DEPTH	0.00
	INPUT LOAD									
	OUTPUT CONC .									
% FLOW	OUTPUT LOAD									
	PERCENT REMOVAL									
	RESIDENCE TIME (min.)		#DIV/0!	TO BMP		FROM BMP		RUNOFF REDUCTION		
BIOSWALE CAPACITY, STABILITY & VOLUMES	VELOCITY	CHECK DAM DESIGN		POND EL.	AREA	VOLUME	FILTER EL.	OUTFLOW	FACE EL.	OUTFLOW
	#DIV/0!	NO. DAMS		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	LENGTH (ft)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	CAPACITY	WIDTH (ft.)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	DEPTH	STONE (in.)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0.00	HEIGHT	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
INFILT-RATION. TRENCH	% SURFACE		LENGTH:		WIDTH:		DEPTH:		INF. RATE	
	INFILTRATED LOAD									
	INFILTRATION TIME		23.8	TO BMP		FROM BMP		RUNOFF REDUCTION		

SUMMARY OF FILTERING BMP PERFORMANCE

PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
STRIP & SWALE OUTPUT LOAD (g)	198	2.8	1.3	12.5	4.2	5.0	0.14	0.31
ALL BMPs OUTPUT LOAD (g)	198	2.8	1.3	12.5	4.2	5.0	0.14	0.31
PERCENT REMOVAL	90%	60%	39%	65%	66%	42%	84%	92%

SUMMARY OF SURFACE AND INFILTRATION BMP PERFORMANCE

OUTPUT MASS LOAD (g)	198	2.8	1.3	12.5	4.2	5.0	0.14	0.31
PERCENT REMOVAL	90%	60%	39%	65%	66%	42%	84%	92%
% PREDEVELOPMENT LOAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

DURMM ANALYSIS POST-DEVELOPMENT SUBAREA

PROJECT:	1712 Foulk Road - Drive In Bank			PREPARED BY	
MUNICIPALITY:		COUNTY:	NEW CASTLE	Duffield Associates, Inc.	
SUBAREA:	FOULK	HYDROGRAPH		DATE:	
BMP:	FILTER STRIP 2 - NEW PARKING FRONT			February 17, 2010	

DURMM INPUT DATA :

GRADED PERVIOUS	CODE	HSG	AREA	AREA(ac)	IMPERVIOUS		LENGTH/AR.	WIDTH/ NO.	AREA(ac)
LANDSCAPE-GD	9	B	443	0.01	PARKING LOT	21	5,124	1	0.12
LAWNS-GD	11	B	765	0.02	SIDEWALKS	26	696	1	0.02
		-	-						
		-	-						
		-	-						
		-	-						
CN & ACRES OF GRADED PERVIOUS			60.6	0.03	CN & ACRES OF IMPERVIOUS			99.3	0.13

NATURAL PERVIOUS	CODE	HSG	AREA	AREA(ac)	TOTAL ACREAGE	0.16	% IMPERV.	83%
					DISCONNECTION ADJUSTMENTS			
					PERCENT IMPERVIOUS		WETTED AREAS	
					WETTED LENGTH		IN SOURCE	
					WETTED WIDTH		IN BMPs	0.02
					% FLOW PATH		TOTAL	0.02
CN & ACRES OF NATURAL PERVIOUS					PERVIOUS CN		%IMPERV.	11%

EVENT	PRECIP.	NATURAL	GRADED	IMPERV.	TO BMPs	FROM BMPs	REDUCTION	RUNOFF(in.)
QUALITY	2.0		19	931	950	704	26%	1.10
BANKFULL	3.3		58	1,561	1,619	1,427	12%	2.23
CONVEYANCE	5.2		147	2,478	2,625	2,529	4%	3.95
FLOODING	7.3		290	3,497	3,787	3,794	0%	5.93

FLOW PATHS	SHEET FLOW PARAMETERS			SWALE FLOW PARAMETERS					
	LENGTH	SLOPE	Manning's n	SURFACE	FLOW %	LENGTH	SLOPE	SIDES	BOTTOM
UPPER	5	0.0100	0.011	1	100%	1	1.0000	1.0	1.0
LOWER	40	0.0100	0.011	1	100%	1	1.0000	1.0	1.0
% RUNOFF IMPERV.	98%	Tc Path	IMPERV						

ROUTING RESULTS:		OK	SHEET TIME (hr.)	DEPTH (ft.)	VELOCITY (fps.)	SWALE TIME (hr.)	TOTAL TIME (min.)	PEAK FLOW (cfs)	CURVE NO
QUALITY	STORAGE	1.10	0.003	0.04	11.40	0.00	1.2	0.37	90.1
	Ia/P	0.110	0.016	0.04	11.40	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
BANKFULL	STORAGE	1.16	0.002	0.06	14.63	0.00	0.9	0.76	89.6
	Ia/P	0.070	0.013	0.06	14.63	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CONVEYANCE	STORAGE	1.25	0.002	0.07	17.89	0.00	0.7	1.34	88.9
	Ia/P	0.048	0.010	0.07	17.89	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
FLOODING	STORAGE	1.32	0.002	0.09	20.59	0.00	0.6	2.00	88.4
	Ia/P	0.036	0.008	0.09	20.59	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

SUBAREA POLLUTANT LOADING

PARAMETER	*TSS*	*PP*	*SP*	*ON*	*NH3*	*NO3*	*Cu*	*Zn*
IMPERVIOUS EMCs (mg/l)	74	0.24	0.06	1.24	0.41	0.30	0.029	0.140
GRADED PERVIOUS EMCs (mg/l)	82	1.15	0.78	1.78	0.48	0.31	0.013	0.072
NATURAL PERVIOUS EMCs (mg/l)								
IMPERVIOUS LOADS (g.)	1,960	6.2	1.6	32.6	10.9	7.9	0.8	3.7
GRADED PERVIOUS LOADS (g.)	44	0.6	0.4	1.0	0.3	0.2	0.0	0.0
NATURAL PERVIOUS LOADS (g.)								
TOTAL SUBAREA LOAD	2,005	7	2	34	11	8	0.8	3.7

DURMM ANALYSIS	BMP DESIGN DATA & RESULTS		
PROJECT:	1712 Foulk Road - Drive In Bank		PREPARED BY
MUNICIPALITY:		COUNTY: NEW CASTLE	Duffield Associates, Inc.
SUBAREA:	FOULK	HYDROGRAPH	DATE:
BMP:	FILTER STRIP 2 - NEW PARKING FRONT		February 17, 2010

POSTDEVELOPMENT LOAD DATA

PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
INPUT CONCENTRATION	74.5	0.25	0.08	1.25	0.42	0.30	0.029	0.139
INPUT MASS LOADS (g)	2,005	7	2	34	11	8	1	4
INCREASE IN SUBAREA LOAD	2,005	7	2	34	11	8	1	4
% PREDEVELOPMENT LOAD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

BMP DESIGN AND PERFORMANCE

				BIO. OK?	OK	AREA OK?	OK	LOAD OK?	OK
FILTER STRIPS	CN	61	LENGTH 109	WIDTH	6	SLOPE	1%	COVER #	1.00
	INPUT LOAD		2,005	6.8	2.1	33.6	11.2	8.1	0.78	3.73
	OUTPUT CONC		20.5	0.17	0.07	0.78	0.26	0.28	0.011	0.035
% FLOW	OUTPUT LOAD		410	3.4	1.5	15.5	5.1	5.6	0.21	0.70
100.0%	PERCENT REMOVAL		80%	50%	28%	54%	54%	31%	73%	81%
654	LINEAR LOAD (cu.ft./ft.)		8.54	TO BMP	950	FROM BMP	704	RUNOFF REDUCTION		26%
BIO-RETENTION	BUFFER		LENGTH		WIDTH		DEPTH		INF. RATE	
	INPUT LOAD									
	OUTPUT CONC									
% FLOW	OUTPUT LOAD									
	PERCENT REMOVAL									
	HYDRAULIC LOAD (ft.)			TO BMP		FROM BMP		RUNOFF REDUCTION		
BIOSWALE QUALITY DESIGN	CN		LENGTH		SIDES:1		BOTTOM		SWALE OK?	#DIV/0!
	SLOPE		COVER		#N/A		VELOCITY	#DIV/0!	DEPTH	0.00
	INPUT LOAD									
	OUTPUT CONC									
% FLOW	OUTPUT LOAD									
	PERCENT REMOVAL									
	RESIDENCE TIME (min.)		#DIV/0!	TO BMP		FROM BMP		RUNOFF REDUCTION		
BIOSWALE CAPACITY, STABILITY & VOLUMES	VELOCITY	CHECK DAM DESIGN		POND EL.	AREA	VOLUME	FILTER EL.	OUTFLOW	FACE EL.	OUTFLOW
	#DIV/0!	NO. DAMS		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	LENGTH (ft)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	CAPACITY	WIDTH (ft.)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	DEPTH	STONE (in.)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0.00	HEIGHT	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
INFILT-RATION. TRENCH	% SURFACE		LENGTH:		WIDTH:		DEPTH:		INF. RATE	
	INFILTRATED LOAD									
	INFILTRATION TIME		23.9	TO BMP		FROM BMP		RUNOFF REDUCTION		

SUMMARY OF FILTERING BMP PERFORMANCE

PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
STRIP & SWALE OUTPUT LOAD (g)	410	3.4	1.5	15.5	5.1	5.6	0.21	0.70
ALL BMPs OUTPUT LOAD (g)	410	3.4	1.5	15.5	5.1	5.6	0.21	0.70
PERCENT REMOVAL	80%	50%	28%	54%	54%	31%	73%	81%

SUMMARY OF SURFACE AND INFILTRATION BMP PERFORMANCE

OUTPUT MASS LOAD (g)	410	3.4	1.5	15.5	5.1	5.6	0.21	0.70
PERCENT REMOVAL	80%	50%	28%	54%	54%	31%	73%	81%
% PREDEVELOPMENT LOAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

DURMM ANALYSIS POST-DEVELOPMENT SUBAREA

PROJECT:	1712 Foulk Road - Drive In Bank			PREPARED BY	
MUNICIPALITY:		COUNTY:	NEW CASTLE	Duffield Associates, Inc.	
SUBAREA:	DRIVE IN	HYDROGRAPH		DATE:	
BMP:	FILTER STRIP 3 - DRIVE IN			February 17, 2010	

DURMM INPUT DATA :

GRADED PERVIOUS	CODE	HSG	AREA	AREA(ac)	IMPERVIOUS		LENGTH/AR.	WIDTH/ NO.	AREA(ac)
LANDSCAPE-GD	9	B	120	0.00	PARKING LOT	21	3,498	1	0.08
LAWNS-GD	11	B	944	0.02	SIDEWALKS	26	84	1	0.00
		-	-						
		-	-						
		-	-						
		-	-						
CN & ACRES OF GRADED PERVIOUS			60.9	0.02	CN & ACRES OF IMPERVIOUS			99.6	0.08
NATURAL PERVIOUS	CODE	HSG	AREA	AREA(ac)	TOTAL ACREAGE		0.11	% IMPERV.	77%
					DISCONNECTION ADJUSTMENTS				
					PERCENT IMPERVIOUS			WETTED AREAS	
					WETTED LENGTH			IN SOURCE	
					WETTED WIDTH			IN BMPs	0.02
					% FLOW PATH			TOTAL	0.02
CN & ACRES OF NATURAL PERVIOUS					PERVIOUS CN			%IMPERV.	21%

EVENT	PRECIP.	NATURAL	GRADED	IMPERV.	TO BMPs	FROM BMPs	REDUCTION	RUNOFF(in.)
QUALITY	2.0		17	585	602	368	39%	0.81
BANKFULL	3.3		52	973	1,024	819	20%	1.82
CONVEYANCE	5.2		131	1,537	1,669	1,582	5%	3.51
FLOODING	7.3		258	2,164	2,422	2,451	-1%	5.43

FLOW PATHS	SHEET FLOW PARAMETERS			SWALE FLOW PARAMETERS					
	LENGTH	SLOPE	Manning's n	SURFACE	FLOW %	LENGTH	SLOPE	SIDES	BOTTOM
UPPER	47	0.0333	0.011	1	100%	1	1.0000	1.0	1.0
LOWER				1	100%	1	1.0000	1.0	1.0
% RUNOFF IMPERV.	97%	Tc Path	IMPERV						

ROUTING RESULTS:		OK	SHEET TIME (hr.)	DEPTH (ft.)	VELOCITY (fps.)	SWALE TIME (hr.)	TOTAL TIME (min.)	PEAK FLOW (cfs)	CURVE NO
QUALITY	STORAGE	1.71	0.011	0.03	9.05	0.00	0.7	0.19	85.4
	Ia/P	0.171		0.03	9.05	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
BANKFULL	STORAGE	1.81	0.009	0.04	11.76	0.00	0.5	0.41	84.6
	Ia/P	0.110		0.04	11.76	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CONVEYANCE	STORAGE	1.83	0.007	0.06	14.69	0.00	0.4	0.77	84.5
	Ia/P	0.070		0.06	14.69	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
FLOODING	STORAGE	1.90	0.006	0.07	17.03	0.00	0.4	1.17	84.1
	Ia/P	0.052		0.07	17.03	0.00			
	BIOSWALE RESULTS			0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

SUBAREA POLLUTANT LOADING

PARAMETER	*TSS*	*PP*	*SP*	*ON*	*NH3*	*NO3*	*Cu*	*Zn*
IMPERVIOUS EMCs (mg/l)	63	0.21	0.05	1.21	0.44	0.30	0.030	0.140
GRADED PERVIOUS EMCs (mg/l)	94	0.80	0.66	1.79	0.49	0.34	0.014	0.084
NATURAL PERVIOUS EMCs (mg/l)								
IMPERVIOUS LOADS (g.)	1,040	3.4	0.9	20.0	7.3	5.0	0.5	2.3
GRADED PERVIOUS LOADS (g.)	46	0.4	0.3	0.9	0.2	0.2	0.0	0.0
NATURAL PERVIOUS LOADS (g.)								
TOTAL SUBAREA LOAD	1,086	4	1	21	8	5	0.5	2.4

DURMM ANALYSIS	BMP DESIGN DATA & RESULTS		
PROJECT:	1712 Foulk Road - Drive In Bank		PREPARED BY
MUNICIPALITY:		COUNTY: NEW CASTLE	Duffield Associates, Inc.
SUBAREA:	DRIVE IN	HYDROGRAPH	DATE:
BMP:	FILTER STRIP 3 - DRIVE IN		February 17, 2010

POSTDEVELOPMENT LOAD DATA

PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
INPUT CONCENTRATION	63.7	0.22	0.07	1.22	0.44	0.30	0.029	0.138
INPUT MASS LOADS (g)	1,086	4	1	21	8	5	1	2
INCREASE IN SUBAREA LOAD	1,086	4	1	21	8	5	1	2
% PREDEVELOPMENT LOAD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

BMP DESIGN AND PERFORMANCE

				BIO. OK?	OK	AREA OK?	OK	LOAD OK?	OK
FILTER STRIPS	CN 61	LENGTH	96	WIDTH	8	SLOPE	10%	COVER #	1.00
	INPUT LOAD	1,086	3.8	1.2	20.9	7.6	5.1	0.50	2.36
	OUTPUT CONC .	14.1	0.15	0.07	0.72	0.25	0.28	0.009	0.025
% FLOW	OUTPUT LOAD	147	1.6	0.7	7.5	2.6	2.9	0.09	0.26
100.0%	PERCENT REMOVAL	86%	58%	40%	64%	66%	44%	81%	89%
768	LINEAR LOAD (cu.ft./ft.)	6.09	TO BMP	602	FROM BMP	368	RUNOFF REDUCTION		39%

BIO-RETENTION	BUFFER	LENGTH		WIDTH		DEPTH		INF. RATE	
	INPUT LOAD								
	OUTPUT CONC .								
% FLOW	OUTPUT LOAD								
	PERCENT REMOVAL								
	HYDRAULIC LOAD (ft.)		TO BMP		FROM BMP		RUNOFF REDUCTION		

BIOSWALE QUALITY DESIGN	CN	LENGTH		SIDES:1		BOTTOM		SWALE OK?	#DIV/0!
	SLOPE	COVER		#N/A		VELOCITY	#DIV/0!	DEPTH	0.00
	INPUT LOAD								
	OUTPUT CONC .								
% FLOW	OUTPUT LOAD								
	PERCENT REMOVAL								
	RESIDENCE TIME (min.)	#DIV/0!	TO BMP		FROM BMP		RUNOFF REDUCTION		

BIOSWALE CAPACITY, STABILITY & VOLUMES	VELOCITY	CHECK DAM DESIGN	POND EL.	AREA	VOLUME	FILTER EL.	OUTFLOW	FACE EL.	OUTFLOW
	#DIV/0!	NO. DAMS	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	LENGTH (ft)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	CAPACITY	WIDTH (ft.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	DEPTH	STONE (in.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0.00	HEIGHT #DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

INFILT-RATION. TRENCH	% SURFACE	LENGTH:		WIDTH:		DEPTH:		INF. RATE	
	INFILTRATED LOAD								
	INFILTRATION TIME	23.8	TO BMP		FROM BMP		RUNOFF REDUCTION		

SUMMARY OF FILTERING BMP PERFORMANCE

PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
STRIP & SWALE OUTPUT LOAD (g)	147	1.6	0.7	7.5	2.6	2.9	0.09	0.26
ALL BMPs OUTPUT LOAD (g)	147	1.6	0.7	7.5	2.6	2.9	0.09	0.26
PERCENT REMOVAL	86%	58%	40%	64%	66%	44%	81%	89%

SUMMARY OF SURFACE AND INFILTRATION BMP PERFORMANCE

OUTPUT MASS LOAD (g)	147	1.6	0.7	7.5	2.6	2.9	0.09	0.26
PERCENT REMOVAL	86%	58%	40%	64%	66%	44%	81%	89%
% PREDEVELOPMENT LOAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

DURMM ANALYSIS			POST-DEVELOPMENT SUBAREA					
PROJECT:	1712 Foulk Road - Drive In Bank						PREPARED BY	
MUNICIPALITY:		COUNTY:	NEW CASTLE				Duffield Associates, Inc.	
SUBAREA:	DRIVE IN	HYDROGRAPH					DATE:	
BMP:	FILTER STRIP 4 - DRIVE IN						February 17, 2010	

DURMM INPUT DATA :

GRADED PERVIOUS	CODE	HSG	AREA	AREA(ac)	IMPERVIOUS	LENGTH/AR.	WIDTH/ NO.	AREA(ac)
LANDSCAPE-GD	9	B	204	0.00	PARKING LOT	21	2,039	1	0.05
LAWNS-GD	11	B	467	0.01	SIDEWALKS	26	225	1	0.01
		-	-						
		-	-						
		-	-						
		-	-						
CN & ACRES OF GRADED PERVIOUS			60.7	0.02	CN & ACRES OF IMPERVIOUS			99.3	0.05

NATURAL PERVIOUS	CODE	HSG	AREA	AREA(ac)	TOTAL ACREAGE	0.07	% IMPERV.	77%
					DISCONNECTION ADJUSTMENTS			
					PERCENT IMPERVIOUS		WETTED AREAS	
					WETTED LENGTH		IN SOURCE	
					WETTED WIDTH		IN BMPs	0.01
					% FLOW PATH		TOTAL	0.01
CN & ACRES OF NATURAL PERVIOUS					PERVIOUS CN		%IMPERV.	19%

EVENT	PRECIP.	NATURAL	GRADED	IMPERV.	TO BMPs	FROM BMPs	REDUCTION	RUNOFF(in.)
QUALITY	2.0		11	364	374	237	37%	0.84
BANKFULL	3.3		32	609	641	523	19%	1.86
CONVEYANCE	5.2		82	966	1,048	996	5%	3.55
FLOODING	7.3		162	1,362	1,524	1,537	-1%	5.48

FLOW PATHS	SHEET FLOW PARAMETERS			SWALE FLOW PARAMETERS					
	LENGTH	SLOPE	Manning's n	SURFACE	FLOW %	LENGTH	SLOPE	SIDES	BOTTOM
UPPER	35	0.0167	0.011	1	100%	1	1.0000	1.0	1.0
LOWER				1	100%	1	1.0000	1.0	1.0

% RUNOFF IMPERV.	97%	Tc Path	IMPERV						
ROUTING RESULTS:		OK	SHEET TIME (hr.)	DEPTH (ft.)	VELOCITY (fps.)	SWALE TIME (hr.)	TOTAL TIME (min.)	PEAK FLOW (cfs)	CURVE NO
QUALITY	STORAGE	1.64	0.012	0.03	7.77	0.00	0.7	0.12	85.9
	Ia/P	0.164		0.03	7.77	0.00			
			BIOSWALE RESULTS	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
BANKFULL	STORAGE	1.73	0.009	0.04	10.08	0.00	0.6	0.26	85.2
	Ia/P	0.105		0.04	10.08	0.00			
			BIOSWALE RESULTS	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CONVEYANCE	STORAGE	1.77	0.007	0.05	12.57	0.00	0.4	0.49	85.0
	Ia/P	0.068		0.05	12.57	0.00			
			BIOSWALE RESULTS	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
FLOODING	STORAGE	1.84	0.006	0.06	14.56	0.00	0.4	0.75	84.5
	Ia/P	0.050		0.06	14.56	0.00			
			BIOSWALE RESULTS	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

