STORMWATER MANAGEMENT PLAN NARRATIVE

Prepared for:

Westtown AM West TIC, LLC

Proposed Bank
Parcel No. 67-2-42.4
1506 Route 3 (West Chester Pike)
Township of Westtown
Chester County, PA

Prepared by:

DYNAMIC ENGINEERING

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I. SITE DESCRIPTION

This Narrative has been prepared to describe the stormwater drainage conditions that will occur as a result of the proposed Chase Bank located at 1506 PA State Highway Route 3 (West Chester Pike), in Westtown Township Chester County, Pennsylvania. The site is identified as Tax Parcel Number 67-2-42.4. This report should be reviewed in conjunction with the Stormwater Management Plan drawing that is included in the Overall Site Plan prepared by Dynamic Engineering Consultants, PC. Under current conditions the overall site is developed with a shopping center in which the portion which we proposed to develop is being used as an accessory asphalt parking area. The subject site is bound to the north by PA State Highway Route 3 (West Chester Pike), to the east by retail use and beyond, to the south by accessory parking for retail use, and to the west by accessory parking for retail use. The site has been in its current condition for over 25 years based on historical aerial imagery.

II. PROJECT DESCRIPTION

The site is presently developed as a shopping center. The proposed Chase Bank pad is to be added within the existing parking lot. The proposal includes the construction of the new 3,294 SF Chase Bank and associated improvements such as lighting, landscaping, grading, walkways, driveways, utilities, parking, and other associated items. The total limit of disturbance is 33,327 SF (0.76 acres).

III. DESIGN OVERVIEW

This Stormwater Management Plan Narrative identifies and describes the manner by which the stormwater management design satisfies the performance measures set forth by the Westtown Township Stormwater Management Ordinance, Westtown Township Subdivision & Land Development Ordinance (SALDO), the requirements of Chester County Conservation District (CCCD) to minimize adverse impact of the stormwater runoff to receiving water bodies and surrounding areas in the Chester Creek Watershed.

The scope of this study includes the proposed Chase Bank, associated parking areas, utilities, and proposed on-site stormwater management features as depicted on accompanying engineering plans. Based upon the scope of the project, the development is classified as a "regulated activity" per the regulator agencies and, as such the project has been designed to meet the water quality, volume reduction and stormwater runoff rate standards set forth in the Chester Creek Stormwater Management District.

Runoff generated by the subject site drains to Tributary 00607 of the Chester Creek, which is located within the Chester Creek Watershed. The Chester Creek Watershed is ultimately tributary to the Lower Delaware River. Tributary 00607 is classified as Trout Stocking (TSF) and Migratory Fish (MF) water per Pennsylvania's Water Quality Criteria (PA Code Title 25, Chapter 93) and is not considered a Special Protection or Exceptional Value water. This report will address the specific design elements required by the State, County and Township for discharges to surface waters of this type.

Accordingly, the following items are addressed within this report:

- Standards for nonstructural stormwater management project design
- Water quality and streambank erosion protection
- Evaluation of the non-discharge alternative
- Volume control and runoff quantity standards
- Calculation of stormwater runoff and groundwater recharge

A hydrological evaluation is provided for the 1, 2, 10 and 100-year design storm events utilizing the Urban Hydrology for Small Watershed TR55 method. Per the Chester Creek Stormwater Management District, the post-development runoff rates are not to exceed the pre-development runoff rates as listed in the table below:

Proposed Condition Design Storm	Reduce to Predevelopment Condition Design Storm
2-year	2-year
10-year	10-year
100-year	100-year

The stormwater analysis includes the requirements set forth in the Ordinance as follows:

- The analysis in Appendix F demonstrates that the proposed subsurface infiltration basin BMP will manage the net change for storms when compared to preconstruction runoff volume and water quality.
- The existing pre-development non-forested pervious areas are considered meadow in good condition in the existing condition analysis.
- The water quality volume and treatment has been maximized to the extent practicable.
- The analysis demonstrates the proposed BMPs will meet the rate requirements specified in the Chester Creek Stormwater Management District; and manage the net change in peak rate for the 1-, 2-, 10-, and 100-year/24-hour storm event to not exceed the maximum allowable rates. The below sections discuss compliance with the applicable peak discharge rate.

IV. EXISTING DRAINAGE CONDITIONS

The subject site is currently developed with asphalt pavement parking.

No stream, wetlands, floodway, watercourse, or riparian forest buffers are located on or near the direct vicinity of the subject site.

Under the existing conditions, stormwater runoff generated by the subject site drains to the East Branch Chester Creek. This stormwater analysis will focus primarily on the proposed Chase Bank. The limits of the drainage study have been delineated to accommodate the proposed development and any off-site discharge to the subject site. Two (2) points of interest (POIs) have been analyzed for this project. The points of interest ensure post-development runoff rates and volume are reduced/equal in post development conditions. One (1) point of interest (POI) has been analyzed for this project. The point of interest ensures post-development runoff rates and volumes are reduced to the existing conveyance system and will not be negatively impacted. The point of interest is ultimately tributary to the Chester Creek Watershed. The tract has been evaluated with the following drainage sub watershed areas as depicted on the Existing Drainage Area Map included within Appendix L of this report.

<u>Pre-Development POD 1:</u> POD 1 is identified on the Drainage Area Maps (Appendix L) as an existing inlet tributary to the existing stormwater basin (Basin B) for the existing shopping center located to the southwest of the property. The analyzed drainage area includes approximately eighty six of the subject property, the site's frontage along the Route 3 (West Chester Pike). Under existing conditions, stormwater run-off from these areas flows uncontrolled sheet flow to an existing inlet located south of the site. The post-developed flow rate and volume will be reduced to the maximum allowable rate set forth within the Chester Creek ACT 167 at POD 1.

<u>Pre-Development POD 2:</u> POI D is identified on the Drainage Area Maps (Appendix L) as bypass off the southeast portion of the lot to an existing basin (Basin C) located to the southeast of the site. The analyzed drainage area includes the remaining portion of the subject property and the remaining portion of the site not included in POI 1. Under existing conditions, stormwater run-off from these areas flows shallow concentrated flow to the existing basin used to manage existing site. The post-developed flow rate and volume will be reduced to the maximum allowable rate set forth within the Chester Creek ACT 167 at POI 2.

Based upon the USDA Natural Resources Conservation Service (NRCS) Soil Survey, the soil type native to the site are:

CHESTER COUNTY SOIL SURVEY INFORMATION		
SOIL TYPE (SYMBOL)	**SOIL TYPE (NAME)**	**HYDROLOGIC SOIL GROUP (HSG)**
UrB	Urban land, 0 to 8 percent slopes	B

These soils types are further described as follows:

Urban land, zero to eight percent slopes (UrB): This soil series is generally mapped beneath the entire subject property. The parent material is reported to be pavement, buildings, and other artificially covered areas of human transported material. The typical soil profile and depth to seasonal high groundwater is not reported.

V. PROPOSED DRAINAGE CONDITIONS

Under the proposed conditions, the site will be developed with 3,294 SF Chase Bank and associated improvements such as lighting, landscaping, grading, walkways, driveways, utilities, parking, and a subsurface infiltration basin. The intent of the proposed design is to maintain the existing runoff characteristics where practicable and manage the peak flow and volume to the point of interest (POD). All storm events will be released within the allowable reduction limits. The site improvements have been designed to respect and maintain the existing drainage patterns and minimize soil disturbance to the fullest extent possible. The post-development conditions were modeled utilizing drainage sub-watershed areas similar to the existing conditions model. These drainage sub-watershed areas are depicted on the Proposed Drainage Map included within Appendix L of this narrative and are further described below:

<u>Post-Development POD 1:</u> POD 1 is identified on the Drainage Area Maps (Appendix L) as an existing inlet tributary to the existing stormwater basin (Basin B) for the existing shopping center located to the southwest of the property. The analyzed drainage area includes a majority of the subject property as well as the site's frontage along the Route 3. A majority of the runoff generated from this area is conveyed via a proposed stormwater conveyance system to one (1) proposed subsurface infiltration basin. An infiltration rate of 0.20 in/hr was assumed for the design of the infiltration basin. For these reasons, a subsurface infiltration basin is proposed to be utilized for this project. A further, more detailed discussion of the proposed subsurface infiltration basin is provided in subsequent sections of this narrative. Volume reduction will be achieved utilizing the subsurface infiltration basin BMP and an outlet control structure with low flow orifices. However, this system will ultimately be tributary to the existing inlet within the stormwater conveyance system located to the west of the development near the shopping center access driveway. The remaining portion of runoff generated by this area bypasses the proposed subsurface infiltration basin and flows via sheet flow directly to the aforementioned existing inlet in the stormwater conveyance system to the south of the site. The post-developed flow rate and volume will be reduced to the maximum allowable rate set forth within the Chester Creek ACT 167 at POI 1.

Post-Development POD 2: POI D is identified on the Drainage Area Maps (Appendix L) as bypass off the southeast portion of the lot to an existing basin (Basin C) located to the southeast of the site. The analyzed drainage area includes the remaining portion of the subject property and the remaining portion of the site not included in POI 1. The runoff generated by this area will shallow concentrated flow and bypass to the existing basin (Basin C) located to the southeast of the property. The proposed drainage patterns have been designed to significantly reduce the pre-development bypass area at POI-2 in post-development conditions, stormwater runoff generated by the overall site is conveyed to the proposed on-site stormwater management system to the maximum extent possible (associated with POI 1). The post-developed flow rate and volume will be reduced to the maximum allowable rate set forth within the Neshaminy Creek ACT 167 at POI 2. When both Points of Interest are analyzed together, the development will ultimately decrease total stormwater runoff rate and volume to the existing inlet associated with the existing stormwater conveyance system within the Veterans Highway right-of-way and the northwest corner of the property in post conditions.

VI. DESIGN METHODOLOGY

The intent of the design of the proposed stormwater management plan for this redevelopment project is to provide measures as required to address applicable aspects of the Township Ordinances and PA Code Title 25. In order to prepare the stormwater management design for the subject project, extensive initial investigation of the property and topographic survey were performed. On-site review of the tract was performed by Dynamic Engineering Consultants, PC and Dynamic Earth to verify existing site conditions and land cover characteristics. Dynamic Survey, LLC, prepared an overall boundary, location and topographic survey.

Based on review of the existing site conditions, the Drainage Area Maps were prepared for the existing and proposed site conditions as defined within this report. A site layout is proposed within the tract area of the previously existing development to the maximum extent possible, and a grading plan was developed with consideration to the existing drainage patterns. The plan was designed to maintain drainage patterns and reduce peak flow rates and volumes from post-development to pre-development conditions to the maximum extent feasible.

Stormwater runoff generated by the proposed improvements will be collected by a series of inlets and directed into the proposed subsurface infiltration basin within the parking lot or sheet flow directly into the existing stormwater conveyance system. The stormwater conveyance system has been designed to safely convey the 100-year storm event. The pipe sizes have been calculated utilizing the Rational Method. See Appendix I of this narrative for pipe sizing calculations.

Runoff volumes for the site were modeled utilizing HydroCAD 10.20-5a computer software, utilizing the Urban Hydrology for Small Watershed TR55 method for the applicable design storms. The 1, 2-, 10- and 100-year design rainfall depths were obtained from NOAA Atlas 14 for the site with a type II distribution. The rainfall depth values are included in Appendix E of this narrative. Existing and proposed curve number calculations have been included within Appendix C and D of this report and are based upon the associated Hydrological Soil Groups. Since the project has a relatively small footprint and a majority of the site is impervious, the existing time of concentration utilized is 6 minutes. Associated hydrographs are included in Appendixes G and H of this narrative.

VII. BMP DESIGN

The proposed Stormwater Management BMPs have been designed in conformance with the Pennsylvania Stormwater Best Management Practices Manual. The BMPs have been designed to provide improved water quality functions as well as to slow the rate of runoff from the subject parcel.

Subsurface Infiltration Bed (BMP 6.4.3)
The subsurface infiltration basin has been proposed on-site and located beneath the standard duty asphalt pavement. Stormwater runoff from the site is collected in the inlets and piped to the subsurface infiltration basin. Design elements incorporated into the subsurface detention basin include the following:

- 24" HDPE Perforated Pipe System;
- Basin designed with flat bottom for infiltration;
- Proposed outlet control structure to control rate of discharge, and
- Not installed on recently placed fill (<5 years)

VIII. BMP LOADING RATIOS

Loading ratios are one of the most integral aspects related to the design of infiltration BMPs. Overloading is the most common reason for failure of a BMP. This is due to the increased presence of total suspended solids (TSS). The loading ratio is determined by comparing the drainage area and infiltration area. The Pennsylvania BMP manual recommends loading ratios of 5:1 for impervious areas and 8:1 for overall.

The recommended loading ratios are exceeded for the subsurface infiltration basin on this project, however, there are multiple reasons why the exceeded loading ratios are justified for these BMPs. A portion of the impervious area (3,294 SF) which drains to the infiltration BMPs is clean roof area. Roof area provides about one-quarter of TSS as compared to traveled streets.

Although some infiltration BMP areas for this project have a loading ratio in excess of the recommend ratios found in the Pennsylvania BMP manual, it is with the understanding of the justifications above that these BMPs will be able to function as designed, provided that they are properly maintained. The area calculations are as follows:

Surface and Impervious Area to Infiltration Area (Subsurface Infiltration Basin)	
Total Tributary Area	31,404 SF
Impervious Area	20,941 SF
Roof Area	3,294 SF
Infiltration Area (2-Year WSEL)	3,090 SF

BASIN LOADING RATIOS (Subsurface Infiltration Basin)		
Basin # 1	Ratio of Total Tributary Area (8:1 recommended)	Ratio of Impervious Tributary Area (5:1 recommended)
With Roof Impervious	10.1:1	6.7:1
Without Roof Impervious	**9.1:1**	**5.7:1**

IX. WATER QUALITY AND STREAMBANK EROSION PROTECTION

The water quality and streambank erosion protection design has been developed to satisfy the applicable requirements of the Township Ordinances via a subsurface infiltration basin. The intent of the drainage design is to maintain the existing drainage patterns and discharge points while satisfying the applicable water quality and streambank erosion protection criteria. As previously mentioned, the subject site is previously developed. The proposed redevelopment has been designed to remain largely within the limits of the previously developed area. Based on the fact that existing flow patterns are maintained, runoff is reduced and existing outlet protection measures are adequate, no negative downstream impacts are anticipated from the proposed improvements.

X. RUNOFF RATE REDUCTION PERFORMANCE

Per the Township Ordinances, specific post-development peak flow rate reductions are required. The proposed development has been designed to limit the impervious coverage on site as well as provide stormwater BMPs to meet these reduction requirements. The following table provides the existing and proposed peak runoff rate performance for the point of interest also found in Appendix F:

Westtown AM West TIC, LLC POI-001				
POD #002				
Design Storm	**Pre-Development (CFS)**	**Max Allowable (CFS)**	**Post-Development (CFS)**	**Reduction in Flow (CFS)**
1 YR	0.79	0.79	0.33	-0.46
2 YR	1.02	1.02	0.58	-0.44
5 YR	1.40	1.40	1.24	-0.16
10 YR	1.75	1.75	1.61	-0.14
25 YR	2.28	2.28	2.03	-0.25
50 YR	2.74	2.74	2.34	-0.40
100 YR	3.26	3.26	2.67	-0.59

Westtown AM West TIC, LLC POI-002				
POD #002				
Design Storm	**Pre-Development (CFS)**	**Max Allowable (CFS)**	**Post-Development (CFS)**	**Reduction in Flow (CFS)**
1 YR	0.17	0.17	0.17	0.00
2 YR	0.23	0.23	0.22	-0.01
5 YR	0.34	0.34	0.29	-0.05
10 YR	0.43	0.43	0.35	-0.08
25 YR	0.58	0.58	0.44	-0.14
50 YR	0.72	0.72	0.52	-0.20
100 YR	0.87	0.87	0.60	-0.27

Westtown AM West TIC, LLC				
Pre vs. Post Development				
Design Storm	**Pre-Development (CFS)**	**Max Allowable (CFS)**	**Post-Development (CFS)**	**Reduction in Flow (CFS)**
1 YR	0.96	0.96	0.50	-0.46
2 YR	1.24	1.24	0.66	-0.58
5 YR	1.74	1.74	1.51	-0.23
10 YR	2.19	2.19	1.95	-0.24
25 YR	2.86	2.86	2.45	-0.41
50 YR	3.46	3.46	2.84	-0.62
100 YR	4.13	4.13	3.24	-0.89

XI. GROUNDWATER RECHARGE

An infiltration rate of 0.20 inches per hour was selected for the proposed subsurface infiltration basin. This rate was chosen based on the soil characteristics and existing hydrological data of the area. It is sufficient to ensure effective water management, preventing both surface flooding and excessive groundwater recharge. Additionally, this rate allows for the gradual infiltration of stormwater, promoting groundwater recharge and reducing the risk of erosion. The assumed rate aligns with local regulations and best practices for sustainable stormwater management, ensuring the basin operates efficiently under typical storm conditions.

XIII. CONCLUSION

In compliance with Township, County and State requirements, the proposed redevelopment of the subject property is designed with provisions for safe and efficient control of stormwater runoff in a manner that will not adversely affect the existing drainage patterns, the adjacent roadways, or adjacent parcels. The proposed development will comply with the Township Ordinances and State requirements for stormwater runoff quality, volume, and quantity. Based on the information summarized in this report, the proposed development will limit impacts on the existing stormwater management system and meet or exceed water quality, runoff rates, and volume requirements to the maximum extent feasible.

APPENDIX

A. NRCS SOIL SURVEY

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Chester County, Pennsylvania

July 2, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

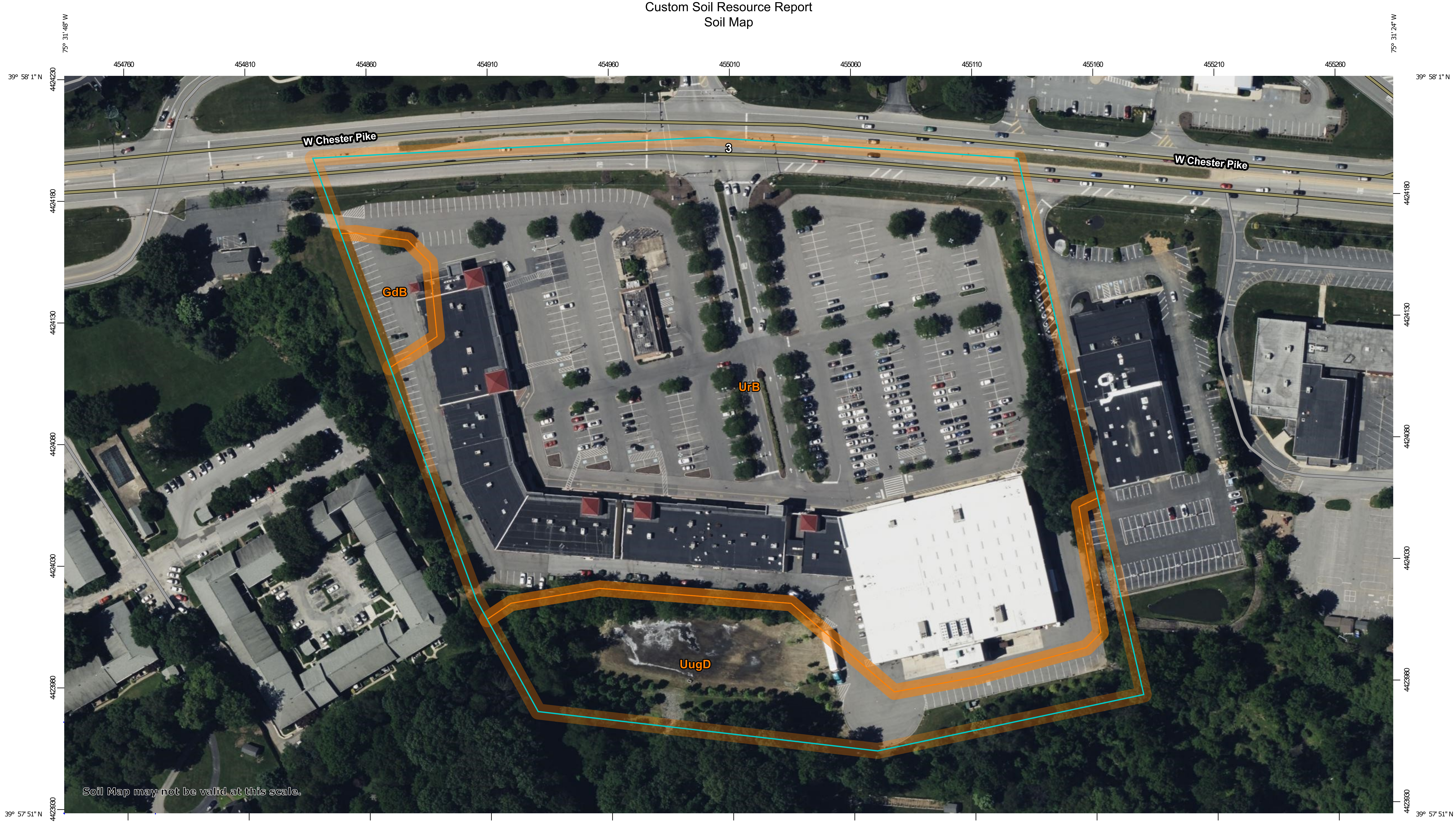
While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



Map Scale: 1:1,480 if printed on B landscape (17" x 11") sheet.

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 16, Sep 4, 2023

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

Date(s) aerial images were photographed: Jun 5, 2022—Jul 4, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GdB	Gladstone gravelly loam, 3 to 8 percent slopes	0.3	2.0%
UrB	Urban land, 0 to 8 percent slopes	13.2	81.5%
UugD	Urban land-Udorthents, schist and gneiss complex, 8 to 25 percent slopes	2.7	16.5%
Totals for Area of Interest		**16.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Chester County, Pennsylvania

GdB—Gladstone gravelly loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v7gk
Elevation: 250 to 1,200 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Gladstone and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gladstone

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy colluvium derived from granite and gneiss and/or loamy residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 10 inches: gravelly loam
Bt1 - 10 to 22 inches: sandy clay loam
Bt2 - 22 to 37 inches: loam
C - 37 to 66 inches: sandy loam
R - 66 to 76 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 60 to 80 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F148XY024PA - Moist, Piedmont - felsic, Upland, Mixed Oak - Hardwood - Conifer Forest
Hydric soil rating: No

Minor Components

Parker

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Califon

Percent of map unit: 5 percent
Landform: Flats
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Annandale

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

UrB—Urban land, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1r3nt
Elevation: 800 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Pavement, buildings and other artifically covered areas human transported material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Udorthents, unstable fill

Percent of map unit: 10 percent
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

UugD—Urban land-Udorthents, schist and gneiss complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: pjnz
Elevation: 200 to 2,000 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 45 to 61 degrees F
Frost-free period: 110 to 235 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Udorthents, schist and gneiss, and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Pavement, buildings and other artifically covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Hydric soil rating: No

Description of Udorthents, Schist And Gneiss

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Graded areas of schist and/or gneiss

Typical profile

Ap - 0 to 6 inches: loam
C - 6 to 40 inches: silty clay loam
R - 40 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 70 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 60 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Gladstone

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Glenelg

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Baile

Percent of map unit: 1 percent
Landform: Depressions

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Edgemont

Percent of map unit: 1 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Glenville

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

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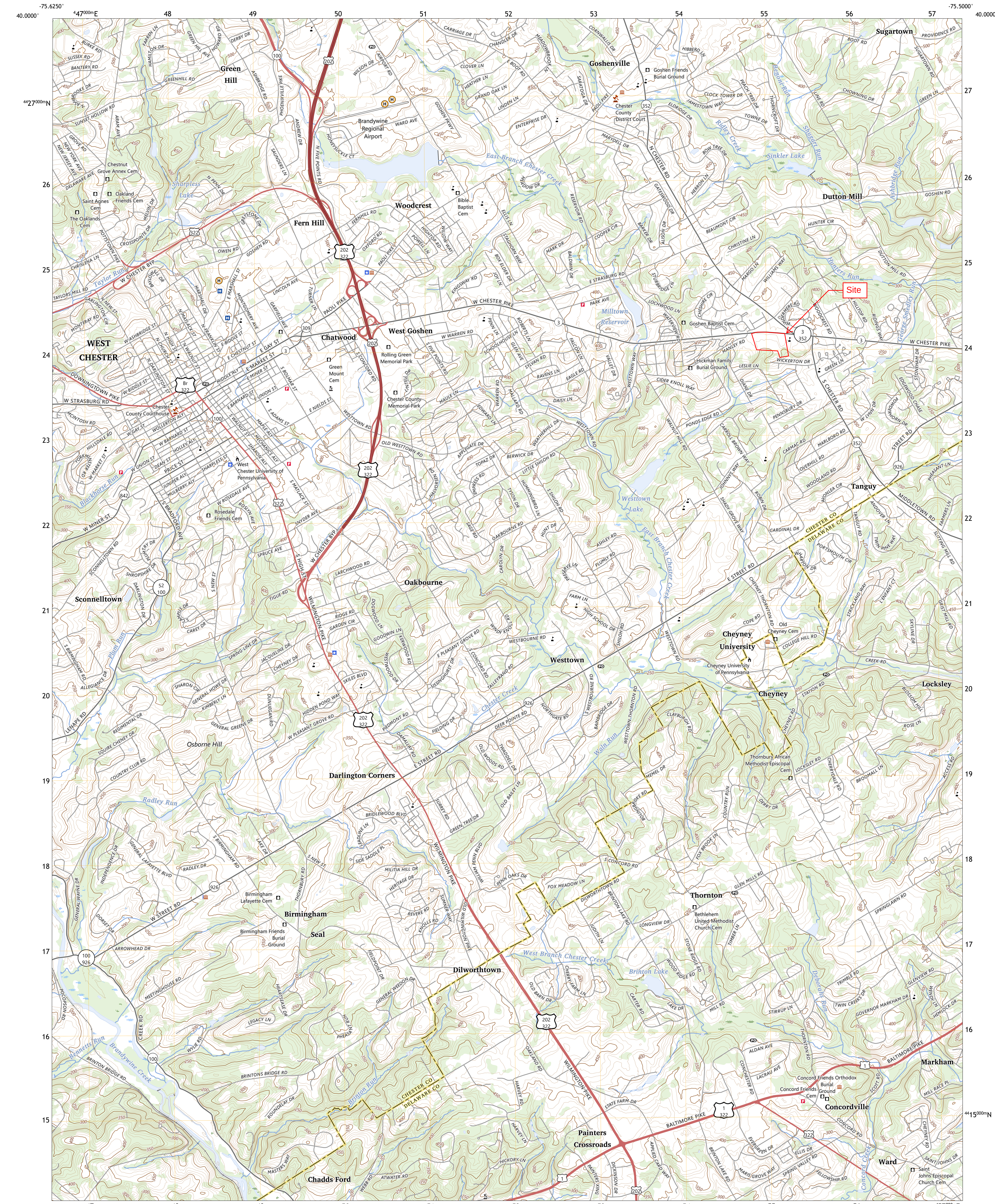
B. USGS MAP

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

WEST CHESTER QUADRANGLE
PENNSYLVANIA
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 18S
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may be shown. Obtain permission before entering private lands.

Imagery....................NAIP, June 2017 - December 2017
Roads.................U.S. Census Bureau, 2016 - 2016
Names...GNIS, 1979 - 2023
Hydrography.................National Hydrography Dataset, 2001 - 2022
Contours.........................National Elevation Dataset, 2016
Boundaries..............Multiple sources; see metadata file 2021 - 2022
Wetlands.................FWS National Wetlands Inventory 1981 - 1999

11°43′ 208 MILS
0°22′ 7 MILS
UTM GRID AND 2023 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
VK
Grid Zone Designation
18S

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

QUADRANGLE LOCATION

ADJOINING QUADRANGLES
1 Downingtown
2 Malvern
3 Valley Forge
4 Unionville
5 Media
6 Kennett Square
7 Wilmington North
8 Marcus Hook

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

WEST CHESTER, PA
2023

NSN. 7643016391932
NGA REF NO. USGSX24K48159

C. RUNOFF CURVE NUMBER (CN) CALCULATIONS - EXISTING

DYNAMIC ENGINEERING

Existing Drainage Area Summary and Average Curve Number(CN) Calculations

Project: Paramount - Westtown (Chase Bank)
Job #: 1478-99-191
Location: 1502 West Chester Pike, Westtown, PA

Computed By:KDS
Checked By: MTM
Date: 09/27/2024

Drainage Area	Impervious Area (acre)	Impervious Area (sf)	Curve Number (CN) Used	HSG B - Meadow (acre)	HSG B - Meadow (sf)	Curve Number (CN) Used	HSG B - Lawn (acre)	HSG B - Lawn (sf)	Curve Number (CN) Used	HSG B - Woods (acre)	HSG B - Woods (sf)	Curve Number (CN) Used	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
DP 001 Existing Basin B (POI 1)	0.29	12,510	98	0.11	4,833	58	0.00	-	61	0.00	-	55	0.11	0.40	6.7
40% Onsite Impervious to Meadow (POI 1)**	0.00	-	98	0.19	8,339	58	0.00	-	61	0.00	-	55	0.19	0.19	6.7
DP 002 Existing Basin C (POI 2)	0.06	2,622	98	0.07	3,251	58	0.00	-	61	0.00	-	55	0.07	0.13	6.2
40% Onsite Impervious to Meadow (POI 2)**	0.00	-	98	0.04	1,748	58	0.00	-	61	0.00	-	55	0.04	0.04	6.2
On-Site Total	**0.35**			**0.42**			**0.00**			**0.00**			**0.42**	**0.76**	

Per County Soil Survey	UrB	HSG	B	Soil	Urban Land, 0 to 8 percent slopes
Per County Soil Survey					

Description	Runoff Curve Number (CN) (HSG A)	Runoff Curve Number (CN) (HSG B)	Runoff Curve Number (CN) (HSG C)	Runoff Curve Number (CN) (HSG D)
Impervious Surface	98	98	98	98
Open Space (lawn) (good)	39	61	74	80
Woods (good)	30	55	70	77
Meadow	30	58	71	78

* All onsite open space and grass coverage in existing conditions must be considered as "Meadow" in good condition.
** 40% of the onsite impervious area must be considered as "Meadow" in good condition.

