Project Title
NEW CONSTRUCTION
OSWEGATCHIE FIRE STATION
441 BOSTON POST RD
WATERFORD, CT 06385

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

By	Description	Date	Reviewed By

Drawing Title
3D VIEW

Project Phase
100% DESIGN DEVELOPMENT

Date
31-2425

Scale

Drawn By
EC

Project Number
23-252

Drawing Number
A305

7 January 2025

Jonathan Mullen
Planning Director
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385

RE: Stormwater Management Report
Oswegatchie Fire Station
441 Boston Post Road
Waterford, Connecticut
Langan Project No.: 140286501

Dear Mr. Mullen,

This report provides an analysis of the proposed peak runoff discharges and the engineering design for the proposed stormwater conveyance system at 441 Boston Post Road.

PROJECT DESPCRIPTION

Existing Conditions

The project site is located at 441 Boston Post Road in Waterford CT; see Figure 1. The overall approximately 2.0-acre parcel is currently occupied by the existing Oswegatchie Fire Station, including impervious and grass areas. The parcel is located within the Niantic River sub regional drainage basin. The parcel area does not contain any known locations of State and Federal Listed Species and Critical Habitats per the CT Natural Diversity Data Base Areas map of Waterford, CT dated June 2024. The project site is located on the western part of the parcel within the limits of the existing fire station site. To the west the project site is bordered by a garden shop. To the south, the project site is bordered by Boston Post Road. To the east the project site is bordered by residential properties on Boston Post Road. To the north the site is bordered by lightly wooded wetland areas. The existing project site is mostly impervious areas with the majority of stormwater running overland towards the wetlands in the north.

Based upon a topographic survey prepared by Langan, dated June 28, 2024, the site grades slope downward from the southern corner of the property towards the northern property line, with elevations ranging from approximately 35 feet to about 30 feet.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Study of the town of Waterford, Connecticut map number 09011C0481J with an effective date of August 5, 2013, the proposed development is located within Zone X (Unshaded). Zone X (Unshaded) is considered a Low-Risk Area and described by FEMA as areas outside the 0.2-percent-annual-chance chance flood. No base flood elevations or base flood depths are shown within these zones.

According to the USDA Natural Resources Conservation Service Web Soil Survey, the site's soil type varies throughout. The site is mostly classified as Hinckley Loamy Sand with an A hydrologic rating and slopes between 3 and 15 percent. Additionally, the eastern corner of the site is classified as Walpole Sandy Loam with a D hydrologic rating and slopes between 0 and 3 percent.

There are wetland areas to the east and north of the site. While some of the site work is proposed within the 100-foot upland review area, no direct wetland impacts are proposed.

Proposed Project

The proposed project consists of the demolition of the existing fire station and the construction of a new fire station building with new landscaped areas, driveways, and parking areas. Additional improvements include new stormwater and utility infrastructure. A summary of the change in impervious is shown below.

Project Site Impervious Cover [SF]

Existing Conditions	Proposed Conditions	Net Decrease
±52,200	±31,500	±20,700

The proposed stormwater system has been designed to maintain existing site hydrology to the maximum extent practicable. The majority of runoff from the new development will be conveyed to various stormwater management systems before discharging to either the existing stormwater network in Boston Post Road or overland towards the existing offsite wetlands. Water quality improvements include yard drains with sumps, a pretreatment swale and a rain garden. These water quality improvements have been designed to retain 100% of the proposed project's water quality volume onsite. This achieves the average annual pollutant load reduction requirements as per the recommendations of the 2024 CT Stormwater Quality Manual.

Details of the size and location of the stormwater network can be found on the Grading &

Drainage Plans, detail sheets and supporting calculations in the appendices of this report.

PEAK RUNOFF ANALYSIS (See Appendices A & B)

The stormwater management system is designed to control the rate of runoff from the site's watersheds to be equal or less than existing conditions up to, and including, a 100-year design storm event.