SUBAREA POLLUTANT LOADING

PARAMETER	*TSS*	*PP*	*SP*	*ON*	*NH3*	*NO3*	*Cu*	*Zn*
IMPERVIOUS EMCs (mg/l)	72	0.23	0.06	1.23	0.42	0.30	0.030	0.140
GRADED PERVIOUS EMCs (mg/l)	85	1.06	0.75	1.78	0.48	0.32	0.013	0.075
NATURAL PERVIOUS EMCs (mg/l)								
IMPERVIOUS LOADS (g.)	741	2.4	0.6	12.7	4.3	3.1	0.3	1.4
GRADED PERVIOUS LOADS (g.)	26	0.3	0.2	0.5	0.1	0.1	0.0	0.0
NATURAL PERVIOUS LOADS (g.)								
TOTAL SUBAREA LOAD	767	3	1	13	4	3	0.3	1.5

DURMM ANALYSIS	BMP DESIGN DATA & RESULTS		
PROJECT:	1712 Foulk Road - Drive In Bank		PREPARED BY
MUNICIPALITY:		COUNTY: NEW CASTLE	Duffield Associates, Inc.
SUBAREA:	DRIVE IN	HYDROGRAPH	DATE:
BMP:	FILTER STRIP 4 - DRIVE IN		February 17, 2010

POSTDEVELOPMENT LOAD DATA

PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
INPUT CONCENTRATION	72.3	0.25	0.08	1.25	0.42	0.30	0.029	0.138
INPUT MASS LOADS (g)	767	3	1	13	4	3	0	1
INCREASE IN SUBAREA LOAD	767	3	1	13	4	3	0	1
% PREDEVELOPMENT LOAD	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

BMP DESIGN AND PERFORMANCE

	BMP DESIGN AND PERFORMANCE				BIO. OK?	OK	AREA OK?	OK	LOAD OK?	OK
FILTER STRIPS	CN	61	LENGTH	72	WIDTH	6	SLOPE	5%	COVER #	1.00
	INPUT LOAD		767	2.7	0.8	13.2	4.5	3.2	0.31	1.46
	OUTPUT CONC .		17.6	0.17	0.08	0.75	0.25	0.28	0.010	0.030
% FLOW	OUTPUT LOAD		118	1.1	0.5	5.0	1.7	1.9	0.07	0.20
100.0%	PERCENT REMOVAL		85%	58%	39%	62%	62%	41%	79%	86%
432	LINEAR LOAD (cu.ft./ft.)		5.05	TO BMP	374	FROM BMP	237	RUNOFF REDUCTION		37%
BIO-RETENTION	BUFFER		LENGTH		WIDTH		DEPTH		INF. RATE	
	INPUT LOAD									
	OUTPUT CONC .									
% FLOW	OUTPUT LOAD									
	PERCENT REMOVAL									
	HYDRAULIC LOAD (ft.)			TO BMP		FROM BMP		RUNOFF REDUCTION		
BIOSWALE QUALITY DESIGN	CN		LENGTH		SIDES:1		BOTTOM	SWALE OK?		#DIV/0!
	SLOPE		COVER		#N/A		VELOCITY	#DIV/0!	DEPTH	0.00
	INPUT LOAD									
	OUTPUT CONC .									
% FLOW	OUTPUT LOAD									
	PERCENT REMOVAL									
	RESIDENCE TIME (min.)		#DIV/0!	TO BMP		FROM BMP		RUNOFF REDUCTION		
BIOSWALE CAPACITY, STABILITY & VOLUMES	VELOCITY	CHECK DAM DESIGN		POND EL.	AREA	VOLUME	FILTER EL.	OUTFLOW	FACE EL.	OUTFLOW
	#DIV/0!	NO. DAMS		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	LENGTH (ft)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	CAPACITY	WIDTH (ft.)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	DEPTH	STONE (in.)		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0.00	HEIGHT	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
INFILT-RATION. TRENCH	% SURFACE		LENGTH:		WIDTH:		DEPTH:		INF. RATE	
	INFILTRATED LOAD									
	INFILTRATION TIME		23.8	TO BMP		FROM BMP		RUNOFF REDUCTION		

SUMMARY OF FILTERING BMP PERFORMANCE

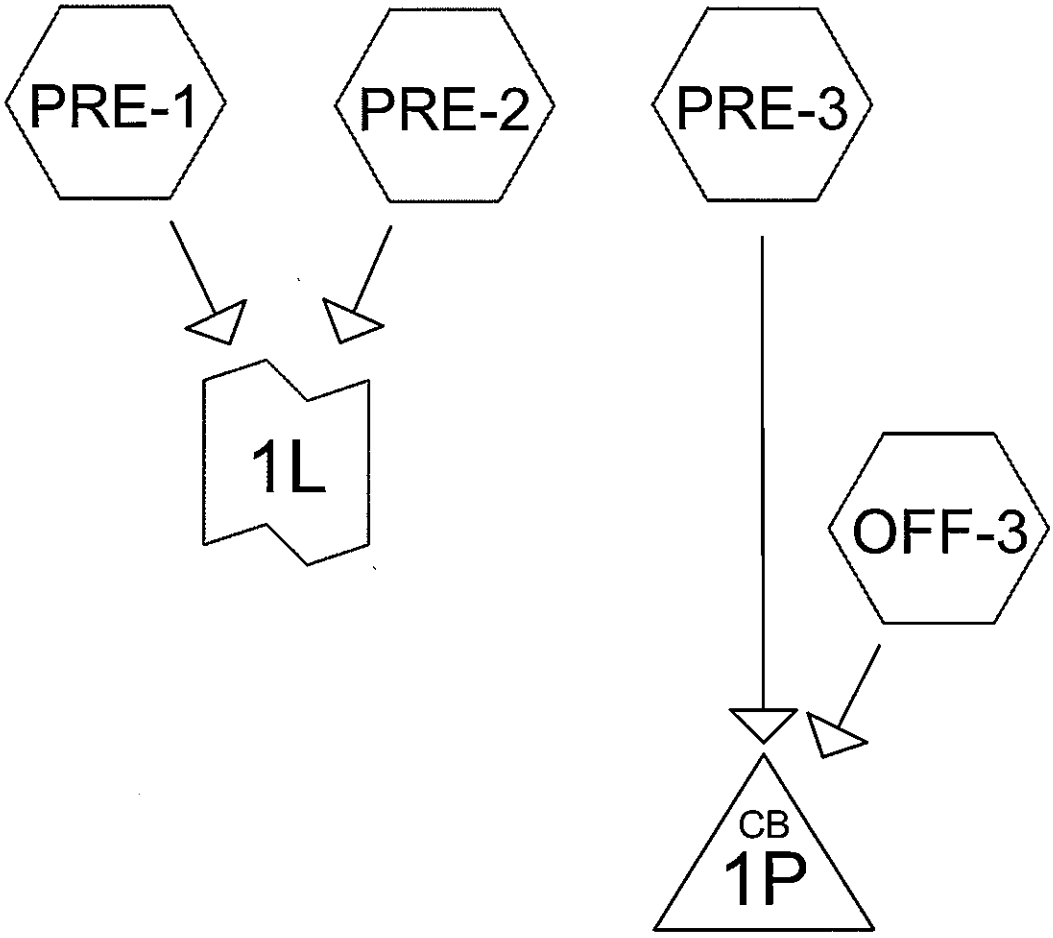
PARAMETER	TSS	PP	SP	ON	NH3	NO3	Cu	Zn
STRIP & SWALE OUTPUT LOAD (g)	118	1.1	0.5	5.0	1.7	1.9	0.07	0.20
ALL BMPs OUTPUT LOAD (g)	118	1.1	0.5	5.0	1.7	1.9	0.07	0.20
PERCENT REMOVAL	85%	58%	39%	62%	62%	41%	79%	86%

SUMMARY OF SURFACE AND INFILTRATION BMP PERFORMANCE

OUTPUT MASS LOAD (g)	118	1.1	0.5	5.0	1.7	1.9	0.07	0.20
PERCENT REMOVAL	85%	58%	39%	62%	62%	41%	79%	86%
% PREDEVELOPMENT LOAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX C

PRE-DEVELOPMENT CALCULATIONS



POI #3

Subcat Reach Pond Link

Drainage Diagram for 7802CB.0310a site
Prepared by {enter your company name here}, Printed 9/1/2011
HydroCAD® 9.00 s/n 02614 © 2009 HydroCAD Software Solutions LLC

Effective April 2016

Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment OFF-3: Runoff Area=1.476 ac 15.99% Impervious Runoff Depth=1.48"
Flow Length=360' Tc=15.5 min CN=64.40 Runoff=2.64 cfs 0.182 af

Subcatchment PRE-1: Runoff Area=11,768 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98.00 Runoff=1.82 cfs 0.103 af

Subcatchment PRE-2: Runoff Area=12,369 sf 89.97% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=94.29 Runoff=1.85 cfs 0.098 af

Subcatchment PRE-3: Runoff Area=23,241 sf 59.68% Impervious Runoff Depth=3.00"
Tc=6.0 min CN=83.08 Runoff=2.76 cfs 0.133 af

Pond 1P: POI #3 Peak Elev=371.56' Inflow=4.52 cfs 0.315 af
Primary=4.52 cfs 0.315 af Secondary=0.00 cfs 0.000 af Outflow=4.52 cfs 0.315 af

Link 1L: POI#1&2 Inflow=3.67 cfs 0.201 af
Primary=3.67 cfs 0.201 af

Total Runoff Area = 2.564 ac Runoff Volume = 0.516 af Average Runoff Depth = 2.42"
57.87% Pervious = 1.484 ac 42.13% Impervious = 1.080 ac

Summary for Subcatchment OFF-3:

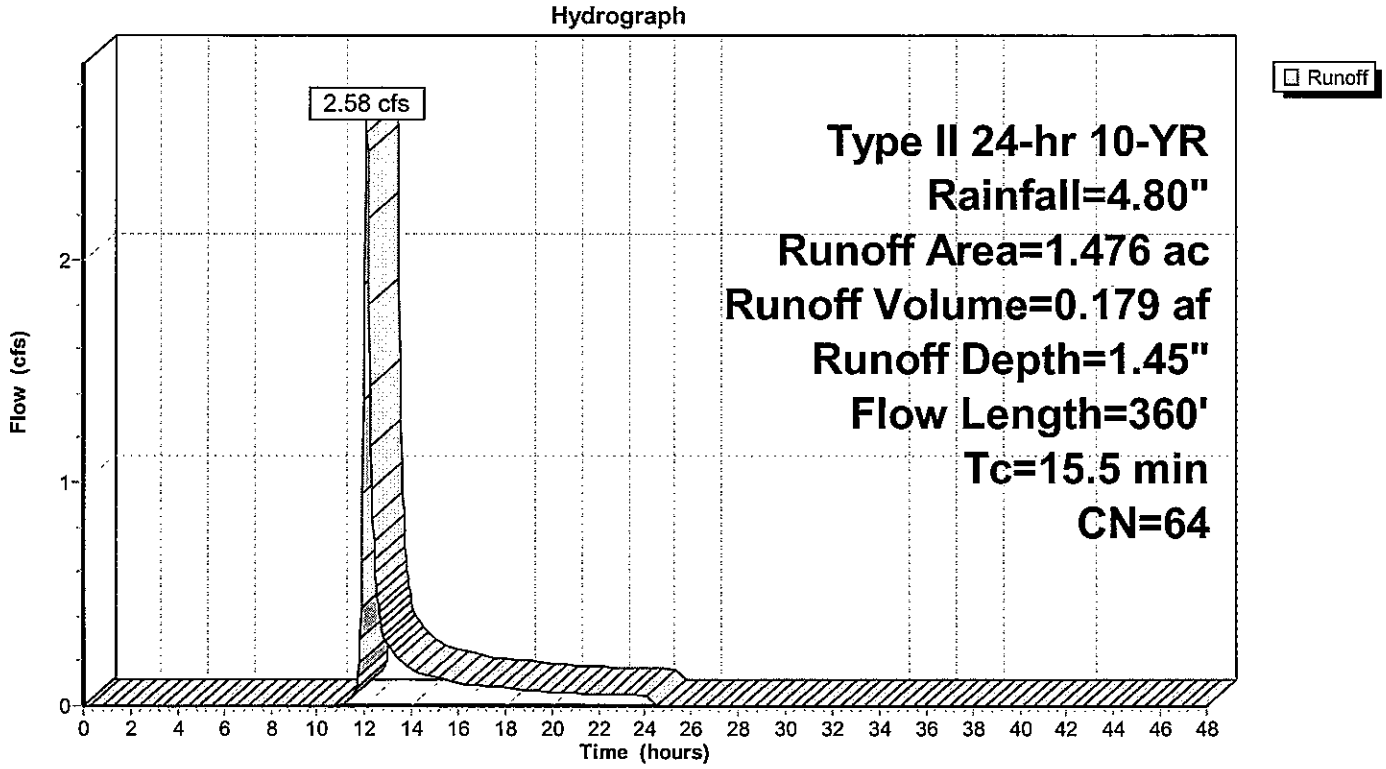
Runoff = 2.58 cfs @ 12.09 hrs, Volume= 0.179 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

Area (ac)	CN	Description
1.240	58	Woods/grass comb., Good, HSG B
0.236	98	Paved parking, HSG B
1.476	64	Weighted Average
1.240		84.01% Pervious Area
0.236		15.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0230	0.12		**Sheet Flow, Offsite-Residential Lawn** Grass: Dense n= 0.240 P2= 3.20"
2.0	260	0.0180	2.16		**Shallow Concentrated Flow, lawn/draw to inlet** Unpaved Kv= 16.1 fps
15.5	360	Total			

Subcatchment OFF-3:



Summary for Subcatchment PRE-1:

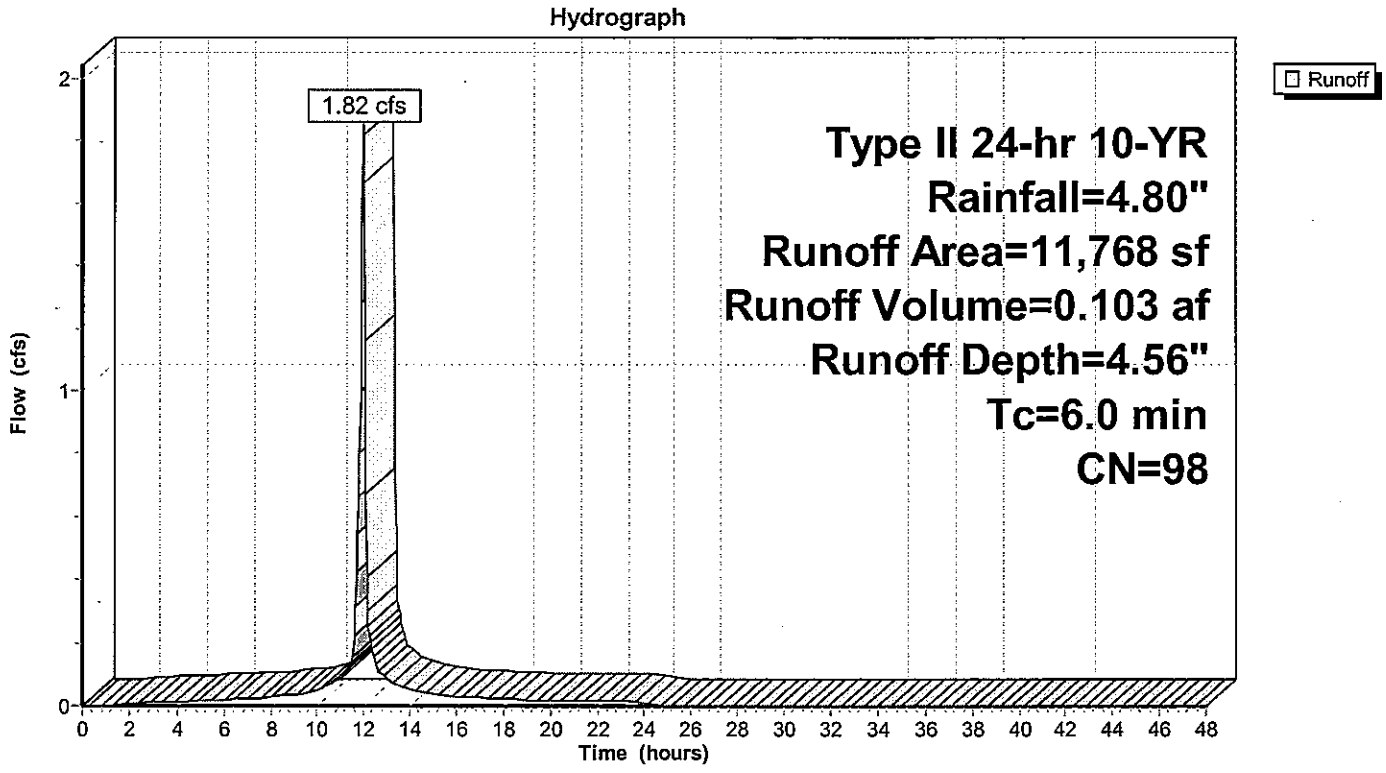
Runoff = 1.82 cfs @ 11.96 hrs, Volume= 0.103 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
2,266	98	Roofs, HSG B
9,502	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
11,768	98	Weighted Average
11,768		100.00% Impervious Area

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

Subcatchment PRE-1:



Summary for Subcatchment PRE-2:

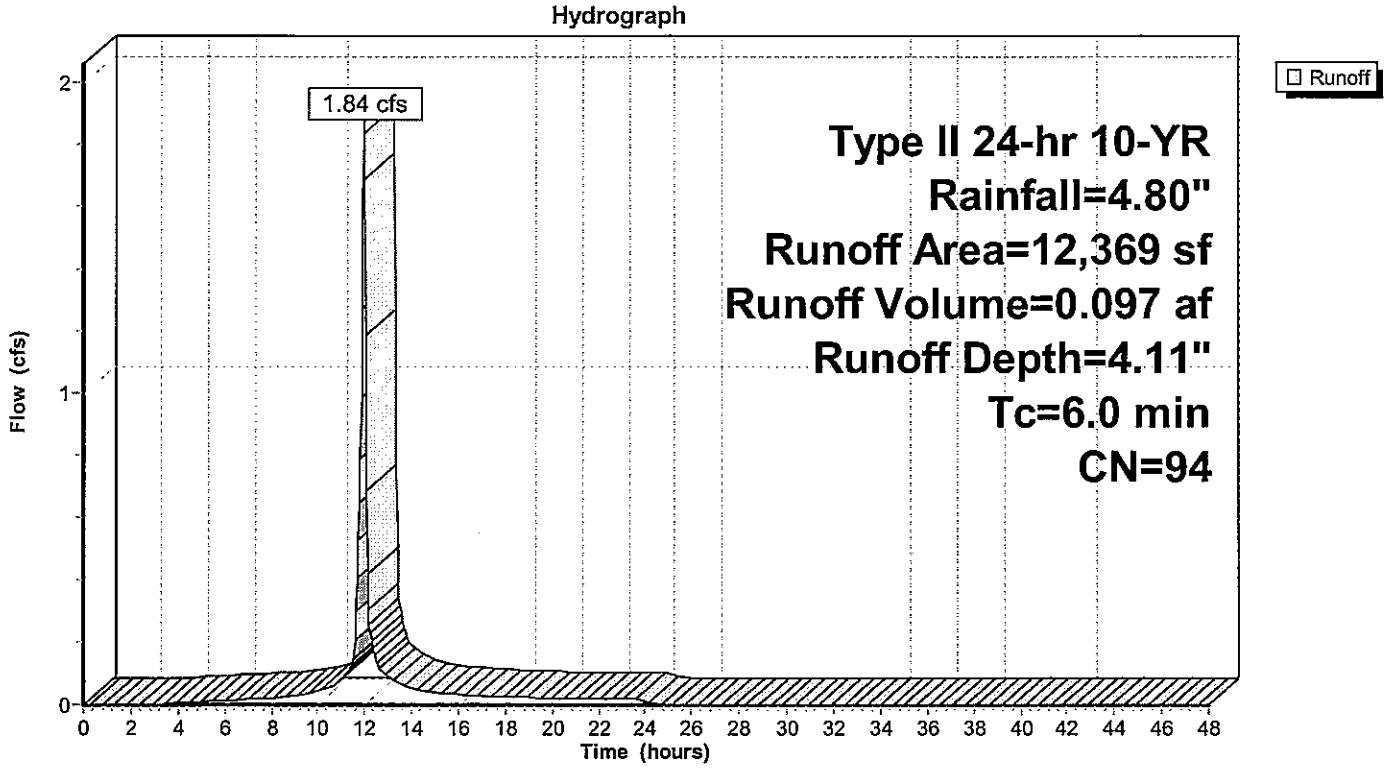
Runoff = 1.84 cfs @ 11.96 hrs, Volume= 0.097 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
2,922	98	Roofs, HSG B
8,207	98	Paved parking, HSG B
1,240	61	>75% Grass cover, Good, HSG B
12,369	94	Weighted Average
1,240		10.03% Pervious Area
11,129		89.97% Impervious Area