D. RUNOFF CURVE NUMBER (CN) CALCULATIONS – PROPOSED

DYNAMIC ENGINEERING

Proposed Drainage Area Summary and Average Curve Number(CN) Calculations

Project: Paramount - Westtown (Chase Bank)
Job #: 1478-99-191
Location: 1502 West Chester Pike, Westtown, PA

Computed By: KDS
Checked By: SRM
Date: 09/27/24

Drainage Area	Impervious Area (acre)	Impervious Area (sf)	Curve Number (CN) Used	HSG B - Meadow (acre)	HSG B - Meadow (sf)	Curve Number (CN) Used	HSG B - Lawn (acre)	HSG B - Lawn (sf)	Curve Number (CN) Used	HSG B - Woods (acre)	HSG B - Woods (sf)	Curve Number (CN) Used	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
PROP ONSITE TO UG BASIN	0.40	17,420	98	0.00		58	0.10	4,382	61	0.00	-	55	0.10	0.50	6.0
PROP OFFSITE TO UG BASIN	0.08	3,420	98	0.00		58	0.14	6,081	61	0.00	-	55	0.14	0.22	6.0
PROP ONSITE BYPASS TO POD 1	0.12	5,107	98	0.00		58	0.04	1,828	61	0.00	-	55	0.04	0.16	6.0
PROP ONSITE BYPASS POD 002	0.06	2,726	98	0.00	-	58	0.03	1,216	61	0.00	-	55	0.03	0.09	6.0
Total	**0.66**			**0.00**			**0.31**			**0.00**			**0.31**	**0.97**	

Per County Soil Survey	UrB	HSG	B	Soil	Urban Land, 0 to 8 percent slopes
Per County Soil Survey					

Description	Runoff Curve Number (CN)	Runoff Curve Number (CN)	Runoff Curve Number (CN)	Runoff Curve Number (CN) (HSG
Impervious Surface	98	98	98	98
Open Space (lawn) (good)	39	61	74	80
Woods (good)	30	55	70	77
Meadow	30	58	71	78

E. NOAA RAINFALL DATA

NOAA Atlas 14, Volume 2, Version 3
Location name: Bristol, Pennsylvania, USA*
Latitude: 40.1072°, Longitude: -74.8772°
Elevation: 29.17 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.347 (0.316-0.381)	0.414 (0.378-0.455)	0.492 (0.447-0.539)	0.548 (0.496-0.601)	0.617 (0.556-0.676)	0.668 (0.599-0.733)	0.718 (0.641-0.790)	0.764 (0.678-0.844)	0.822 (0.723-0.914)	0.868 (0.756-0.970)
10-min	0.555 (0.505-0.609)	0.663 (0.604-0.728)	0.788 (0.715-0.864)	0.876 (0.794-0.961)	0.984 (0.887-1.08)	1.06 (0.954-1.17)	1.14 (1.02-1.25)	1.21 (1.08-1.34)	1.30 (1.14-1.45)	1.37 (1.19-1.53)
15-min	0.693 (0.632-0.761)	0.833 (0.759-0.915)	0.996 (0.905-1.09)	1.11 (1.00-1.22)	1.25 (1.12-1.37)	1.35 (1.21-1.48)	1.44 (1.29-1.59)	1.53 (1.36-1.69)	1.64 (1.44-1.82)	1.72 (1.49-1.92)
30-min	0.950 (0.866-1.04)	1.15 (1.05-1.26)	1.42 (1.29-1.55)	1.61 (1.46-1.76)	1.85 (1.67-2.02)	2.03 (1.82-2.23)	2.21 (1.97-2.43)	2.38 (2.11-2.63)	2.61 (2.29-2.90)	2.78 (2.42-3.10)
60-min	1.19 (1.08-1.30)	1.44 (1.32-1.59)	1.82 (1.65-1.99)	2.09 (1.90-2.29)	2.46 (2.22-2.70)	2.75 (2.46-3.02)	3.04 (2.72-3.35)	3.34 (2.96-3.69)	3.74 (3.29-4.15)	4.05 (3.53-4.53)
2-hr	1.43 (1.29-1.57)	1.74 (1.58-1.91)	2.19 (1.99-2.41)	2.54 (2.30-2.79)	3.02 (2.71-3.31)	3.41 (3.04-3.73)	3.80 (3.37-4.18)	4.20 (3.70-4.63)	4.76 (4.14-5.29)	5.20 (4.48-5.81)
3-hr	1.56 (1.42-1.73)	1.90 (1.73-2.10)	2.41 (2.18-2.66)	2.80 (2.52-3.09)	3.35 (3.00-3.69)	3.79 (3.38-4.17)	4.25 (3.76-4.70)	4.73 (4.14-5.24)	5.39 (4.65-6.01)	5.94 (5.06-6.65)
6-hr	1.97 (1.79-2.18)	2.39 (2.17-2.65)	3.02 (2.73-3.33)	3.52 (3.17-3.89)	4.25 (3.80-4.69)	4.86 (4.31-5.36)	5.51 (4.84-6.09)	6.21 (5.40-6.88)	7.22 (6.16-8.06)	8.06 (6.77-9.06)
12-hr	2.40 (2.19-2.67)	2.91 (2.65-3.23)	3.69 (3.35-4.09)	4.35 (3.93-4.82)	5.34 (4.77-5.90)	6.19 (5.48-6.85)	7.13 (6.23-7.90)	8.16 (7.02-9.10)	9.71 (8.16-10.9)	11.0 (9.11-12.5)
24-hr	2.76 (2.56-2.98)	3.34 (3.10-3.60)	4.25 (3.95-4.59)	5.03 (4.65-5.42)	6.19 (5.68-6.65)	7.19 (6.54-7.71)	8.29 (7.48-8.89)	9.51 (8.49-10.2)	11.3 (9.96-12.2)	12.9 (11.2-13.9)
2-day	3.18 (2.95-3.46)	3.86 (3.57-4.19)	4.92 (4.55-5.35)	5.81 (5.35-6.31)	7.12 (6.52-7.70)	8.23 (7.48-8.90)	9.45 (8.52-10.2)	10.8 (9.62-11.7)	12.7 (11.2-13.8)	14.4 (12.5-15.7)
3-day	3.37 (3.14-3.65)	4.08 (3.79-4.42)	5.18 (4.81-5.61)	6.10 (5.64-6.59)	7.43 (6.84-8.01)	8.56 (7.82-9.22)	9.78 (8.88-10.5)	11.1 (10.0-12.0)	13.1 (11.6-14.1)	14.7 (12.9-15.9)
4-day	3.56 (3.32-3.84)	4.31 (4.01-4.64)	5.44 (5.07-5.87)	6.38 (5.93-6.88)	7.75 (7.15-8.33)	8.89 (8.16-9.55)	10.1 (9.24-10.9)	11.5 (10.4-12.3)	13.4 (12.0-14.4)	15.0 (13.3-16.2)
7-day	4.18 (3.90-4.49)	5.02 (4.69-5.40)	6.26 (5.84-6.73)	7.30 (6.78-7.83)	8.79 (8.13-9.42)	10.0 (9.25-10.8)	11.4 (10.4-12.2)	12.8 (11.7-13.7)	14.9 (13.4-16.0)	16.7 (14.9-17.9)
10-day	4.77 (4.47-5.10)	5.71 (5.36-6.11)	7.01 (6.57-7.49)	8.07 (7.55-8.61)	9.58 (8.92-10.2)	10.8 (10.0-11.5)	12.1 (11.2-12.9)	13.5 (12.4-14.4)	15.4 (14.0-16.4)	17.0 (15.3-18.2)
20-day	6.46 (6.11-6.83)	7.67 (7.26-8.11)	9.19 (8.71-9.72)	10.4 (9.84-11.0)	12.1 (11.4-12.7)	13.4 (12.6-14.1)	14.7 (13.8-15.5)	16.1 (15.0-17.0)	17.9 (16.6-19.0)	19.4 (17.8-20.6)
30-day	8.02 (7.63-8.44)	9.47 (9.00-9.97)	11.1 (10.6-11.7)	12.4 (11.8-13.1)	14.2 (13.4-14.9)	15.5 (14.6-16.3)	16.8 (15.8-17.7)	18.1 (17.0-19.1)	19.9 (18.6-21.0)	21.2 (19.7-22.4)
45-day	10.3 (9.78-10.7)	12.1 (11.5-12.6)	14.0 (13.3-14.6)	15.4 (14.7-16.1)	17.2 (16.4-18.0)	18.6 (17.7-19.5)	19.9 (18.9-20.9)	21.2 (20.0-22.3)	22.8 (21.5-24.0)	24.0 (22.5-25.3)
60-day	12.3 (11.7-12.8)	14.4 (13.8-15.1)	16.5 (15.8-17.2)	18.1 (17.3-18.9)	20.1 (19.2-21.0)	21.5 (20.5-22.5)	22.9 (21.8-23.9)	24.1 (22.9-25.3)	25.7 (24.4-27.0)	26.9 (25.4-28.2)

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

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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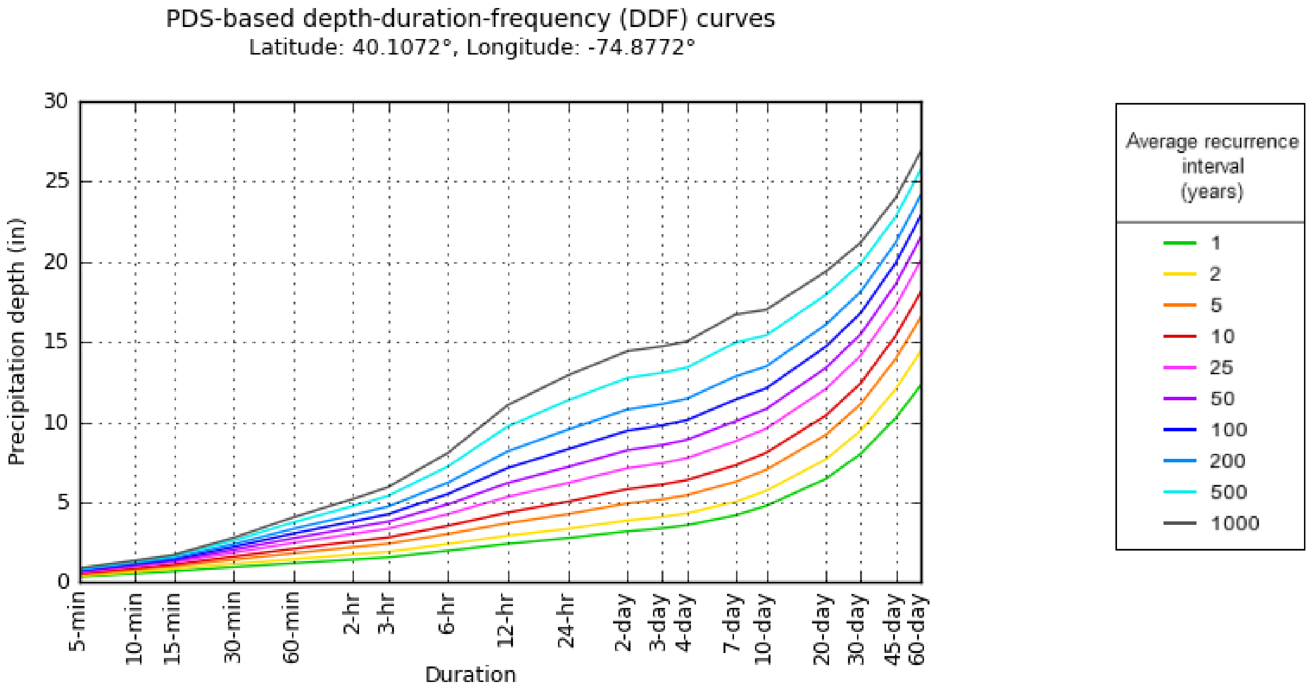
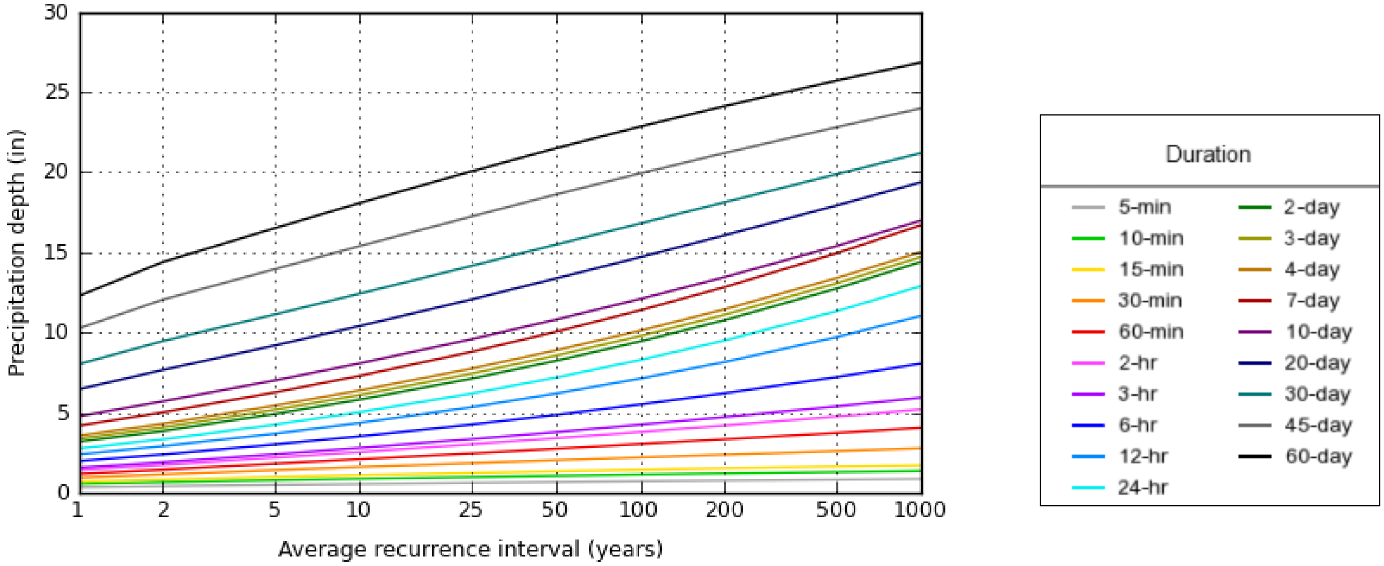
PF graphical





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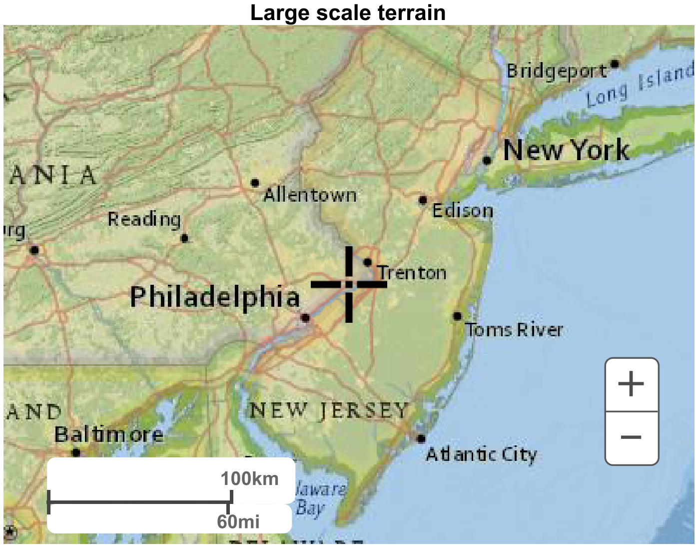
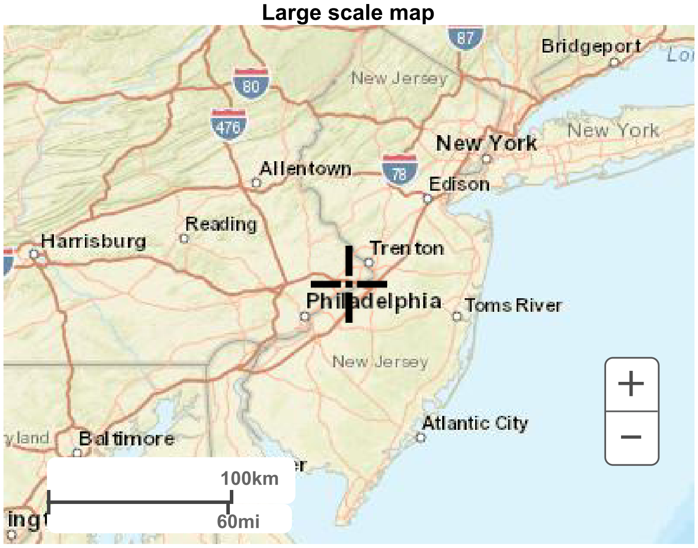
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map



Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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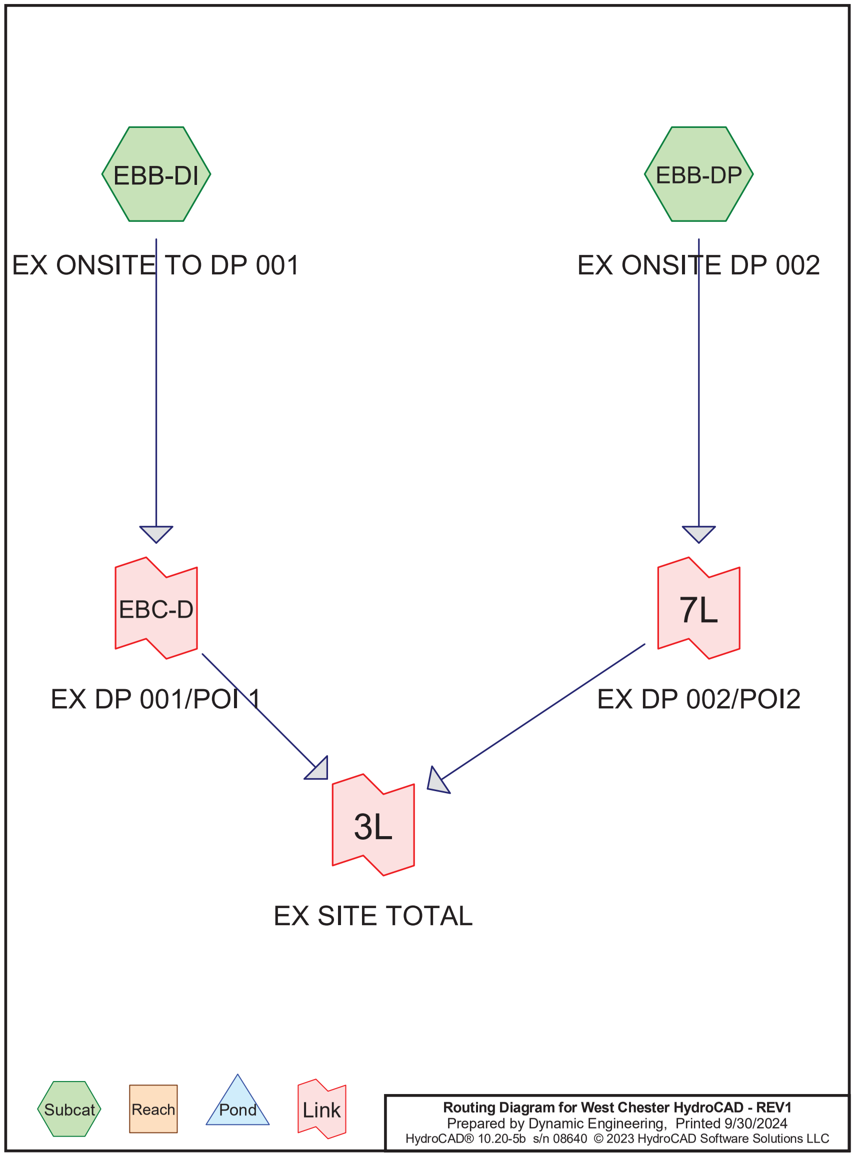
F. PEAK RATE SUMMARY

POD-01				
Design Storm	Pre-Development (CFS)	Max Allowable (CFS)	Post-Development (CFS)	Reduction in Flow (CFS)
1 YR	0.79	0.79	0.33	-0.46
2 YR	1.02	1.02	0.58	-0.44
5 YR	1.40	1.40	1.24	-0.16
10 YR	1.75	1.75	1.61	-0.14
25 YR	2.28	2.28	2.03	-0.25
50 YR	2.74	2.74	2.34	-0.40
100 YR	3.26	3.26	2.67	-0.59

POD-02				
Design Storm	Pre-Development (CFS)	Max Allowable (CFS)	Post-Development (CFS)	Reduction in Flow (CFS)
1 YR	0.17	0.17	0.17	0.00
2 YR	0.23	0.23	0.22	-0.01
5 YR	0.34	0.34	0.29	-0.05
10 YR	0.43	0.43	0.35	-0.08
25 YR	0.58	0.58	0.44	-0.14
50 YR	0.72	0.72	0.52	-0.20
100 YR	0.87	0.87	0.60	-0.27

SITE TOTAL				
Design Storm	Pre-Development (CFS)	Max Allowable (CFS)	Post-Development (CFS)	Reduction in Flow (CFS)
1 YR	0.96	0.96	0.50	-0.46
2 YR	1.24	1.24	0.66	-0.58
5 YR	1.74	1.74	1.51	-0.23
10 YR	2.19	2.19	1.95	-0.24
25 YR	2.86	2.86	2.45	-0.41
50 YR	3.46	3.46	2.84	-0.62
100 YR	4.13	4.13	3.24	-0.89

G. HYDROGRAPH SUMMARY REPORTS -
EXISTING CONDITIONS
1 YR, 2 YR, 5 YR, 10 YR, 25 YR, 50 YR & 100 YR



Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-Year	NOAA 24-hr	C	Default	24.00	1	7.55	2

Time span=0.00-192.00 hrs, dt=0.05 hrs, 3841 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EBB-DI: EX ONSITE TO DP Runoff Area=25,682 sf 48.71% Impervious Runoff Depth=4.99"
Tc=6.7 min CN=WQ Runoff=3.26 cfs 10,684 cf

Subcatchment EBB-DP: EX ONSITE DP 002 Runoff Area=7,621 sf 34.40% Impervious Runoff Depth=4.35"
Tc=6.2 min CN=WQ Runoff=0.87 cfs 2,760 cf

Link 3L: EX SITE TOTAL Inflow=4.13 cfs 13,444 cf
Primary=4.13 cfs 13,444 cf

Link 7L: EX DP 002/POI2 Inflow=0.87 cfs 2,760 cf
Primary=0.87 cfs 2,760 cf

Link EBC-D: EX DP 001/POI 1 Inflow=3.26 cfs 10,684 cf
Primary=3.26 cfs 10,684 cf

Total Runoff Area = 33,303 sf Runoff Volume = 13,444 cf Average Runoff Depth = 4.84"
54.56% Pervious = 18,171 sf 45.44% Impervious = 15,132 sf

Summary for Subcatchment EBB-DI: EX ONSITE TO DP 001

Runoff = 3.26 cfs @ 12.14 hrs, Volume= 10,684 cf, Depth= 4.99"
Routed to Link EBC-D : EX DP 001/POI 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=7.55"

	Area (sf)	CN	Description
	12,510	98	Paved parking, HSG B
*	4,833	58	
*	8,339	58	
	25,682		Weighted Average
	13,172	58	51.29% Pervious Area
	12,510	98	48.71% Impervious Area

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

Summary for Subcatchment EBB-DP: EX ONSITE DP 002

Runoff = 0.87 cfs @ 12.13 hrs, Volume= 2,760 cf, Depth= 4.35"
Routed to Link 7L : EX DP 002/POI2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=7.55"

	Area (sf)	CN	Description
	2,622	98	Paved parking, HSG B
*	3,251	58	
*	1,748	58	
	7,621		Weighted Average
	4,999	58	65.60% Pervious Area
	2,622	98	34.40% Impervious Area

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

Summary for Link 3L: EX SITE TOTAL

Inflow Area = 33,303 sf, 45.44% Impervious, Inflow Depth = 4.84" for 100-Year event
Inflow = 4.13 cfs @ 12.14 hrs, Volume= 13,444 cf
Primary = 4.13 cfs @ 12.14 hrs, Volume= 13,444 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs

Summary for Link 7L: EX DP 002/POI2

Inflow Area = 7,621 sf, 34.40% Impervious, Inflow Depth = 4.35" for 100-Year event
Inflow = 0.87 cfs @ 12.13 hrs, Volume= 2,760 cf
Primary = 0.87 cfs @ 12.13 hrs, Volume= 2,760 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 3L : EX SITE TOTAL

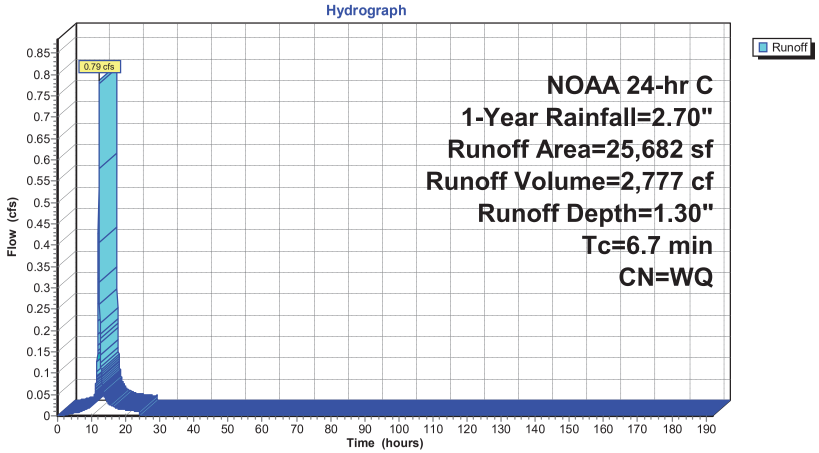
Primary outflow = Inflow, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs

Summary for Link EBC-D: EX DP 001/POI 1

Inflow Area = 25,682 sf, 48.71% Impervious, Inflow Depth = 4.99" for 100-Year event
Inflow = 3.26 cfs @ 12.14 hrs, Volume= 10,684 cf
Primary = 3.26 cfs @ 12.14 hrs, Volume= 10,684 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 3L : EX SITE TOTAL

Primary outflow = Inflow, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs

Subcatchment EBB-DI: EX ONSITE TO DP 001



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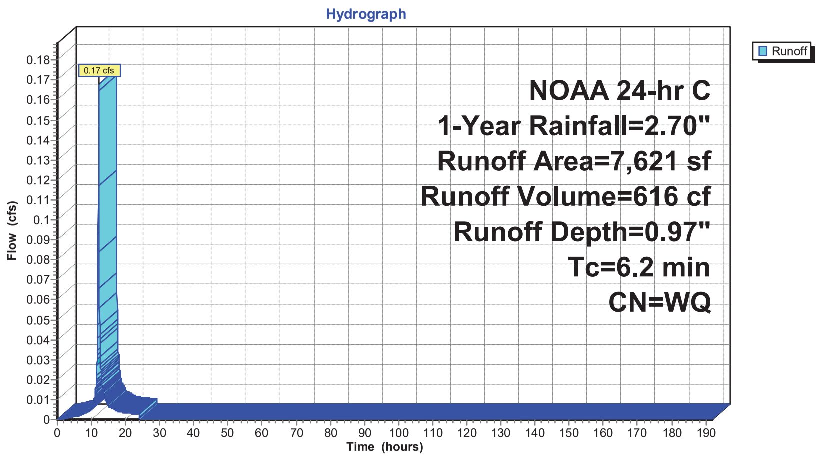

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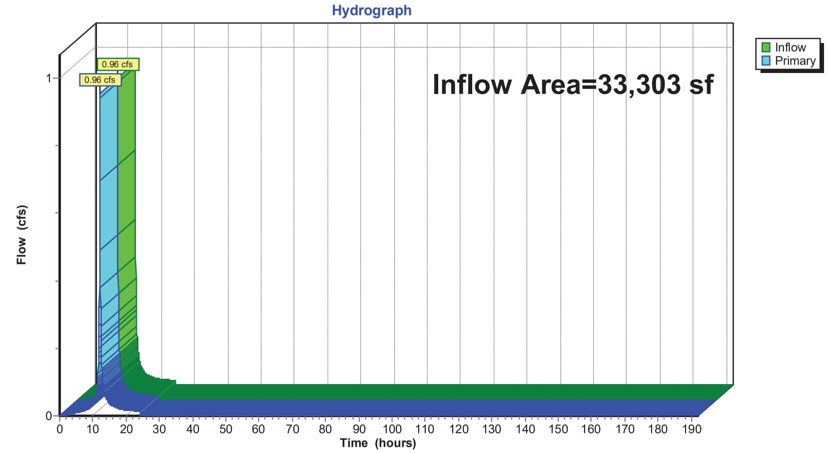

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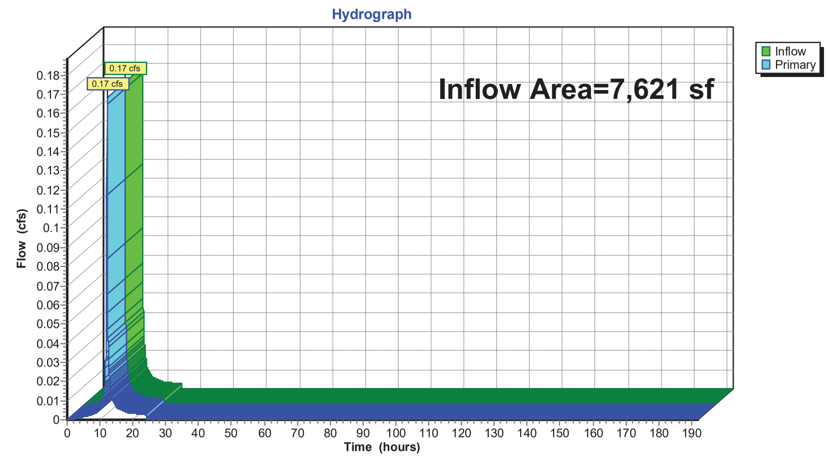

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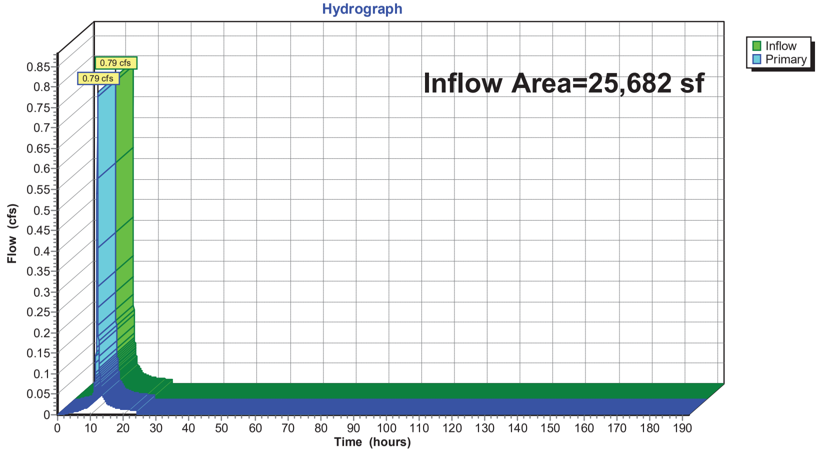

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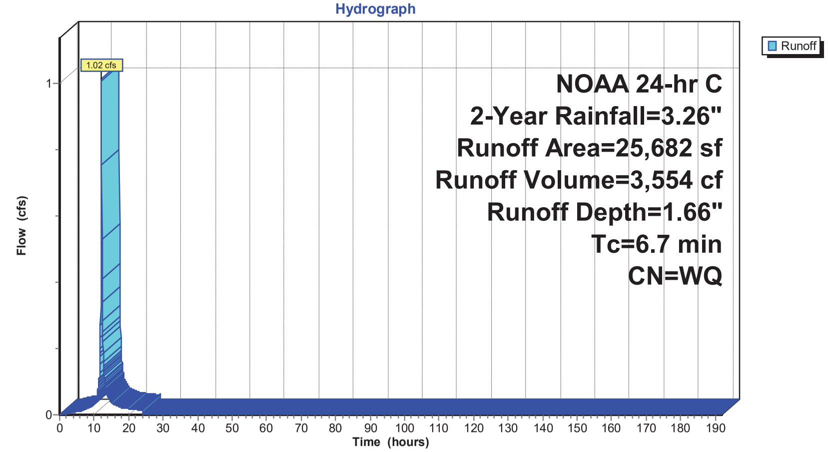

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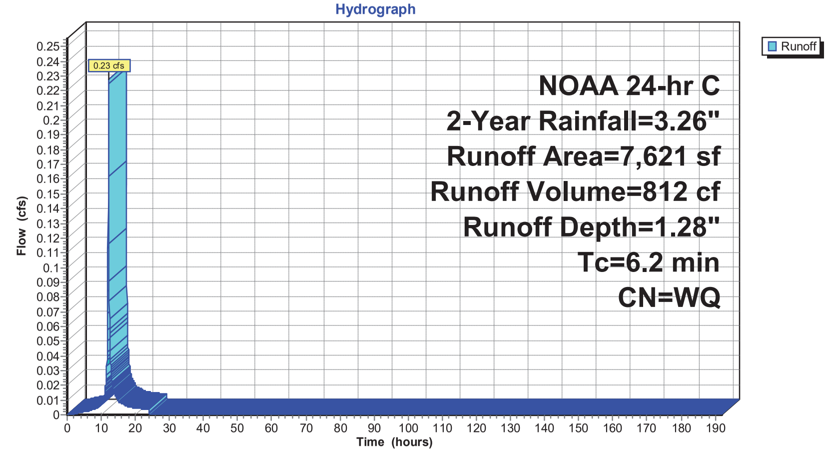

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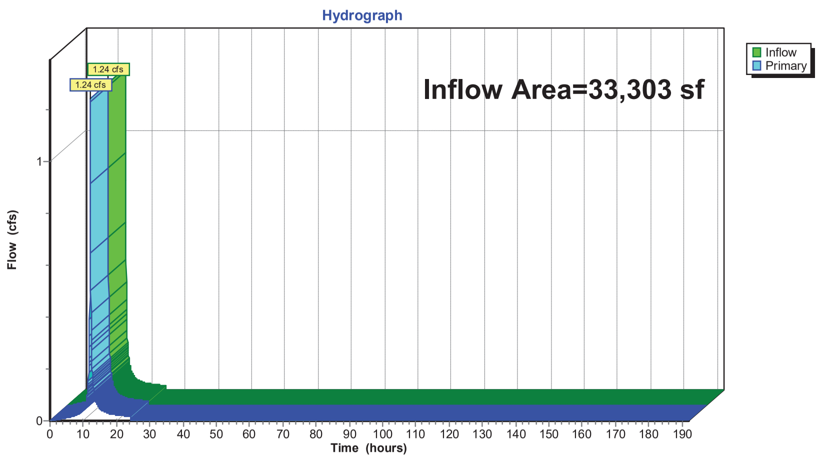

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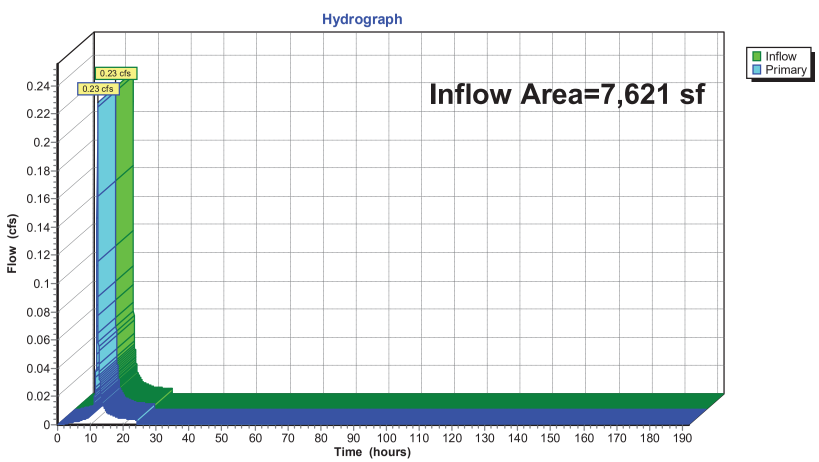