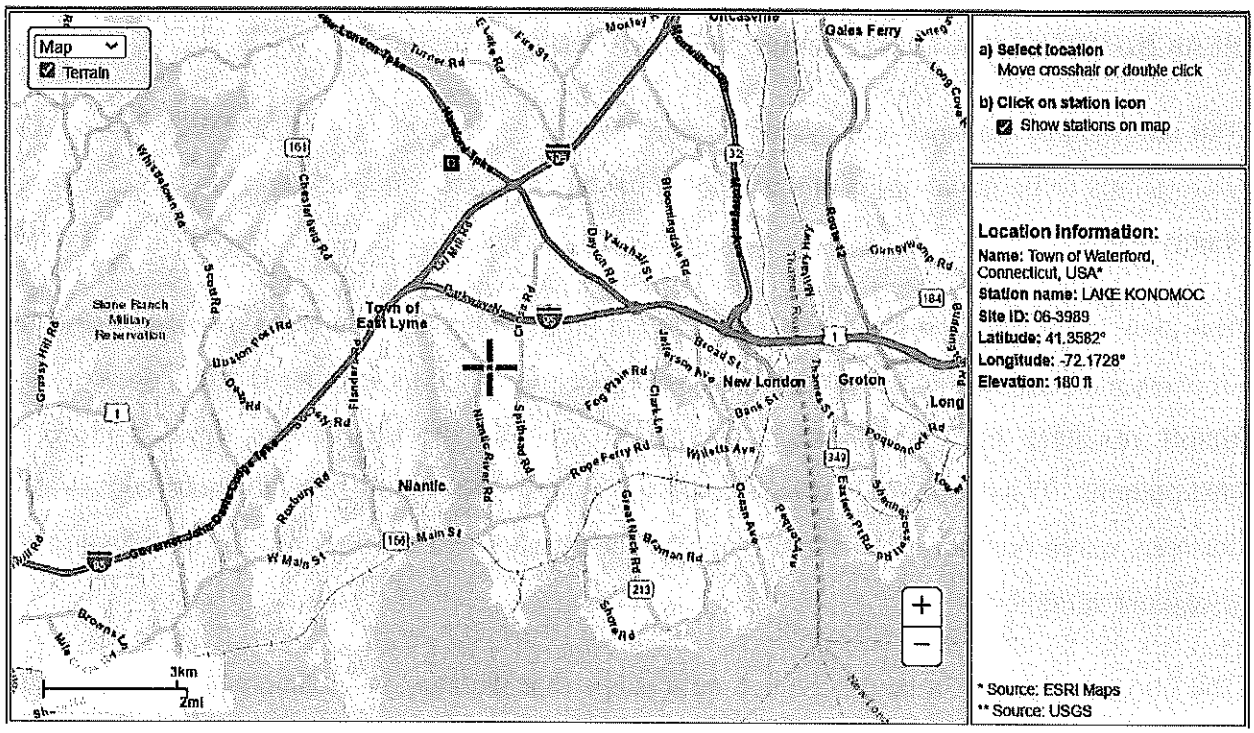
The peak runoff discharges for the existing and proposed conditions were analyzed using Soil Conservation Service (SCS) methodology which outlines procedures for calculating peak rates of runoff resulting from precipitation events as well as procedures for developing runoff hydrographs. The entire site was included in the analysis; see Figures EXWS and PRWS. Values for area, curve number (CN), and a time of concentration were calculated for the existing and proposed conditions.

The curve number is a land sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. The soils within the watershed are divided into hydrologic soil groups (A, B, C, and D). The SCS classification system evaluates the runoff potential of a soil according to its infiltration and transmission rates. "A" soils have the lowest runoff potential, while "D" soils have the greatest runoff potential.

The time of concentration (Tc) is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods outlined in TR-55.

For this study, a 24-hour SCS Type III standard rainfall distribution was used to determine the peak flow rate and volume to all points of discharge from the site. Precipitation data used for the various storm events is based on the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for Lake Konomoc Station. Lake Konomoc Station was chosen for rainfall data because it is the station located within the closest proximity of the project location as shown in Graphic 1. A summary of all rainfall data utilized in the analysis for this site is provided below and a complete compilation of data provided by NOAA for this location is included in Appendix C.

Graphic 1. NOAA Rainfall Data Location Map



NOAA Precipitation Depth per Average Recurrence Interval [in]

Duration	2-Year	10-Year	25-Year	100-Year
24-hour	3.45	5.13	6.17	7.79

Existing Condition (See Appendix A)

The project area's existing drainage conditions were analyzed as Watersheds A, B, and C (See Drawing EXWS).

Existing Watershed A is approximately 0.26 acres and comprises grassy areas, driveway aprons onto the site and the southwestern portion of the existing building. Stormwater runoff from this watershed either flows into the existing storm drainage network or overland and offsite towards Boston Post Road.

Existing Watershed B is approximately 0.08 acres and consists of grass and brush areas at the east of the site. Stormwater runoff from this watershed flows overland to the wetlands #2 to the east of the site.

Existing Watershed C is about 1.27 acres and consists of the existing building and parking areas along with grassy and brush areas. Stormwater runoff from this watershed flows overland to the wetlands #1 offsite to the north.