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

Subcatchment PRE-2:



Summary for Subcatchment PRE-3:

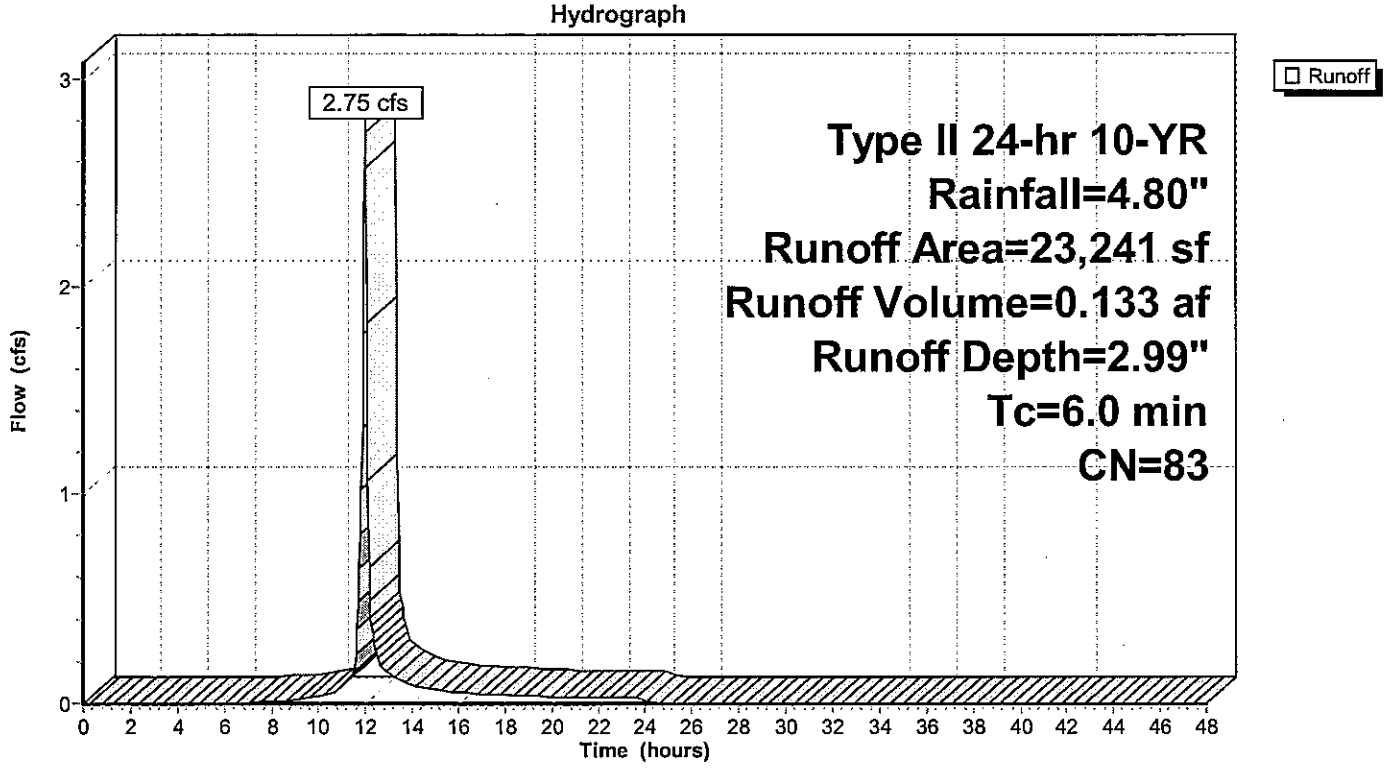
Runoff = 2.75 cfs @ 11.97 hrs, Volume= 0.133 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
1,394	98	Roofs, HSG B
12,476	98	Paved parking, HSG B
9,371	61	>75% Grass cover, Good, HSG B
23,241	83	Weighted Average
9,371		40.32% Pervious Area
13,870		59.68% Impervious Area

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

Subcatchment PRE-3:



Summary for Pond 1P: POI #3

Inflow Area = 2.010 ac, 27.59% Impervious, Inflow Depth = 1.86" for 10-YR event
Inflow = 4.46 cfs @ 12.00 hrs, Volume= 0.312 af
Outflow = 4.46 cfs @ 12.00 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min
Primary = 4.46 cfs @ 12.00 hrs, Volume= 0.312 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

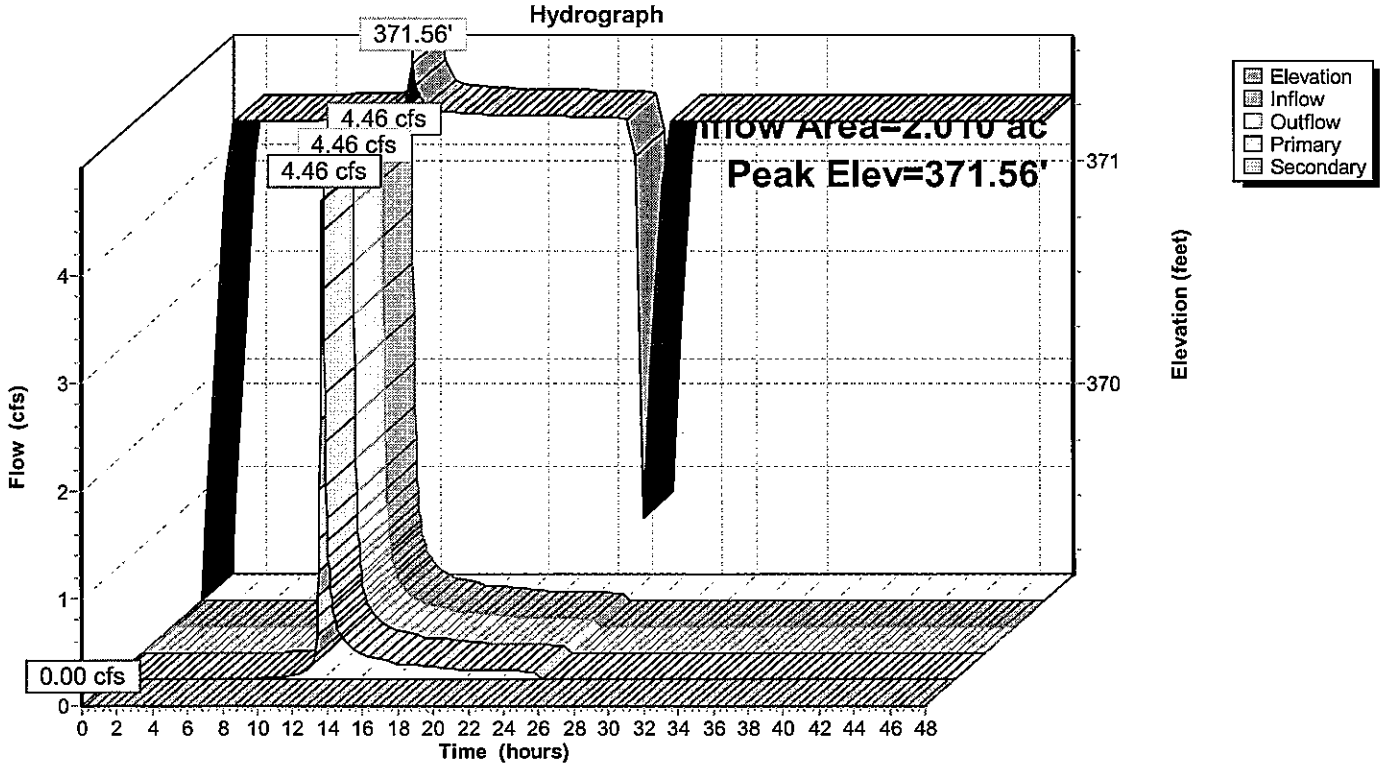
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 371.56' @ 12.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	369.11'	**15.0" Round Culvert** L= 127.0' Box, headwall w/3 square edges, Ke= 0.500 Outlet Invert= 368.42' S= 0.0054 '/' Cc= 0.900 n= 0.012
#2	Device 1	371.30'	**23.9" x 37.5" Horiz. Orifice/Grate** C= 0.600 in 23.9" x 37.5" Grate Limited to weir flow at low heads
#3	Secondary	372.00'	**60.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.44 cfs @ 12.00 hrs HW=371.56' (Free Discharge)
↑—**1=Culvert** (Passes 4.44 cfs of 6.75 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 4.44 cfs @ 1.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=369.14' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POI #3

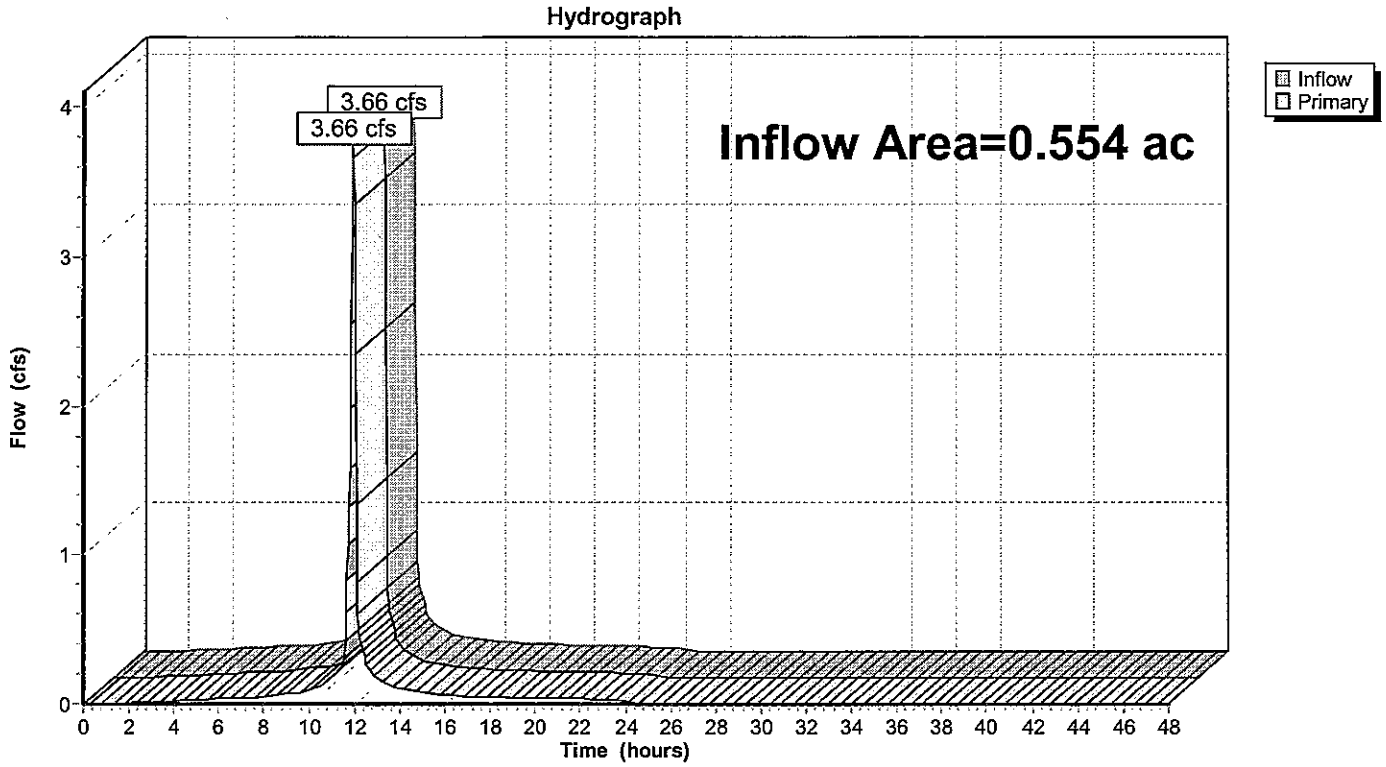


Summary for Link 1L:

Inflow Area = 0.554 ac, 94.86% Impervious, Inflow Depth = 4.33" for 10-YR event
Inflow = 3.66 cfs @ 11.96 hrs, Volume= 0.200 af
Primary = 3.66 cfs @ 11.96 hrs, Volume= 0.200 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Link 1L:



Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment OFF-3: Runoff Area=1.476 ac 15.99% Impervious Runoff Depth=3.83"
Flow Length=360' Tc=15.5 min CN=64.40 Runoff=7.16 cfs 0.471 af

Subcatchment PRE-1: Runoff Area=11,768 sf 100.00% Impervious Runoff Depth=7.76"
Tc=6.0 min CN=98.00 Runoff=3.05 cfs 0.175 af

Subcatchment PRE-2: Runoff Area=12,369 sf 89.97% Impervious Runoff Depth=7.32"
Tc=6.0 min CN=94.29 Runoff=3.16 cfs 0.173 af

Subcatchment PRE-3: Runoff Area=23,241 sf 59.68% Impervious Runoff Depth=5.99"
Tc=6.0 min CN=83.08 Runoff=5.30 cfs 0.266 af

Pond 1P: POI #3 Peak Elev=372.07' Inflow=10.65 cfs 0.737 af
Primary=7.61 cfs 0.703 af Secondary=3.04 cfs 0.034 af Outflow=10.65 cfs 0.737 af

Link 1L: POI#1&2 Inflow=6.20 cfs 0.348 af
Primary=6.20 cfs 0.348 af

Total Runoff Area = 2.564 ac Runoff Volume = 1.085 af Average Runoff Depth = 5.08"
57.87% Pervious = 1.484 ac 42.13% Impervious = 1.080 ac

Summary for Subcatchment OFF-3:

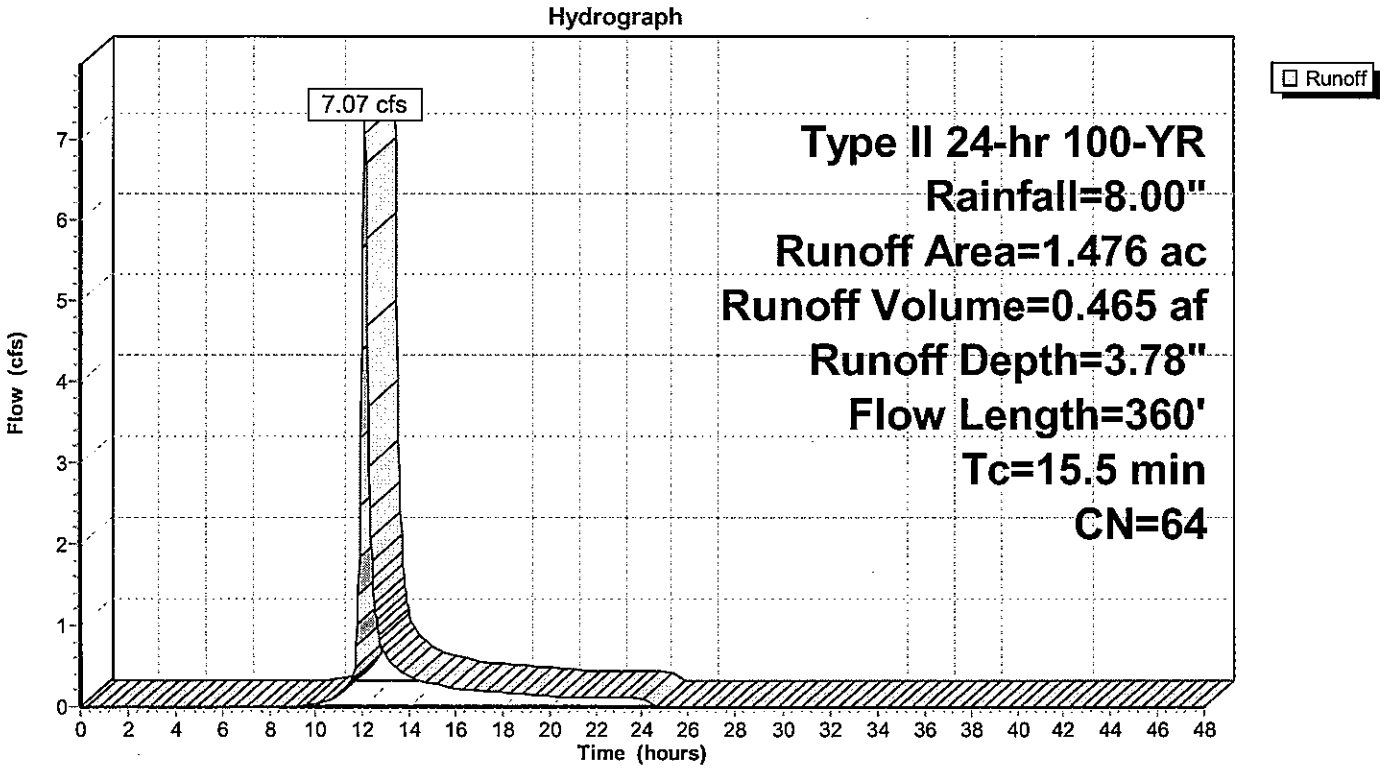
Runoff = 7.07 cfs @ 12.08 hrs, Volume= 0.465 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

Area (ac)	CN	Description
1.240	58	Woods/grass comb., Good, HSG B
0.236	98	Paved parking, HSG B
1.476	64	Weighted Average
1.240		84.01% Pervious Area
0.236		15.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0230	0.12		**Sheet Flow, Offsite-Residential Lawn** Grass: Dense n= 0.240 P2= 3.20"
2.0	260	0.0180	2.16		**Shallow Concentrated Flow, lawn/draw to inlet** Unpaved Kv= 16.1 fps
15.5	360	Total			

Subcatchment OFF-3:



Summary for Subcatchment PRE-1:

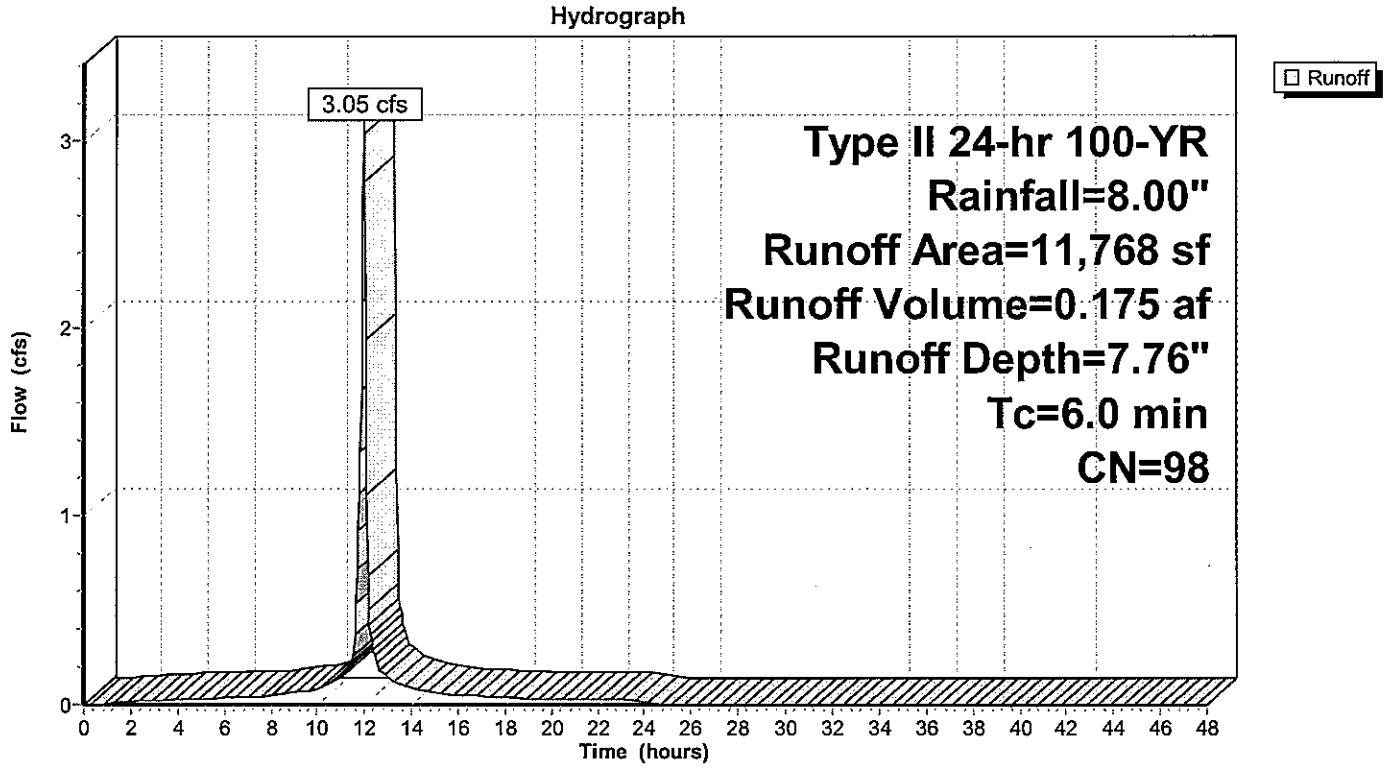
Runoff = 3.05 cfs @ 11.96 hrs, Volume= 0.175 af, Depth= 7.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