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NOAA 24-hr C 2-Year Rainfall=3.26"
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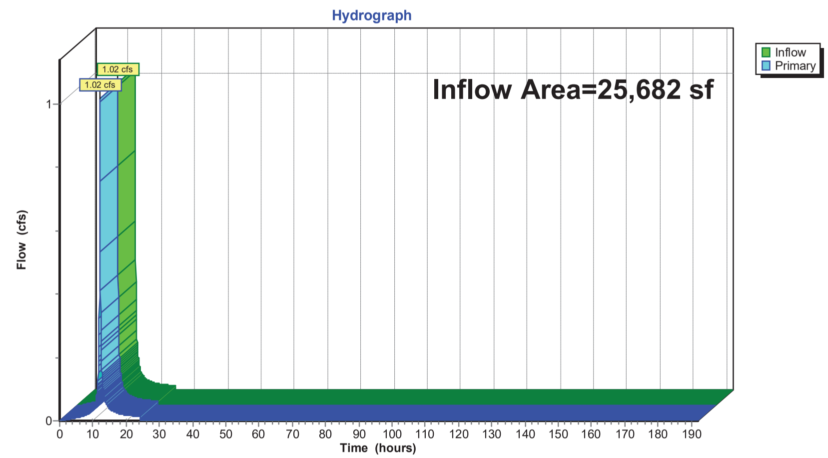
Link EBC-D: EX DP 001/POI 1



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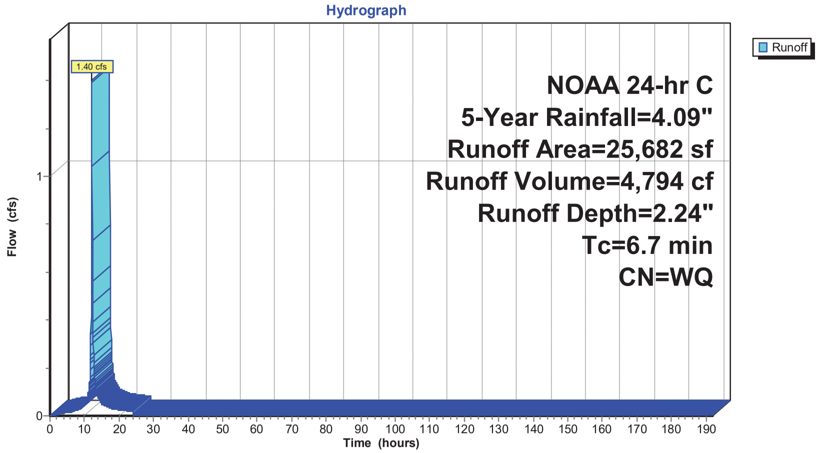

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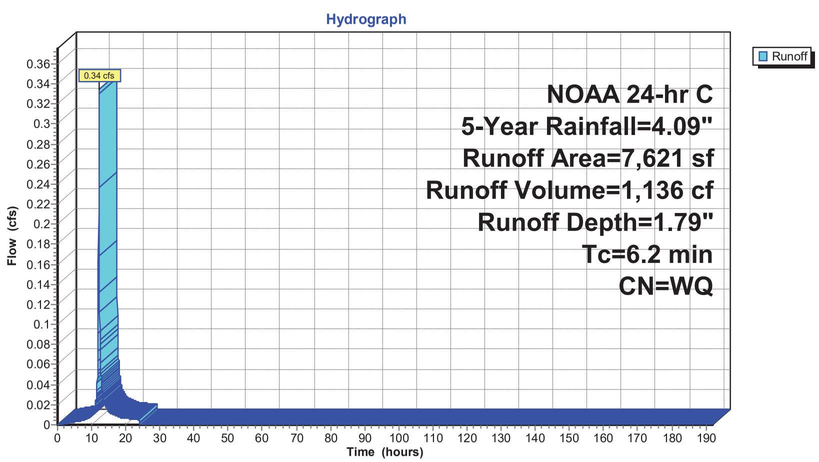

West Chester HydroCAD - REV1
NOAA 24-hr C 5-Year Rainfall=4.09"
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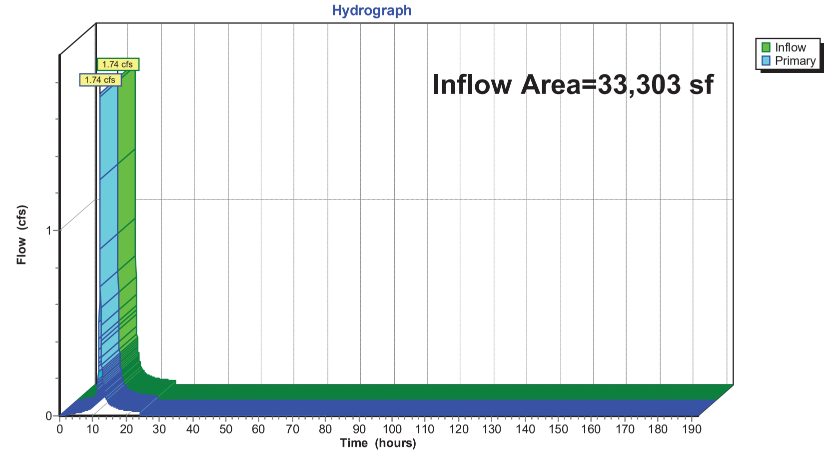
Link 3L: EX SITE TOTAL



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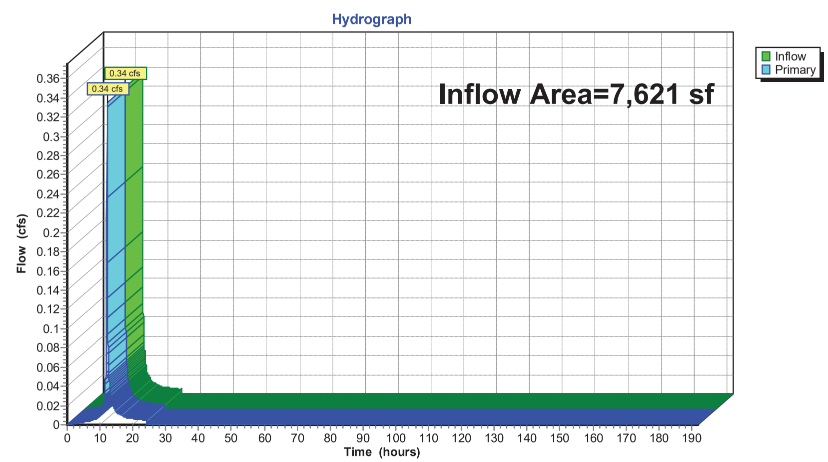

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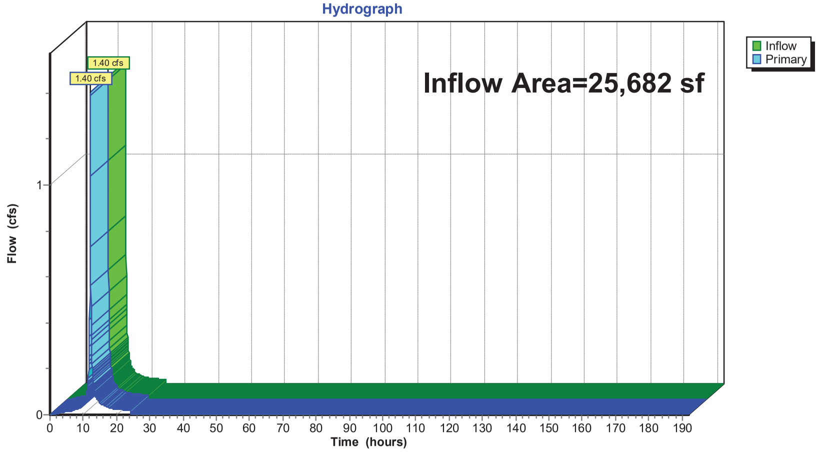

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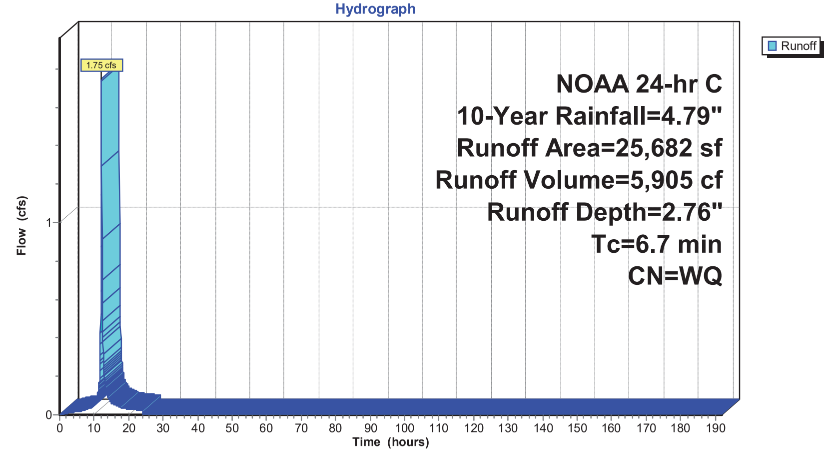

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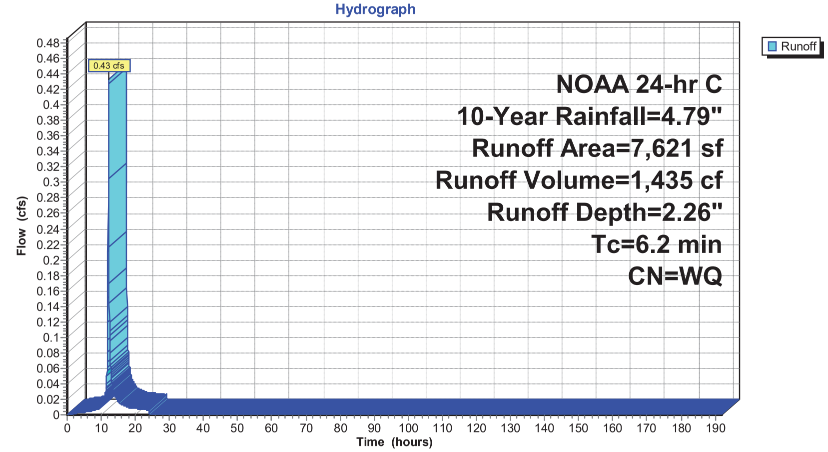

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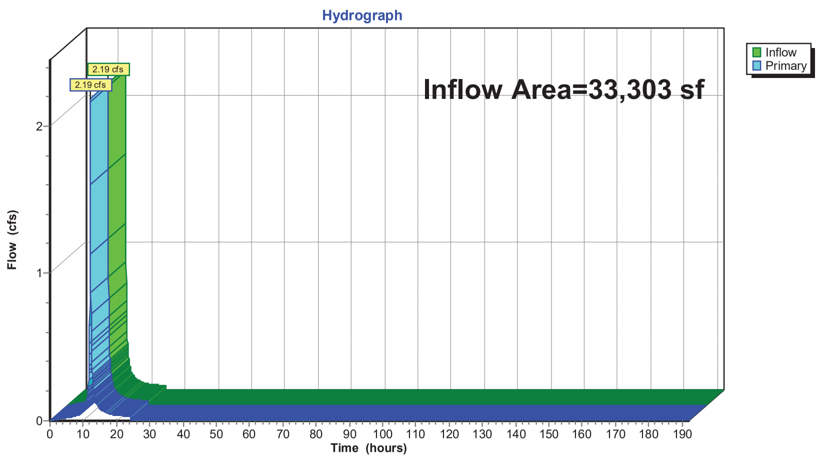

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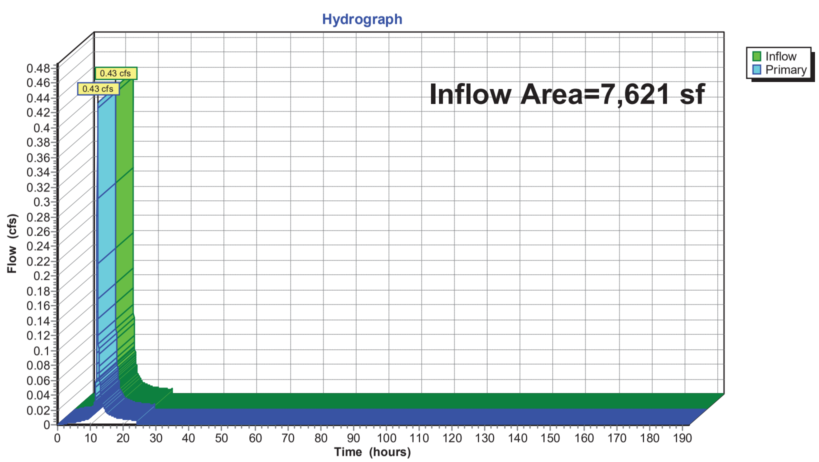

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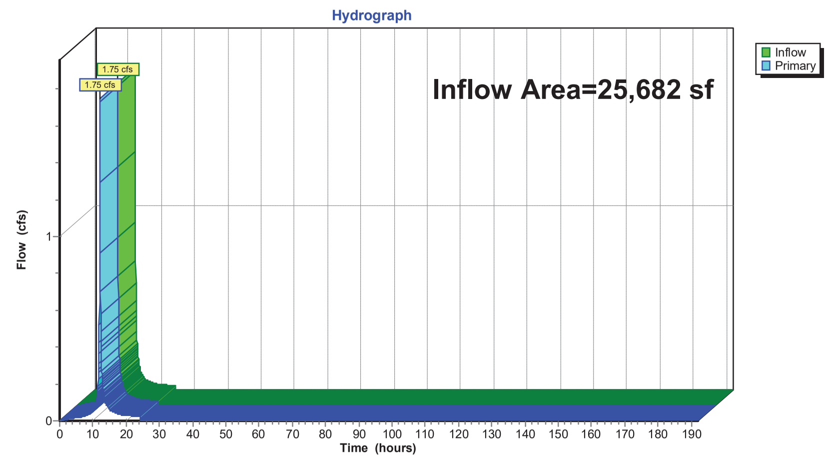

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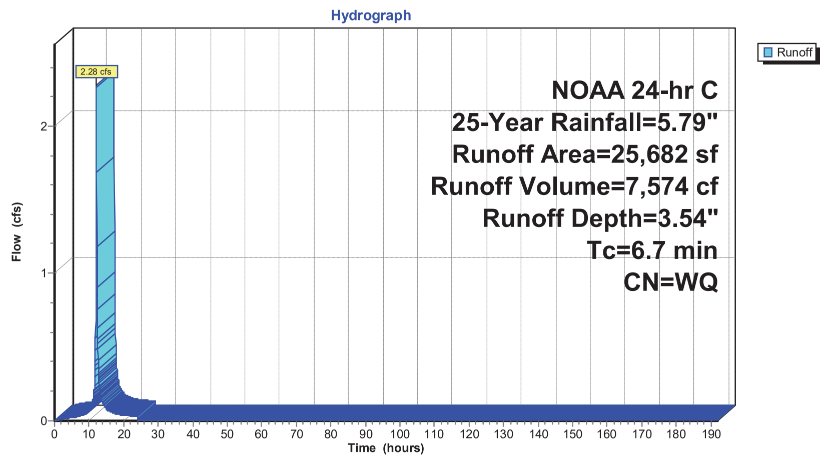

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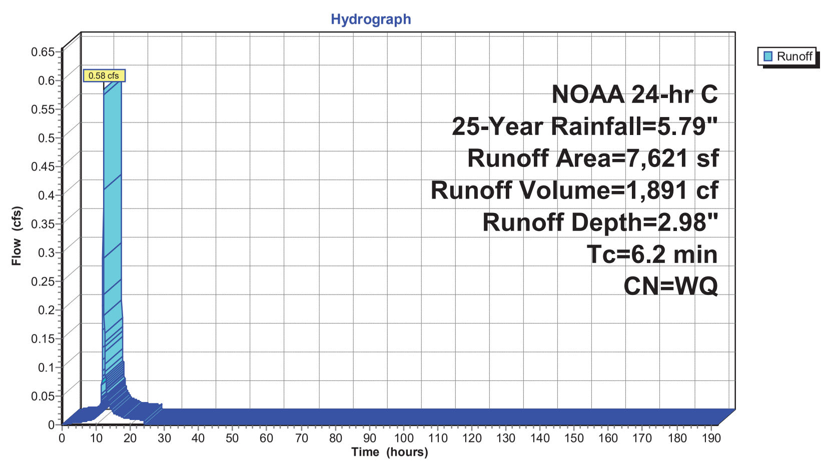

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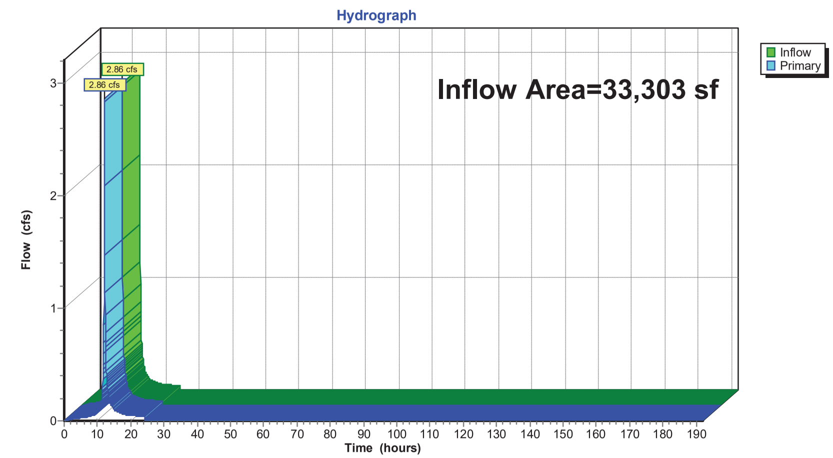

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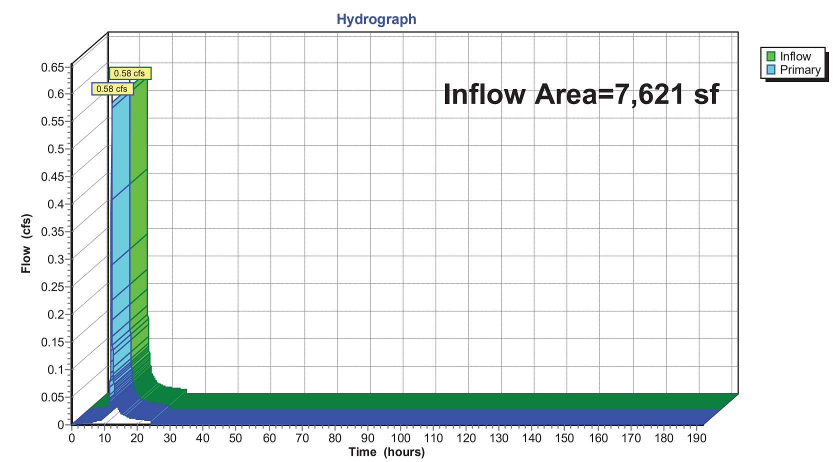

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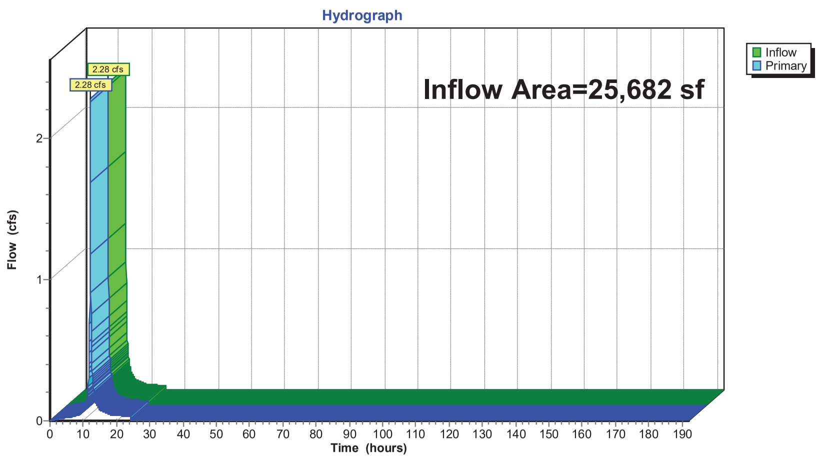
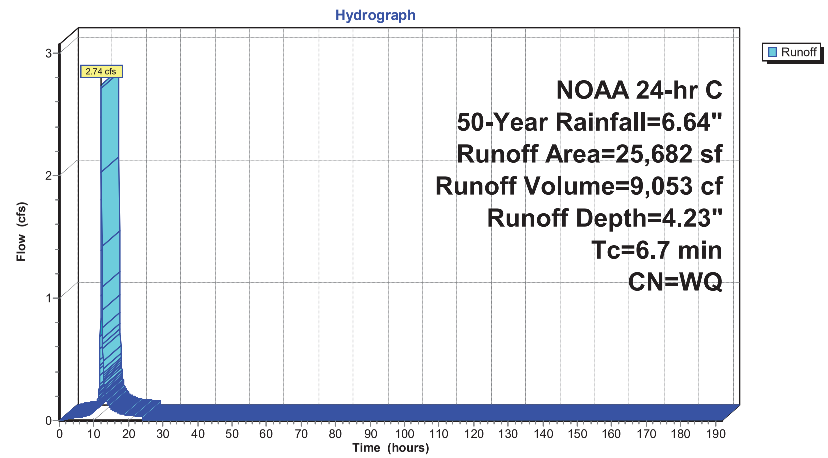
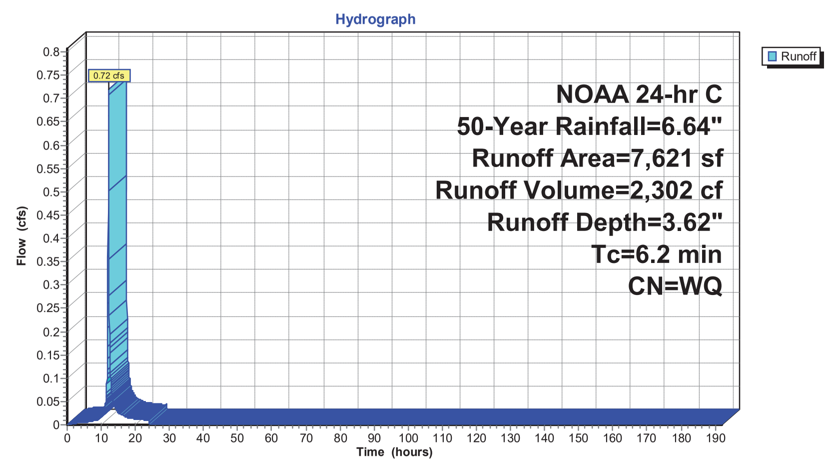


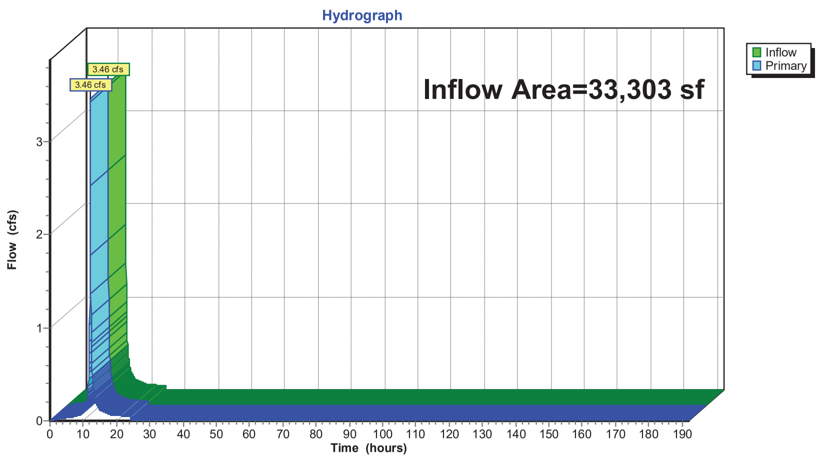
Subcatchment EBB-DI: EX ONSITE TO DP 001



Subcatchment EBB-DP: EX ONSITE DP 002



Link 3L: EX SITE TOTAL



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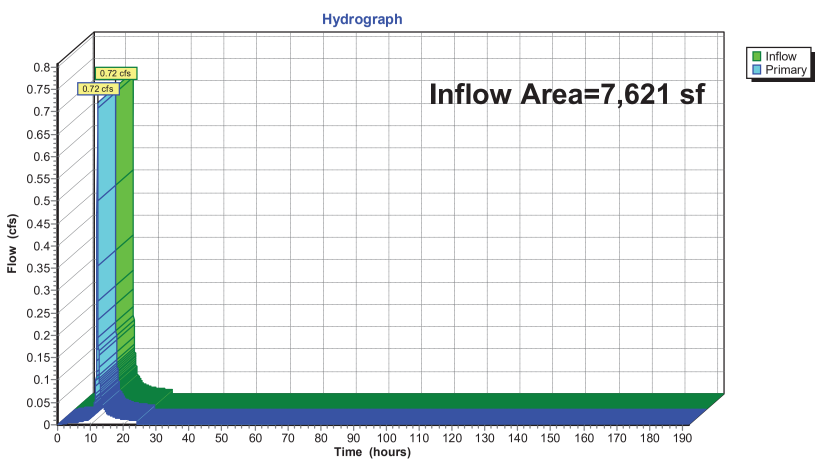

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NOAA 24-hr C 50-Year Rainfall=6.64"
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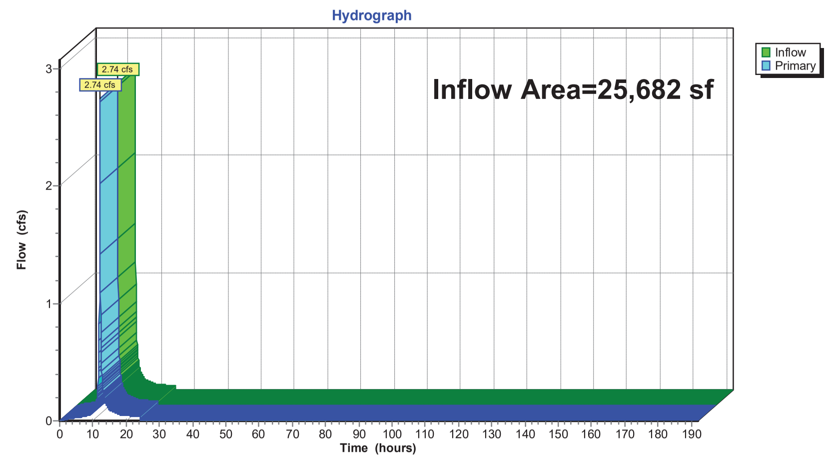
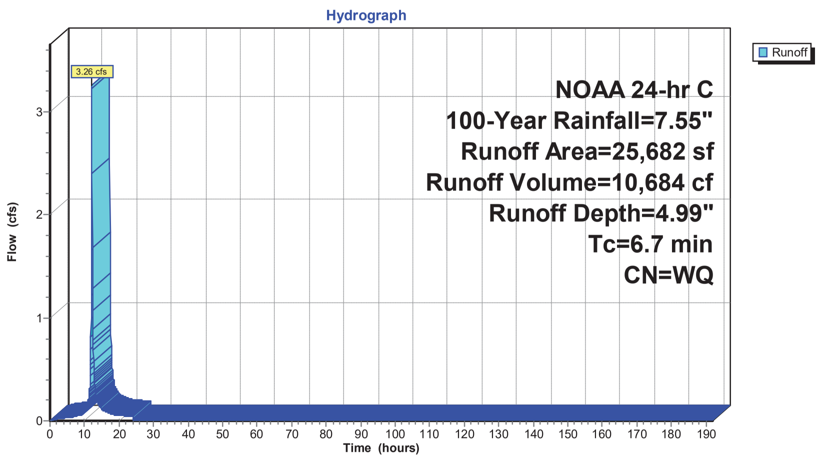
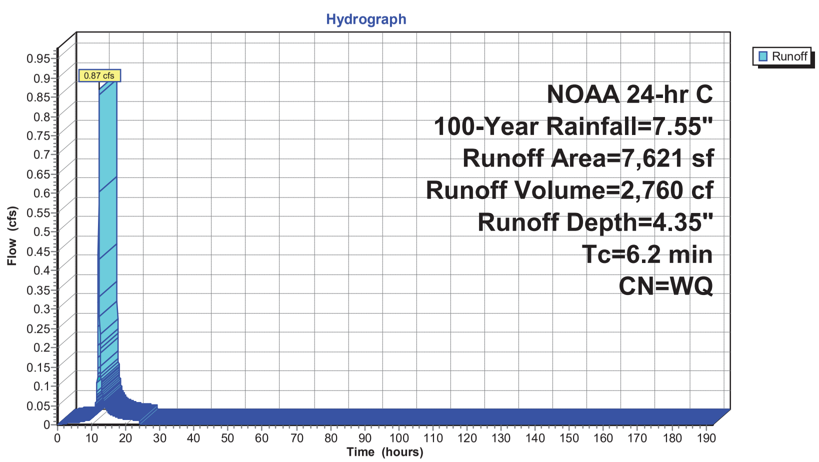
Link EBC-D: EX DP 001/POI 1



Subcatchment EBB-DI: EX ONSITE TO DP 001



Subcatchment EBB-DP: EX ONSITE DP 002



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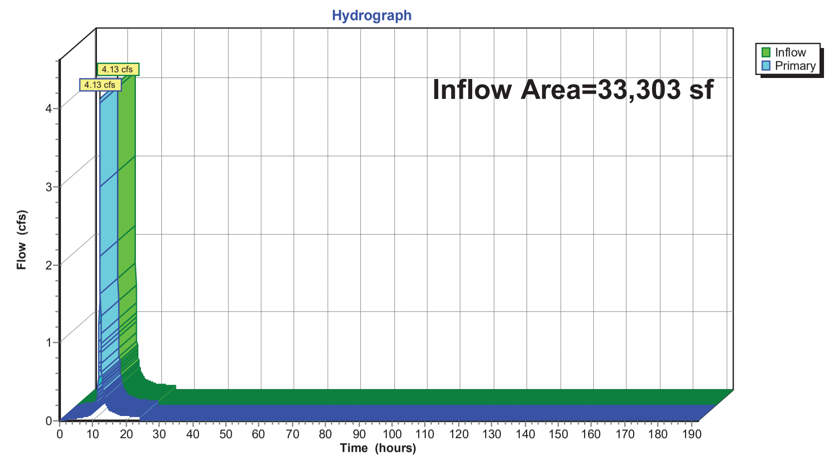
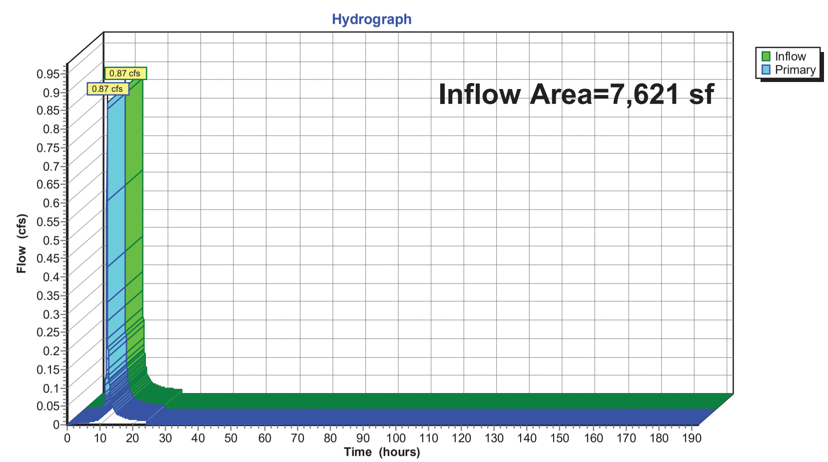
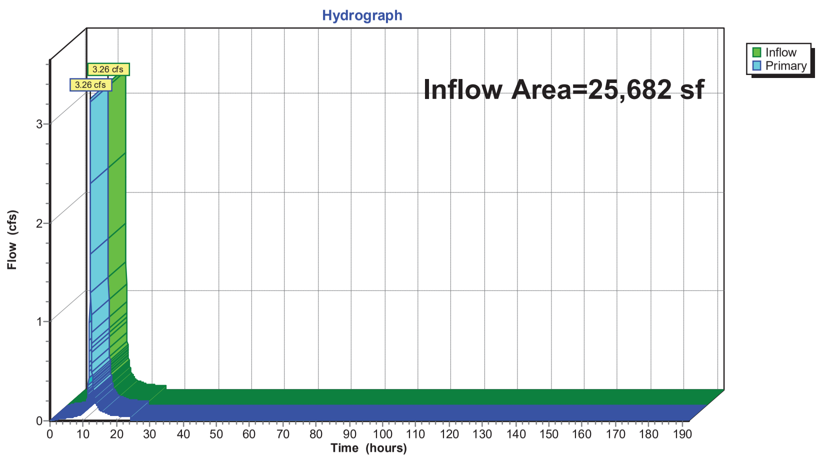
Link 3L: EX SITE TOTAL



Link 7L: EX DP 002/POI2



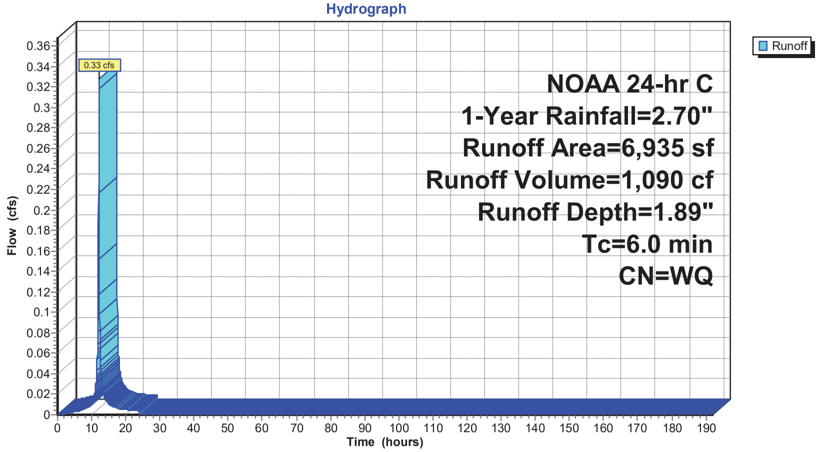
Link EBC-D: EX DP 001/POI 1



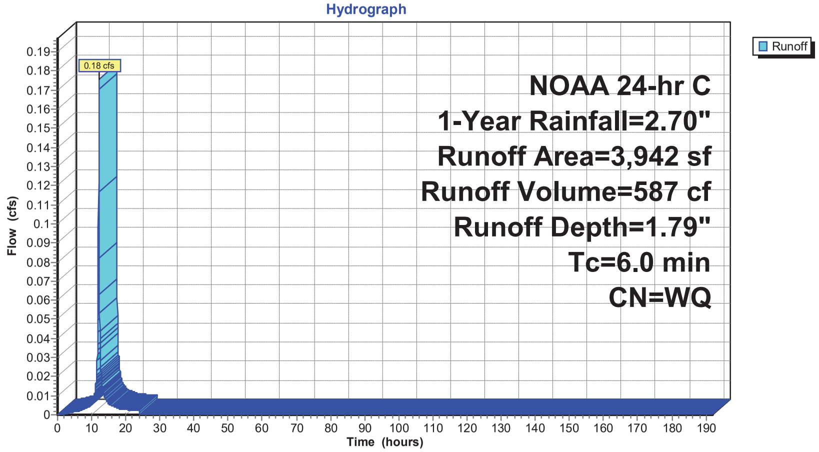
H. HYDROGRAPH SUMMARY REPORTS – PROPOSED CONDITIONS

1 YR, 2 YR, 5 YR, 10 YR, 25 YR, 50 YR & 100 YR

Subcatchment 2S: PROP ONSITE BYPASS POD 1

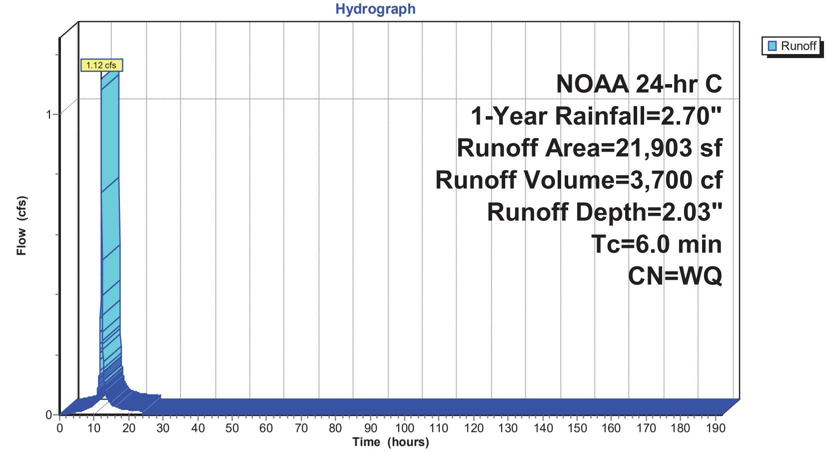


Subcatchment 4S: Prop.ONSITE Bypass POD 2

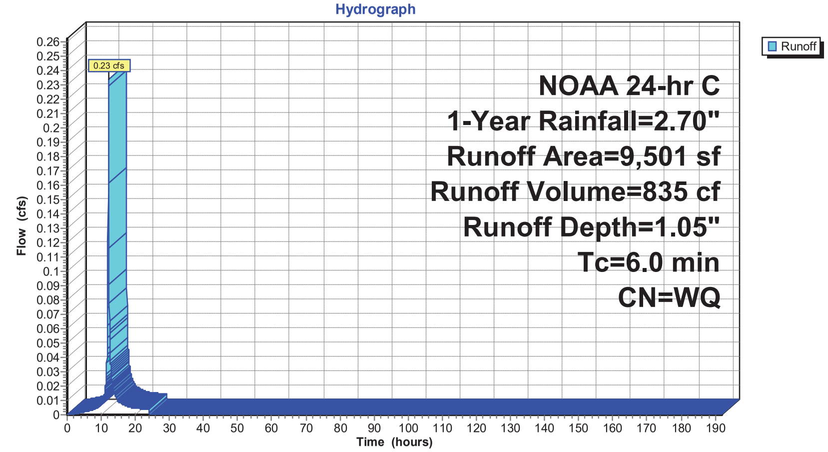


West Chester HydroCAD - REV1 *NOAA 24-hr C 1-Year Rainfall=2.70"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

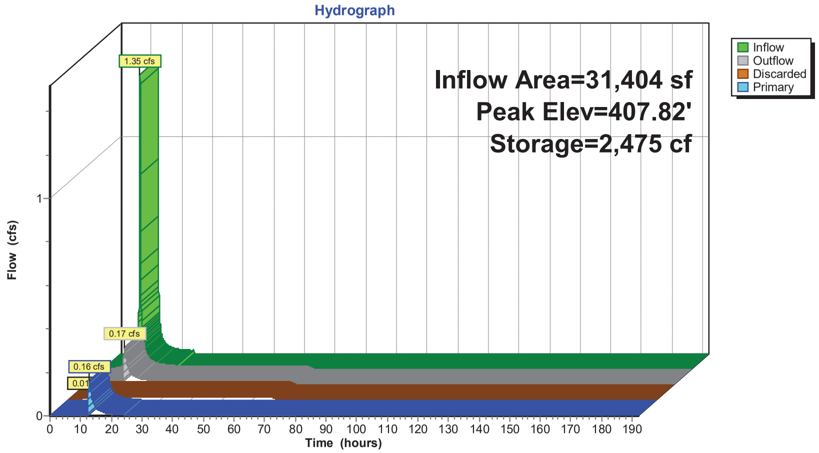
Subcatchment 9S: PROP ONSITE TO BASIN



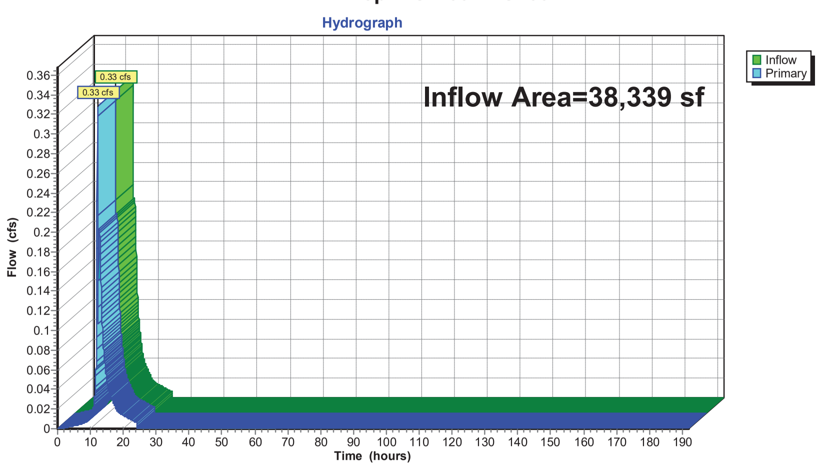
Subcatchment 11S: PROP OFFSITE TO BASIN



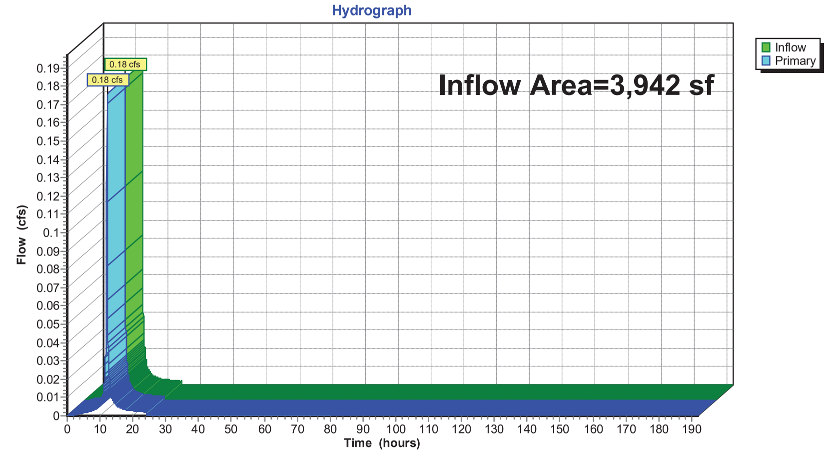
Pond 8P: Prop. UG Basin 24"



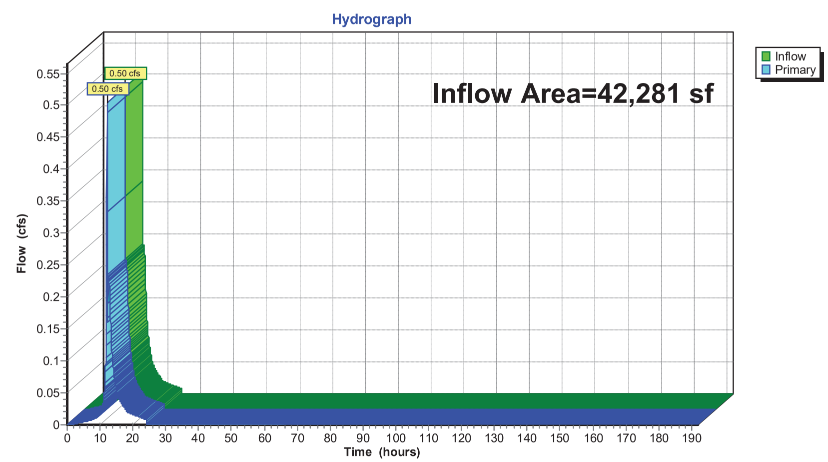
Link 1L: Prop. POD 001/POI 001



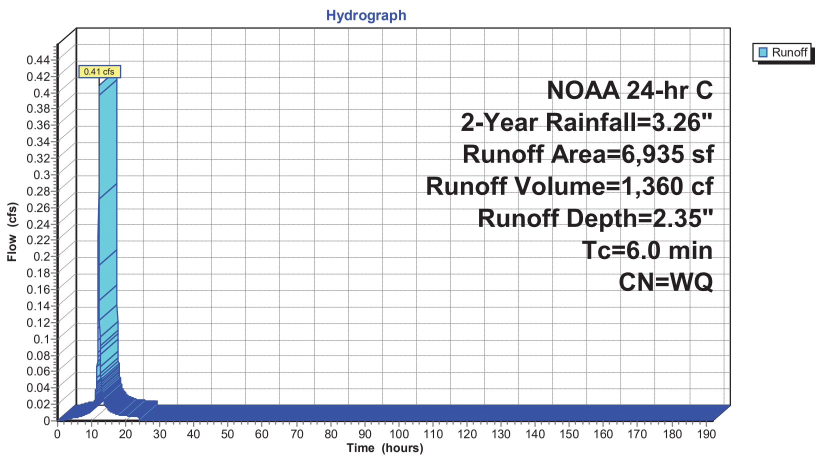
Link 2L: Prop. POD 002/POI 002



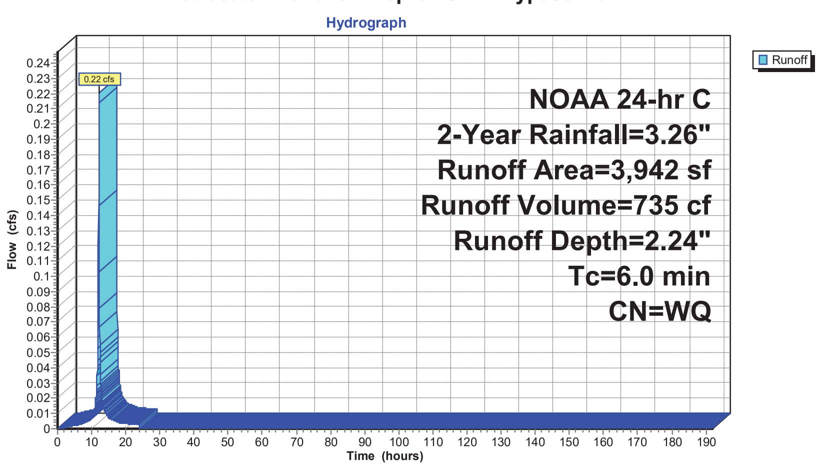
Link 4L: PROP. SITE TOTAL



Subcatchment 2S: PROP ONSITE BYPASS POD 1



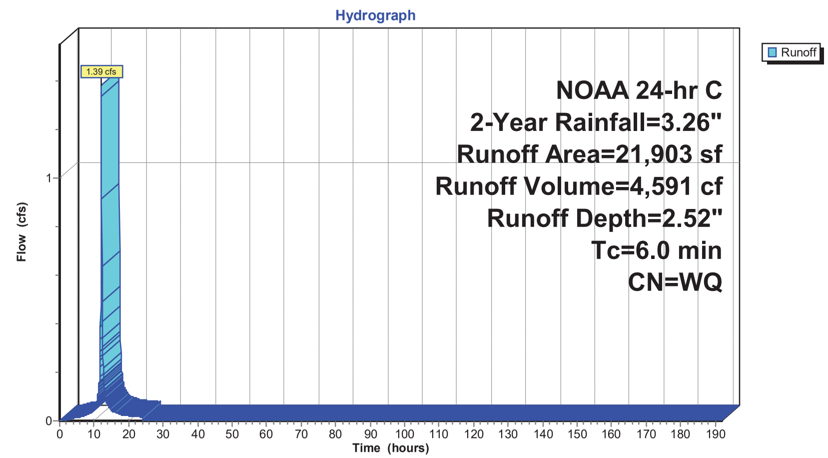
Subcatchment 4S: Prop.ONSITE Bypass POD 2



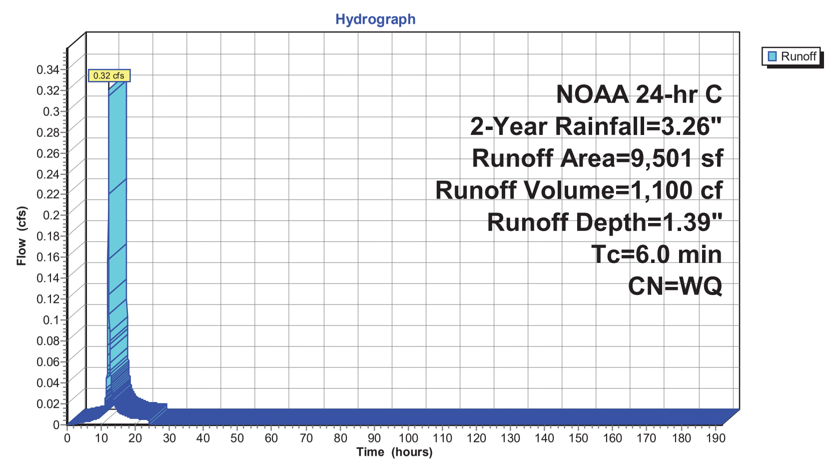
West Chester HydroCAD - REV1
Prepared by Dynamic Engineering
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr C 2-Year Rainfall=3.26"
Printed 9/30/2024

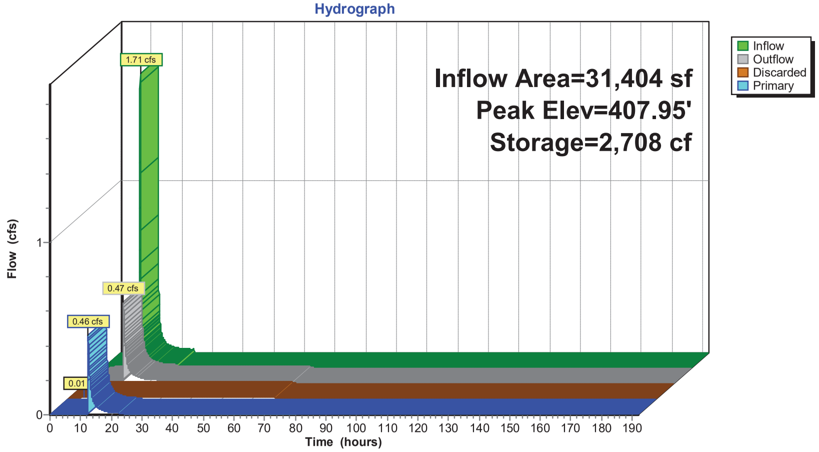
Subcatchment 9S: PROP ONSITE TO BASIN



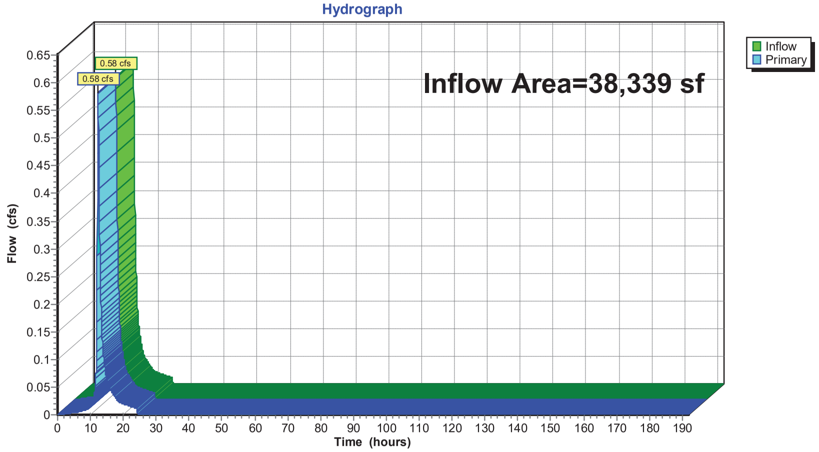
Subcatchment 11S: PROP OFFSITE TO BASIN



Pond 8P: Prop. UG Basin 24"



Link 1L: Prop. POD 001/POI 001



West Chester HydroCAD - REV1 *NOAA 24-hr C 2-Year Rainfall=3.26"*
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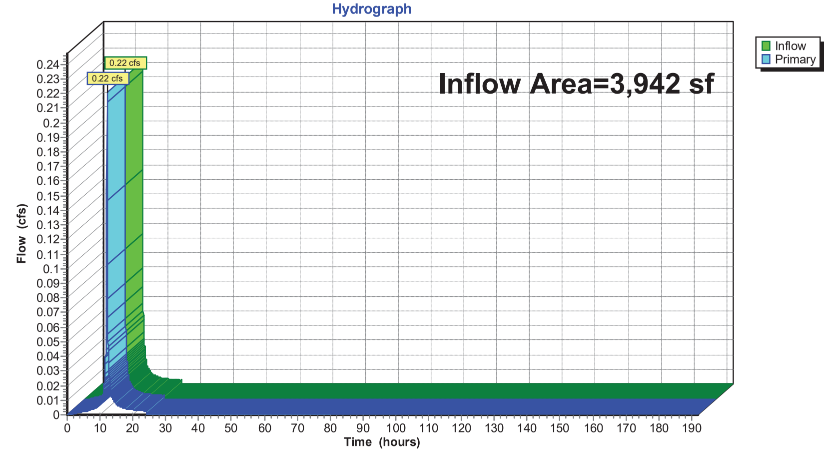
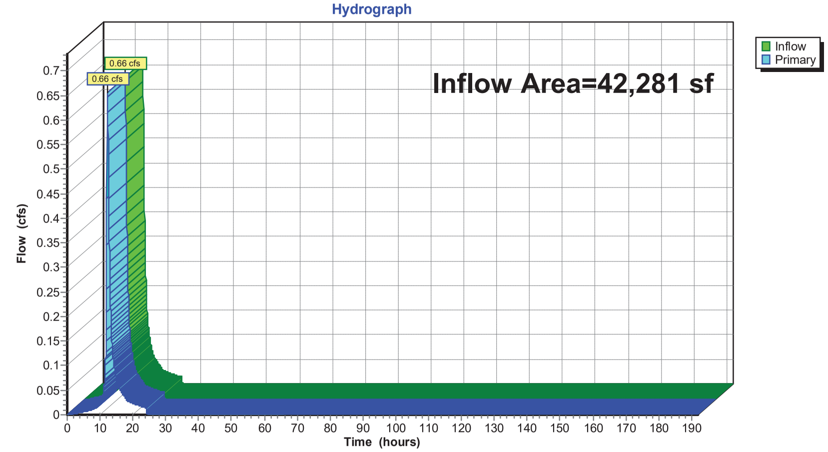
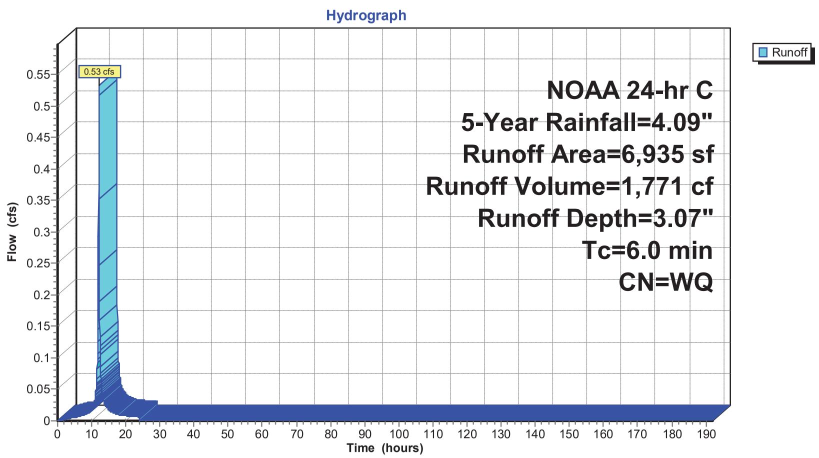
Link 2L: Prop. POD 002/POI 002



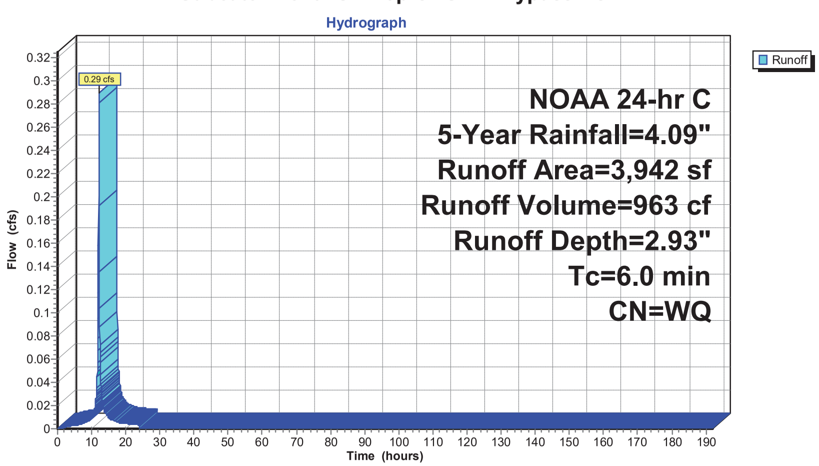
Link 4L: PROP. SITE TOTAL



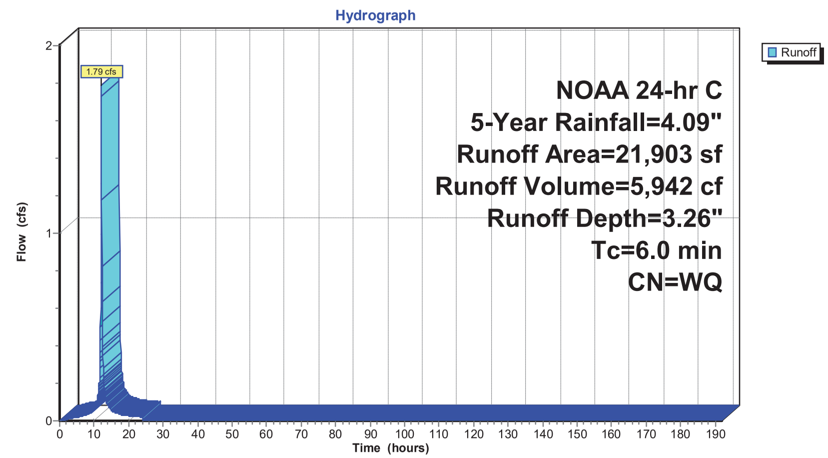
Subcatchment 2S: PROP ONSITE BYPASS POD 1



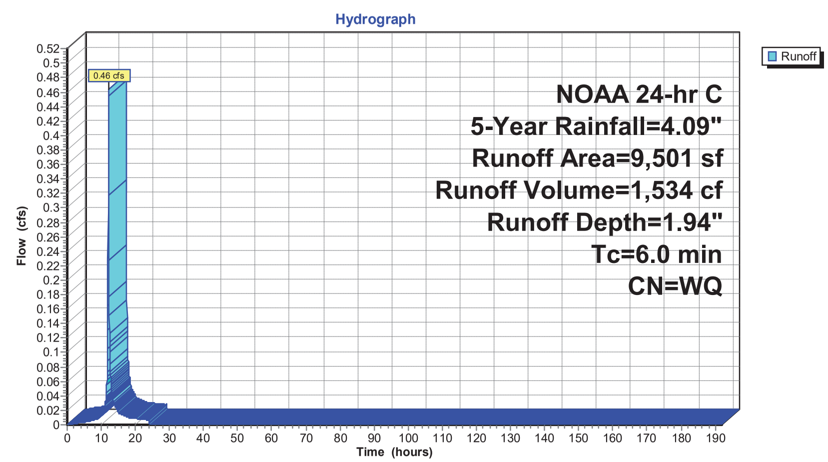
Subcatchment 4S: Prop.ONSITE Bypass POD 2



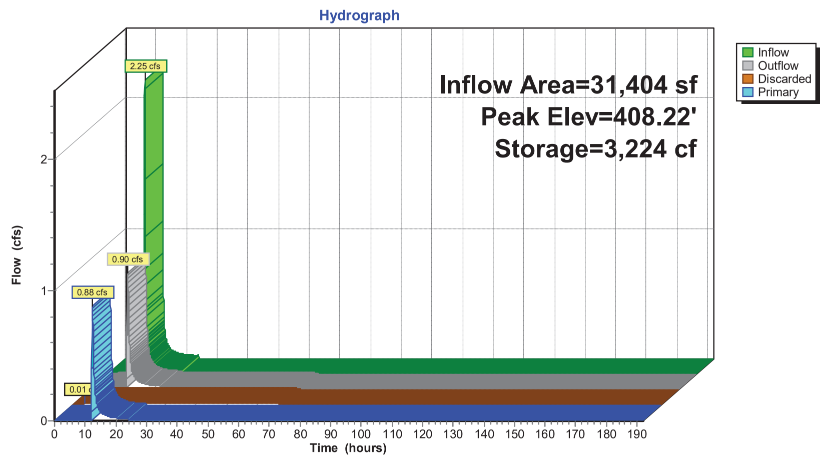
Subcatchment 9S: PROP ONSITE TO BASIN



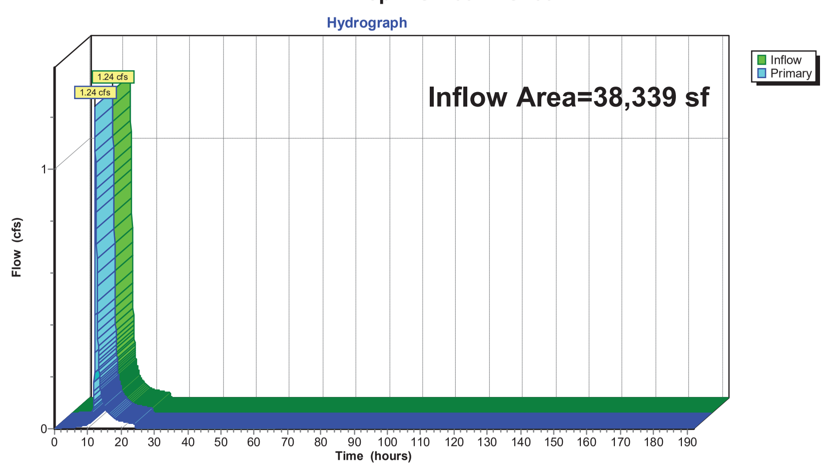
Subcatchment 11S: PROP OFFSITE TO BASIN



Pond 8P: Prop. UG Basin 24"

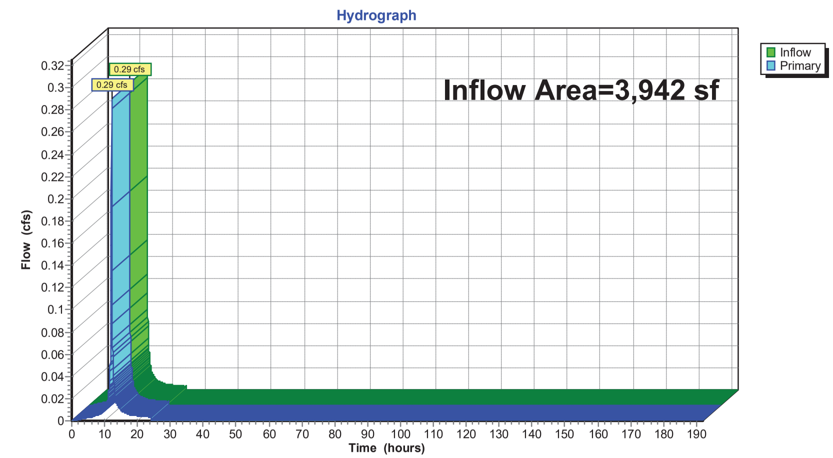


Link 1L: Prop. POD 001/POI 001

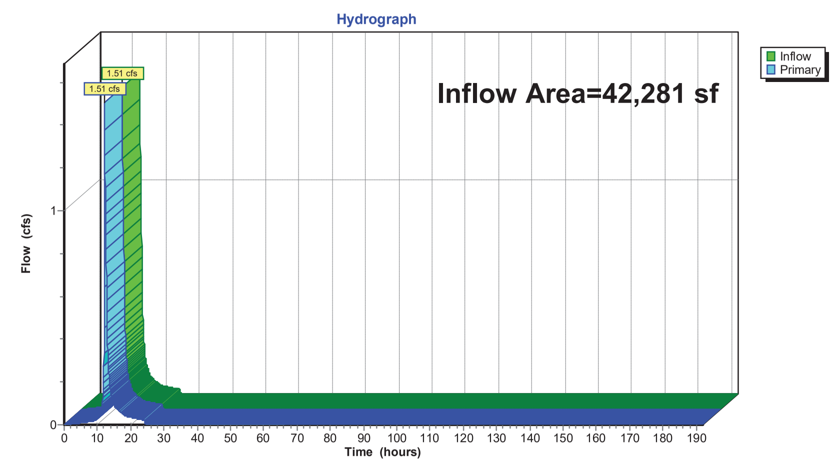


West Chester HydroCAD - REV1 *NOAA 24-hr C 5-Year Rainfall=4.09"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

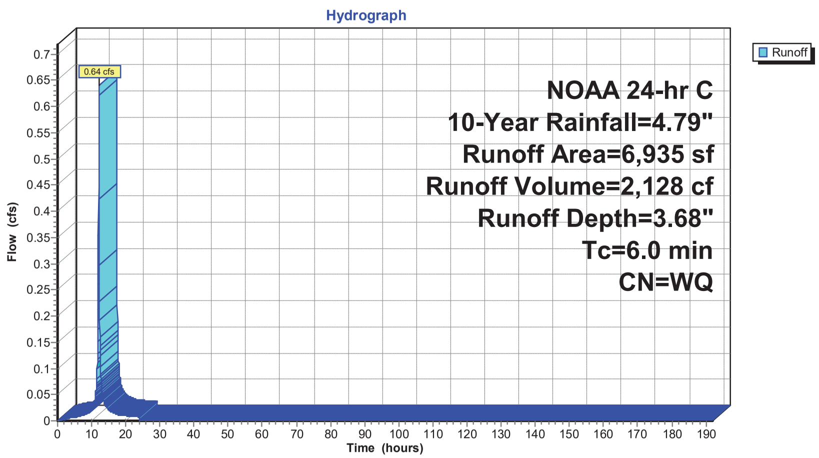
Link 2L: Prop. POD 002/POI 002



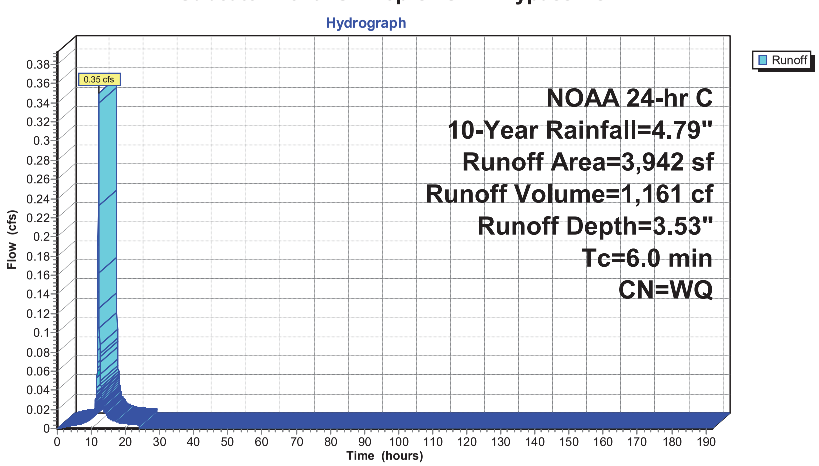
Link 4L: PROP. SITE TOTAL



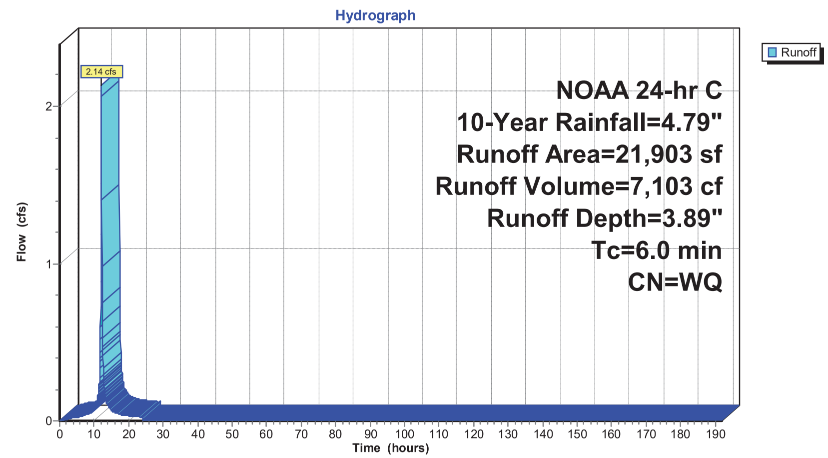
Subcatchment 2S: PROP ONSITE BYPASS POD 1