Area (sf)	CN	Description
2,266	98	Roofs, HSG B
9,502	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
11,768	98	Weighted Average
11,768		100.00% Impervious Area

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

Subcatchment PRE-1:



Summary for Subcatchment PRE-2:

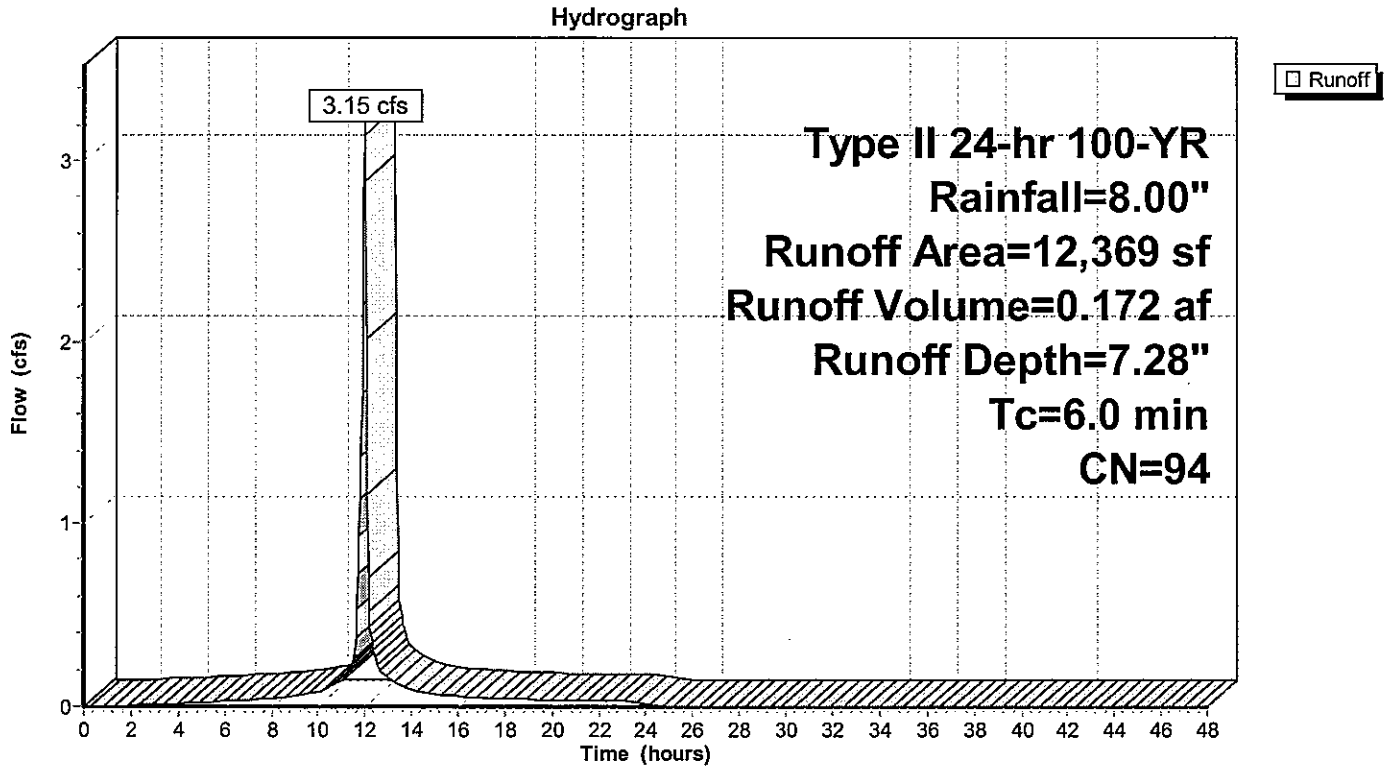
Runoff = 3.15 cfs @ 11.96 hrs, Volume= 0.172 af, Depth= 7.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

Area (sf)	CN	Description
2,922	98	Roofs, HSG B
8,207	98	Paved parking, HSG B
1,240	61	>75% Grass cover, Good, HSG B
12,369	94	Weighted Average
1,240		10.03% Pervious Area
11,129		89.97% Impervious Area

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

Subcatchment PRE-2:



Summary for Subcatchment PRE-3:

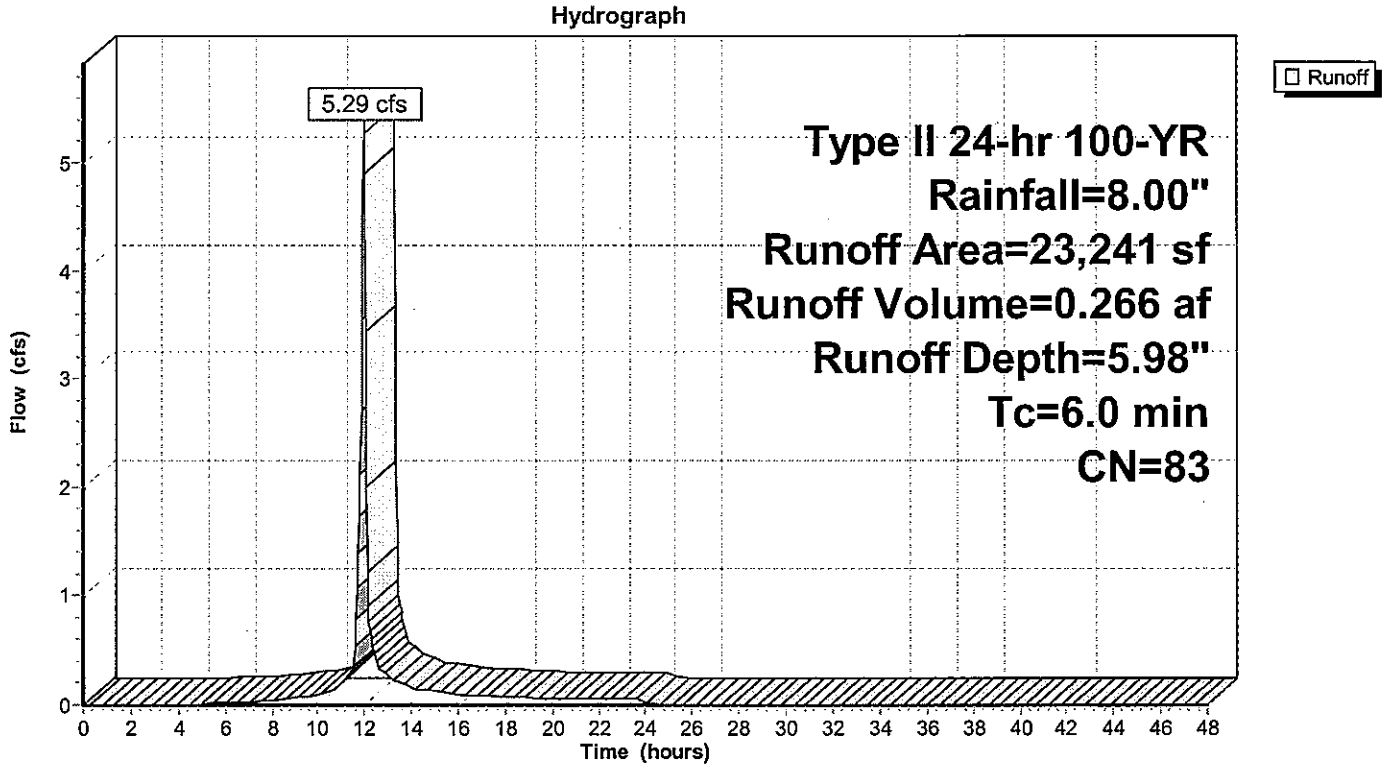
Runoff = 5.29 cfs @ 11.97 hrs, Volume= 0.266 af, Depth= 5.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

Area (sf)	CN	Description
1,394	98	Roofs, HSG B
12,476	98	Paved parking, HSG B
9,371	61	>75% Grass cover, Good, HSG B
23,241	83	Weighted Average
9,371		40.32% Pervious Area
13,870		59.68% Impervious Area

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

Subcatchment PRE-3:



Summary for Pond 1P: POI #3

Inflow Area = 2.010 ac, 27.59% Impervious, Inflow Depth = 4.36" for 100-YR event
Inflow = 10.57 cfs @ 12.01 hrs, Volume= 0.731 af
Outflow = 10.57 cfs @ 12.01 hrs, Volume= 0.731 af, Atten= 0%, Lag= 0.0 min
Primary = 7.61 cfs @ 12.01 hrs, Volume= 0.699 af
Secondary = 2.95 cfs @ 12.01 hrs, Volume= 0.032 af

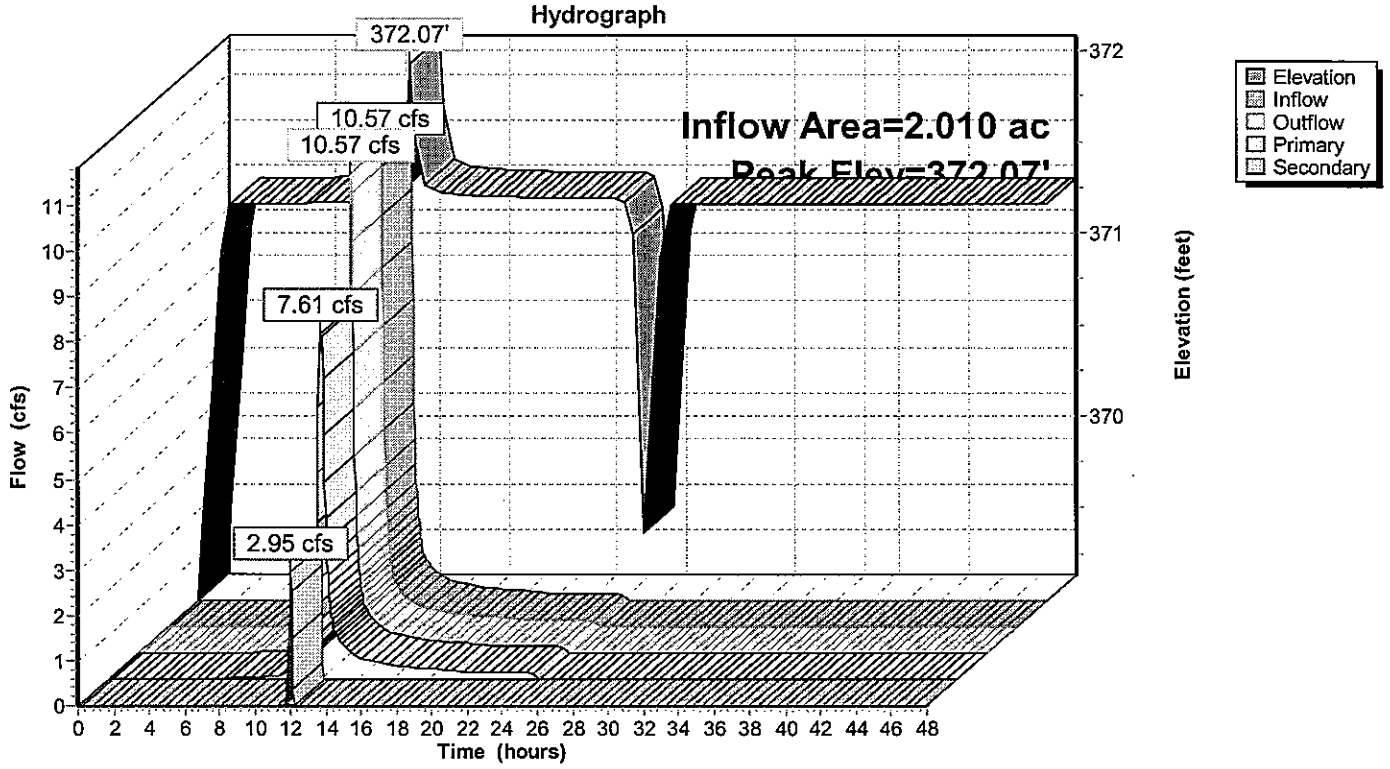
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 372.07' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	369.11'	**15.0" Round Culvert** L= 127.0' Box, headwall w/3 square edges, Ke= 0.500 Outlet Invert= 368.42' S= 0.0054 '/' Cc= 0.900 n= 0.012
#2	Device 1	371.30'	**23.9" x 37.5" Horiz. Orifice/Grate** C= 0.600 in 23.9" x 37.5" Grate Limited to weir flow at low heads
#3	Secondary	372.00'	**60.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.61 cfs @ 12.01 hrs HW=372.07' (Free Discharge)
└**1=Culvert** (Barrel Controls 7.61 cfs @ 6.20 fps)
└**2=Orifice/Grate** (Passes 7.61 cfs of 22.68 cfs potential flow)

Secondary OutFlow Max=2.86 cfs @ 12.01 hrs HW=372.07' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 2.86 cfs @ 0.67 fps)

Pond 1P: POI #3

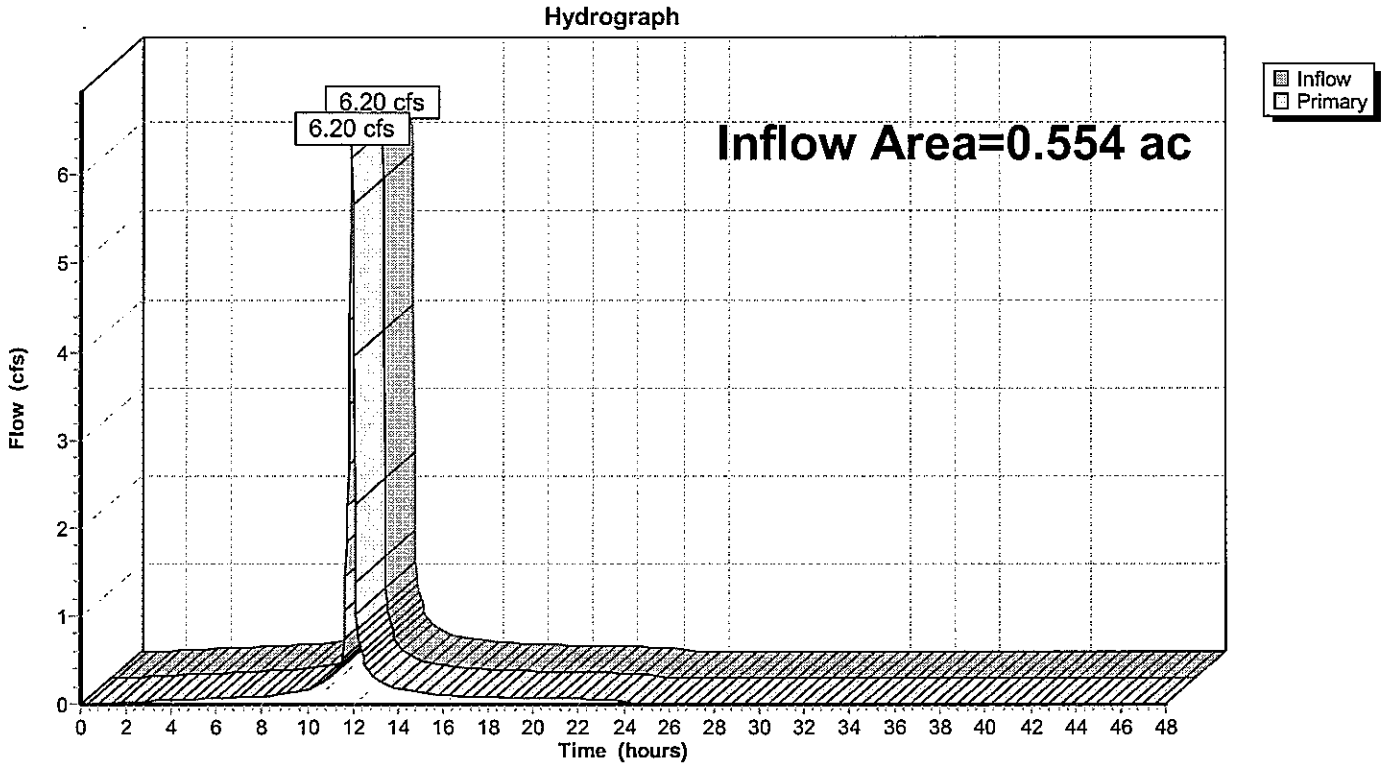


Summary for Link 1L:

Inflow Area = 0.554 ac, 94.86% Impervious, Inflow Depth = 7.52" for 100-YR event
Inflow = 6.20 cfs @ 11.96 hrs, Volume= 0.347 af
Primary = 6.20 cfs @ 11.96 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min

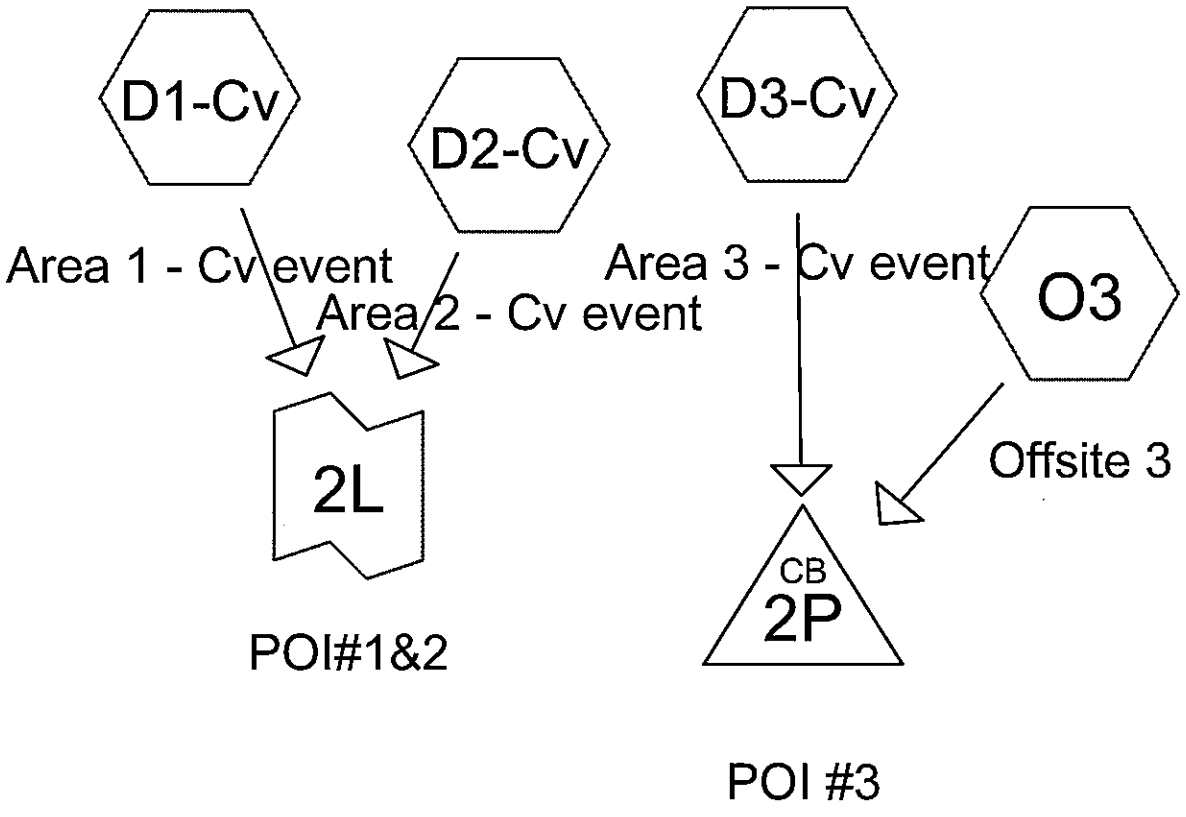
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Link 1L:



APPENDIX D

POST-DEVELOPMENT CALCULATIONS



Subcat Reach Pond Link

Drainage Diagram for 9151CA.0310a site

Prepared by {enter your company name here}, Printed 9/1/2011

Effective April 2016

Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment D1-Cv: Area 1 - Cv event Runoff Area=12,094 sf 16.37% Impervious Runoff Depth=3.11"
Tc=6.0 min CN=84.26 Runoff=1.48 cfs 0.072 af

Subcatchment D2-Cv: Area 2 - Cv event Runoff Area=13,075 sf 37.18% Impervious Runoff Depth=3.53"
Tc=6.0 min CN=88.54 Runoff=1.77 cfs 0.088 af

Subcatchment D3-Cv: Area 3 - Cv event Runoff Area=22,208 sf 36.71% Impervious Runoff Depth=3.05"
Tc=6.0 min CN=83.58 Runoff=2.67 cfs 0.130 af

Subcatchment O3: Offsite 3 Runoff Area=1.476 ac 15.99% Impervious Runoff Depth=1.48"
Flow Length=360' Tc=15.5 min CN=64.40 Runoff=2.64 cfs 0.182 af

Pond 2P: POI #3 Peak Elev=371.56' Inflow=4.43 cfs 0.312 af
Primary=4.43 cfs 0.312 af Secondary=0.00 cfs 0.000 af Outflow=4.43 cfs 0.312 af

Link 2L: POI#1&2 Inflow=3.25 cfs 0.160 af
Primary=3.25 cfs 0.160 af

Total Runoff Area = 2.564 ac Runoff Volume = 0.472 af Average Runoff Depth = 2.21"
77.37% Pervious = 1.983 ac 22.63% Impervious = 0.580 ac

Summary for Subcatchment D1-Cv: Area 1 - Cv event

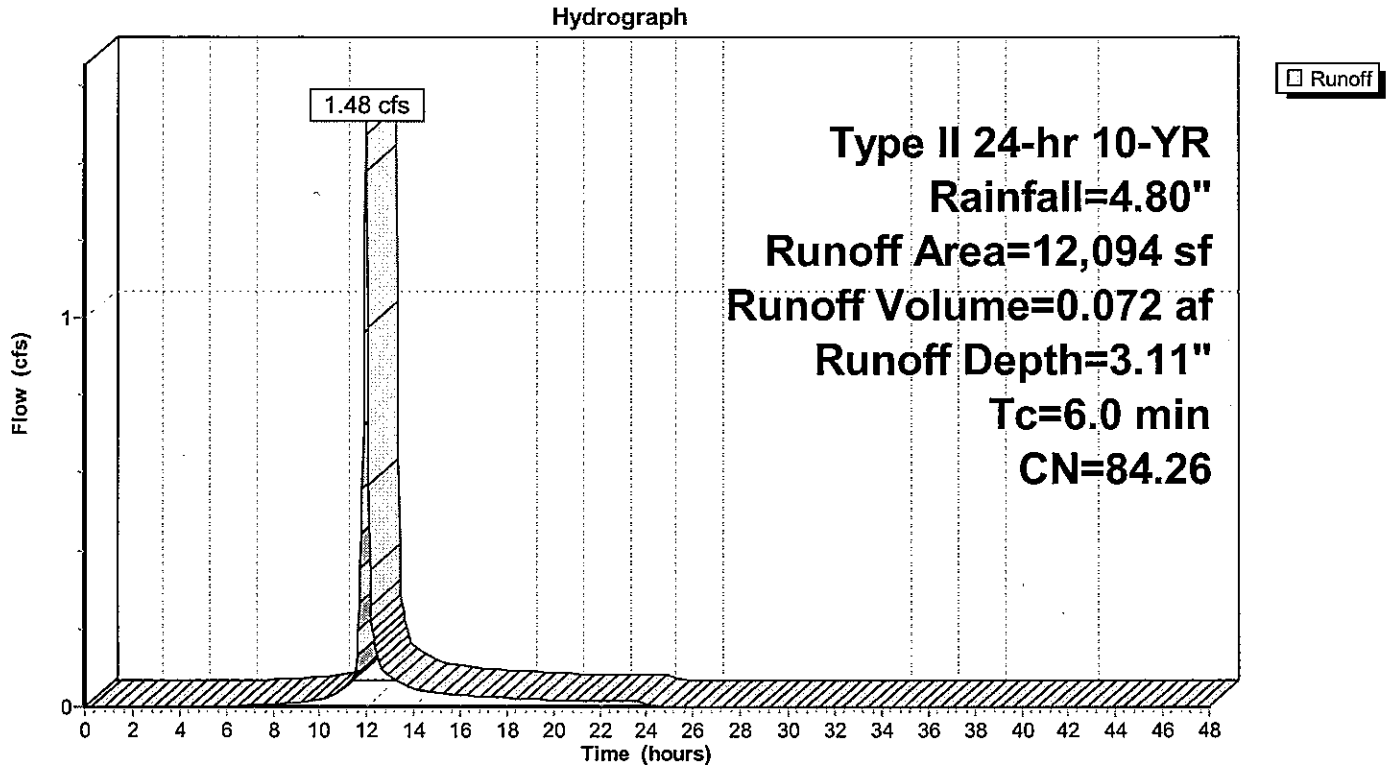
Runoff = 1.48 cfs @ 11.97 hrs, Volume= 0.072 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

	Area (sf)	CN	Description
	0	98.00	Roofs, HSG B
*	1,069	98.00	Paved parking, HSG B
*	911	98.00	Sidewalk, HSG B
	2,307	61.00	>75% Grass cover, Good, HSG B
*	7,807	87.65	DURMM FS 1
	12,094	84.26	Weighted Average
	10,114		83.63% Pervious Area
	1,980		16.37% Impervious Area

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

Subcatchment D1-Cv: Area 1 - Cv event



Summary for Subcatchment D2-Cv: Area 2 - Cv event

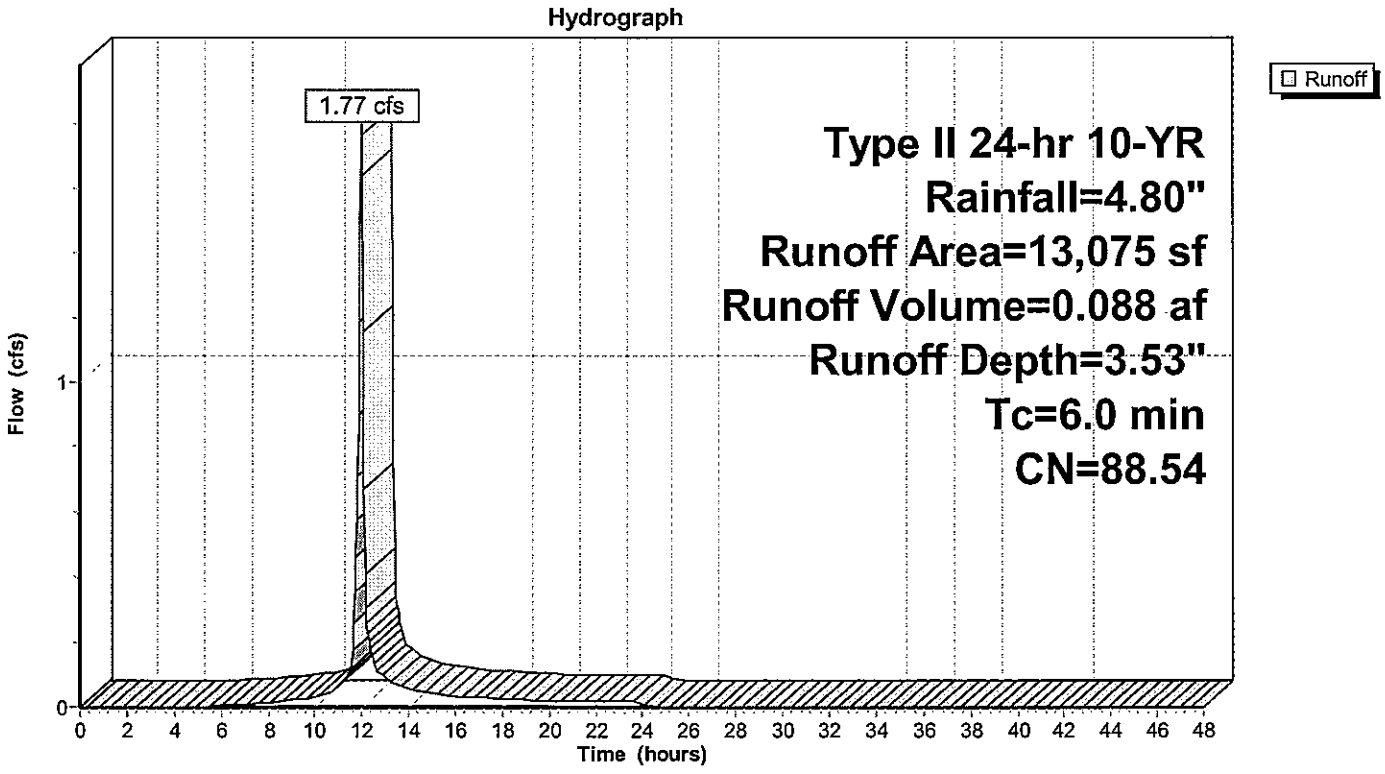
Runoff = 1.77 cfs @ 11.97 hrs, Volume= 0.088 af, Depth= 3.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

	Area (sf)	CN	Description
	1,967	98.00	Roofs, HSG B
	2,894	98.00	Paved parking, HSG B
	1,186	61.00	>75% Grass cover, Good, HSG B
*	7,028	86.65	DURMM FS 2
	13,075	88.54	Weighted Average
	8,214		62.82% Pervious Area
	4,861		37.18% Impervious Area

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

Subcatchment D2-Cv: Area 2 - Cv event



Summary for Subcatchment D3-Cv: Area 3 - Cv event

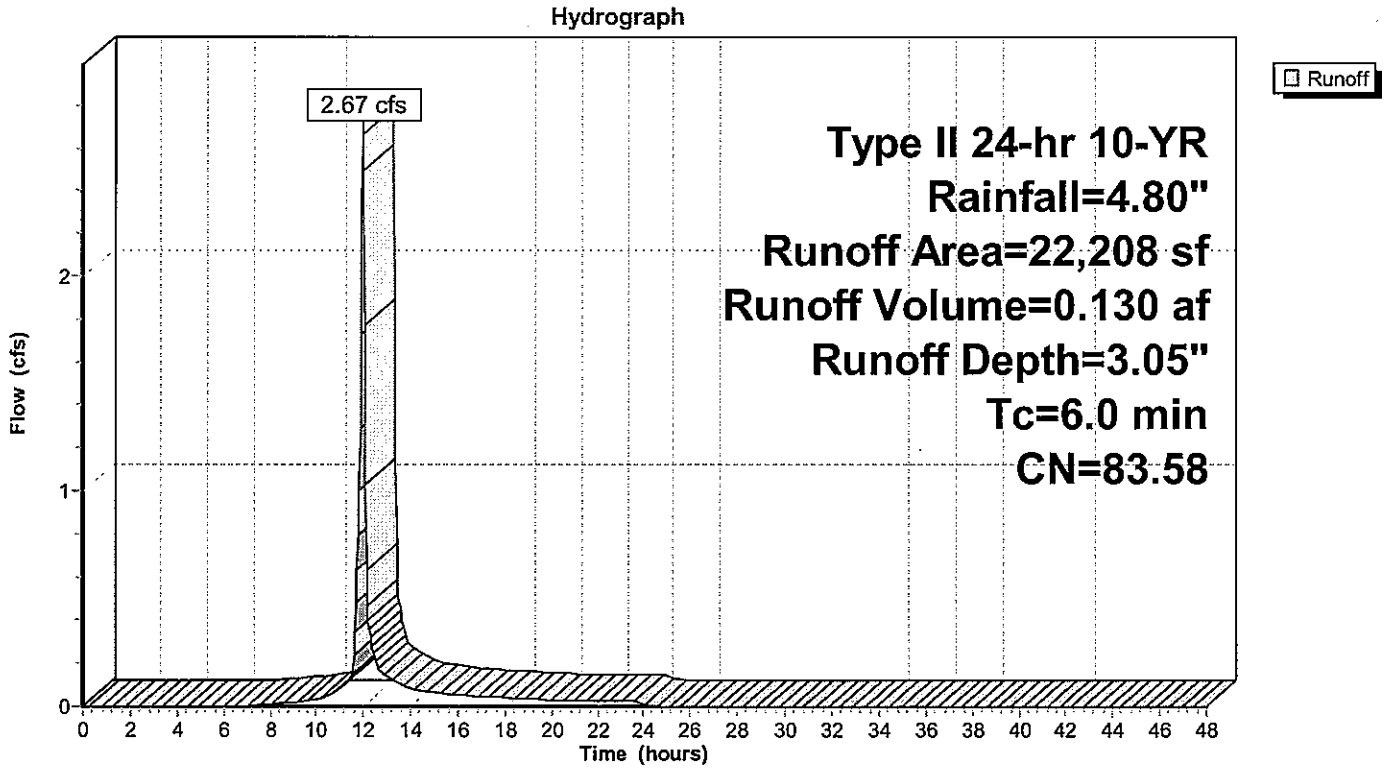
Runoff = 2.67 cfs @ 11.97 hrs, Volume= 0.130 af, Depth= 3.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

	Area (sf)	CN	Description
	2,551	98.00	Roofs, HSG B
	5,601	98.00	Paved parking, HSG B
	6,450	61.00	>75% Grass cover, Good, HSG B
*	4,671	88.45	DURMM FS 3
*	2,935	85.37	DURMM FS 4
	22,208	83.58	Weighted Average
	14,056		63.29% Pervious Area
	8,152		36.71% Impervious Area

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

Subcatchment D3-Cv: Area 3 - Cv event



Summary for Subcatchment O3: Offsite 3

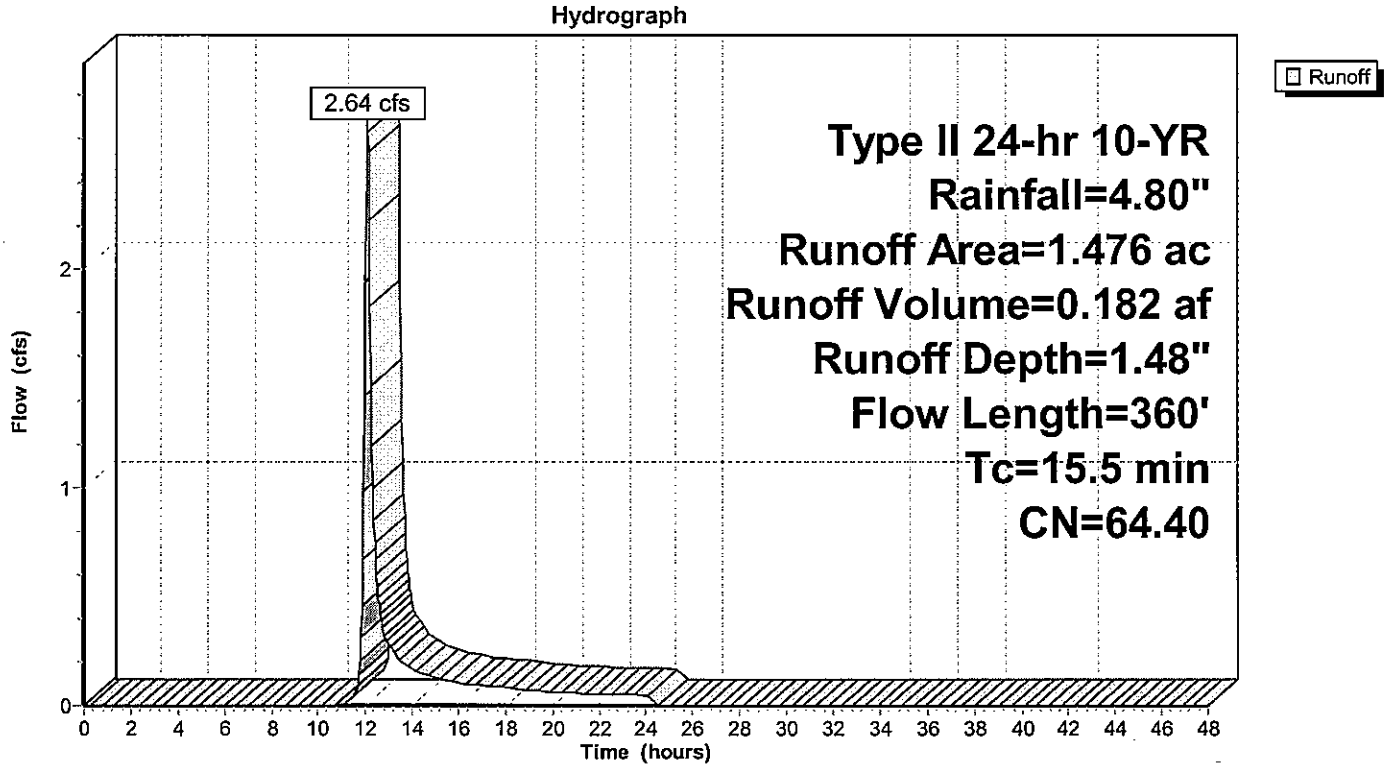
Runoff = 2.64 cfs @ 12.09 hrs, Volume= 0.182 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 10-YR Rainfall=4.80"

Area (ac)	CN	Description
1.240	58.00	Woods/grass comb., Good, HSG B
0.236	98.00	Paved parking, HSG B
1.476	64.40	Weighted Average
1.240		84.01% Pervious Area
0.236		15.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0230	0.12		**Sheet Flow, Offsite-Residential Lawn** Grass: Dense n= 0.240 P2= 3.20"
2.0	260	0.0180	2.16		**Shallow Concentrated Flow, lawn/draw to inlet** Unpaved Kv= 16.1 fps
15.5	360	Total			

Subcatchment O3: Offsite 3



Summary for Pond 2P: POI #3

Inflow Area = 1.986 ac, 21.31% Impervious, Inflow Depth = 1.88" for 10-YR event
Inflow = 4.43 cfs @ 12.00 hrs, Volume= 0.312 af
Outflow = 4.43 cfs @ 12.00 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min
Primary = 4.43 cfs @ 12.00 hrs, Volume= 0.312 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

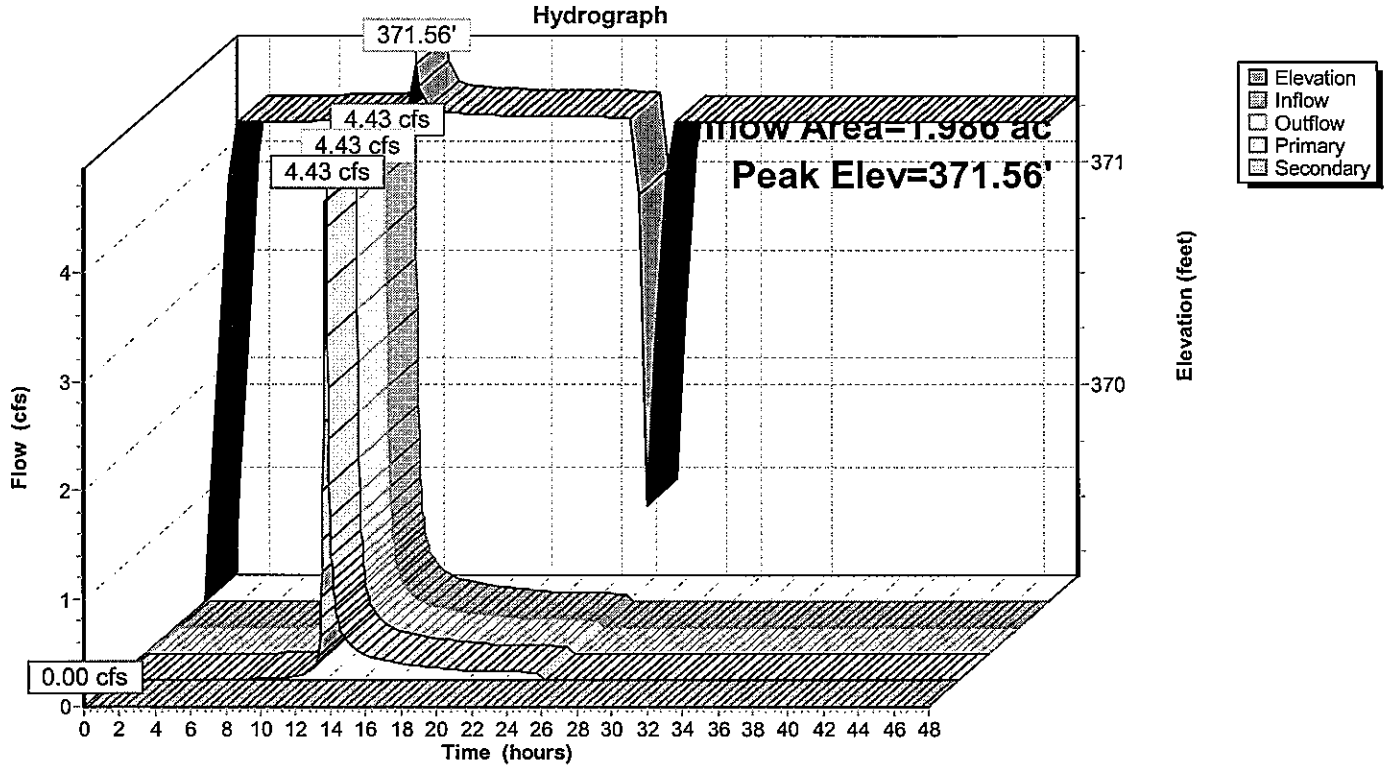
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 371.56' @ 12.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	369.11'	**15.0" Round Culvert** L= 127.0' Box, headwall w/3 square edges, Ke= 0.500 Outlet Invert= 368.42' S= 0.0054 '/' Cc= 0.900 n= 0.012
#2	Device 1	371.30'	**23.9" x 37.5" Horiz. Orifice/Grate** C= 0.600 in 23.9" x 37.5" Grate Limited to weir flow at low heads
#3	Secondary	372.00'	**60.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.41 cfs @ 12.00 hrs HW=371.56' (Free Discharge)
└**1=Culvert** (Passes 4.41 cfs of 6.75 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 4.41 cfs @ 1.66 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=369.14' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: POI #3