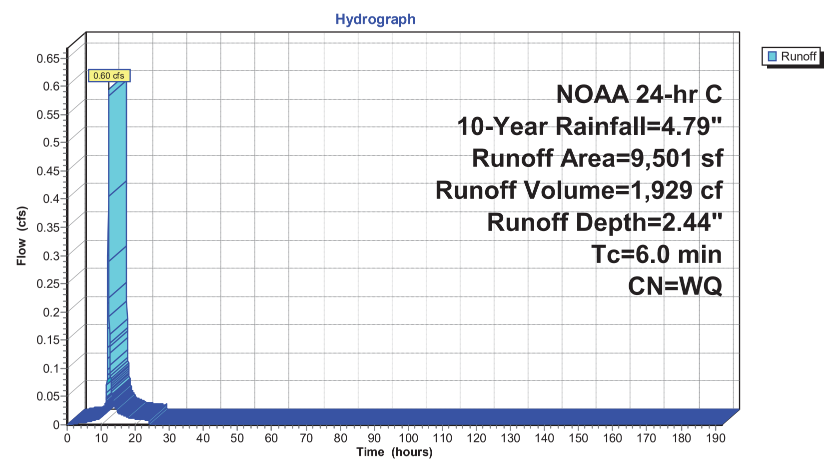
Subcatchment 4S: Prop.ONSITE Bypass POD 2



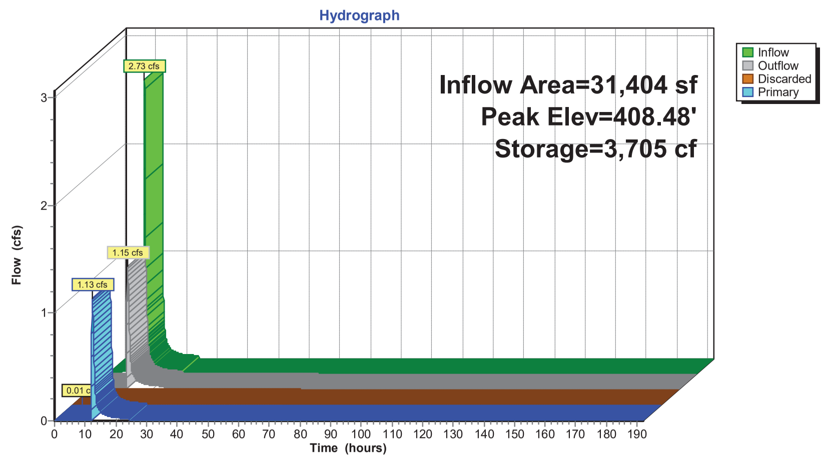
Subcatchment 9S: PROP ONSITE TO BASIN



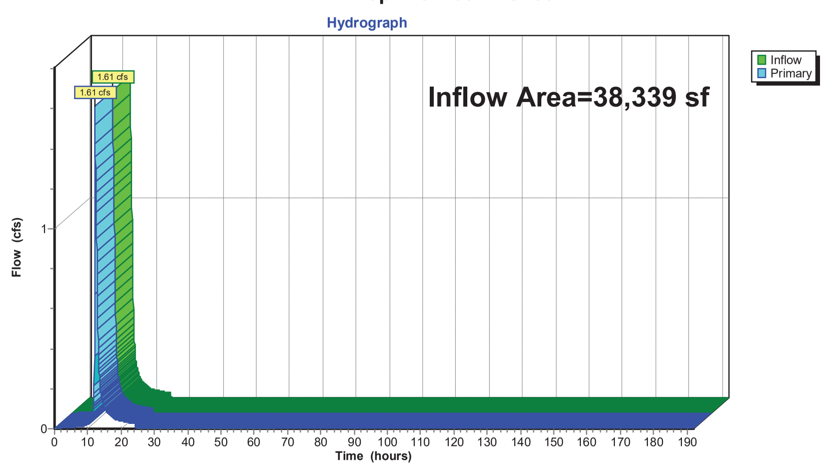
Subcatchment 11S: PROP OFFSITE TO BASIN



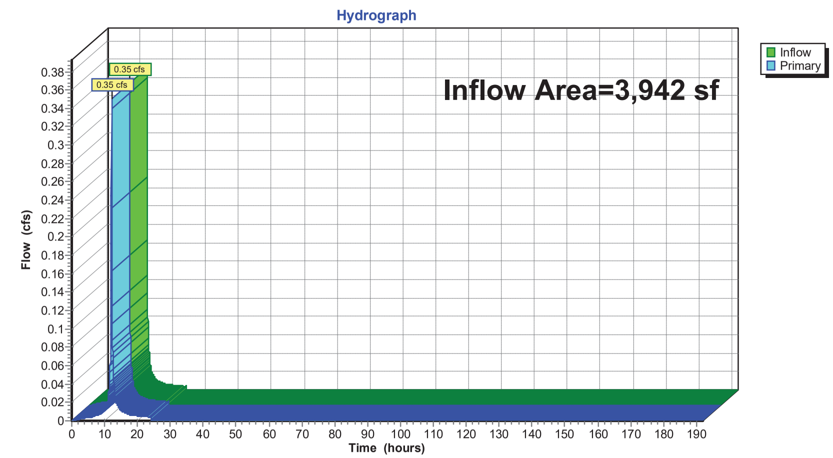
Pond 8P: Prop. UG Basin 24"



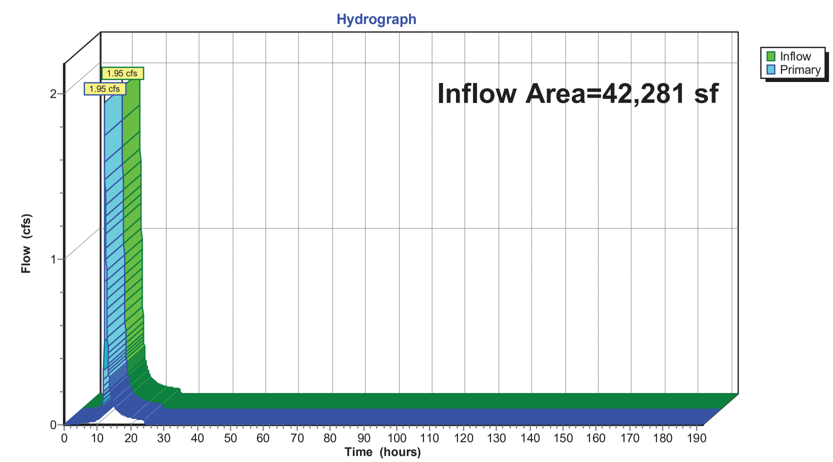
Link 1L: Prop. POD 001/POI 001



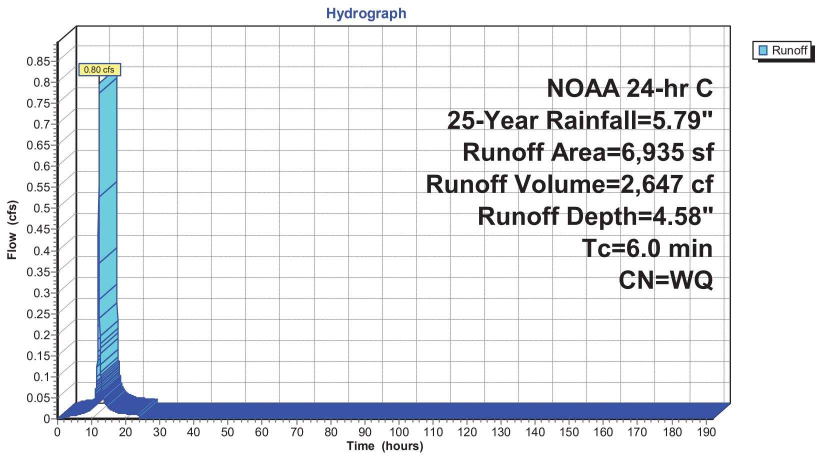
Link 2L: Prop. POD 002/POI 002



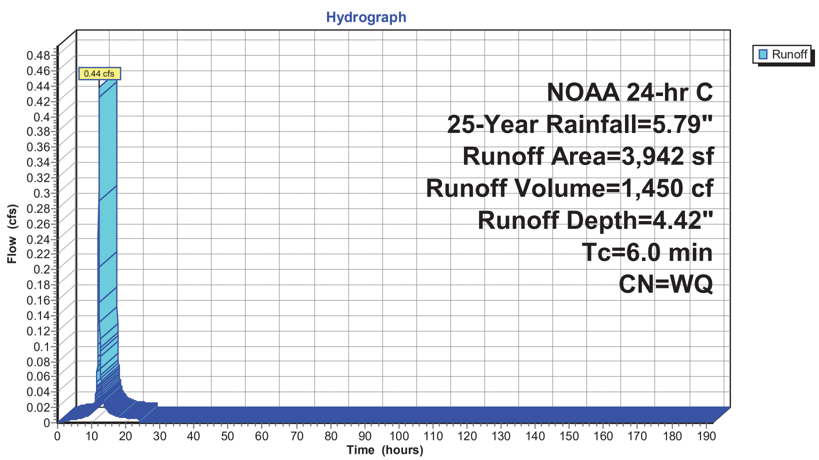
Link 4L: PROP. SITE TOTAL



Subcatchment 2S: PROP ONSITE BYPASS POD 1

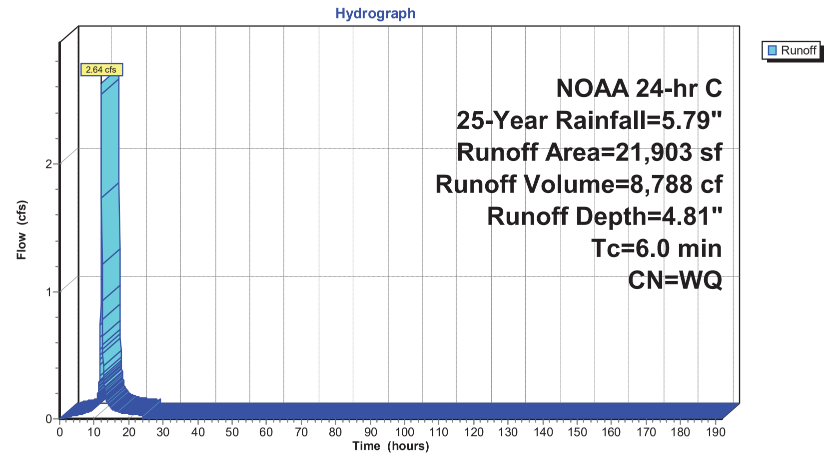


Subcatchment 4S: Prop.ONSITE Bypass POD 2

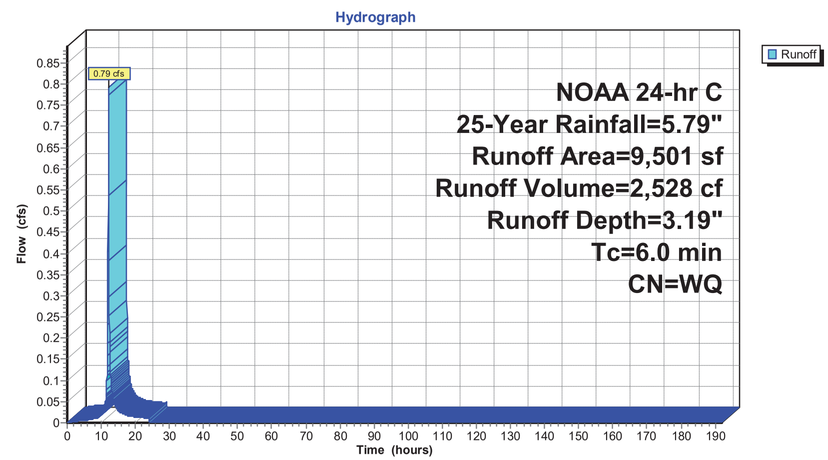


West Chester HydroCAD - REV1
Prepared by Dynamic Engineering
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC
NOAA 24-hr C 25-Year Rainfall=5.79"
Printed 9/30/2024

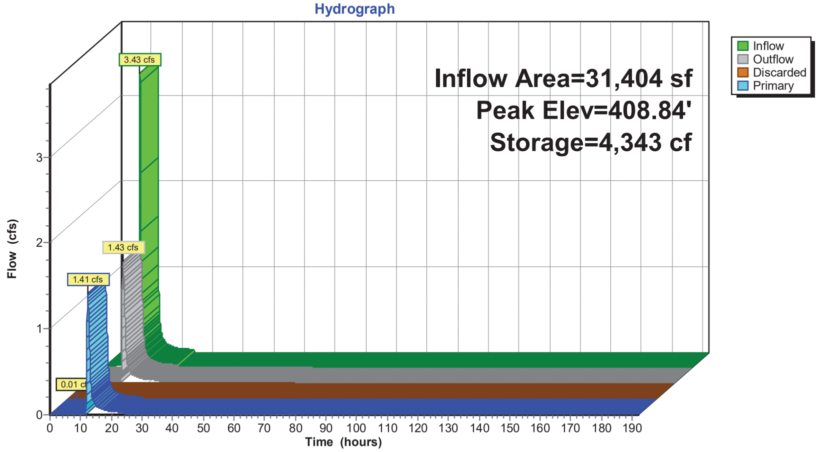
Subcatchment 9S: PROP ONSITE TO BASIN



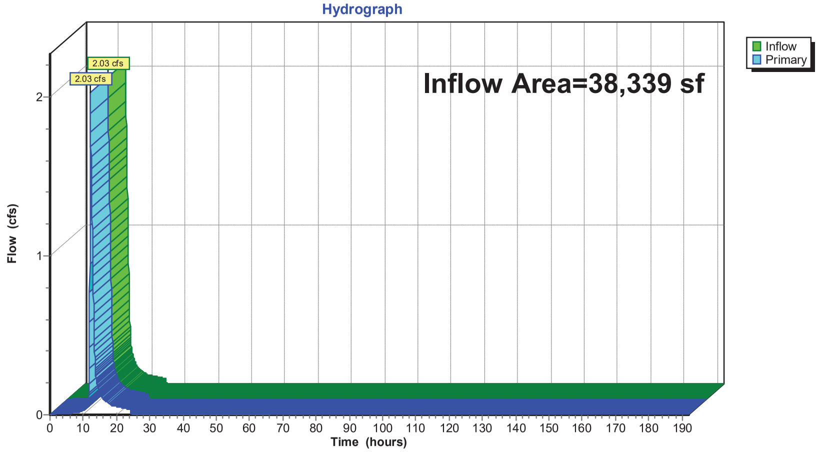
Subcatchment 11S: PROP OFFSITE TO BASIN



Pond 8P: Prop. UG Basin 24"

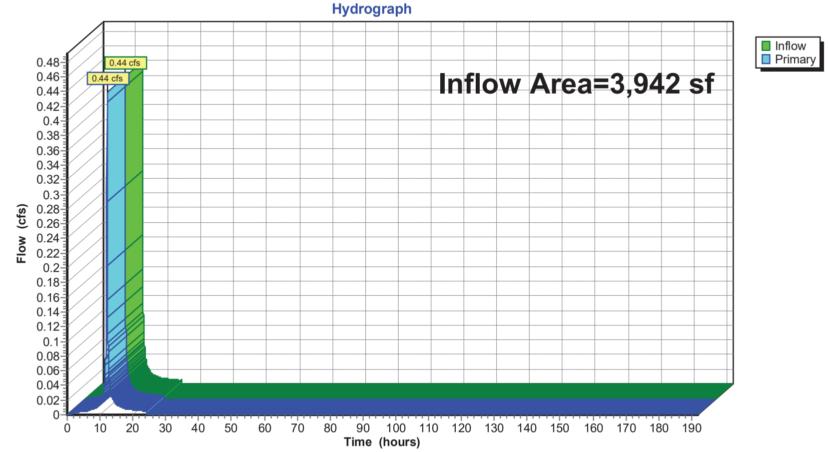


Link 1L: Prop. POD 001/POI 001

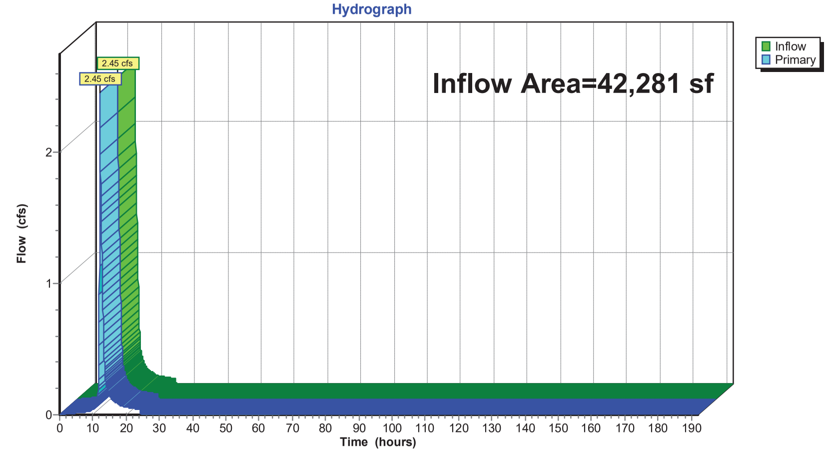


West Chester HydroCAD - REV1 *NOAA 24-hr C 25-Year Rainfall=5.79"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

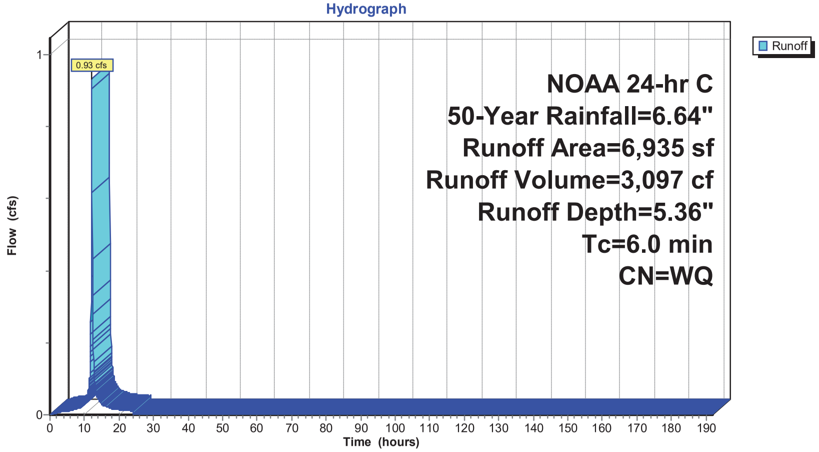
Link 2L: Prop. POD 002/POI 002



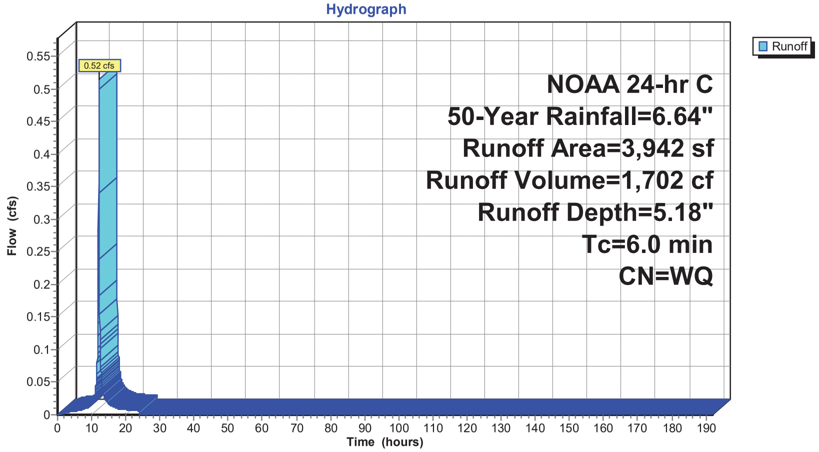
Link 4L: PROP. SITE TOTAL



Subcatchment 2S: PROP ONSITE BYPASS POD 1



Subcatchment 4S: Prop.ONSITE Bypass POD 2



West Chester HydroCAD - REV1 *NOAA 24-hr C 50-Year Rainfall=6.64"*
Prepared by Dynamic Engineering Printed 9/30/2024
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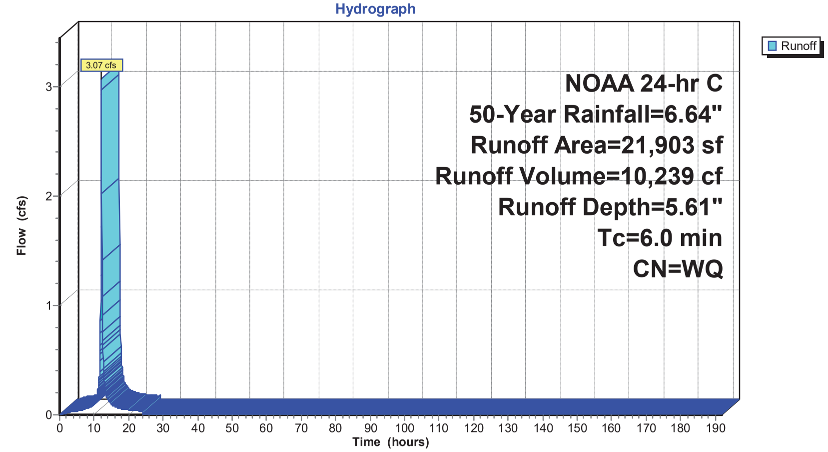
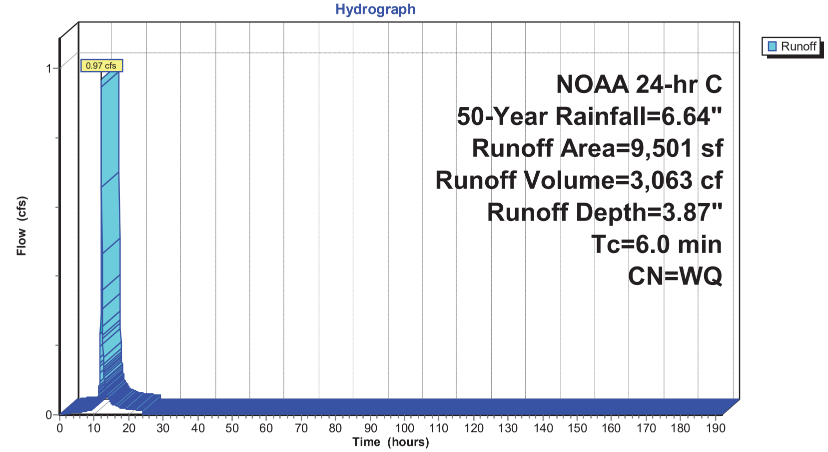
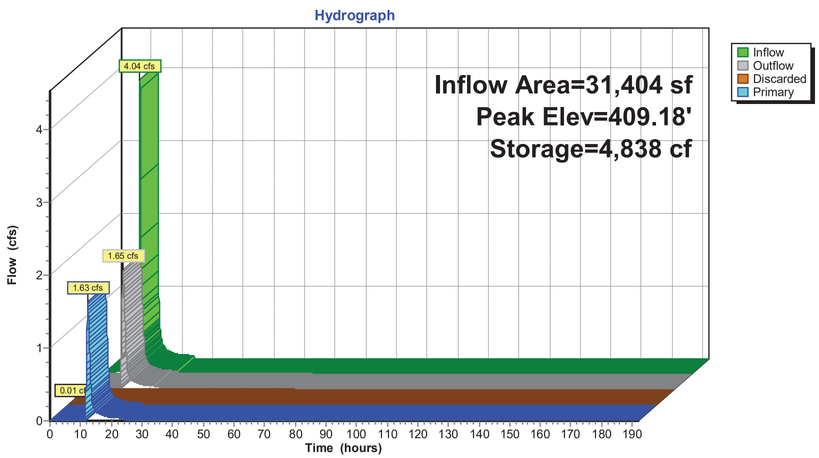
Subcatchment 9S: PROP ONSITE TO BASIN



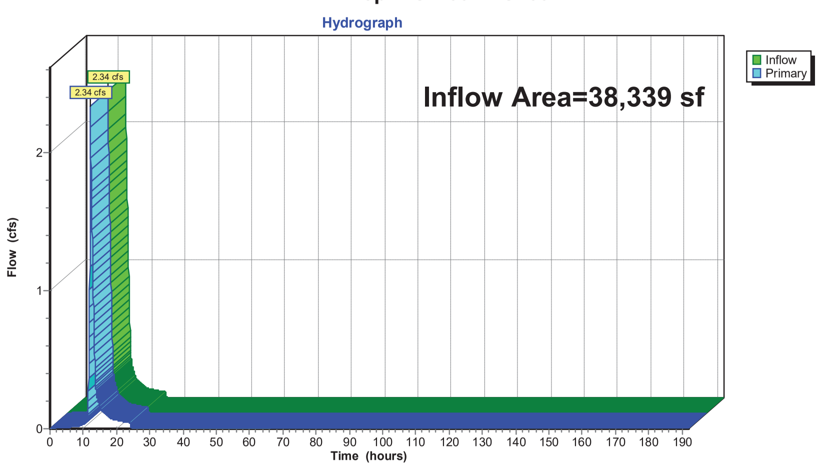
Subcatchment 11S: PROP OFFSITE TO BASIN



Pond 8P: Prop. UG Basin 24"



Link 1L: Prop. POD 001/POI 001



West Chester HydroCAD - REV1 *NOAA 24-hr C 50-Year Rainfall=6.64"*
Prepared by Dynamic Engineering Printed 9/30/2024
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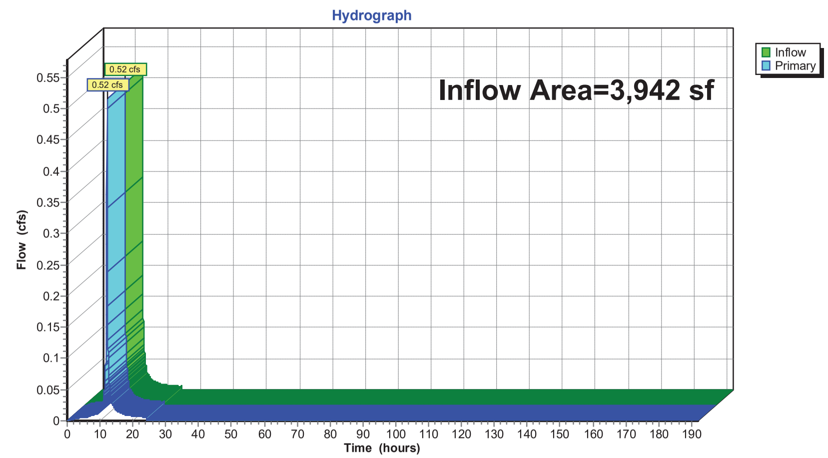
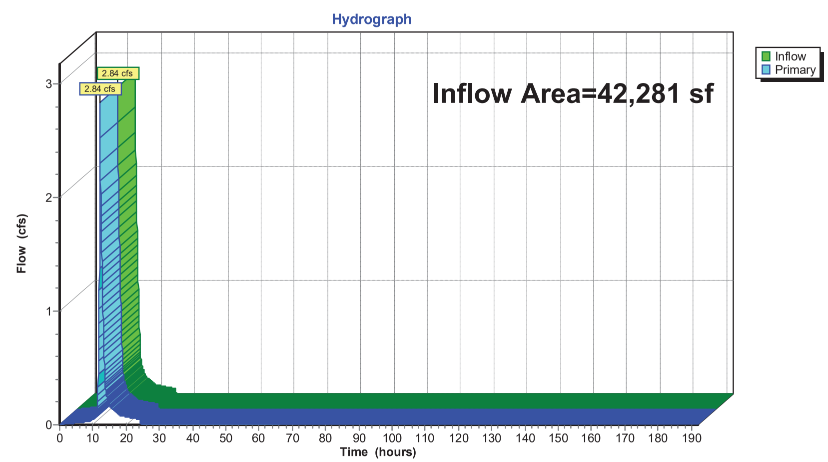
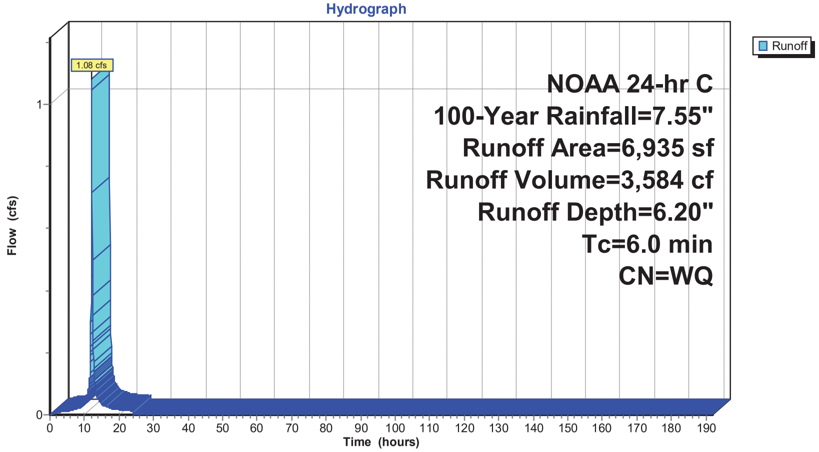
Link 2L: Prop. POD 002/POI 002



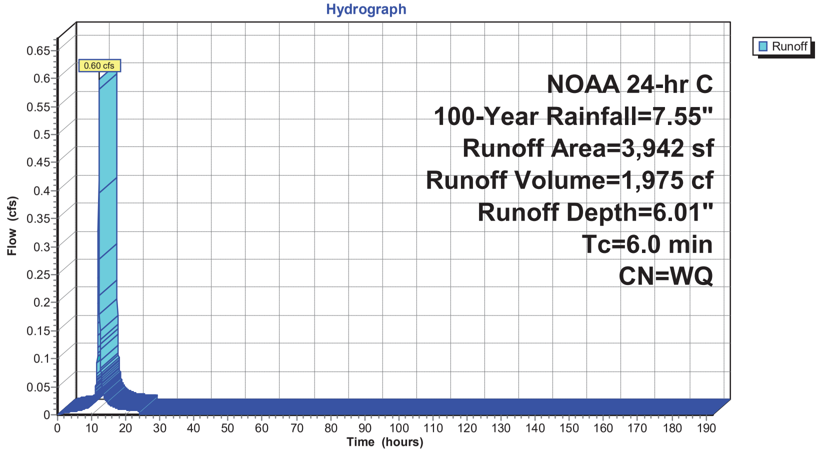
Link 4L: PROP. SITE TOTAL



Subcatchment 2S: PROP ONSITE BYPASS POD 1

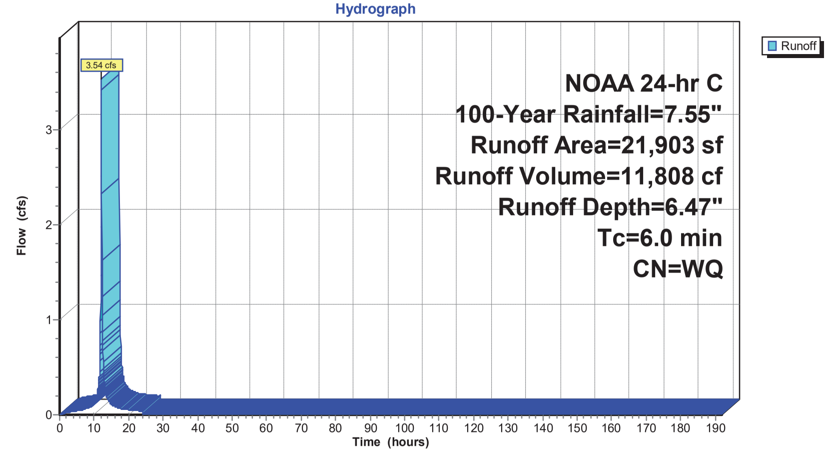


Subcatchment 4S: Prop.ONSITE Bypass POD 2

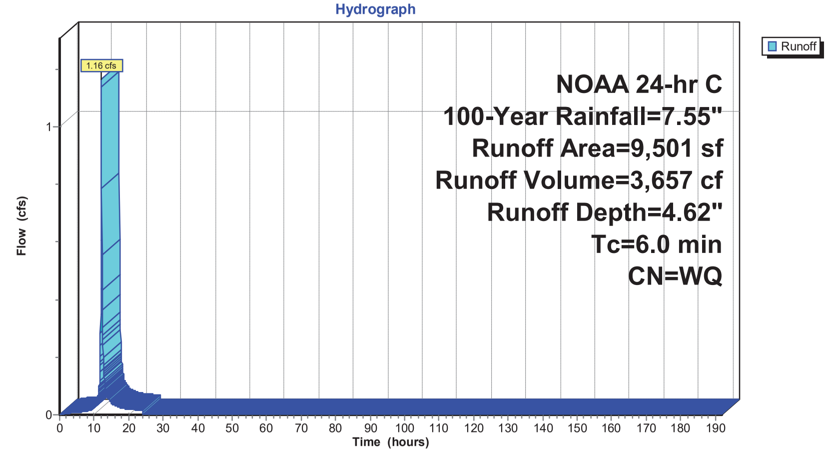


West Chester HydroCAD - REV1 *NOAA 24-hr C 100-Year Rainfall=7.55"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

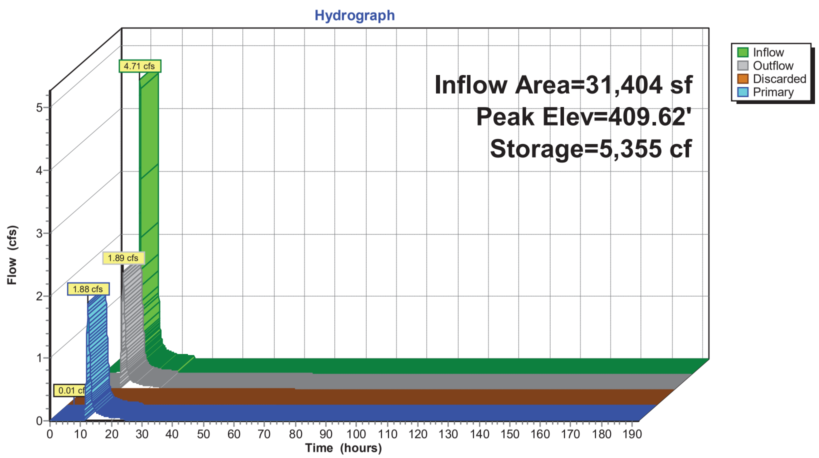
Subcatchment 9S: PROP ONSITE TO BASIN



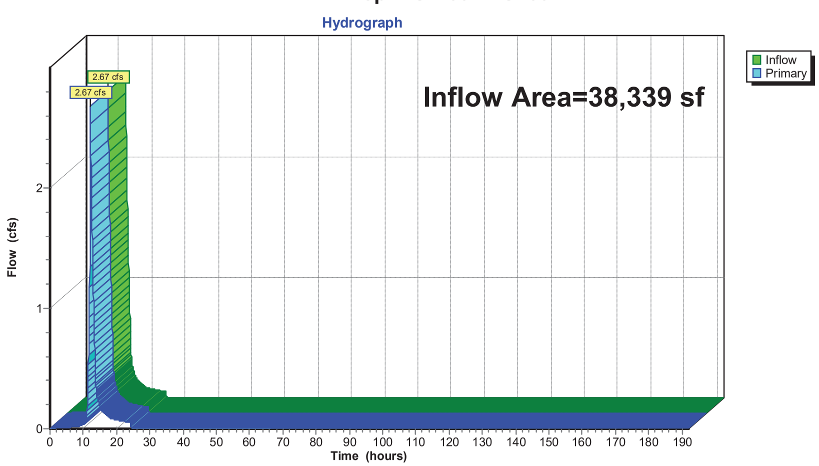
Subcatchment 11S: PROP OFFSITE TO BASIN



Pond 8P: Prop. UG Basin 24"

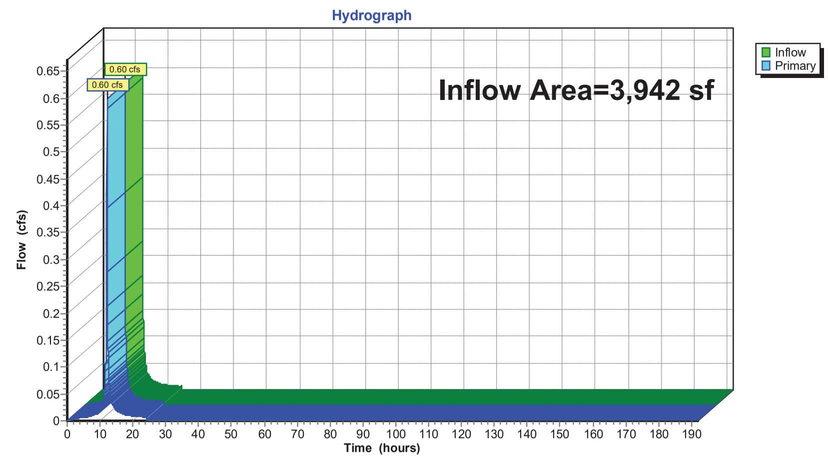


Link 1L: Prop. POD 001/POI 001

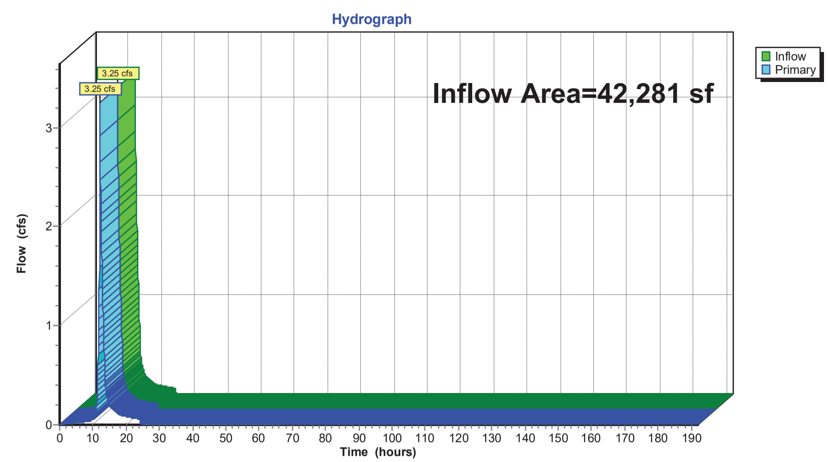


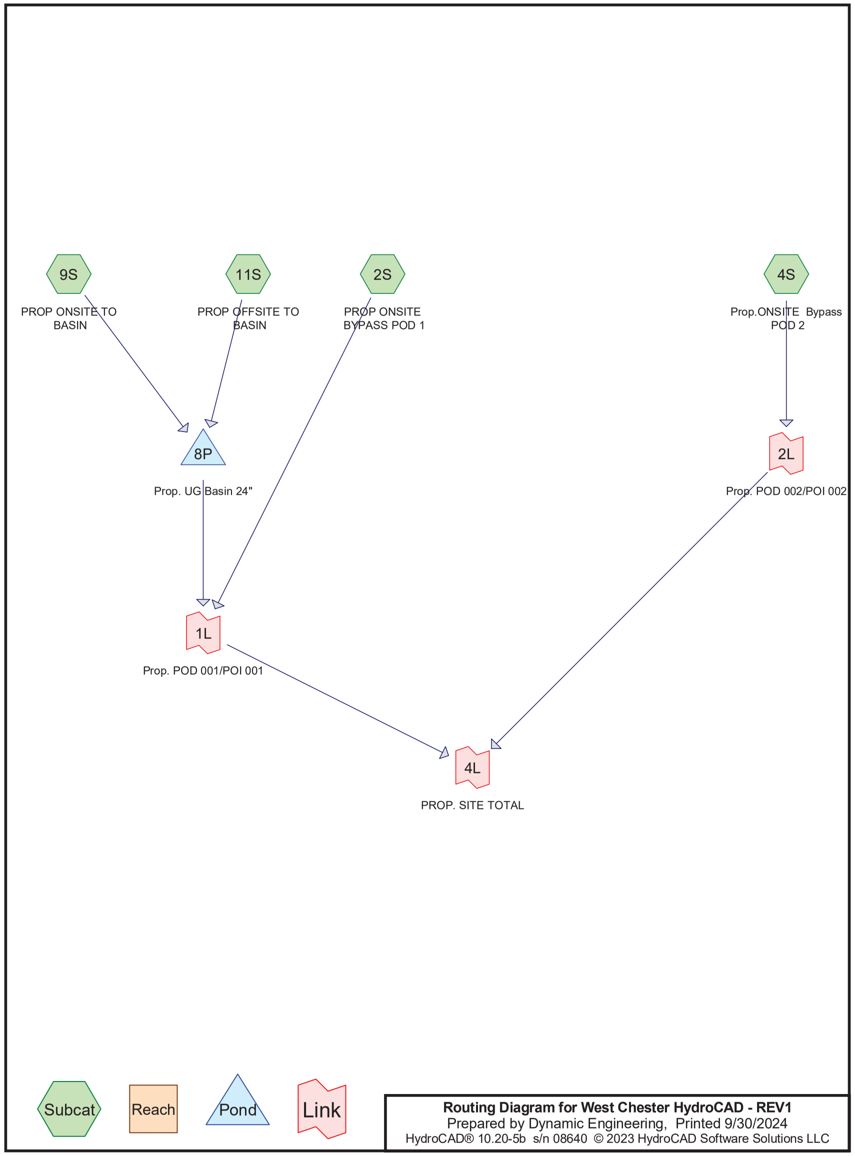
West Chester HydroCAD - REV1 *NOAA 24-hr C 100-Year Rainfall=7.55"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

Link 2L: Prop. POD 002/POI 002



Link 4L: PROP. SITE TOTAL





Routing Diagram for West Chester HydroCAD - REV1
Prepared by Dynamic Engineering, Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

West Chester HydroCAD - REV1
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-Year	NOAA 24-hr	C	Default	24.00	1	7.55	2

Time span=0.00-192.00 hrs, dt=0.05 hrs, 3841 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: PROP ONSITE BYPASS Runoff Area=6,935 sf 73.64% Impervious Runoff Depth=6.20"
Tc=6.0 min CN=WQ Runoff=1.08 cfs 3,584 cf

Subcatchment 4S: Prop.ONSITE Bypass Runoff Area=3,942 sf 69.15% Impervious Runoff Depth=6.01"
Tc=6.0 min CN=WQ Runoff=0.60 cfs 1,975 cf

Subcatchment 9S: PROP ONSITE TO Runoff Area=21,903 sf 79.99% Impervious Runoff Depth=6.47"
Tc=6.0 min CN=WQ Runoff=3.54 cfs 11,808 cf

Subcatchment 11S: PROP OFFSITE TO Runoff Area=9,501 sf 36.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=WQ Runoff=1.16 cfs 3,657 cf

Pond 8P: Prop. UG Basin 24" Peak Elev=409.62' Storage=5,355 cf Inflow=4.71 cfs 15,465 cf
Discarded=0.01 cfs 3,468 cf Primary=1.88 cfs 11,997 cf Outflow=1.89 cfs 15,465 cf

Link 1L: Prop. POD 001/POI 001 Inflow=2.67 cfs 15,582 cf
Primary=2.67 cfs 15,582 cf

Link 2L: Prop. POD 002/POI 002 Inflow=0.60 cfs 1,975 cf
Primary=0.60 cfs 1,975 cf

Link 4L: PROP. SITE TOTAL Inflow=3.25 cfs 17,557 cf
Primary=3.25 cfs 17,557 cf

Total Runoff Area = 42,281 sf Runoff Volume = 21,025 cf Average Runoff Depth = 5.97"
31.95% Pervious = 13,507 sf 68.05% Impervious = 28,774 sf

Summary for Subcatchment 2S: PROP ONSITE BYPASS POD 1

Runoff = 1.08 cfs @ 12.13 hrs, Volume= 3,584 cf, Depth= 6.20"
Routed to Link 1L : Prop. POD 001/POI 001

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=7.55"

	Area (sf)	CN	Description
*	5,107	98	
*	1,828	61	
	6,935		Weighted Average
	1,828	61	26.36% Pervious Area
	5,107	98	73.64% Impervious Area

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

Summary for Subcatchment 4S: Prop.ONSITE Bypass POD 2

Runoff = 0.60 cfs @ 12.13 hrs, Volume= 1,975 cf, Depth= 6.01"
Routed to Link 2L : Prop. POD 002/POI 002

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=7.55"

	Area (sf)	CN	Description
	2,726	98	Paved parking, HSG B
*	1,216	61	Sewer Ext per
	3,942		Weighted Average
	1,216	61	30.85% Pervious Area
	2,726	98	69.15% Impervious Area

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

Summary for Subcatchment 9S: PROP ONSITE TO BASIN

Runoff = 3.54 cfs @ 12.13 hrs, Volume= 11,808 cf, Depth= 6.47"
Routed to Pond 8P : Prop. UG Basin 24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=7.55"

	Area (sf)	CN	Description
	17,521	98	Paved parking, HSG B
*	4,382	61	
	21,903		Weighted Average
	4,382	61	20.01% Pervious Area
	17,521	98	79.99% Impervious Area

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

Summary for Subcatchment 11S: PROP OFFSITE TO BASIN

Runoff = 1.16 cfs @ 12.13 hrs, Volume= 3,657 cf, Depth= 4.62"
Routed to Pond 8P : Prop. UG Basin 24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Rainfall=7.55"

	Area (sf)	CN	Description
*	3,420	98	
*	6,081	61	
	9,501		Weighted Average
	6,081	61	64.00% Pervious Area
	3,420	98	36.00% Impervious Area

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

Summary for Pond 8P: Prop. UG Basin 24"

[92] Warning: Device #4 is above defined storage

Inflow Area = 31,404 sf, 66.68% Impervious, Inflow Depth = 5.91" for 100-Year event
Inflow = 4.71 cfs @ 12.13 hrs, Volume= 15,465 cf
Outflow = 1.89 cfs @ 12.28 hrs, Volume= 15,465 cf, Atten= 60%, Lag= 9.1 min
Discarded = 0.01 cfs @ 2.05 hrs, Volume= 3,468 cf
Primary = 1.88 cfs @ 12.28 hrs, Volume= 11,997 cf
Routed to Link 1L : Prop. POD 001/POI 001

Routing by Stor-Ind method, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs
Peak Elev= 409.62' @ 12.28 hrs Surf.Area= 3,090 sf Storage= 5,355 cf

Plug-Flow detention time= 356.2 min calculated for 15,461 cf (100% of inflow)
Center-of-Mass det. time= 356.8 min (1,118.2 - 761.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	406.00'	3,834 cf	**20.83'W x 148.33'L x 3.83'H Field A**
			11,846 cf Overall - 2,262 cf Embedded = 9,584 cf x 40.0% Voids
#2A	407.00'	1,788 cf	**ADS N-12 24"** x 28 Inside #1
			Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
			Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf
			28 Chambers in 4 Rows
			16.83' Header x 3.10 sf x 1 = 52.2 cf Inside
		5,622 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	407.10'	**15.0" Round Culvert**
			L= 129.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 407.10' / 406.45' S= 0.0050 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Discarded	406.00'	**0.200 in/hr Exfiltration over Surface area**
#3	Device 1	407.70'	**14.0" W x 3.0" H Vert. 3"x14" Orifice** C= 0.600
			Limited to weir flow at low heads
#4	Device 1	410.00'	**4.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.01 cfs @ 2.05 hrs HW=406.04' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.88 cfs @ 12.28 hrs HW=409.61' (Free Discharge)
└─**1=Culvert** (Passes 1.88 cfs of 6.41 cfs potential flow)
  ├─**3=3"x14" Orifice** (Orifice Controls 1.88 cfs @ 6.43 fps)
  └─**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

28.0" Wide + 30.0" Spacing = 58.0" C-C Row Spacing

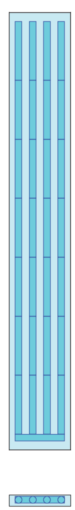
7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
4 Rows x 28.0" Wide + 30.0" Spacing x 3 + 24.0" Side Stone x 2 = 20.83' Base Width
12.0" Stone Base + 28.0" Chamber Height + 6.0" Stone Cover = 3.83' Field Height

28 Chambers x 62.0 cf + 16.83' Header x 3.10 sf = 1,788.2 cf Chamber Storage
28 Chambers x 78.4 cf + 16.83' Header x 3.92 sf = 2,261.9 cf of Displacement

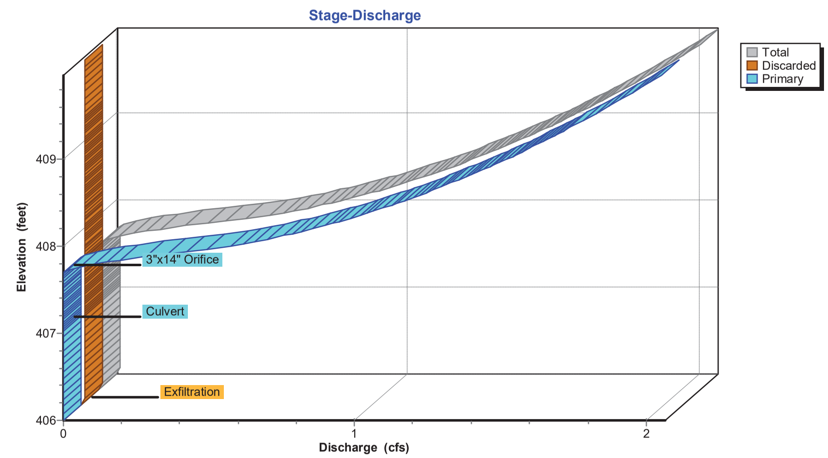
11,846.3 cf Field - 2,261.9 cf Chambers = 9,584.4 cf Stone x 40.0% Voids = 3,833.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,621.9 cf = 0.129 af
Overall Storage Efficiency = 47.5%
Overall System Size = 148.33' x 20.83' x 3.83'

28 Chambers
438.8 cy Field
355.0 cy Stone



Pond 8P: Prop. UG Basin 24"



Stage-Area-Storage for Pond 8P: Prop. UG Basin 24"

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
406.00	**3,090**	0	408.60	3,090	3,927
406.05	3,090	62	408.65	3,090	4,017
406.10	3,090	124	408.70	3,090	4,106
406.15	3,090	185	408.75	3,090	4,193
406.20	3,090	247	408.80	3,090	4,279
406.25	3,090	309	408.85	3,090	4,364
406.30	3,090	371	408.90	3,090	4,446
406.35	3,090	433	408.95	3,090	4,526
406.40	3,090	494	409.00	3,090	4,603
406.45	3,090	556	409.05	3,090	4,677
406.50	3,090	618	409.10	3,090	4,747
406.55	3,090	680	409.15	3,090	4,809
406.60	3,090	742	409.20	3,090	4,860
406.65	3,090	803	409.25	3,090	4,911
406.70	3,090	865	409.30	3,090	4,965
406.75	3,090	927	409.35	3,090	5,024
406.80	3,090	989	409.40	3,090	5,086
406.85	3,090	1,051	409.45	3,090	5,148
406.90	3,090	1,113	409.50	3,090	5,210
406.95	3,090	1,174	409.55	3,090	5,272
407.00	3,090	1,236	409.60	3,090	5,333
407.05	3,090	1,293	409.65	3,090	5,395
407.10	3,090	1,346	409.70	3,090	5,457
407.15	3,090	1,397	409.75	3,090	5,519
407.20	3,090	1,450	409.80	3,090	**5,581**
407.25	3,090	1,516	409.85	3,090	**5,622**
407.30	3,090	1,587	409.90	3,090	5,622
407.35	3,090	1,662	409.95	3,090	5,622
407.40	3,090	1,740	410.00	3,090	5,622
407.45	3,090	1,821			
407.50	3,090	1,904			
407.55	3,090	1,989			
407.60	3,090	2,076			
407.65	3,090	2,164			
407.70	3,090	2,253			
407.75	3,090	2,343			
407.80	3,090	2,434			
407.85	3,090	2,526			
407.90	3,090	2,619			
407.95	3,090	2,712			
408.00	3,090	2,806			
408.05	3,090	2,900			
408.10	3,090	2,994			
408.15	3,090	3,088			
408.20	3,090	3,183			
408.25	3,090	3,277			
408.30	3,090	3,371			
408.35	3,090	3,465			
408.40	3,090	3,559			
408.45	3,090	3,652			
408.50	3,090	3,744			
408.55	3,090	3,836			

West Chester HydroCAD - REV1 *NOAA 24-hr C 100-Year Rainfall=7.55"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

Summary for Link 1L: Prop. POD 001/POI 001

Inflow Area = 38,339 sf, 67.94% Impervious, Inflow Depth = 4.88" for 100-Year event
Inflow = 2.67 cfs @ 12.16 hrs, Volume= 15,582 cf
Primary = 2.67 cfs @ 12.16 hrs, Volume= 15,582 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 4L : PROP. SITE TOTAL

Primary outflow = Inflow, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs

Summary for Link 2L: Prop. POD 002/POI 002

```
Inflow Area =        3,942 sf,  69.15% Impervious,  Inflow Depth =  6.01"   for  100-Year event
Inflow      =       0.60 cfs @  12.13 hrs,  Volume=           1,975 cf
Primary     =       0.60 cfs @  12.13 hrs,  Volume=           1,975 cf,  Atten= 0%,  Lag= 0.0 min
   Routed to Link 4L : PROP. SITE TOTAL
```