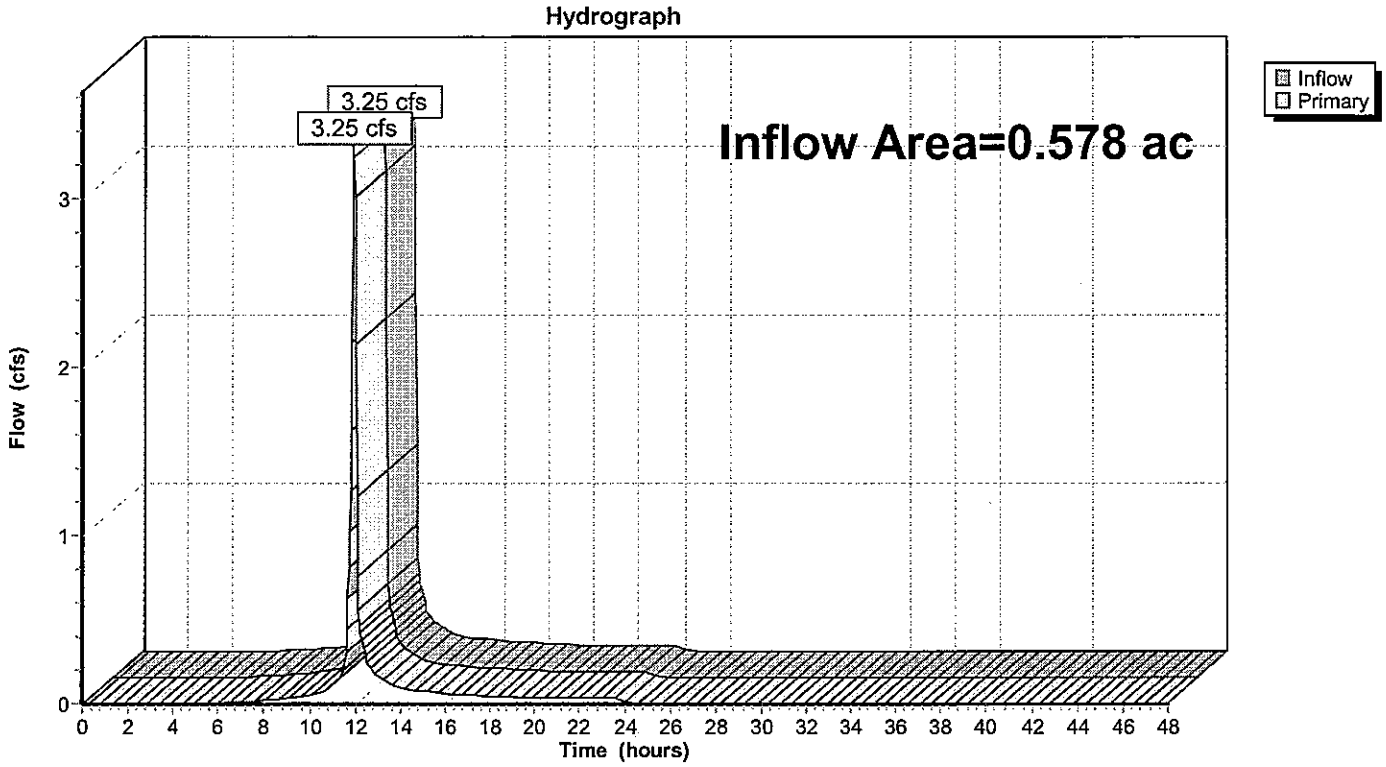


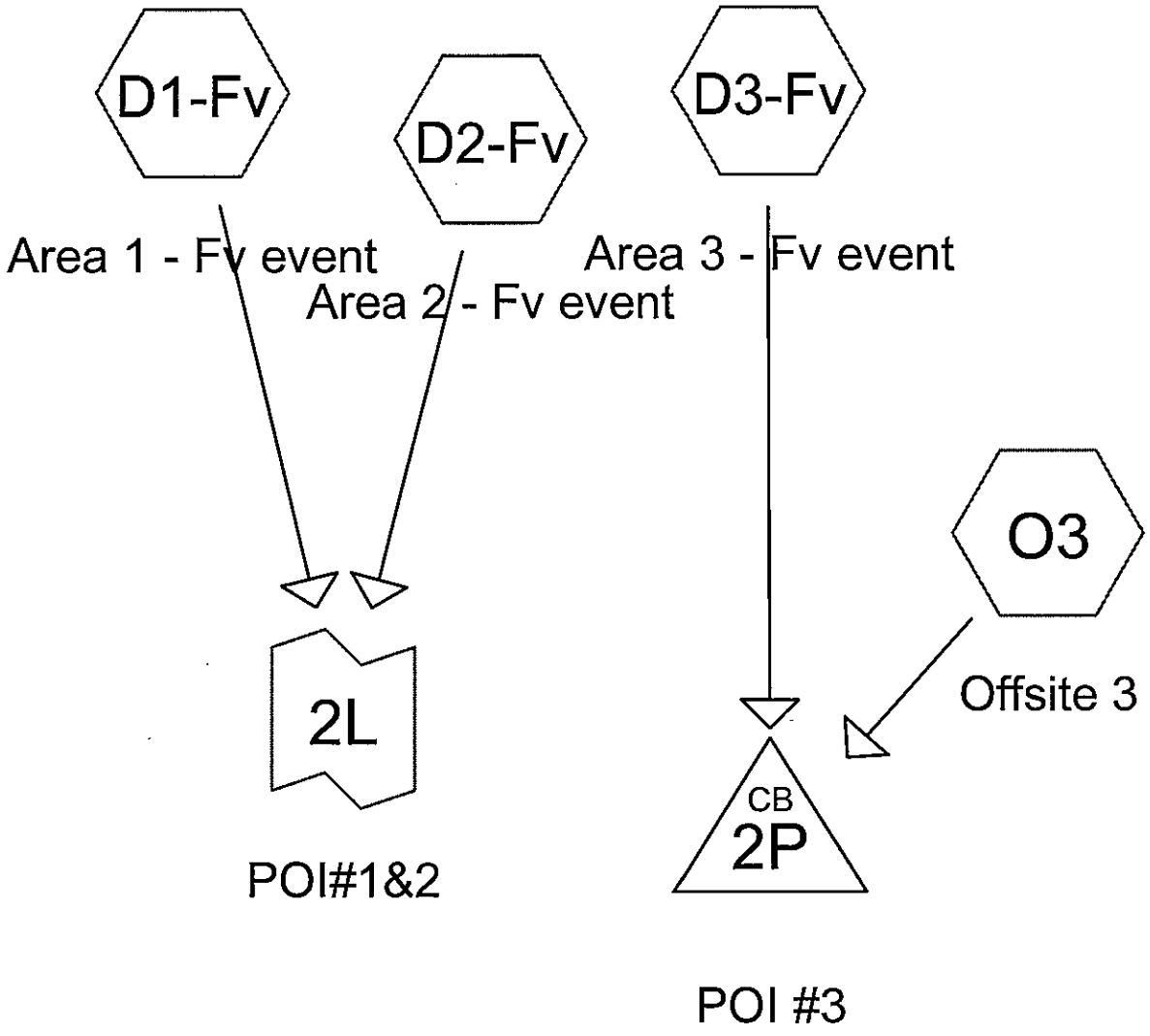
Summary for Link 2L: POI#1&2

Inflow Area = 0.578 ac, 27.18% Impervious, Inflow Depth = 3.33" for 10-YR event
Inflow = 3.25 cfs @ 11.97 hrs, Volume= 0.160 af
Primary = 3.25 cfs @ 11.97 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Link 2L: POI#1&2





Subcat Reach Pond Link

Drainage Diagram for 9151CA.0310a site

Prepared by {enter your company name here}, Printed 9/1/2011

Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment D1-Fv: Area 1 - Fv event Runoff Area=12,094 sf 16.37% Impervious Runoff Depth=6.29"
Tc=6.0 min CN=85.64 Runoff=2.85 cfs 0.146 af

Subcatchment D2-Fv: Area 2 - Fv event Runoff Area=13,075 sf 37.18% Impervious Runoff Depth=6.77"
Tc=6.0 min CN=89.67 Runoff=3.22 cfs 0.169 af

Subcatchment D3-Fv: Area 3 - Fv event Runoff Area=22,208 sf 36.71% Impervious Runoff Depth=6.13"
Tc=6.0 min CN=84.30 Runoff=5.15 cfs 0.260 af

Subcatchment O3: Offsite 3 Runoff Area=1.476 ac 15.99% Impervious Runoff Depth=3.83"
Flow Length=360' Tc=15.5 min CN=64.40 Runoff=7.16 cfs 0.471 af

Pond 2P: POI #3 Peak Elev=372.07' Inflow=10.51 cfs 0.731 af
Primary=7.61 cfs 0.699 af Secondary=2.90 cfs 0.032 af Outflow=10.51 cfs 0.731 af

Link 2L: POI#1&2 Inflow=6.07 cfs 0.315 af
Primary=6.07 cfs 0.315 af

Total Runoff Area = 2.564 ac Runoff Volume = 1.046 af Average Runoff Depth = 4.90"
77.37% Pervious = 1.983 ac 22.63% Impervious = 0.580 ac

Summary for Subcatchment D1-Fv: Area 1 - Fv event

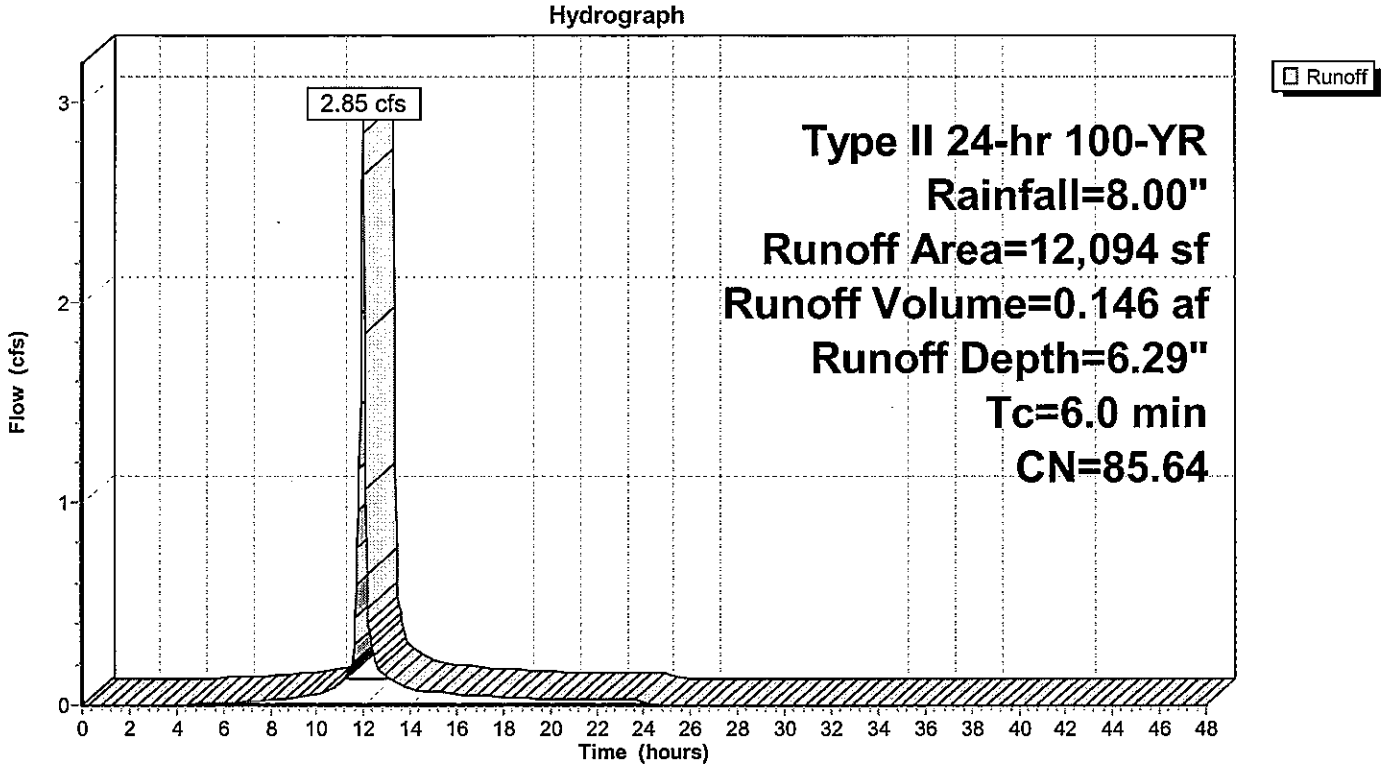
Runoff = 2.85 cfs @ 11.97 hrs, Volume= 0.146 af, Depth= 6.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

	Area (sf)	CN	Description
	0	98.00	Roofs, HSG B
*	1,069	98.00	Paved parking, HSG B
*	911	98.00	Sidewalk, HSG B
	2,307	61.00	>75% Grass cover, Good, HSG B
*	7,807	89.78	DURMM FS 1
	12,094	85.64	Weighted Average
	10,114		83.63% Pervious Area
	1,980		16.37% Impervious Area

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

Subcatchment D1-Fv: Area 1 - Fv event



Summary for Subcatchment D2-Fv: Area 2 - Fv event

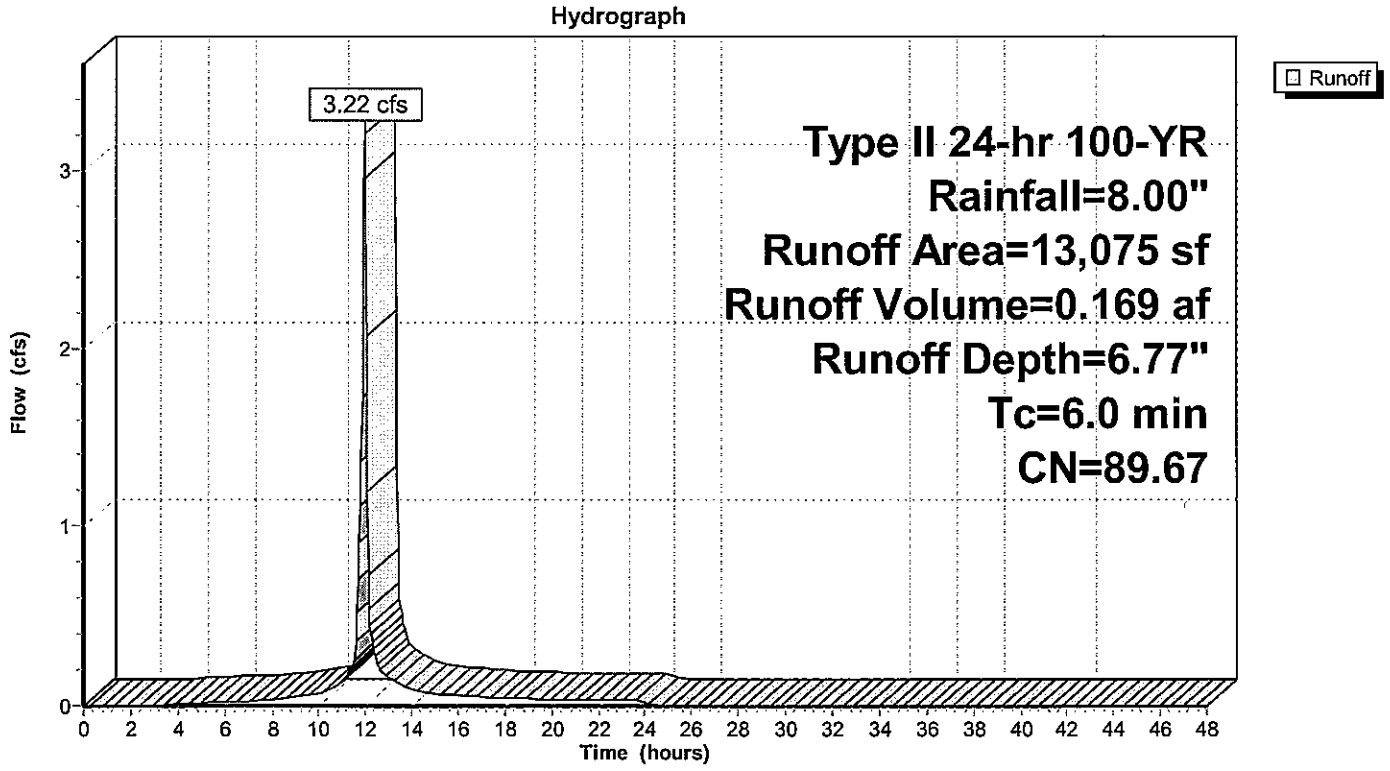
Runoff = 3.22 cfs @ 11.96 hrs, Volume= 0.169 af, Depth= 6.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

	Area (sf)	CN	Description
	1,967	98.00	Roofs, HSG B
	2,894	98.00	Paved parking, HSG B
	1,186	61.00	>75% Grass cover, Good, HSG B
*	7,028	88.75	DURMM FS 2
	13,075	89.67	Weighted Average
	8,214		62.82% Pervious Area
	4,861		37.18% Impervious Area

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

Subcatchment D2-Fv: Area 2 - Fv event



Summary for Subcatchment D3-Fv: Area 3 - Fv event

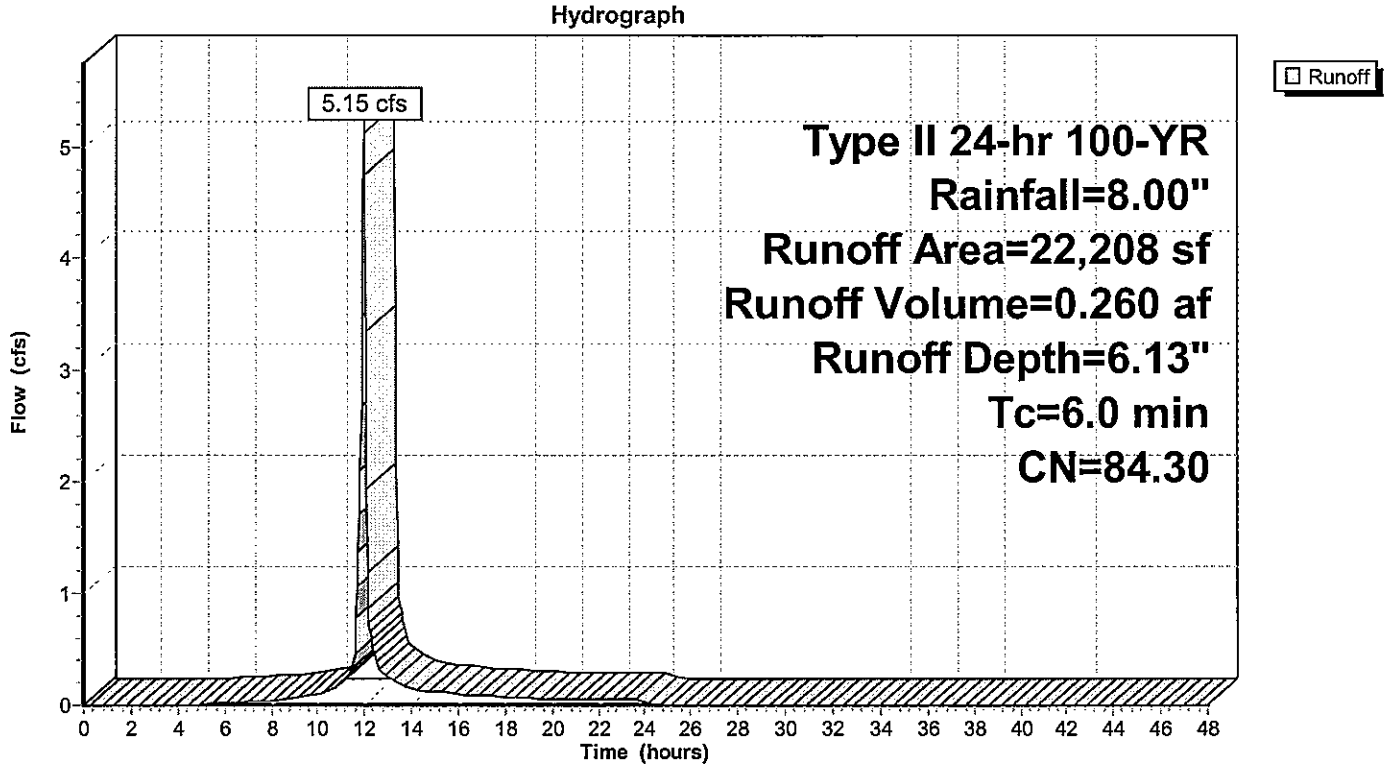
Runoff = 5.15 cfs @ 11.97 hrs, Volume= 0.260 af, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

	Area (sf)	CN	Description
	2,551	98.00	Roofs, HSG B
	5,601	98.00	Paved parking, HSG B
	6,450	61.00	>75% Grass cover, Good, HSG B
*	4,671	90.60	DURMM FS 3
*	2,935	87.43	DURMM FS 4
	22,208	84.30	Weighted Average
	14,056		63.29% Pervious Area
	8,152		36.71% Impervious Area

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

Subcatchment D3-Fv: Area 3 - Fv event



Summary for Subcatchment O3: Offsite 3

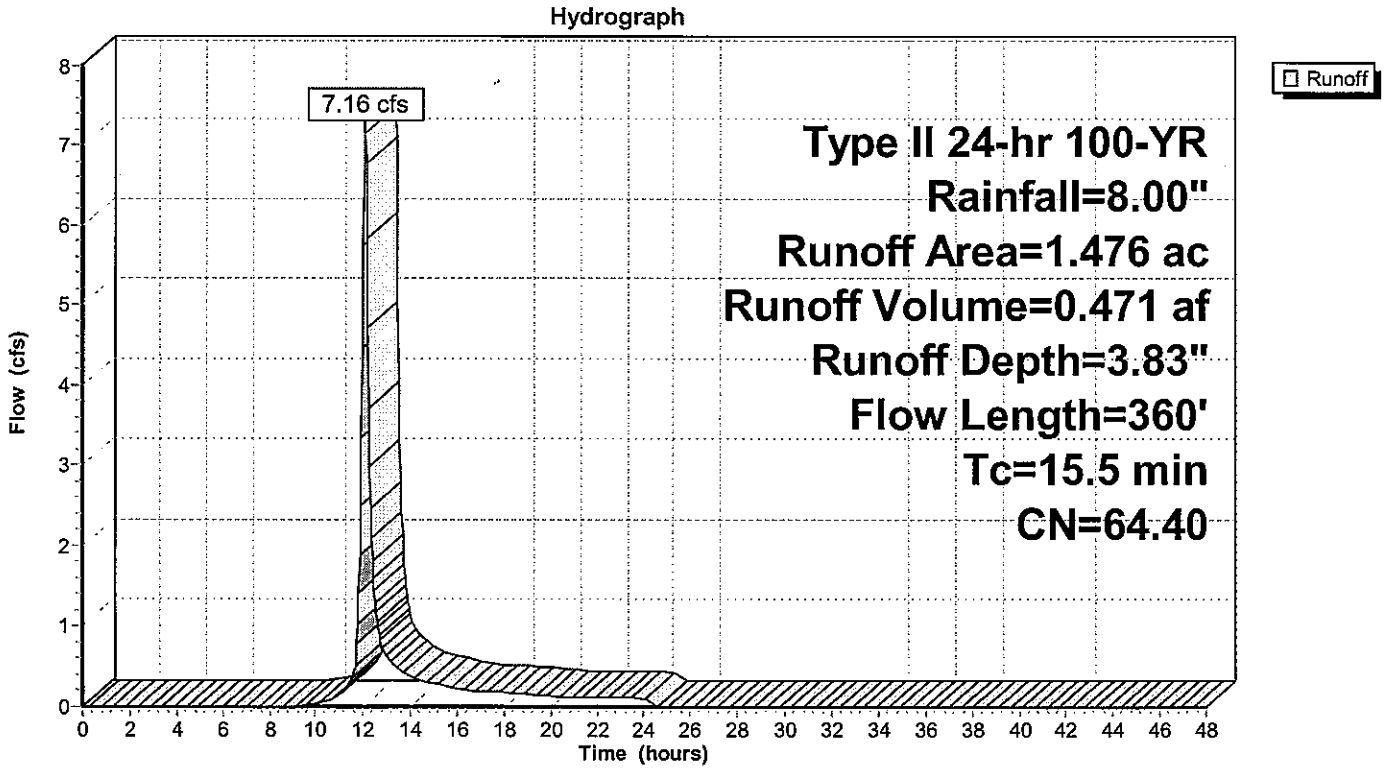
Runoff = 7.16 cfs @ 12.08 hrs, Volume= 0.471 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 100-YR Rainfall=8.00"

Area (ac)	CN	Description
1.240	58.00	Woods/grass comb., Good, HSG B
0.236	98.00	Paved parking, HSG B
1.476	64.40	Weighted Average
1.240		84.01% Pervious Area
0.236		15.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0230	0.12		**Sheet Flow, Offsite-Residential Lawn** Grass: Dense n= 0.240 P2= 3.20"
2.0	260	0.0180	2.16		**Shallow Concentrated Flow, lawn/draw to inlet** Unpaved Kv= 16.1 fps
15.5	360	Total			

Subcatchment O3: Offsite 3



Summary for Pond 2P: POI #3

Inflow Area = 1.986 ac, 21.31% Impervious, Inflow Depth = 4.42" for 100-YR event
Inflow = 10.51 cfs @ 12.01 hrs, Volume= 0.731 af
Outflow = 10.51 cfs @ 12.01 hrs, Volume= 0.731 af, Atten= 0%, Lag= 0.0 min
Primary = 7.61 cfs @ 12.01 hrs, Volume= 0.699 af
Secondary = 2.90 cfs @ 12.01 hrs, Volume= 0.032 af

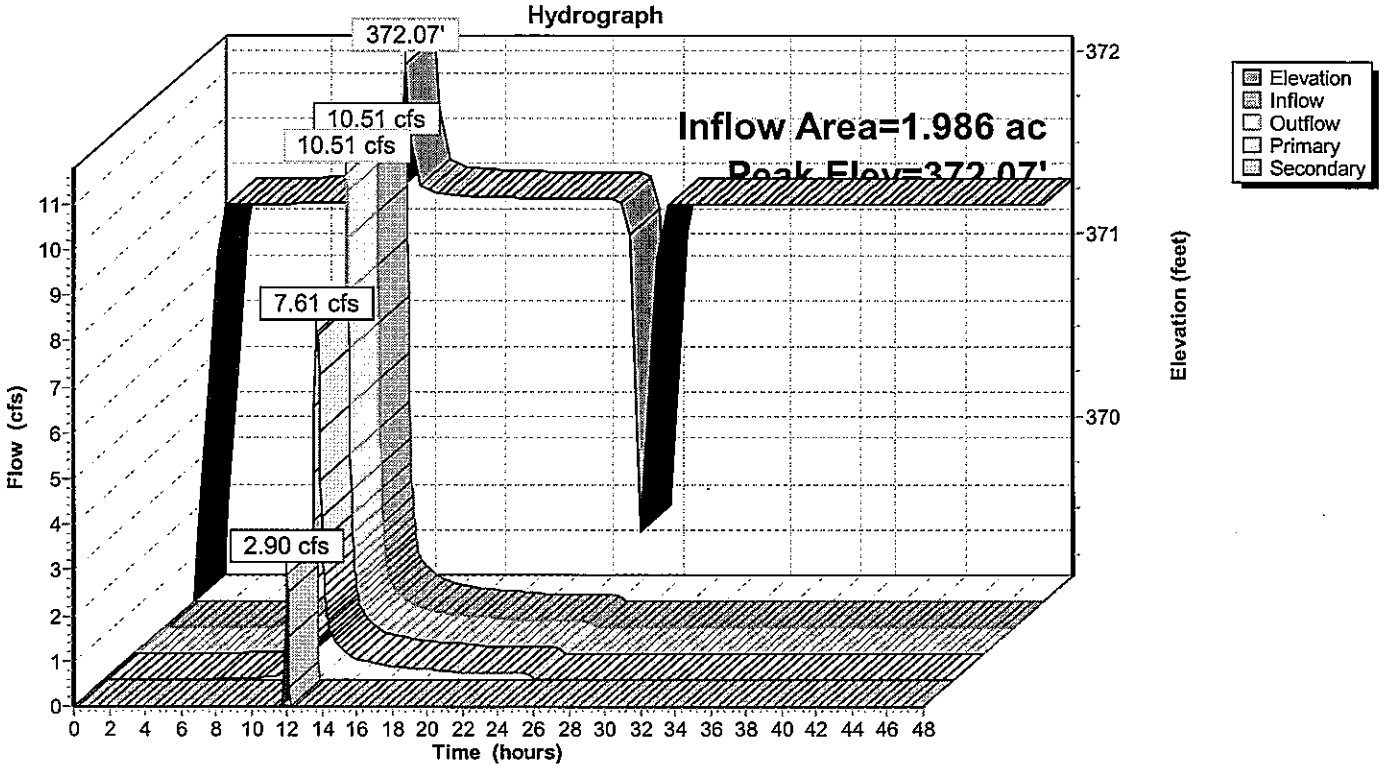
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 372.07' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	369.11'	**15.0" Round Culvert** L= 127.0' Box, headwall w/3 square edges, Ke= 0.500 Outlet Invert= 368.42' S= 0.0054 '/' Cc= 0.900 n= 0.012
#2	Device 1	371.30'	**23.9" x 37.5" Horiz. Orifice/Grate** C= 0.600 in 23.9" x 37.5" Grate Limited to weir flow at low heads
#3	Secondary	372.00'	**60.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.61 cfs @ 12.01 hrs HW=372.07' (Free Discharge)
└**1=Culvert** (Barrel Controls 7.61 cfs @ 6.20 fps)
└**2=Orifice/Grate** (Passes 7.61 cfs of 22.63 cfs potential flow)

Secondary OutFlow Max=2.80 cfs @ 12.01 hrs HW=372.07' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 2.80 cfs @ 0.66 fps)

Pond 2P: POI #3

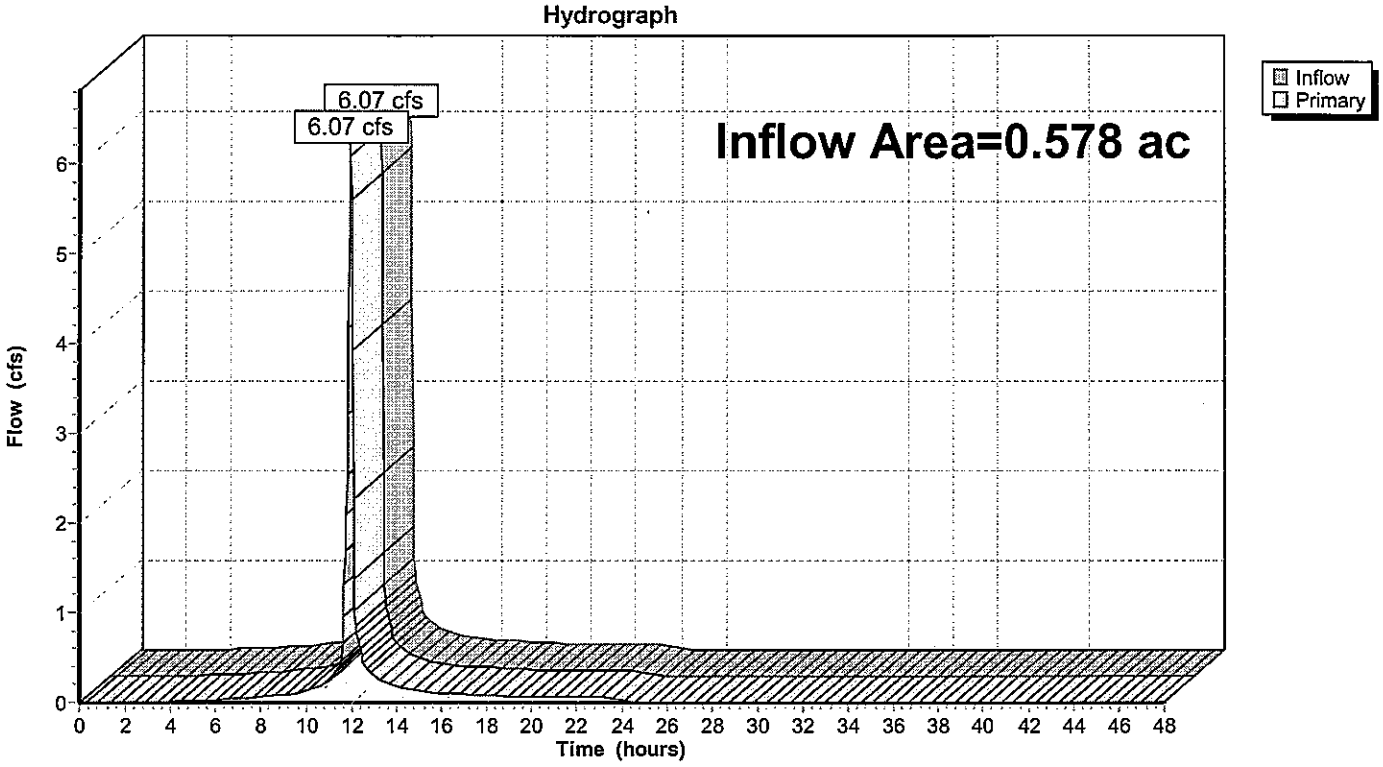


Summary for Link 2L: POI#1&2

Inflow Area = 0.578 ac, 27.18% Impervious, Inflow Depth = 6.54" for 100-YR event
Inflow = 6.07 cfs @ 11.97 hrs, Volume= 0.315 af
Primary = 6.07 cfs @ 11.97 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Link 2L: POI#1&2



APPENDIX E

PRE-DEVELOPMENT AND POST-DEVELOPMENT DRAINAGE PLANS

SEDIMENT & STORMWATER MANAGEMENT PLANS

REDEVELOPMENT PROJECT

SHELLPOT CREEK WATERSHED

STANDARD SEDIMENT AND STORMWATER CONSTRUCTION NOTES:

A. THE DNREC SEDIMENT AND STORMWATER PROGRAM MUST BE NOTIFIED IN WRITING FIVE (5) DAYS PRIOR TO COMMENCING WITH CONSTRUCTION. FAILURE TO DO SO CONSTITUTES A VIOLATION OF THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLAN.

B. REVIEW AND OR APPROVAL OF THE SEDIMENT AND STORMWATER MANAGEMENT PLAN SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OR HER RESPONSIBILITIES FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS, NOR SHALL IT RELIEVE THE CONTRACTOR FROM ERRORS OR OMISSIONS IN THE APPROVED PLAN.

C. IF THE APPROVED PLAN NEEDS TO BE MODIFIED, ADDITIONAL SEDIMENT AND STORMWATER CONTROL MEASURES MAY BE REQUIRED AS DEEMED NECESSARY BY DNREC OR THE DELEGATED AGENCY.

D. FOLLOWING SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN 14 CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER SEDIMENT CONTROLS, SOIL STOCKPILES, AND ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

E. "ALL EROSION AND SEDIMENT CONTROL PRACTICES SHALL COMPLY WITH THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.

F. APPROVED PLANS REMAIN VALID FOR 3 YEARS FROM THE DATE OF APPROVAL.

G. POST CONSTRUCTION VERIFICATION DOCUMENTS ARE TO BE SUBMITTED TO THE DNREC SEDIMENT AND STORMWATER PROGRAM [OR, THE RELEVANT DELEGATED AGENCY] WITHIN 60-DAYS OF STORMWATER MANAGEMENT FACILITY COMPLETION.

H. APPROVAL OF A SEDIMENT AND STORMWATER MANAGEMENT PLAN DOES NOT GRANT OR IMPLY A RIGHT TO DISCHARGE STORMWATER RUNOFF. THE OWNER/DEVELOPER IS RESPONSIBLE FOR ACQUIRING ANY AND ALL AGREEMENTS, EASEMENTS, ETC., NECESSARY TO COMPLY WITH STATE DRAINAGE AND OTHER APPLICABLE LAWS.

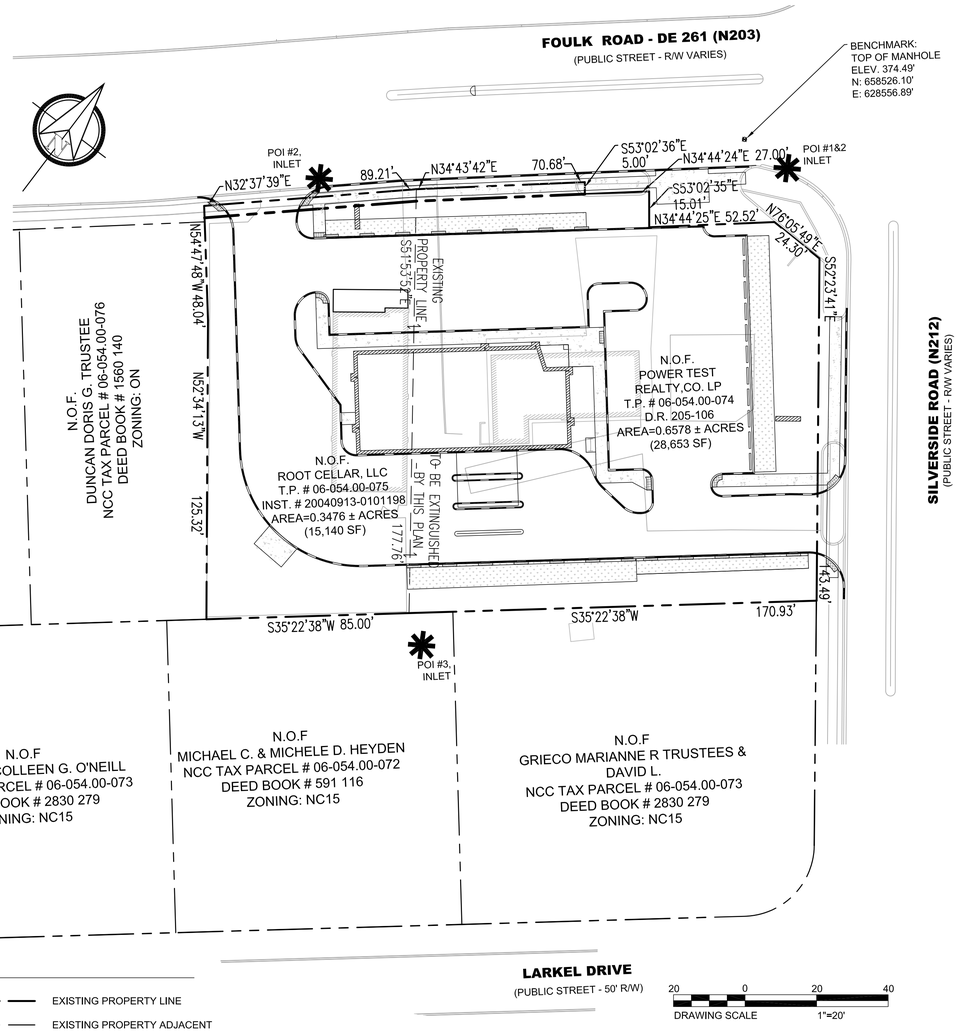
I. THE NOTICE OF INTENT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER A NPDES GENERAL PERMIT FOR THIS PROJECT IS #_ (TO BE FILLED IN ONCE RECEIVED). AT ANY TIME THE OWNERSHIP FOR THIS PROJECT CHANGES, A TRANSFER OF AUTHORIZATION OR A CO-PERMITTEE APPLICATION MUST BE SUBMITTED TO DNREC. THE PERMITTEE OF RECORD SHALL NOT BE RELIEVED OF THEIR RESPONSIBILITIES UNTIL A NOTICE OF TERMINATION HAS BEEN PROCESSED BY DNREC.

J. THE OWNER SHALL BE FAMILIAR WITH AND COMPLY WITH ALL ASPECTS OF THE NPDES CONSTRUCTION GENERAL PERMIT ASSOCIATED WITH THE PROJECT, INCLUDING, BUT NOT LIMITED TO, PERFORMING WEEKLY SITE INSPECTIONS DURING CONSTRUCTION AND AFTER RAIN EVENTS, AND MAINTAINING WRITTEN LOGS OF THESE INSPECTIONS.