Primary outflow = Inflow, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs

Summary for Link 4L: PROP. SITE TOTAL

```
Inflow Area =       42,281 sf,  68.05% Impervious,  Inflow Depth =  4.98"   for  100-Year event
Inflow      =       3.25 cfs @  12.15 hrs,  Volume=          17,557 cf
Primary     =       3.25 cfs @  12.15 hrs,  Volume=          17,557 cf,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-192.00 hrs, dt= 0.05 hrs

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

28.0" Wide + 30.0" Spacing = 58.0" C-C Row Spacing

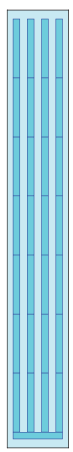
7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
4 Rows x 28.0" Wide + 30.0" Spacing x 3 + 24.0" Side Stone x 2 = 20.83' Base Width
12.0" Stone Base + 28.0" Chamber Height + 6.0" Stone Cover = 3.83' Field Height

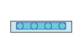
28 Chambers x 62.0 cf + 16.83' Header x 3.10 sf = 1,788.2 cf Chamber Storage
28 Chambers x 78.4 cf + 16.83' Header x 3.92 sf = 2,261.9 cf Displacement

11,846.3 cf Field - 2,261.9 cf Chambers = 9,584.4 cf Stone x 40.0% Voids = 3,833.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,621.9 cf = 0.129 af
Overall Storage Efficiency = 47.5%
Overall System Size = 148.33' x 20.83' x 3.83'

28 Chambers
438.8 cy Field
355.0 cy Stone





Hydrograph for Pond 8P: Prop. UG Basin 24"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	406.00	0.00	0.00	0.00
5.00	0.01	33	406.03	0.01	**0.01**	0.00
10.00	**0.05**	**231**	**406.19**	**0.01**	**0.01**	**0.00**
15.00	**0.04**	**2,338**	**407.75**	**0.05**	0.01	**0.04**
20.00	0.02	2,282	407.72	0.02	0.01	0.01
25.00	0.00	2,215	407.68	0.01	0.01	0.00
30.00	0.00	1,958	407.53	0.01	0.01	0.00
35.00	0.00	1,700	407.37	0.01	0.01	0.00
40.00	0.00	1,443	407.19	0.01	0.01	0.00
45.00	0.00	1,185	406.96	0.01	0.01	0.00
50.00	0.00	928	406.75	0.01	0.01	0.00
55.00	0.00	670	406.54	0.01	0.01	0.00
60.00	0.00	412	406.33	0.01	0.01	0.00
65.00	0.00	155	406.13	0.01	0.01	0.00
70.00	0.00	2	406.00	0.00	0.00	0.00
75.00	0.00	0	406.00	0.00	0.00	0.00
80.00	0.00	0	406.00	0.00	0.00	0.00
85.00	0.00	0	406.00	0.00	0.00	0.00
90.00	0.00	0	406.00	0.00	0.00	0.00
95.00	0.00	0	406.00	0.00	0.00	0.00
100.00	0.00	0	406.00	0.00	0.00	0.00
105.00	0.00	0	406.00	0.00	0.00	0.00
110.00	0.00	0	406.00	0.00	0.00	0.00
115.00	0.00	0	406.00	0.00	0.00	0.00
120.00	0.00	0	406.00	0.00	0.00	0.00
125.00	0.00	0	406.00	0.00	0.00	0.00
130.00	0.00	0	406.00	0.00	0.00	0.00
135.00	0.00	0	406.00	0.00	0.00	0.00
140.00	0.00	0	406.00	0.00	0.00	0.00
145.00	0.00	0	406.00	0.00	0.00	0.00
150.00	0.00	0	406.00	0.00	0.00	0.00
155.00	0.00	0	406.00	0.00	0.00	0.00
160.00	0.00	0	406.00	0.00	0.00	0.00
165.00	0.00	0	406.00	0.00	0.00	0.00
170.00	0.00	0	406.00	0.00	0.00	0.00
175.00	0.00	0	406.00	0.00	0.00	0.00
180.00	0.00	0	406.00	0.00	0.00	0.00
185.00	0.00	0	406.00	0.00	0.00	0.00
190.00	0.00	0	406.00	0.00	0.00	0.00

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

28.0" Wide + 30.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
4 Rows x 28.0" Wide + 30.0" Spacing x 3 + 24.0" Side Stone x 2 = 20.83' Base Width
12.0" Stone Base + 28.0" Chamber Height + 6.0" Stone Cover = 3.83' Field Height

28 Chambers x 62.0 cf + 16.83' Header x 3.10 sf = 1,788.2 cf Chamber Storage
28 Chambers x 78.4 cf + 16.83' Header x 3.92 sf = 2,261.9 cf of Displacement

11,846.3 cf Field - 2,261.9 cf Chambers = 9,584.4 cf Stone x 40.0% Voids = 3,833.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,621.9 cf = 0.129 af
Overall Storage Efficiency = 47.5%
Overall System Size = 148.33' x 20.83' x 3.83'

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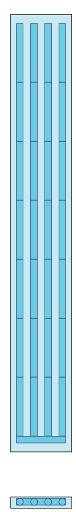
355.0 cy Stone



Hydrograph for Pond 8P: Prop. UG Basin 24"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	406.00	0.00	0.00	0.00
5.00	0.02	45	406.04	0.01	**0.01**	0.00
10.00	**0.06**	**348**	**406.28**	**0.01**	**0.01**	**0.00**
15.00	**0.06**	**2,356**	**407.76**	**0.07**	0.01	**0.05**
20.00	0.03	2,295	407.72	0.03	0.01	0.01
25.00	0.00	2,226	407.69	0.01	0.01	0.00
30.00	0.00	1,969	407.54	0.01	0.01	0.00
35.00	0.00	1,711	407.38	0.01	0.01	0.00
40.00	0.00	1,453	407.20	0.01	0.01	0.00
45.00	0.00	1,196	406.97	0.01	0.01	0.00
50.00	0.00	938	406.76	0.01	0.01	0.00
55.00	0.00	681	406.55	0.01	0.01	0.00
60.00	0.00	423	406.34	0.01	0.01	0.00
65.00	0.00	166	406.13	0.01	0.01	0.00
70.00	0.00	3	406.00	0.00	0.00	0.00
75.00	0.00	0	406.00	0.00	0.00	0.00
80.00	0.00	0	406.00	0.00	0.00	0.00
85.00	0.00	0	406.00	0.00	0.00	0.00
90.00	0.00	0	406.00	0.00	0.00	0.00
95.00	0.00	0	406.00	0.00	0.00	0.00
100.00	0.00	0	406.00	0.00	0.00	0.00
105.00	0.00	0	406.00	0.00	0.00	0.00
110.00	0.00	0	406.00	0.00	0.00	0.00
115.00	0.00	0	406.00	0.00	0.00	0.00
120.00	0.00	0	406.00	0.00	0.00	0.00
125.00	0.00	0	406.00	0.00	0.00	0.00
130.00	0.00	0	406.00	0.00	0.00	0.00
135.00	0.00	0	406.00	0.00	0.00	0.00
140.00	0.00	0	406.00	0.00	0.00	0.00
145.00	0.00	0	406.00	0.00	0.00	0.00
150.00	0.00	0	406.00	0.00	0.00	0.00
155.00	0.00	0	406.00	0.00	0.00	0.00
160.00	0.00	0	406.00	0.00	0.00	0.00
165.00	0.00	0	406.00	0.00	0.00	0.00
170.00	0.00	0	406.00	0.00	0.00	0.00
175.00	0.00	0	406.00	0.00	0.00	0.00
180.00	0.00	0	406.00	0.00	0.00	0.00
185.00	0.00	0	406.00	0.00	0.00	0.00
190.00	0.00	0	406.00	0.00	0.00	0.00

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

28.0" Wide + 30.0" Spacing = 58.0" C-C Row Spacing

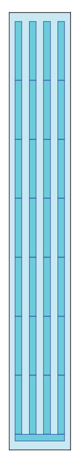
7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
4 Rows x 28.0" Wide + 30.0" Spacing x 3 + 24.0" Side Stone x 2 = 20.83' Base Width
12.0" Stone Base + 28.0" Chamber Height + 6.0" Stone Cover = 3.83' Field Height

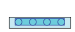
28 Chambers x 62.0 cf + 16.83' Header x 3.10 sf = 1,788.2 cf Chamber Storage
28 Chambers x 78.4 cf + 16.83' Header x 3.92 sf = 2,261.9 cf Displacement

11,846.3 cf Field - 2,261.9 cf Chambers = 9,584.4 cf Stone x 40.0% Voids = 3,833.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,621.9 cf = 0.129 af
Overall Storage Efficiency = 47.5%
Overall System Size = 148.33' x 20.83' x 3.83'

28 Chambers
438.8 cy Field
355.0 cy Stone





West Chester HydroCAD - REV1 *NOAA 24-hr C 5-Year Rainfall=4.09"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

Hydrograph for Pond 8P: Prop. UG Basin 24"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	406.00	0.00	**0.00**	0.00
5.00	0.02	72	406.06	0.01	**0.01**	0.00
10.00	**0.08**	**551**	**406.45**	**0.01**	0.01	**0.00**
15.00	**0.07**	**2,380**	**407.77**	**0.08**	0.01	**0.07**
20.00	0.04	2,310	407.73	0.04	0.01	0.02
25.00	0.00	2,236	407.69	0.01	0.01	0.00
30.00	0.00	1,979	407.54	0.01	0.01	0.00
35.00	0.00	1,721	407.39	0.01	0.01	0.00
40.00	0.00	1,464	407.21	0.01	0.01	0.00
45.00	0.00	1,206	406.98	0.01	0.01	0.00
50.00	0.00	949	406.77	0.01	0.01	0.00
55.00	0.00	691	406.56	0.01	0.01	0.00
60.00	0.00	434	406.35	0.01	0.01	0.00
65.00	0.00	176	406.14	0.01	0.01	0.00
70.00	0.00	4	406.00	0.00	0.00	0.00
75.00	0.00	0	406.00	0.00	0.00	0.00
80.00	0.00	0	406.00	0.00	0.00	0.00
85.00	0.00	0	406.00	0.00	0.00	0.00
90.00	0.00	0	406.00	0.00	0.00	0.00
95.00	0.00	0	406.00	0.00	0.00	0.00
100.00	0.00	0	406.00	0.00	0.00	0.00
105.00	0.00	0	406.00	0.00	0.00	0.00
110.00	0.00	0	406.00	0.00	0.00	0.00
115.00	0.00	0	406.00	0.00	0.00	0.00
120.00	0.00	0	406.00	0.00	0.00	0.00
125.00	0.00	0	406.00	0.00	0.00	0.00
130.00	0.00	0	406.00	0.00	0.00	0.00
135.00	0.00	0	406.00	0.00	0.00	0.00
140.00	0.00	0	406.00	0.00	0.00	0.00
145.00	0.00	0	406.00	0.00	0.00	0.00
150.00	0.00	0	406.00	0.00	0.00	0.00
155.00	0.00	0	406.00	0.00	0.00	0.00
160.00	0.00	0	406.00	0.00	0.00	0.00
165.00	0.00	0	406.00	0.00	0.00	0.00
170.00	0.00	0	406.00	0.00	0.00	0.00
175.00	0.00	0	406.00	0.00	0.00	0.00
180.00	0.00	0	406.00	0.00	0.00	0.00
185.00	0.00	0	406.00	0.00	0.00	0.00
190.00	0.00	0	406.00	0.00	0.00	0.00

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

28.0" Wide + 30.0" Spacing = 58.0" C-C Row Spacing

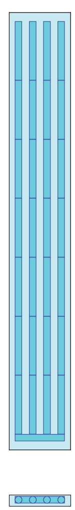
7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
4 Rows x 28.0" Wide + 30.0" Spacing x 3 + 24.0" Side Stone x 2 = 20.83' Base Width
12.0" Stone Base + 28.0" Chamber Height + 6.0" Stone Cover = 3.83' Field Height

28 Chambers x 62.0 cf + 16.83' Header x 3.10 sf = 1,788.2 cf Chamber Storage
28 Chambers x 78.4 cf + 16.83' Header x 3.92 sf = 2,261.9 cf of Displacement

11,846.3 cf Field - 2,261.9 cf Chambers = 9,584.4 cf Stone x 40.0% Voids = 3,833.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,621.9 cf = 0.129 af
Overall Storage Efficiency = 47.5%
Overall System Size = 148.33' x 20.83' x 3.83'

28 Chambers
438.8 cy Field
355.0 cy Stone



Hydrograph for Pond 8P: Prop. UG Basin 24"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	406.00	0.00	**0.00**	0.00
5.00	0.03	110	406.09	0.01	**0.01**	0.00
10.00	**0.09**	**737**	**406.60**	**0.01**	0.01	**0.00**
15.00	**0.09**	**2,400**	**407.78**	**0.10**	0.01	**0.09**
20.00	0.04	2,323	407.74	0.04	0.01	0.03
25.00	0.00	2,241	407.69	0.01	0.01	0.00
30.00	0.00	1,983	407.55	0.01	0.01	0.00
35.00	0.00	1,726	407.39	0.01	0.01	0.00
40.00	0.00	1,468	407.21	0.01	0.01	0.00
45.00	0.00	1,211	406.98	0.01	0.01	0.00
50.00	0.00	953	406.77	0.01	0.01	0.00
55.00	0.00	696	406.56	0.01	0.01	0.00
60.00	0.00	438	406.35	0.01	0.01	0.00
65.00	0.00	181	406.15	0.01	0.01	0.00
70.00	0.00	4	406.00	0.00	0.00	0.00
75.00	0.00	0	406.00	0.00	0.00	0.00
80.00	0.00	0	406.00	0.00	0.00	0.00
85.00	0.00	0	406.00	0.00	0.00	0.00
90.00	0.00	0	406.00	0.00	0.00	0.00
95.00	0.00	0	406.00	0.00	0.00	0.00
100.00	0.00	0	406.00	0.00	0.00	0.00
105.00	0.00	0	406.00	0.00	0.00	0.00
110.00	0.00	0	406.00	0.00	0.00	0.00
115.00	0.00	0	406.00	0.00	0.00	0.00
120.00	0.00	0	406.00	0.00	0.00	0.00
125.00	0.00	0	406.00	0.00	0.00	0.00
130.00	0.00	0	406.00	0.00	0.00	0.00
135.00	0.00	0	406.00	0.00	0.00	0.00
140.00	0.00	0	406.00	0.00	0.00	0.00
145.00	0.00	0	406.00	0.00	0.00	0.00
150.00	0.00	0	406.00	0.00	0.00	0.00
155.00	0.00	0	406.00	0.00	0.00	0.00
160.00	0.00	0	406.00	0.00	0.00	0.00
165.00	0.00	0	406.00	0.00	0.00	0.00
170.00	0.00	0	406.00	0.00	0.00	0.00
175.00	0.00	0	406.00	0.00	0.00	0.00
180.00	0.00	0	406.00	0.00	0.00	0.00
185.00	0.00	0	406.00	0.00	0.00	0.00
190.00	0.00	0	406.00	0.00	0.00	0.00

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

28.0" Wide + 30.0" Spacing = 58.0" C-C Row Spacing

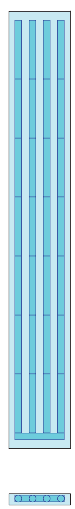
7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
4 Rows x 28.0" Wide + 30.0" Spacing x 3 + 24.0" Side Stone x 2 = 20.83' Base Width
12.0" Stone Base + 28.0" Chamber Height + 6.0" Stone Cover = 3.83' Field Height

28 Chambers x 62.0 cf + 16.83' Header x 3.10 sf = 1,788.2 cf Chamber Storage
28 Chambers x 78.4 cf + 16.83' Header x 3.92 sf = 2,261.9 cf of Displacement

11,846.3 cf Field - 2,261.9 cf Chambers = 9,584.4 cf Stone x 40.0% Voids = 3,833.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,621.9 cf = 0.129 af
Overall Storage Efficiency = 47.5%
Overall System Size = 148.33' x 20.83' x 3.83'

28 Chambers
438.8 cy Field
355.0 cy Stone



Hydrograph for Pond 8P: Prop. UG Basin 24"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	406.00	0.00	**0.00**	0.00
5.00	0.04	179	406.14	0.01	**0.01**	0.00
10.00	**0.12**	**1,017**	**406.82**	**0.01**	0.01	**0.00**
15.00	**0.11**	**2,426**	**407.80**	**0.13**	0.01	**0.11**
20.00	0.05	2,340	407.75	0.05	0.01	0.04
25.00	0.00	2,246	407.70	0.01	0.01	0.00
30.00	0.00	1,989	407.55	0.01	0.01	0.00
35.00	0.00	1,731	407.39	0.01	0.01	0.00
40.00	0.00	1,474	407.22	0.01	0.01	0.00
45.00	0.00	1,216	406.98	0.01	0.01	0.00
50.00	0.00	959	406.78	0.01	0.01	0.00
55.00	0.00	701	406.57	0.01	0.01	0.00
60.00	0.00	444	406.36	0.01	0.01	0.00
65.00	0.00	186	406.15	0.01	0.01	0.00
70.00	0.00	4	406.00	0.00	0.00	0.00
75.00	0.00	0	406.00	0.00	0.00	0.00
80.00	0.00	0	406.00	0.00	0.00	0.00
85.00	0.00	0	406.00	0.00	0.00	0.00
90.00	0.00	0	406.00	0.00	0.00	0.00
95.00	0.00	0	406.00	0.00	0.00	0.00
100.00	0.00	0	406.00	0.00	0.00	0.00
105.00	0.00	0	406.00	0.00	0.00	0.00
110.00	0.00	0	406.00	0.00	0.00	0.00
115.00	0.00	0	406.00	0.00	0.00	0.00
120.00	0.00	0	406.00	0.00	0.00	0.00
125.00	0.00	0	406.00	0.00	0.00	0.00
130.00	0.00	0	406.00	0.00	0.00	0.00
135.00	0.00	0	406.00	0.00	0.00	0.00
140.00	0.00	0	406.00	0.00	0.00	0.00
145.00	0.00	0	406.00	0.00	0.00	0.00
150.00	0.00	0	406.00	0.00	0.00	0.00
155.00	0.00	0	406.00	0.00	0.00	0.00
160.00	0.00	0	406.00	0.00	0.00	0.00
165.00	0.00	0	406.00	0.00	0.00	0.00
170.00	0.00	0	406.00	0.00	0.00	0.00
175.00	0.00	0	406.00	0.00	0.00	0.00
180.00	0.00	0	406.00	0.00	0.00	0.00
185.00	0.00	0	406.00	0.00	0.00	0.00
190.00	0.00	0	406.00	0.00	0.00	0.00

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

28.0" Wide + 30.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
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12.0" Stone Base + 28.0" Chamber Height + 6.0" Stone Cover = 3.83' Field Height

28 Chambers x 62.0 cf + 16.83' Header x 3.10 sf = 1,788.2 cf Chamber Storage
28 Chambers x 78.4 cf + 16.83' Header x 3.92 sf = 2,261.9 cf of Displacement

11,846.3 cf Field - 2,261.9 cf Chambers = 9,584.4 cf Stone x 40.0% Voids = 3,833.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,621.9 cf = 0.129 af
Overall Storage Efficiency = 47.5%
Overall System Size = 148.33' x 20.83' x 3.83'

28 Chambers
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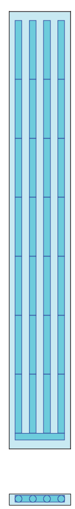
355.0 cy Stone



Hydrograph for Pond 8P: Prop. UG Basin 24"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	406.00	0.00	**0.00**	0.00
5.00	0.04	246	406.20	0.01	**0.01**	0.00
10.00	**0.13**	**1,262**	**407.02**	**0.01**	0.01	**0.00**
15.00	**0.13**	**2,447**	**407.81**	**0.15**	0.01	**0.13**
20.00	0.06	2,353	407.76	0.06	0.01	0.05
25.00	0.00	2,250	407.70	0.01	0.01	0.00
30.00	0.00	1,993	407.55	0.01	0.01	0.00
35.00	0.00	1,735	407.40	0.01	0.01	0.00
40.00	0.00	1,478	407.22	0.01	0.01	0.00
45.00	0.00	1,220	406.99	0.01	0.01	0.00
50.00	0.00	963	406.78	0.01	0.01	0.00
55.00	0.00	705	406.57	0.01	0.01	0.00
60.00	0.00	448	406.36	0.01	0.01	0.00
65.00	0.00	190	406.15	0.01	0.01	0.00
70.00	0.00	5	406.00	0.00	0.00	0.00
75.00	0.00	0	406.00	0.00	0.00	0.00
80.00	0.00	0	406.00	0.00	0.00	0.00
85.00	0.00	0	406.00	0.00	0.00	0.00
90.00	0.00	0	406.00	0.00	0.00	0.00
95.00	0.00	0	406.00	0.00	0.00	0.00
100.00	0.00	0	406.00	0.00	0.00	0.00
105.00	0.00	0	406.00	0.00	0.00	0.00
110.00	0.00	0	406.00	0.00	0.00	0.00
115.00	0.00	0	406.00	0.00	0.00	0.00
120.00	0.00	0	406.00	0.00	0.00	0.00
125.00	0.00	0	406.00	0.00	0.00	0.00
130.00	0.00	0	406.00	0.00	0.00	0.00
135.00	0.00	0	406.00	0.00	0.00	0.00
140.00	0.00	0	406.00	0.00	0.00	0.00
145.00	0.00	0	406.00	0.00	0.00	0.00
150.00	0.00	0	406.00	0.00	0.00	0.00
155.00	0.00	0	406.00	0.00	0.00	0.00
160.00	0.00	0	406.00	0.00	0.00	0.00
165.00	0.00	0	406.00	0.00	0.00	0.00
170.00	0.00	0	406.00	0.00	0.00	0.00
175.00	0.00	0	406.00	0.00	0.00	0.00
180.00	0.00	0	406.00	0.00	0.00	0.00
185.00	0.00	0	406.00	0.00	0.00	0.00
190.00	0.00	0	406.00	0.00	0.00	0.00

Pond 8P: Prop. UG Basin 24" - Chamber Wizard Field A

Chamber Model = ADS N-12 24" (ADS N-12® Pipe)
Inside= 23.8"W x 23.8"H => 3.10 sf x 20.00'L = 62.0 cf
Outside= 28.0"W x 28.0"H => 3.92 sf x 20.00'L = 78.4 cf

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7 Chambers/Row x 20.00' Long +2.33' Header x 1 = 142.33' Row Length +36.0" End Stone x 2 = 148.33' Base Length
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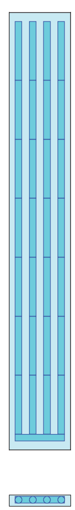


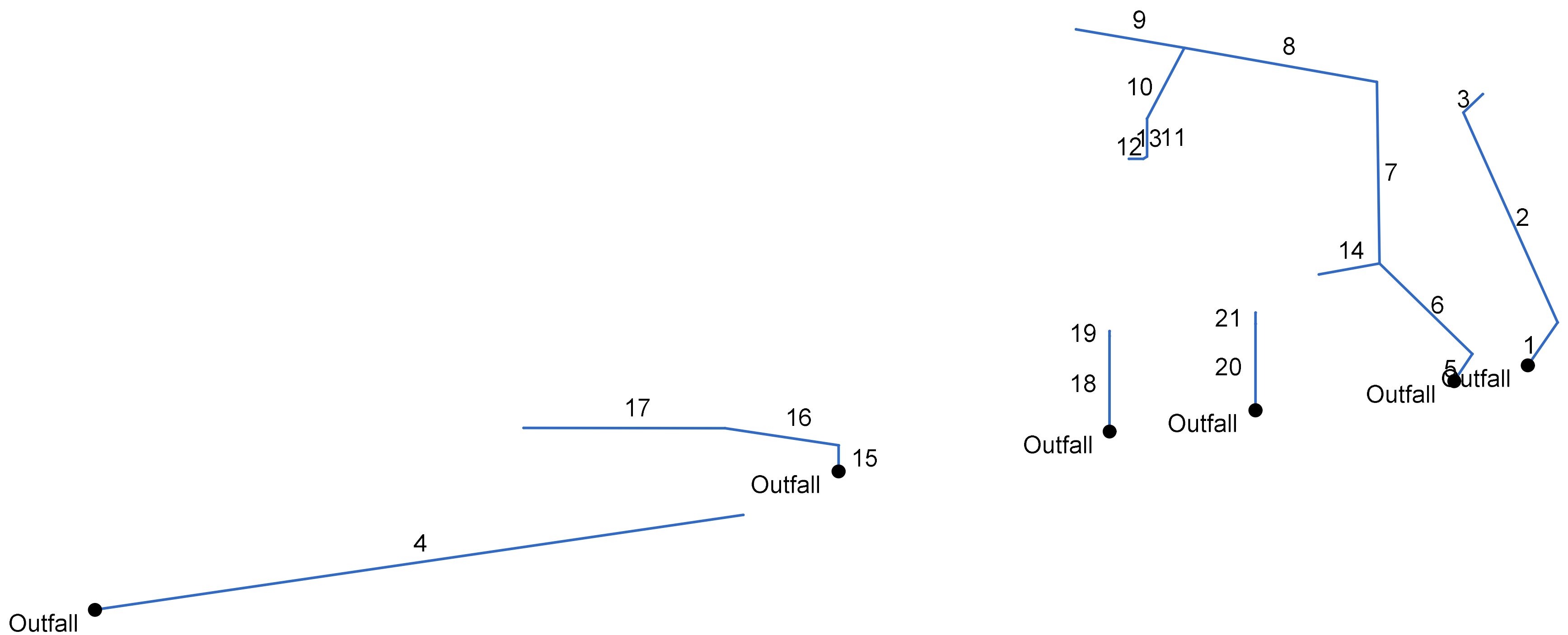
West Chester HydroCAD - REV1 *NOAA 24-hr C 100-Year Rainfall=7.55"*
Prepared by Dynamic Engineering Printed 9/30/2024
HydroCAD® 10.20-5b s/n 08640 © 2023 HydroCAD Software Solutions LLC

Hydrograph for Pond 8P: Prop. UG Basin 24"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	406.00	0.00	**0.00**	0.00
5.00	0.05	323	406.26	0.01	**0.01**	0.00
10.00	**0.15**	**1,530**	**407.26**	**0.01**	0.01	**0.00**
15.00	**0.15**	**2,468**	**407.82**	**0.17**	0.01	**0.15**
20.00	0.07	2,366	407.76	0.07	0.01	0.06
25.00	0.00	2,254	407.70	0.01	0.01	0.00
30.00	0.00	1,996	407.55	0.01	0.01	0.00
35.00	0.00	1,738	407.40	0.01	0.01	0.00
40.00	0.00	1,481	407.22	0.01	0.01	0.00
45.00	0.00	1,223	406.99	0.01	0.01	0.00
50.00	0.00	966	406.78	0.01	0.01	0.00
55.00	0.00	708	406.57	0.01	0.01	0.00
60.00	0.00	451	406.36	0.01	0.01	0.00
65.00	0.00	193	406.16	0.01	0.01	0.00
70.00	0.00	5	406.00	0.00	0.00	0.00
75.00	0.00	0	406.00	0.00	0.00	0.00
80.00	0.00	0	406.00	0.00	0.00	0.00
85.00	0.00	0	406.00	0.00	0.00	0.00
90.00	0.00	0	406.00	0.00	0.00	0.00
95.00	0.00	0	406.00	0.00	0.00	0.00
100.00	0.00	0	406.00	0.00	0.00	0.00
105.00	0.00	0	406.00	0.00	0.00	0.00
110.00	0.00	0	406.00	0.00	0.00	0.00
115.00	0.00	0	406.00	0.00	0.00	0.00
120.00	0.00	0	406.00	0.00	0.00	0.00
125.00	0.00	0	406.00	0.00	0.00	0.00
130.00	0.00	0	406.00	0.00	0.00	0.00
135.00	0.00	0	406.00	0.00	0.00	0.00
140.00	0.00	0	406.00	0.00	0.00	0.00
145.00	0.00	0	406.00	0.00	0.00	0.00
150.00	0.00	0	406.00	0.00	0.00	0.00
155.00	0.00	0	406.00	0.00	0.00	0.00
160.00	0.00	0	406.00	0.00	0.00	0.00
165.00	0.00	0	406.00	0.00	0.00	0.00
170.00	0.00	0	406.00	0.00	0.00	0.00
175.00	0.00	0	406.00	0.00	0.00	0.00
180.00	0.00	0	406.00	0.00	0.00	0.00
185.00	0.00	0	406.00	0.00	0.00	0.00
190.00	0.00	0	406.00	0.00	0.00	0.00

I. STORMWATER COLLECTION SYSTEM CALCULATIONS (STORM SEWERS)

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Pipe Sizing 100YR.stm	Number of lines: 21	Date: 9/30/2024

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	15.546	0.00	0.56	0.00	0.00	0.53	0.0	5.6	7.6	4.06	11.66	2.34	18	1.03	413.25	413.41	414.76	414.77	414.89	417.95	502 TO 501
2	1	73.372	0.00	0.56	0.00	0.00	0.53	0.0	5.1	7.8	4.16	24.27	4.04	18	4.46	413.90	417.17	414.83	417.95	417.95	421.44	503 TO 502
3	2	7.268	0.56	0.56	0.95	0.53	0.53	5.0	5.0	7.8	4.17	0.00	4.11	18	0.00	417.34	417.34	418.12	418.24	421.44	419.98	503 TO 503
4	End	129.461	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.87	4.94	2.08	15	0.50	406.45	407.10	407.70	407.80	409.64	411.72	101 TO 27
5	End	9.823	0.14	0.42	0.95	0.13	0.40	5.0	7.3	7.1	2.84	4.97	2.32	15	0.51	407.00	407.05	409.60	409.62	0.00	412.48	202 TO 201
6	5	35.439	0.07	0.28	0.95	0.07	0.27	5.0	6.9	7.2	1.92	4.97	1.57	15	0.51	407.22	407.40	409.68	409.71	412.48	413.37	203 TO 202
7	6	61.502	0.00	0.19	0.00	0.00	0.18	0.0	6.0	7.5	1.35	4.87	1.10	15	0.49	407.57	407.87	409.75	409.77	413.37	414.33	204 TO 203
8	7	39.038	0.00	0.19	0.00	0.00	0.18	0.0	5.4	7.7	1.39	4.99	1.13	15	0.51	408.04	408.24	409.79	409.81	414.33	414.44	204A TO 204
9	8	21.809	0.17	0.17	0.95	0.16	0.16	5.0	5.0	7.8	1.27	4.95	1.03	15	0.50	408.24	408.35	409.82	409.83	414.44	413.50	205 TO 204A
10	8	25.059	0.00	0.02	0.00	0.00	0.02	0.0	5.2	7.8	0.15	0.22	1.61	4	1.00	408.24	408.49	409.82	409.94	414.44	414.01	32 TO 204A
11	10	12.776	0.00	0.02	0.00	0.00	0.02	0.0	5.0	7.8	0.15	0.22	1.62	4	1.02	408.49	408.62	409.95	410.01	414.01	414.64	35 TO 32
12	11	1.078	0.00	0.02	0.00	0.00	0.02	0.0	5.0	7.8	0.15	0.21	1.62	4	0.93	408.62	408.63	410.04	410.05	414.64	414.65	34 TO 35
13	12	2.657	0.02	0.02	0.95	0.02	0.02	5.0	5.0	7.8	0.15	0.19	1.62	4	0.75	408.63	408.65	410.08	410.09	414.65	414.44	31 TO 34
14	6	12.436	0.02	0.02	0.95	0.02	0.02	5.0	5.0	7.8	0.15	0.22	1.62	4	0.97	408.02	408.14	409.75	409.81	413.37	414.43	33 TO 203
15	End	8.884	0.04	0.26	0.95	0.04	0.25	5.0	5.8	7.6	1.87	4.68	1.53	15	0.45	407.00	407.04	409.60	409.61	0.00	412.38	112 TO 111
16	15	22.706	0.00	0.22	0.00	0.00	0.21	0.0	5.5	7.7	1.60	5.07	1.31	15	0.53	407.21	407.33	409.64	409.65	412.38	412.02	113 TO 112
17	16	38.945	0.22	0.22	0.95	0.21	0.21	5.0	5.0	7.8	1.64	4.87	1.34	15	0.49	407.50	407.69	409.66	409.68	412.02	411.64	114 TO 113
18	End	32.379	0.00	0.02	0.00	0.00	0.02	0.0	5.0	7.8	0.15	0.60	0.76	6	0.99	407.00	407.32	409.60	409.62	0.00	414.45	37 TO 38
19	18	1.640	0.02	0.02	0.95	0.02	0.02	5.0	5.0	7.8	0.15	0.67	0.76	6	1.22	407.32	407.34	409.62	409.62	414.45	414.45	36 TO 37
20	End	29.208	0.00	0.02	0.00	0.00	0.02	0.0	5.0	7.8	0.15	0.22	1.62	4	0.99	407.00	407.29	409.60	409.73	0.00	414.08	40 TO 41
21	20	3.869	0.02	0.02	0.95	0.02	0.02	5.0	5.0	7.8	0.15	0.22	1.62	4	1.03	407.29	407.33	409.74	409.76	414.08	414.65	39 TO 40

Project File: Pipe Sizing 100YR.stm | Number of lines: 21 | Run Date: 9/30/2024

NOTES:Intensity = 44.22 / (Inlet time + 9.10) ^ 0.65; Return period =Yrs. 100 ; c = cir e = ellip b = box

J. VOLUME WORKSHEETS CALCULATIONS

1" (inch) Over Imperious Calculations

Project:	**Proposed Chase Bank**	Computed By:
Job #:	1478-99-191	Checked By:
Location:	Westtown Township, PA	Date:
		Revised:

Total Impervious	25253
	0.083333
Required WQ Vol.	2104.417

SRM
JAG
7/15/2024
9/12/2024

K. BASIN DEWATERING CALCULATIONS

DYNAMIC ENGINEERING

Infiltration Basin Drain time Calculations

Project:	**Proposed Chase Bank**	Computed By:	SRM
Job #:	1478-99-191	Checked By:	JAG
Location:	Westtown Township, PA	Date:	7/15/2024
		Revised:	9/12/2024

Basin Name: **UG HDPE Basin**

Volume of Runoff to be Infiltrated =	2,104	cubic feet			
Surface Area of Infiltration Area =	3,000	square feet			
Effective Depth of Runoff to be Infiltrated = Volume of Runoff to be Infiltrated / Surface Area of Infiltration Area =	0.70	feet	=	8.42	inches
Field Tested Recharge Rate =	0.61	inches per hour			
Design Recharge Rate * =	0.20	inches per hour			

Effective Depth of Runoff to be Infiltrated / Design Recharge Rate = Time to Empty Basin = 41.2 hours**

1. Volume of Runoff to be Infiltrated is referenced from the Proposed Hydrographs (2 YR/24-HR storm event), Hydrograph #25.
2. *Note : Factor of Safety of 3.0 is applied to the Field Tested Recharge Rate to establish the Design Recharge Rate for Drain Time Calculations*
3. *Note : Time to Empty Basin must be less than 96 hours. Therefore;* Drain time is less than 96 Hours, therefore, design is acceptable
4. *Per Township Stormwater Ordinance Section 402.11 - normally dry, open top, storage facilities shall completely drainage the volume control store over a period of time not less than 24 hours and not more than 72 hours from the end of the design storm. However, because the infiltration basins are designed to be underground (i.e. not open top) facilities, and infiltration period up to 96 hours is acceptable per the PADEP Guidelines.*

L. TIME OF CONCENTRATION CALCULATIONS

STANDARD E&S WORKSHEET #9

Determination of Time of Concentration (T_c)

(FOR SCS METHOD)

PROJECT NAME: Paramount West Chester
LOCATION: Westtown Township PA
PREPARED BY: MSW DATE: 7/1/24
LAST REVISED BY: DATE:

FEATURE/STRUCTURE ##

Two-year 24-hour Rainfall, P_2: 2.99

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}}$$

Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: [3]	
Light underbrush	0.40
Dense underbrush	0.80

OVERLAND FLOW:

PATH NUMBER	Length L (ft)	TYPE OF COVER	"n" VALUE	AVG. SLOPE (S) (ft/ft)	TIME (minutes)
A-B	44	Dense Grasses	0.24	0.21	3.00
B-C	56	Smooth Surfaces	0.011	0.038	0.25

SHALLOW CONCENTRATED FLOW:

PATH NUMBER	Length (ft)	TYPE OF COVER	AVG. SLOPE (ft/ft)	V (ft/sec)	TIME (minutes)
C-D	419	Paved	0.01	2.03	3.44