K. BEFORE ANY EARTHWORK OR EXCAVATION TAKES PLACE, THE CONTRACTOR SHALL CALL MISS UTILITY AT 811 OR 1.800.282.8555 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION, TO HAVE ALL EXISTING UTILITIES MARKED ONSITE.

NOTES:

1. THE PURPOSE OF THIS LAND DEVELOPMENT PLAN IS TO DEMOLISH AN EXISTING 1,824± S.F. BUILDING ON TAX PARCEL 06-054.00-074 AND A 2,420 S.F. BUILDING ON TAX PARCEL 06-054.00-075, EXTINGUISH THE BOUNDARY LINE BETWEEN THE TWO PARCELS, AND TO CONSTRUCT A 3,934± S.F. BANK WITH DRIVE-THROUGH LANES AND ASSOCIATED PARKING.
2. THE PROPERTY LINES AND TOPOGRAPHY DEPICTED ON THIS PLAN ARE TAKEN FROM THE BOUNDARY AND TOPOGRAPHICAL SURVEY ENTITLED "1708 & 1712 FOULK ROAD - FOULK & SILVERSIDE ROADS", BY RAMESH C. BATTA ASSOCIATES, DATED OCTOBER 19, 2009.
3. FLOODPLAIN DOES NOT EXIST ON THIS SITE, PER FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 10003C0067 J, EFFECTIVE DATE JANUARY 17, 2007.
4. ACCORDING TO THE WATER RESOURCE PROTECTION AREA MAP 1 OF 3, DATED JANUARY 1993, AND REVISED MAY 2001 AND FEBRUARY 2006, THIS SITE DOES NOT LIE WITHIN THE LIMITS OF A W.R.P.A.
5. NO CRITICAL NATURAL RESOURCE AREAS EXIST WITHIN THE SITE PER THE NATURAL AREAS INVENTORY.
6. THIS SITE WAS EVALUATED IN ACCORDANCE WITH THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL TO IDENTIFY THE PRESENCE OF JURISDICTIONAL WETLANDS, AND NO WETLANDS WERE FOUND TO EXIST ON THE SITE. SEE LETTER OF NO FINDINGS, BY DUFFIELD ASSOCIATES, DATED OCTOBER 7, 2009.
6. NO DEBRIS IS TO BE BURIED ON THIS SITE.
7. ALL ENTRANCES SHALL CONFORM TO DELDOT'S STANDARDS AND REGULATIONS FOR SUBDIVISION STREETS AND STATE HIGHWAY ACCESS AND SHALL BE SUBJECT TO ITS APPROVAL.
8. EXCEPT AS MODIFIED BY THESE DRAWINGS AND CONTRACT DOCUMENTS, ALL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH "THE STATE OF DELAWARE DEPARTMENT OF TRANSPORTATION (DELDOT) STANDARD SPECIFICATIONS", DATED AUGUST 2001, LATER REVISED JANUARY 2008.
9. CONTRACTOR SHALL PRESERVE ALL TREES ON THIS SITE UNLESS SPECIFIED FOR REMOVAL IN THE APPROVED LANDSCAPE PLAN FOR THE SITE.
10. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS IN THE FIELD AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH WORK.
11. THE CONTRACTOR'S ACTIVITIES SHALL BE LIMITED TO THE AREA WITHIN THE LIMIT OF DISTURBANCE LINE SHOWN ON THESE DRAWINGS. STORAGE OF EQUIPMENT / MATERIALS OUTSIDE OF THIS AREA SHALL NOT BE PERMITTED. PARKING OF VEHICLES OUTSIDE THE LIMIT OF DISTURBANCE SHALL NOT BE PERMITTED WITHOUT PRIOR APPROVAL OF THE ENGINEER.
12. THESE PLANS DO NOT CONTAIN THE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY. CONSTRUCTION SAFETY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

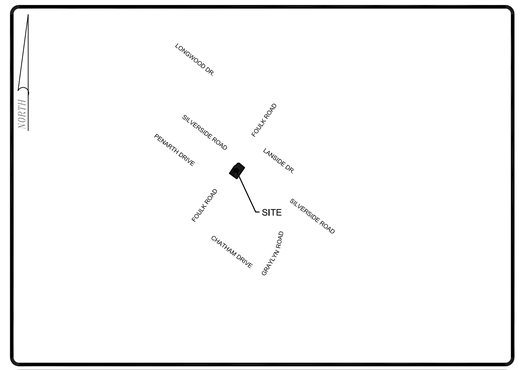


LEGEND

- EXISTING PROPERTY LINE
- EXISTING PROPERTY ADJACENT
- EXISTING BUILDING
- PROPOSED BUILDING
- PROPOSED SIDEWALK
- PROPOSED CURB, 8-INCH REVEAL

SITE SOILS:

NtB - NESHAMINY-TALLEYVILLE URBAN LAND COMPLEX
3% - 8% SLOPES - HSG B



MAP: NCC ZONING MAP 10 — LOCATION MAP — SCALE: 1" = 1/4 MILE

SITE DATA:

1.	APPLICATION NO.:	_____	
2.	TAX PARCEL NO.:	06-054.00-074	06-054.00-075
3.	POSTAL ADDRESS:	1712 FOULK ROAD WILMINGTON, DE 19803	1708 FOULK ROAD WILMINGTON, DE 19803
4.	OWNER:	NAME ADDRESS	NAME ADDRESS
5.	SOURCE OF TITLE:	DEED BOOK _____	INSTRUMENT NO. _____
6.	DATUM:	HORIZONTAL - NAD 1983 (DELAWARE STATE PLANE) VERTICAL - NAVD 1988 BENCHMARK: TOP OF EXISTING STORM MANHOLE NEAR STOP BAR IN FOULK ROAD NORTHBOUND RIGHT THROUGH LANE, ELEVATION 374.49	
7.	ACREAGE:	EXISTING GROSS AREA: 06-054.00-074 0.6578 ACRES 06-054.00-075 0.3476 ACRES TOTAL 1.0054 ACRES	
8.	ZONING DISTRICT:	CN-COMMERCIAL NEIGHBORHOOD	
9.	AREAS:	EXISTING BUILDINGS/CANOPY: 0.151 AC EXISTING OTHER IMPERVIOUS: 0.597 AC EXISTING LANDSCAPED AREA: 0.257 AC EXISTING TOTAL: 1.005 AC PROPOSED BUILDINGS/CANOPY: 0.106 AC PROPOSED OTHER IMPERVIOUS: 0.580 AC PROPOSED LANDSCAPED AREA: 0.319 AC PROPOSED TOTAL: 1.005 AC PROPOSED STORMWATER MANAGEMENT AREA: 0.072 AC	
	GROSS FLOOR AREA:	EXISTING (TO BE REMOVED): 1712 FOULK RD 1,824 SF 1708 FOULK RD 2,420 SF TOTAL 4,244 SF PROPOSED (BANK): 3,934 SF	
10.	PARKING RATIONALE:	REQUIRED: 3,934 S.F. (BANK) @ 4.0 P.S. PER 1000 S.F. = 16 SPACES 3 DRIVE-IN LANES @ 6 STACKING PER LANE = 18 STACKING SPACES PROVIDED: 30 (BANK) W/ 2 HANDICAP SPACES PLUS 18 STACKING SPACES	
11.	WATER SUPPLY:	UNITED WATER DELAWARE	
12.	SANITARY SEWER:	NEW CASTLE COUNTY	
13.	LIMIT OF DISTURBANCE:	POI#1 (DELDOT INLET): 0.300 AC POI#2 (DELDOT INLET): 0.278 AC POI#3 (LAWN INLET): 0.509 AC TOTAL: 1.087 AC	

INDEX OF SHEETS

THE COMPLETE PROJECT PLAN SET INCLUDES:

- RECORD MINOR LAND DEVELOPMENT PLAN
- GENERAL DEVELOPMENT PLANS
- SEDIMENT & STORMWATER MANAGEMENT PLANS
- LANDSCAPE PLAN
- LIGHTING PLAN

SITE DESIGNER CERTIFICATION

I HEREBY CERTIFY THAT THIS PLAN HAS BEEN PREPARED UNDER MY SUPERVISION AND TO THE BEST OF MY KNOWLEDGE COMPLIES WITH THE APPLICABLE STATE AND LOCAL REGULATIONS AND ORDINANCES.

DATE

WILLIAM J. MATHER, P.E.
REGISTRATION #10817

OWNER CERTIFICATION

I, THE UNDERSIGNED, HEREBY CERTIFY THAT ALL LAND CLEARING, CONSTRUCTION, AND DEVELOPMENT SHALL BE PURSUANT TO THE APPROVED PLAN AND RESPONSIBLE PERSONS INVOLVED WILL HAVE A CERTIFICATE OF TRAINING FROM DNREC. DNREC AND NEW CASTLE COUNTY PERSONNEL SHALL HAVE THE RIGHT TO CONDUCT ON-SITE INSPECTIONS.

DATE OWNER

DUFFIELD ASSOCIATES
Consultants in the Geosciences
5400 LIMESTONE ROAD
WILMINGTON, DE 19808-1232
TEL: (302)239-6634
FAX (302)239-8485
OFFICES IN DELAWARE, MARYLAND, PENNSYLVANIA AND NEW JERSEY
E-MAIL: DUFFIELD@DUFFNET.COM

CHECKED BY: WJM
DESIGNED BY: MJK/CMK
DRAWN BY: CMK
FILE NAME: 9151CA-DURMM
WILLIAM J. MATHER, P.E.
STATE: DELAWARE P.E.# 10817

No.	REVISION	CHK'D BY

OWNER:
TAX PARCEL 06-054.00-074
NAME:
ADDRESS:
PHONE:

TAX PARCEL 06-054.00-075
NAME:
ADDRESS:
PHONE:

APPROVAL STAMP:

PRELIMINARY SEDIMENT & STORMWATER MANAGEMENT PLANS

COVER SHEET

REDEVELOPMENT PROJECT

FOULK ROAD

BRANDYWINE HUNDRED-NEW CASTLE COUNTY-DELAWARE

DATE: 30 AUGUST 2011
SCALE: 1" = 20'
PROJECT NO. 9151.CA
SHEET: 1 OF 3

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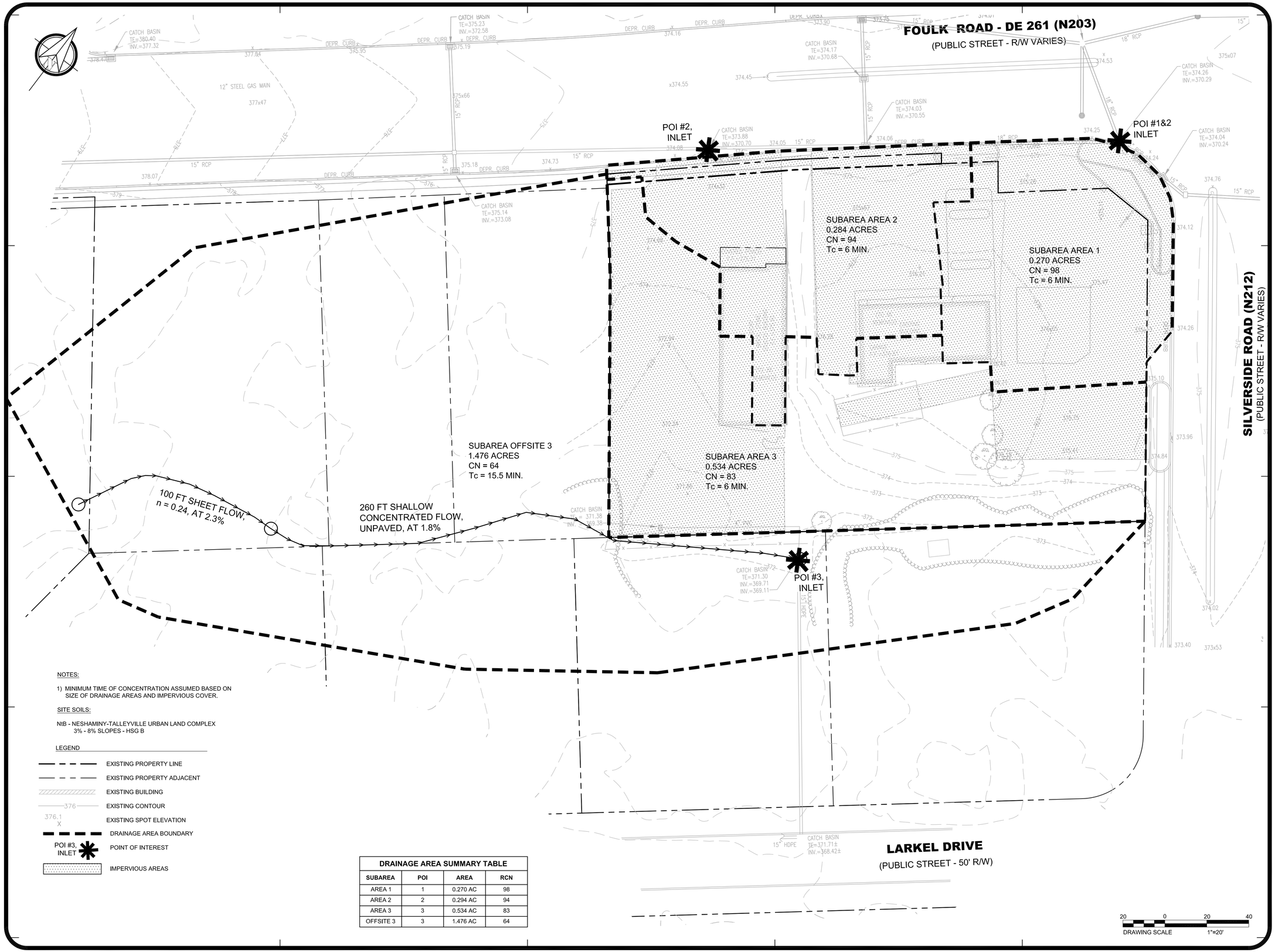
Effective April 2016



DRAINAGE AREA SUMMARY TABLE

SUBAREA	POI	AREA	RCN
AREA 1	1	0.270 AC	98
AREA 2	2	0.294 AC	94
AREA 3	3	0.534 AC	83
OFFSITE 3	3	1.476 AC	64

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DRAWN BY: CMK
FILE NAME: 9151CA-DURMM
WILLIAM J. MATHER, P.E.
STATE: DELAWARE P.E.# 10817

No.	REVISION	CHKD BY

OWNER:

PRELIMINARY SEDIMENT & STORMWATER MANAGEMENT PLANS
PRE-LIMIT OF DISTURBANCE DRAINAGE AREA PLAN

REDEVELOPMENT PROJECT
FOULK ROAD

BRANDYWINE HUNDRED~NEW CASTLE COUNTY~DELAWARE

DATE: 30 AUGUST 2011
SCALE: 1" = 20'
PROJECT NO. 9151.CA
SHEET: 2 OF 3

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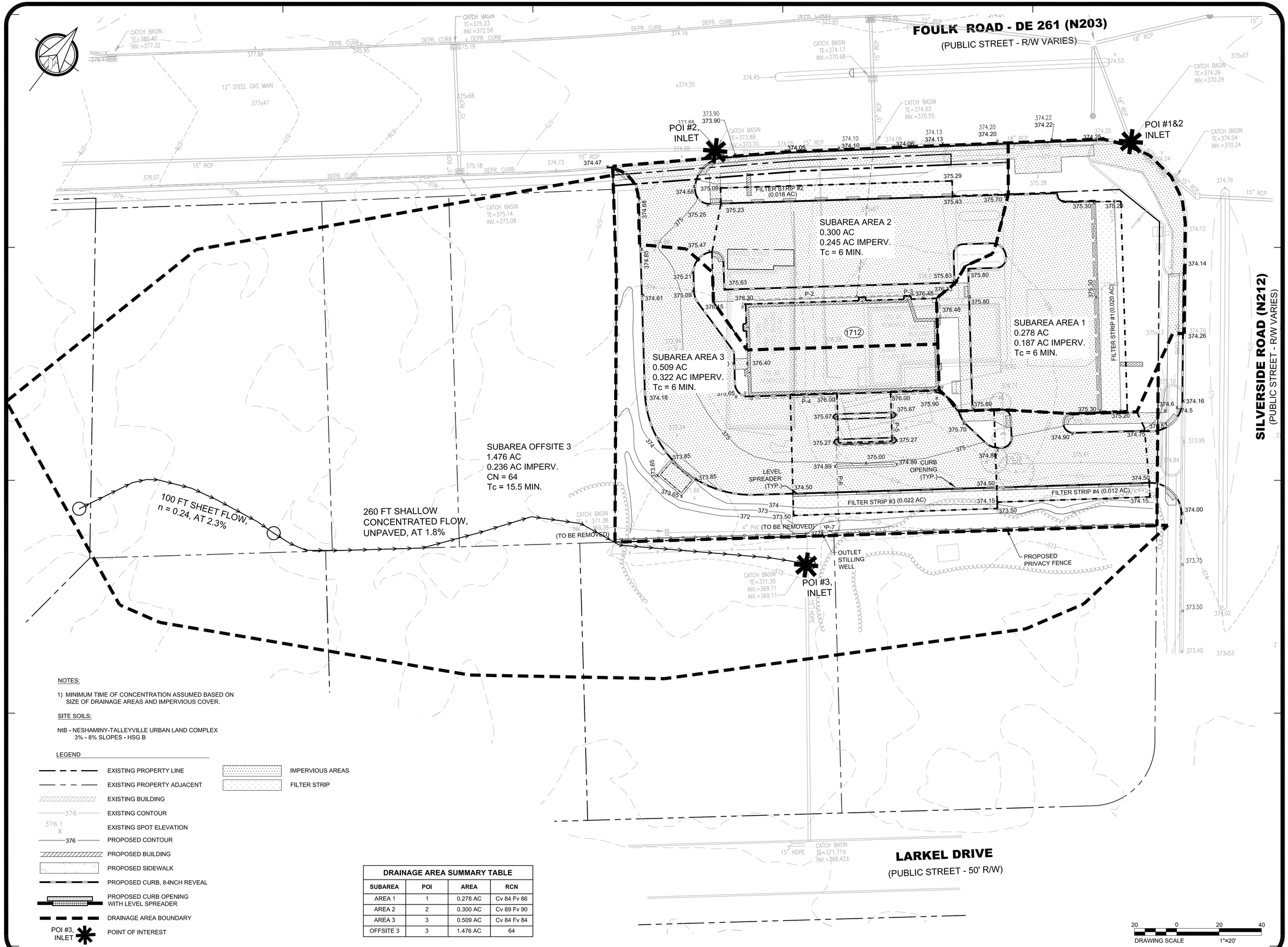
Effective April 2016



NOTES:

1) MINIMUM TIME OF CONCENTRATION ASSUMED BASED ON SIZE OF DRAINAGE AREAS AND IMPERVIOUS COVER.

SITE SOILS:

NIB - NESHAMINY-TALLEYVILLE URBAN LAND COMPLEX
3% - 8% SLOPES - HSG B

LEGEND

- EXISTING PROPERTY LINE
- EXISTING PROPERTY ADJACENT
- EXISTING BUILDING
- EXISTING CONTOUR (376)
- EXISTING SPOT ELEVATION (376.1 X)
- PROPOSED CONTOUR (376)
- PROPOSED BUILDING
- PROPOSED SIDEWALK
- PROPOSED CURB, 8-INCH REVEAL
- PROPOSED CURB OPENING WITH LEVEL SPREADER
- DRAINAGE AREA BOUNDARY
- POI #3, INLET — POINT OF INTEREST
- IMPERVIOUS AREAS
- FILTER STRIP

DRAINAGE AREA SUMMARY TABLE

SUBAREA	POI	AREA	RCN
AREA 1	1	0.278 AC	Cv 84 Fv 86
AREA 2	2	0.300 AC	Cv 89 Fv 90
AREA 3	3	0.509 AC	Cv 84 Fv 84
OFFSITE 3	3	1.476 AC	64

20 0 20 40
DRAWING SCALE 1"=20'

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DRAWN BY: CMK
WILLIAM J. MATHER, P.E.
STATE: DELAWARE P.E.# 10817

No.	REVISION	CHKD BY	DATE

OWNER:

PRELIMINARY SEDIMENT & STORMWATER MANAGEMENT PLANS
POST-LIMIT OF DISTURBANCE DRAINAGE AREA PLAN

REDEVELOPMENT PROJECT
FOULK ROAD

BRANDYWINE HUNDRED~NEW CASTLE COUNTY~DELAWARE

DATE: 30 AUGUST 2011
SCALE: 1" = 20'
PROJECT NO. 9151.CA
SHEET: 3 OF 3

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