CHANNEL FLOW:

PATH NUMBER	Length (ft)	AREA (sq. ft.)	AVG. SLOPE (ft/ft)	WETTED PERIMETER (ft)	HYDRAULIC RADIUS (ft)	MANNING'S n	V (ft/sec)	CHANNEL TIME (minutes)
		0.00		#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!

CHANNEL DIMENSIONS:

PATH NUMBER	BOTTOM WIDTH (ft)	TOTAL DEPTH (ft)	RIGHT SIDE SLOPE (H:V)	LEFT SIDE SLOPE (H:V)	TOP WIDTH (ft)	CALC. FLOW DEPTH (ft)

PIPE FLOW:

PATH NUMBER	Length (ft)	AREA (sq. ft.)	AVG. SLOPE (ft/ft)	WETTED PERIMETER (ft)	HYDRAULIC RADIUS (ft)	MANNING'S n	V (ft/sec)	PIPE TIME (minutes)
		0.00		0.00	#DIV/0!		#DIV/0!	#DIV/0!

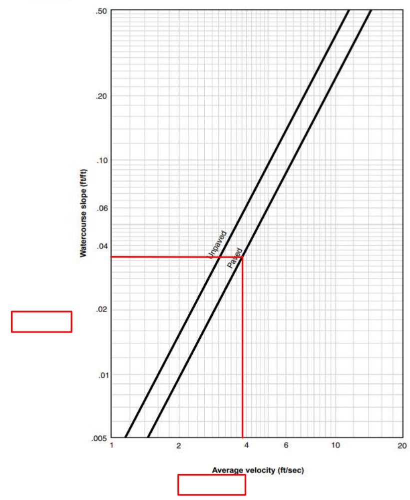
PIPE DIMENSIONS:

PATH NUMBER	PIPE DIAM. (in)	PIPE MATERIAL

Total Time of Concentration: 6.68

FEATURE/STRUCTURE ##

Figure 3-1 Average velocities for estimating travel time for shallow concentrated flow



STANDARD E&S WORKSHEET #9

Determination of Time of Concentration (T_c)

(FOR SCS METHOD)

PROJECT NAME: Paramount West Chester

LOCATION: Westtown Township PA

PREPARED BY: MSW DATE: 7/1/24

LAST REVISED BY: DATE:

FEATURE/STRUCTURE ##

Two-year 24-hour Rainfall, P_2: 2.99

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}}$$

Surface description	n 1/
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses 2/	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: 3/	
Light underbrush	0.40
Dense underbrush	0.80

OVERLAND FLOW:

PATH NUMBER	Length L (ft)	TYPE OF COVER	"n" VALUE	AVG. SLOPE (S) (ft/ft)	TIME (minutes)
A-B	37	Dense Grasses	0.24	0.28	2.33
B-C	63	Smooth Surfaces	0.011	0.05	0.62

SHALLOW CONCENTRATED FLOW:

PATH NUMBER	Length (ft)	TYPE OF COVER	AVG. SLOPE (ft/ft)	V (ft/sec)	TIME (minutes)
B-C	566	Paved	0.02	2.87	3.28

.

PATH NUMBER	Length (ft)	AREA (sq. ft.)	AVG. SLOPE (ft/ft)	WETTED PERIMETER (ft)	HYDRAULIC RADIUS (ft)	MANNING'S n	V (ft/sec)	CHANNEL TIME (minutes)
		0.00		#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!

CHANNEL DIMENSIONS:

PATH NUMBER	BOTTOM WIDTH (ft)	TOTAL DEPTH (ft)	RIGHT SIDE SLOPE (H:V)	LEFT SIDE SLOPE (H:V)	TOP WIDTH (ft)	CALC. FLOW DEPTH (ft)

PIPE FLOW:

PATH NUMBER	Length (ft)	AREA (sq. ft.)	AVG. SLOPE (ft/ft)	WETTED PERIMETER (ft)	HYDRAULIC RADIUS (ft)	MANNING'S n	V (ft/sec)	PIPE TIME (minutes)
		0.00		0.00	#DIV/0!		#DIV/0!	#DIV/0!

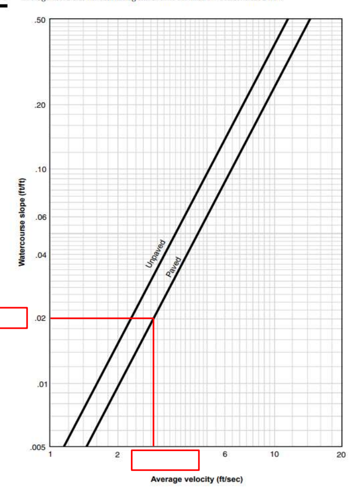
PIPE DIMENSIONS:

PATH NUMBER	PIPE DIAM. (in)	PIPE MATERIAL

Total Time of Concentration: 6.22

FEATURE/STRUCTURE ##

Figure 3-1 Average velocities for estimating travel time for shallow concentrated flow

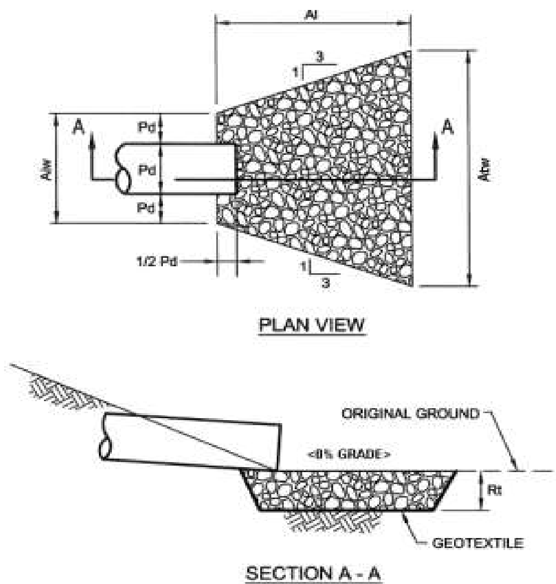


M. RIP RAP CALCULATIONS

EROSION AND SEDIMENTATION CONTROL PLAN

STANDARD WORKSHEET #20
Riprap Apron Outlet Protection

PROJECT NAME: Proposed Chase Bank
LOCATION: Westtown Township, PA
PREPARED BY: MSW DATE: 9/27/2024
CHECKED BY: SRM DATE: 9/27/2024



NO.	PIPE DIA. Do (in.)	TAIL WATER COND.(Max or Min)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
HW #501	18	MIN	0.012	0.01	4.06	2.34	R-3	9	8	1.5	12.5

* The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.

N. STORMWATER INFILTRATION TESTING REPORT (BY DYNAMIC EARTH)

STORMWATER BASIN AREA INVESTIGATION REPORT

PROPOSED CHASE BANK

1506 Pennsylvania State Highway Route 3 (West Chester Pike)
Parcel No. 67-2-42:4
Township of Westtown, Chester County, Pennsylvania

Prepared for:

PARAMOUNT REALTY SERVICES, INC
1195 Route 70, Suite 2000
Lakewood, New Jersey 08701

Prepared by:

DYNAMIC EARTH
826 Newtown Yardley Road, Suite 201
Newtown, PA 18940

Gregory J. Fritts, P.E.
Principal
PA PE License No. 090904

Elena Sherriff
Geologist

Project #1478-99-191EC
September 26, 2024

STORMWATER BASIN AREA INVESTIGATION REPORT
PROPOSED CHASE BANK
1506 Pennsylvania State Highway Route 3 (West Chester Pike)
Parcel No. 67-2-42:4
Township of Westtown, Chester County, Pennsylvania

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

Dynamic Earth, LLC (Dynamic Earth) has completed a subsurface evaluation for the stormwater management facilities associated with the proposed commercial development to be located at 1506 Pennsylvania State Highway Route 3 (West Chester Pike) in the Township of Westtown, Chester County, Pennsylvania.

The subject site is further identified as Parcel No. 67-2-42:4 and is bound to the north by West Chester Pike with commercial properties beyond; to the east by commercial properties; to the west by the existing retail development with commercial properties beyond; and to the south by the existing retail development with residential properties beyond. The project site is shown on the attached *Soil Profile Pit Location Plan* included in the Appendix of this report.

At the time of Dynamic Earth's investigation, the subject site consisted of a paved parcel located in the northeastern corner of a larger retail development with associated pavements and utilities. Surface cover observed at the time of our investigation included asphalt pavements.

Topographic information was provided on a January 10, 2023 *Partial Topographic Survey, Sheets 1 and 2,* prepared by Dynamic Survey, LLC. Existing site grades generally slope downward toward the southeast and southwest from a high elevation of approximately 424.0 feet along the northeastern property boundary, to low elevations of approximately 405.0 feet and 403.0 feet along the southwestern and southeastern property boundaries. The elevations referenced in the survey, and throughout this report, are given in 1988 North American Vertical Datum (NAVD88), unless otherwise noted.

Based on a July 12, 2024 *Grading Plan* prepared by Dynamic Engineering Consultants, P.C., the proposed site development will include the construction of a one-story Chase Bank with associated drive-up ATM. The proposed building is expected to occupy a footprint area of approximately 3,294 square feet and contain a finished floor elevation of approximately 414.65 feet. Based on the aforementioned grading plan, maximum earth cuts and fills of approximately 0.7 feet and 1.7 feet are expected to be required across the proposed building pad; respectively. Additional site improvements are expected to include pavements, utilities, and stormwater management facilities.

The stormwater management facilities proposed to infiltrate stormwater runoff are anticipated to consist of an underground basin located within the southern portion of the site. The proposed underground basin will reportedly contain an invert elevation of 406.5 feet.

2.0 SCOPE OF SERVICES

Dynamic Earth's scope of services pertaining to this report included evaluating the subsurface conditions by excavating soil profile pits to estimate the apparent seasonal high groundwater levels and performing in-situ permeability testing. A total of two soil profile pits (identified as SPP-1 and SPP-2) were excavated using a track-mounted backhoe. Additionally, two in-situ permeability tests were performed at corresponding soil profile pit locations. The test locations were located within existing asphalt-paved areas, were backfilled to the surface with excavated soil, and were patched surficially with hot mix asphalt upon completion. The soil profile pit locations are shown on the attached *Soil Profile Pit Location Plan.* The Township of Westtown's engineer was informed of the planned test pitting prior to our mobilization.

The soils encountered were classified in general conformance with U.S. Department of Agriculture (USDA) soil classification. Observations were made for groundwater and/or redoximorphic features indicative of zones of saturation or seasonal high groundwater. Soil logs are included in the Appendix of this report.

Infiltration testing was performed in general accordance with Pennsylvania's *Stormwater Best Management Practices Manual-Appendix C* using double-ring infiltrometer techniques. Detailed results of the infiltration testing are included in the appendix of this report.

Environmental conditions were not evaluated by Dynamic Earth.

3.0 SOIL SURVEY

Based on a review of the United States Department of Agriculture – Natural Resources Conservation Services (USDA-NRCS) soil survey, Urban Land is mapped beneath the site. The *USDA-NRCS Custom Soil Report* is included in the appendix of this report, for reference.

4.0 RESULTS

Detailed descriptions of the subsurface conditions encountered at each location are provided on the *Records of Subsurface Exploration* included herein. A summary of the subsurface conditions encountered is included below.

4.1 Subsurface Soil Profile

Soil profile pits were performed within asphalt-paved areas and encountered approximately four inches of asphalt underlain by approximately four inches of gravel subbase at the surface. Beneath the surficial cover, existing fill materials were encountered that generally consisted of apparent reworked on-site silty clay loam with variable amounts of gravel and debris. The debris encountered consisted of wood fragments. Where penetrated, this stratum extended to depths ranging between approximately 2.7 feet and 2.9 feet below the ground surface; corresponding to elevations 409.6 feet and 409.3 feet. Beneath the existing fill materials, apparent buried topsoil was encountered within SPP-1 at a depth of approximately 2.7 feet below the ground surface; corresponding to an elevation of 409.3 feet. The apparent buried topsoil extended to a depth of approximately 3.8 feet; corresponding to an elevation of approximately 408.2 feet. Beneath the existing fill material and/or apparent buried topsoil, naturally occurring residual soils were encountered that generally consisted of silt loam with variable amounts of gravel. The natural residual soils extended to termination depths ranging between approximately 12.3 feet and 12.8 feet below the ground surface; corresponding to an elevation of 399.7 feet.

4.2 Subsurface Conditions and Soil Permeability

Evidence of seasonal high groundwater (based on soil mottling) and/or groundwater were not encountered during this investigation. Groundwater is expected to fluctuate seasonally and following periods of significant precipitation.

In-situ testing was performed at each soil profile pit location and yielded permeability rates ranging between approximately 0.5 inches per hour (iph) and 0.75 iph. A summary of groundwater and in-situ permeability test results is tabulated below:

SUMMARY OF SUSBURFACE CONDITIONS & FIELD PERMEABILITY TESTING

Location	Surface Elevation (feet)	Soil Mottling		Groundwater		Infiltration Test Results		Comments
		Depth (feet)	Elevation (feet)	Depth (feet)	Elevation (feet)	Depth (in)	Rate[1] (in/hr)	
SPP-1	412.0	Not Encountered		Not Encountered		60	0.75	Fill to 2.7'
SPP-2	412.5	Not Encountered		Not Encountered		72	0.5	Fill to 2.9'

[1]Field Infiltration Rate – does not include factor of safety

5.0 GENERAL COMMENTS AND LIMITATIONS

Supplemental recommendations will be required upon finalization of conceptual site plans or if significant changes are made in the characteristics or location of the proposed stormwater management facilities. Dynamic Earth should be included as a consultant to the design team and should be provided with final plans for review to confirm these criteria apply or to modify recommendations as necessary.

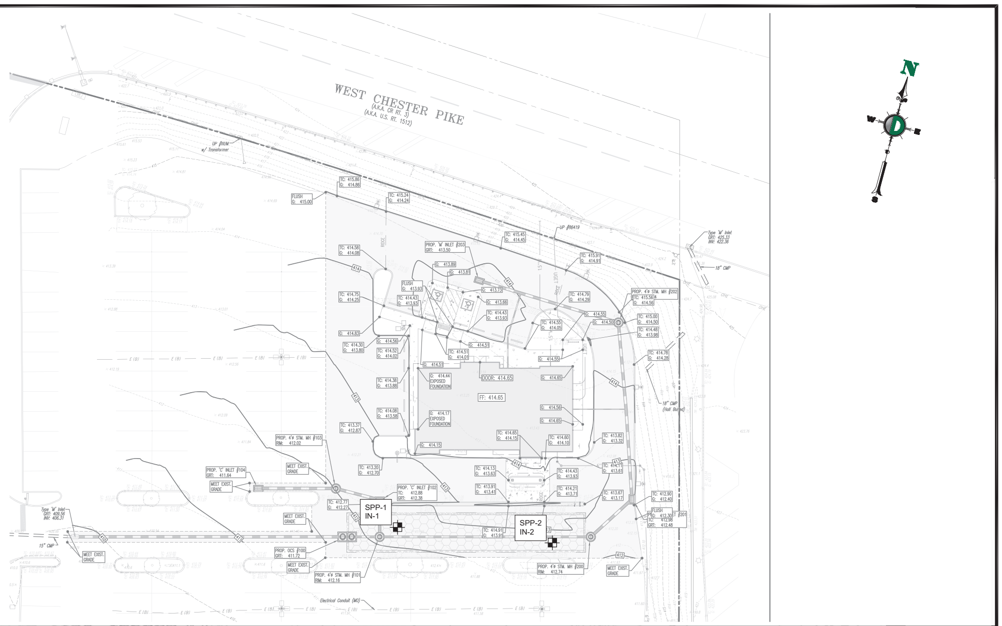
The results presented herein should be utilized by a qualified engineer in preparing preliminary design concepts and site grading. The engineer should consider these results as minimum physical standards that may be superseded by local and regional building codes and structural considerations. These results are prepared for the use of the client for the specific project detailed and should not be used by any third party. These recommendations are relevant to the preliminary design phase and should not be substituted for construction specifications.

The possibility exists that conditions between test locations may differ from those at specific soil profile pit locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may itself alter soil conditions. Therefore, Dynamic Earth Geotechnical Engineers or their representatives should observe and document the final construction procedures used, and the conditions encountered, as well as conduct testing and inspection to ensure the design criteria are met or recommendations to address deviations are implemented.

Dynamic Earth assumes that a qualified contractor will be employed to perform the construction work, and that the contractor will be required to exercise care to ensure all excavations are performed in accordance with applicable regulations and good practice. Particular attention should be paid to avoiding damaging or undermining adjacent properties and maintaining slope stability. Deviations from the noted subsurface conditions encountered during construction should be brought to the attention of the geotechnical engineer.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

Soil Profile Pit Location Plan



SCALE: N.T.S.	JOB No: 99-191EC	TITLE: SOIL PROFILE PIT LOCATION PLAN	LEGEND: SPP-X IN-X — APPROXIMATE LOCATION OF SOIL PROFILE PIT WITH INFILTRATION TEST	DYNAMIC EARTH, LLC
SHEET No: 1 OF 1	DRAWN BY: ES	PROJECT: PARAMOUNT REALTY SERVICES, LLC *PROPOSED CHASE BANK* 1506 PENNSYLVANIA STATE HIGHWAY ROUTE 3 (WEST CHESTER PIKE) PARCEL NO. 67-2-42.4 TOWNSHIP OF WESTTOWN, CHESTER COUNTY, PA	NOTES: 1. THIS PLAN IS NOT FOR CONSTRUCTION AND WAS PREPARED TO ILLUSTRATE TEST LOCATIONS ONLY AND MAY NOT REFLECT THE MOST CURRENT REVISION OF THE BASE PLAN. 2. BASE PLAN OBTAINED FROM A JULY 12, 2024 *GRADING PLAN* PREPARED BY DYNAMIC ENGINEERING CONSULTANTS, PC.	826 Newtown Yardley Road - Suite 201 Newtown, PA 18940 T: 267.685.0276 - F: 267.685.0361 www.dynamic-earth.com
	DESIGNED BY: --			
	CHECKED BY: GJF			
	DATE: 09/26/2024	Rev. # 0 — DEC Client Code: 1478		

Records of Subsurface Exploration

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-1

Page 1 of 1

Project: Proposed Chase Bank
Project No.: 1478-99-191EC
Location: 1506 Pennsylvania State Highway Route 3 (West Chester Pike), Township of Westtown, Chester County, Pennsylvania
Client: Paramount Realty Services, Inc.

				Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Surface Elevation (ft):	412.0	Date Started:	9/5/24				
Termination Depth (ft):	12.3	Date Completed:	9/5/24				
Proposed Location:	SWM	Logged by:	A. Park	Seepage	NE	-	
Excavation / Test Method:	Visual Observation	Contractor:	Neighbors Property Management	Groundwater	NE	-	
		Rig Type:	Bobcat E60	Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%)				STRUCTURE			WATER CONTENT	CONSISTENCY			BOUNDARY		ROOTS		MOTTLING			SAMPLING			INFILTRATION RESULTS
			GRAVEL	COBBLES	STONES	BOULDERS	Shape	Grade	Size		Resistance to Rupture	Stickiness	Plasticity	Distinctness	Topography			Quantity	Size	Contrast	Type	Depth (in)	No.	
0-4	ASPHALT Black (10YR 2/1)													ABRUPT <1"				NONE						
4-8	SUBBASE Gray 10YR 4/2		100	0	0	0	SINGLE GRAIN	STRUCTURELESS		MOIST	LOOSE	NONSTICKY	NONPLASTIC	ABRUPT <1"	WAVY	NONE		NONE						
8-32	FILL Yellowish Brown (10YR 5/4)	SILTY CLAY LOAM	10	0	0	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	SLIGHTLY STICKY	SLIGHTLY PLASTIC	CLEAR <2.5"	SMOOTH	NONE		NONE			BAG	20	S-1	
32-45	TOPSOIL Brown (7.5YR 4/2)	LOAM	10	0	0	0	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX)	FINE	NONE			BAG	40	S-2	
45-147	Strong Brown (7.5YR 5/6)	LOAM	10	0	0	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FRIABLE	NONSTICKY	NONPLASTIC			NONE		NONE			BAG	60	S-3	IN-1 = 0.75 iph

Additional Remarks: Existing fill material encountered to approximately 32 inches below the ground surface. Apparent topsoil encountered between approximately 32 inches to 45 inches below the ground surface. Soil profile pit SPP-1 was terminated at approximately 12.3 feet below the ground surface.

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-2

Page 1 of 1

Project:	Proposed Chase Bank	Project No.:	1478-99-191EC
Location:	1506 Pennsylvania State Highway Route 3 (West Chester Pike), Township of Westtown, Chester County, Pennsylvania	Client:	Paramount Realty Services, Inc.

				Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Surface Elevation (ft):	412.5	Date Started:	9/5/24				
Termination Depth (ft):	12.8	Date Completed:	9/5/24				
Proposed Location:	SWM	Logged by:	A. Park	Seepage	NE	-	
Excavation / Test Method:	Visual Observation	Contractor:	Neighbors Property Management	Groundwater	NE	-	
		Rig Type:	Bobcat E60	Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%) GRAVEL	COBBLES	STONES	BOULDERS	STRUCTURE Shape	Grade	Size	WATER CONTENT	CONSISTENCY Resistance to Rupture	Stickiness	Plasticity	BOUNDARY Distinctness	Topography	ROOTS	MOTTLING Quantity	Size	Contrast	SAMPLING Type	Depth (in)	No.	INFILTRATION RESULTS
0-4	ASPHALT Black (10YR 2/1)		0	0	0	0								ABRUPT <1"			NONE						
4-8	SUBBASE Gray 10YR 4/2		100	0	0	0	STRUCTURELESS SINGLE GRAIN			MOIST	LOOSE	NONSTICKY	NONPLASTIC	ABRUPT <1"	WAVY	NONE	NONE						
8-35	FILL Yellowish Brown (10YR 5/4)	SILTY CLAY LOAM	10	0	0	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	SLIGHTLY STICKY	SLIGHTLY PLASTIC	CLEAR <2.5"	SMOOTH	NONE	NONE			BAG	20	S-1	
35-55	Yellowish Brown (10YR 5/6)	SILT LOAM	10	0	0	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	NONE	NONE			BAG	40	S-2	
55-153	Strong Brown (7.5YR 5/6)	SILT LOAM	10	0	0	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FRIABLE	NONSTICKY	NONPLASTIC			NONE	NONE			BAG	80	S-3	IN-2= 0.5 iph

Additional Remarks: Existing fill material encountered to approximately 35 inches below the ground surface. Debris encountered included wood. Soil profile pit SPP-2 was terminated at approximately 12.8 feet below the ground surface.

Infiltration Test Results

INFILTRATION TEST REPORT

Client: Paramount Realty Services, Inc.
Project: Proposed Chase Bank
Location: 1506 Pennsylvania State Highway Route 3 (West Chester Pike), Township of Westtown, Chester County, Pennsylvania
Project No.: 1478-99-191EC
Test Hole No.: IN-1 @ SPP-1
Date: 9/5/2024
Weather: Sunny and clear
Project Manager: E. Sherriff
Surface Elevation: 412.0 feet
Test Depth/Elevation: 5.0 feet / 407.0

Reading No.	Water Level (Inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/ Hour)
	Start	Finish			
PS-1	8.0	7.625	0.375	0.5	--
PS-2	8.0	7.625	0.375	0.5	--
1	8.0	7.625	0.375	0.5	0.75
2	8.0	7.625	0.375	0.5	0.75
3	8.0	7.625	0.375	0.5	0.75
4	8.0	7.625	0.375	0.5	0.75

Recommended Field Infiltration Rate = 0.75 iph

\\Decpc.local\earthfolders\Data\EARTH Projects\1478 Paramount Realty\99-191EC Westtown PA\Soil Logs\INFILTRATION LOGS.DOC

INFILTRATION TEST REPORT

Client: Paramount Realty Services, Inc.
Project: Proposed Chase Bank
Location: 1506 Pennsylvania State Highway Route 3 (West Chester Pike), Township of Westtown, Chester County, Pennsylvania
Project No.: 1478-99-191EC
Test Hole No.: IN-2 @ SPP-2
Date: 9/5/2024
Weather: Sunny and clear
Project Manager: E. Sherriff
Surface Elevation: 412.5
Test Depth/Elevation: 6.0 feet / 406.5

Reading No.	Water Level (Inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/ Hour)
	Start	Finish			
PS-1	8.0	7.75	0.25	0.5	--
PS-2	8.0	7.75	0.25	0.5	--
1	8.0	7.75	0.25	0.5	0.5
2	8.0	7.75	0.25	0.5	0.5
3	8.0	7.75	0.25	0.5	0.5
4	8.0	7.75	0.25	0.5	0.5

Recommended Field Infiltration Rate = 0.5 iph

NRCS-USDA Custom Soil Survey of Chester County, Pennsylvania

United States Department of Agriculture
NRCS
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Chester County, Pennsylvania

July 31, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

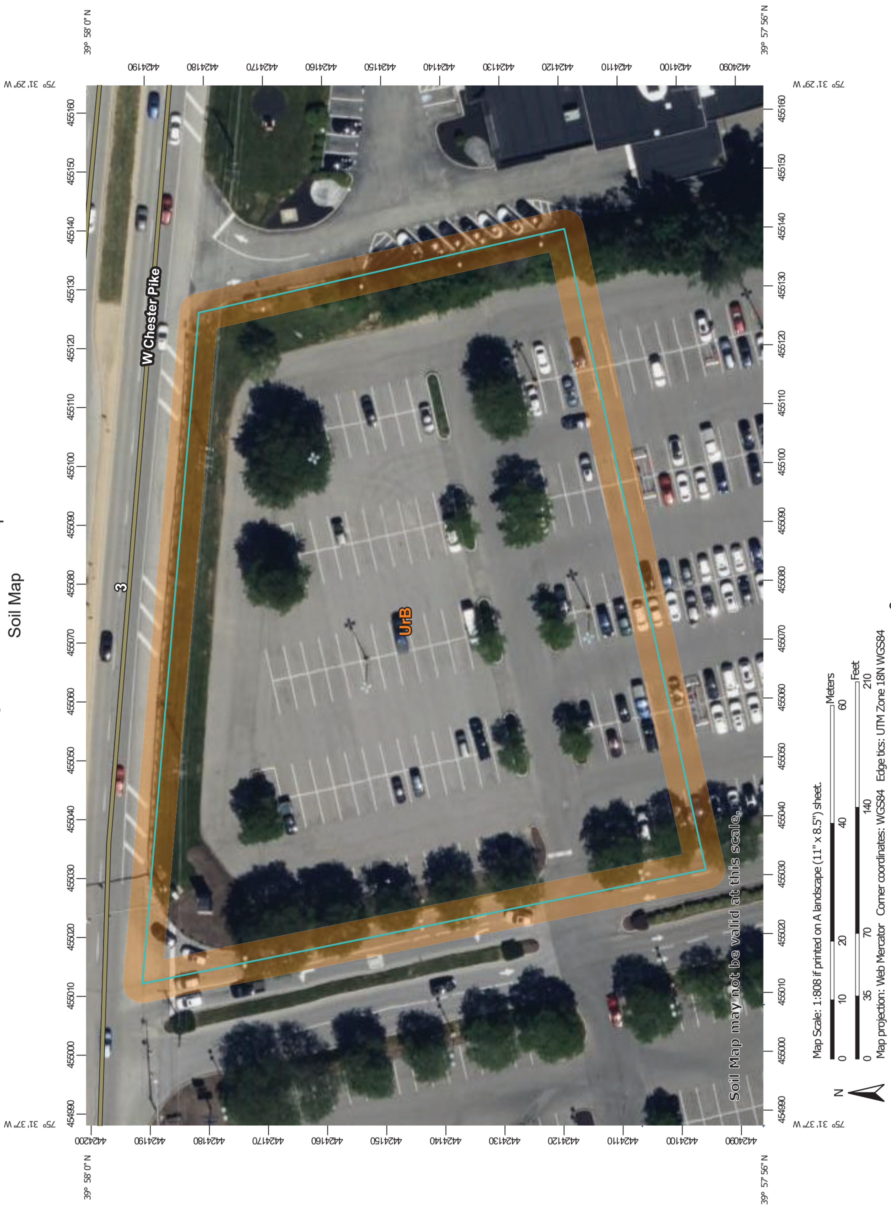
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 16, Sep 4, 2023

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

Date(s) aerial images were photographed: Jun 5, 2022—Jul 4, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UrB	Urban land, 0 to 8 percent slopes	2.2	100.0%
Totals for Area of Interest		**2.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Chester County, Pennsylvania

UrB—Urban land, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1r3nt
Elevation: 800 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Pavement, buildings and other artifically covered areas human transported material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Udorthents, unstable fill

Percent of map unit: 10 percent
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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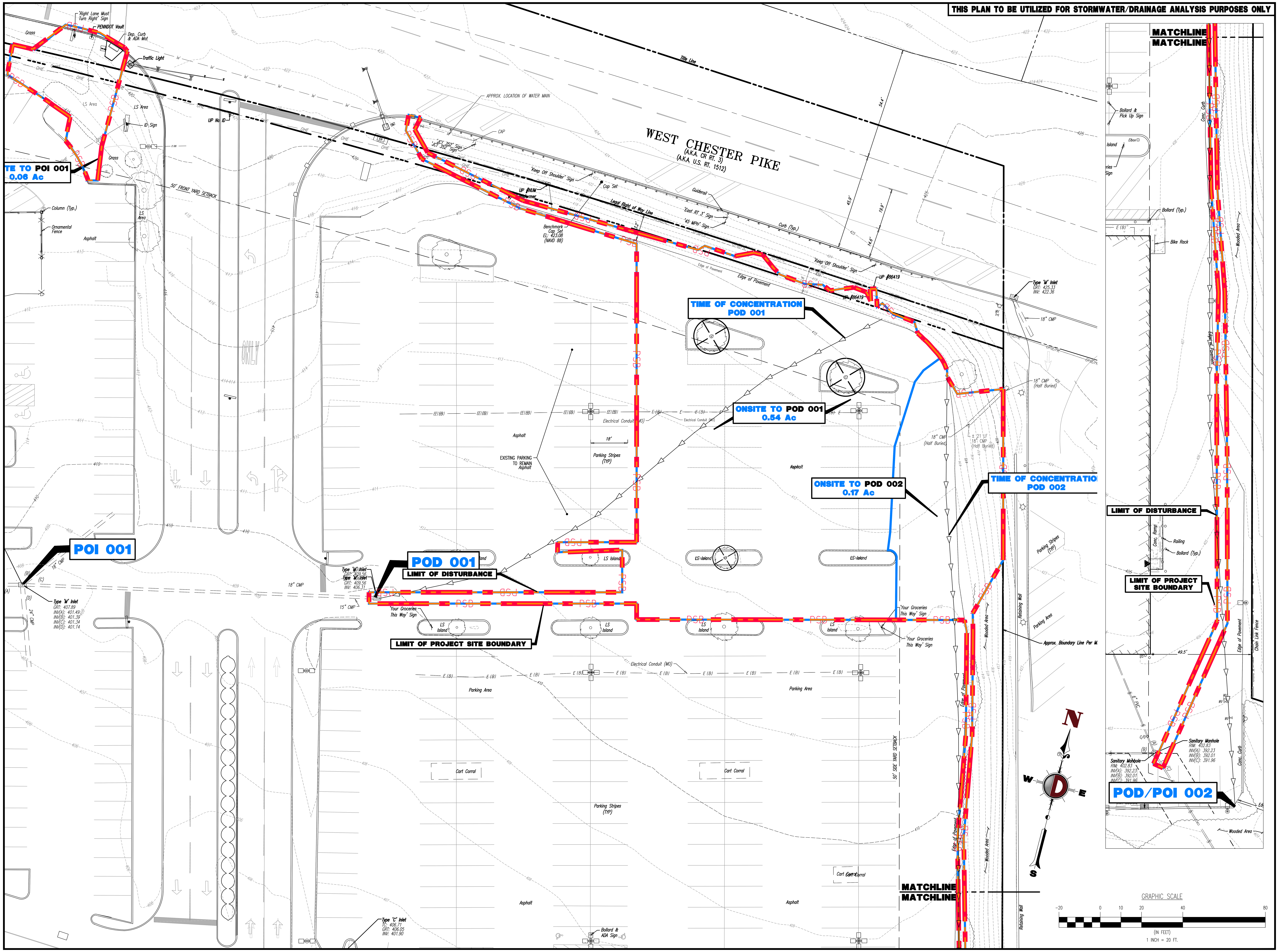
O. DRAINAGE AREA MAPS



1 | 09/30/24 | REV. PER TOWNSHIP COMMENTS | AJR
REV. | DATE | COMMENTS | BY

THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DRAWN BY: ARK | DESIGNED BY: MS | CHECKED BY: MS | CHECKED BY: –

PROJECT: WESTTOWN AM WEST TIC LLC
PROPOSED CHASE BANK
PARCEL NO. 67-2-42.4
1506 PENNSYLVANIA STATE HIGHWAY ROUTE 3 (WEST CHESTER PIKE)
TOWNSHIP OF WESTTOWN
CHESTER COUNTY, PENNSYLVANIA

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JUSTIN A. GEONNOTTI
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MATTHEW SHARO
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NEW JERSEY LICENSE No. 52989

TITLE: EXISTING DRAINAGE AREA MAP

SCALE: (H) 1"=20' (V)
DATE: 07/12/2024
PROJECT No: 1478-99-191
SHEET No: 1 OF 03
Rev. #: 1

Plotted: 09/30/24 – 11:35 AM, By: ksookhu
File: P:\DECPC PROJECTS\1478 Paramount Realty\99-191 West Chester PA\Dwg\4 DA Maps\D147899191ED1.dwg. ---> 01 EXISTING DRAINAGE AREA MAP

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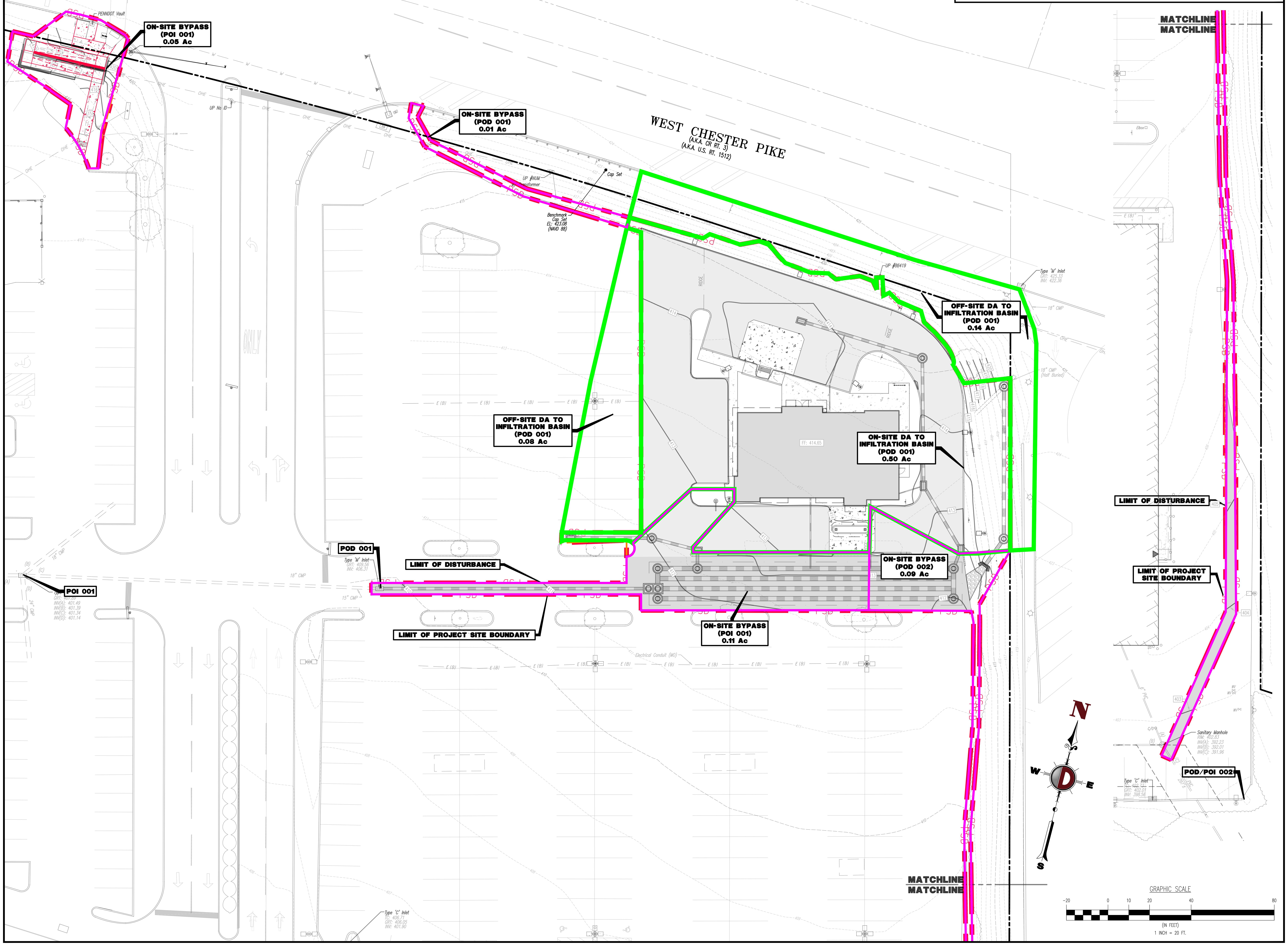

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1	09/30/24	REV. PER TOWNSHIP COMMENTS	AJW

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DRAWN BY:	DESIGNED BY:	CHECKED BY:	CHECKED BY:
ARK	MS	MS	–

PROJECT: WESTTOWN AM WEST TIC LLC
CHASE
PROPOSED CHASE BANK
PARCEL NO. 67-2-42:4
1506 PENNSYLVANIA STATE HIGHWAY ROUTE 3 (WEST CHESTER PIKE)
TOWNSHIP OF WESTTOWN
CHESTER COUNTY, PENNSYLVANIA

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MATTHEW SHARO
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NEW JERSEY LICENSE No. 52989

TITLE: PROPOSED DRAINAGE AREA MAP

SCALE: (H) 1"=20' (V).
DATE: 07/12/2024
PROJECT No: 1478-99-191

SHEET No: 2 OF 03
Rev. #: 1

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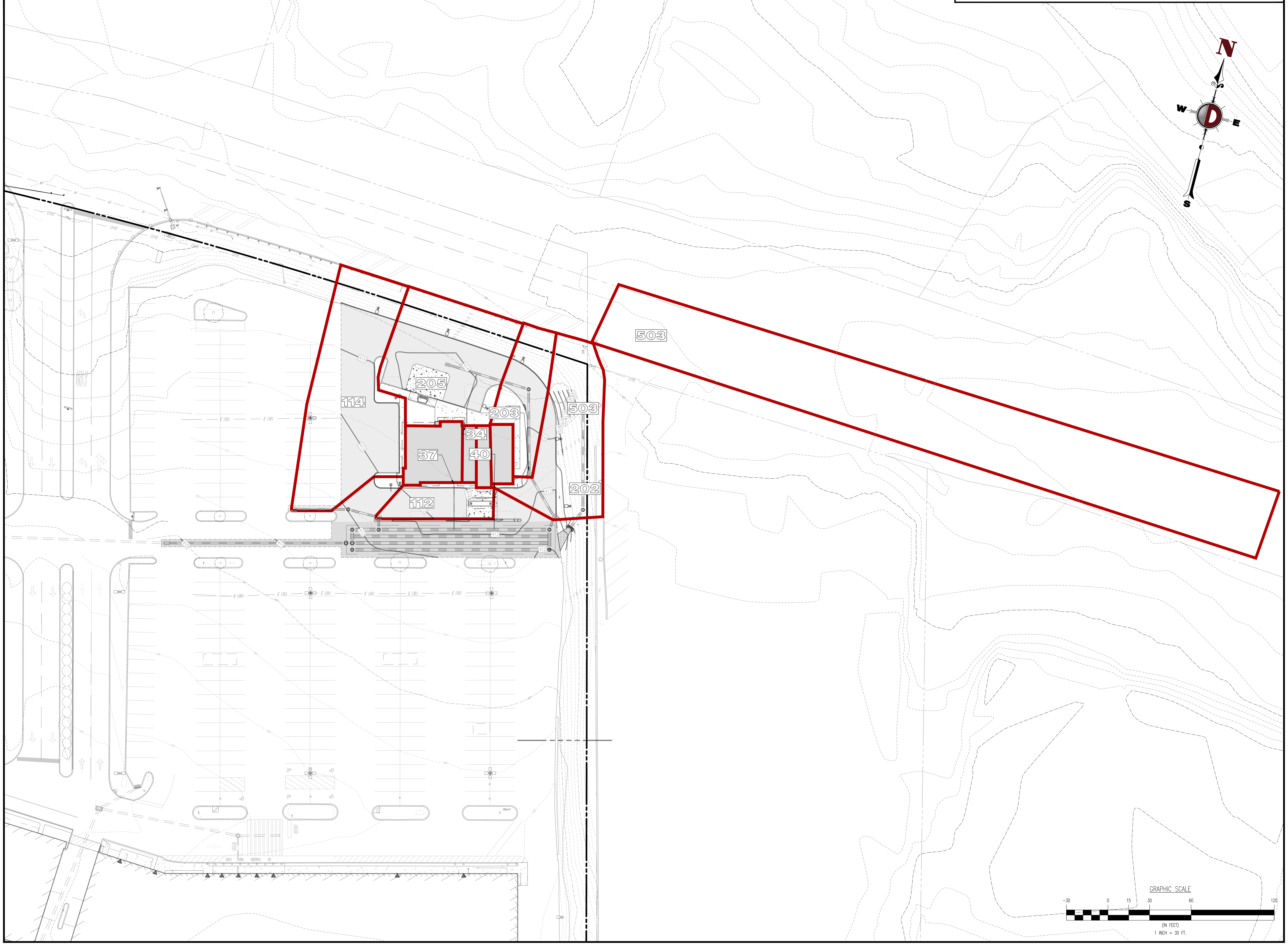

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REV.	DATE	COMMENTS	BY
1	09/30/24	REV. PER TOWNSHIP COMMENTS	AJW

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ARK	MS	MS	–

PROJECT: **WESTTOWN AM WEST TIC LLC**
CHASE
PROPOSED CHASE BANK
PARCEL NO. 67-2-42:4
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TITLE: INLET AREA MAP

SCALE: (H) 1"=20' (V)
DATE: 07/12/2024
PROJECT No: 1478-99-191

SHEET No: 3 OF 03
Rev. #: 1

Plotted: 09/30/24 – 11:38 AM, By: ksookhu
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