Proposed Condition (See Appendix B)

In the proposed condition, site hydrology attempts to mimic existing conditions and all watershed outlets remain the same.

Proposed Watershed A is about 0.37 acres and consists of grassy areas and the proposed driveway aprons. Stormwater will continue to flow overland to Boston Post Road. The proposed site within this watershed has been designed to significantly reduce impervious area as compared with the existing condition.

Proposed Watershed B is about 0.09 acres and includes grass and brush areas to the east of the site. This watershed will remain generally unchanged, and stormwater collected within this watershed will flow overland to the wetlands #2 offside to the east.

Proposed Watershed C is divided into two sub-watersheds: Sub-watershed C1 and Sub-watershed C2. Sub-watershed C1 is about 1.04 acres and consists of the proposed building and parking areas along with grassy areas; stormwater within this watershed will flow either through a pretreatment swale conveyance feature or directly into a rain garden before flowing to the wetlands #2 offsite to the north. Sub-watershed C2 is about 0.12 acres and consists of grassy and brush areas; stormwater within this watershed will continue to flow overland to the wetlands #2 offsite to the north.

Details of the sizes and locations of the stormwater collection systems can be found on drawings CG101. A conservative design infiltration rate for the rain garden is 1 inch per hour. The design infiltration rate will be confirmed with on-site testing prior to construction. Please refer to Appendix F for boring log data within the vicinity of the proposed rain garden. This testing was performed by Barton & Loguidice as a part of a Limited Phase II Environmental Site Assessment report, dated 08/27/2024. According to the boring log data, groundwater was encountered between 6' and 13' below existing grade, and existing site soils within the rain gardens consist of a mainly sandy material.

Site Discharge Peak Flow Comparison for WS-A (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	0.37	0.09	-0.28	75.68%
10-Year	0.77	0.44	-0.33	42.86%
25-Year	1.04	0.71	-0.33	31.73%
100-Year	1.46	1.20	-0.26	17.81%

Site Discharge Peak Flow Comparison for WS-B (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	0.02	0.01	-0.01	50.00%
10-Year	0.09	0.09	0.00	0.00%
25-Year	0.15	0.19	0.00	0.00%
100-Year	0.26	0.26	0.00	0.00%

Site Discharge Peak Flow Comparison for WS-C (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	3.77	0.32	-3.45	91.51%
10-Year	5.91	2.04	-3.87	65.48%
25-Year	7.22	3.73	-3.49	48.34%
100-Year	9.24	5.62	-3.62	39.18%

Site Discharge Peak Flow Comparison for Total Site (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	4.15	0.38	-3.77	90.84%
10-Year	6.76	2.39	-4.37	64.65%
25-Year	8.39	4.44	-3.95	47.08%
100-Year	10.95	6.93	-4.02	36.71%

As can be seen from the tables above, runoff from each watershed and the total site will be attenuated for the storms up to and including the 100-year storm. Additionally, per the 2024 CT Stormwater Quality Manual requirements, runoff from each watershed that includes proposed site development will be attenuated by 50% for the 2-year storm event.

STORMWATER CONVEYANCE SYSTEM (See Appendix D)

The stormwater conveyance system was sized using the Rational Method for the 10-year storm event as per the CTDEEP Stormwater Quality Manual. Values for area, runoff coefficient, C, and

a time of concentration were calculated for each drainage area. The average runoff coefficient was calculated based upon the following cover types:

Cover	C
Grass/Pervious	0.3
Roof/Pavement/Impervious	0.9

Rainfall intensities were taken from the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for Lake Konomoc. Stormwater pipes were then sized based upon the Manning's Equation for full flow pipe capacity and solving for the hydraulic grade line. The computer program Hydraflow Storm Sewers 2011 by Intellisolve was used in the analysis.

Each proposed storm sewer system has been analyzed sing a starting HGL elevation equal to the outlet pipe's crown elevation. This mimics a tailwater elevation equal to the outlet pipe's diameter or a scenario where a proposed pipe is entering an existing pipe flow at full capacity.

STORMWATER QUALITY (See Appendix E)

The proposed stormwater management system has been designed to incorporate stormwater quality measures including a significant decrease in site imperviousness, yard drains with sumps, a pretreatment swale conveyance feature, and a rain garden. These measures will be implemented to increase water quality and minimize the passage of pollutants to the existing stormwater systems as compared to current conditions.

Under current conditions, the entirety of the site impervious cover (±52,200 SF) is considered directly connected impervious area (DCIA). This project proposes to decrease DCIA by over 90%, which will decrease surface runoff and increase infiltration of rainfall into the soil.

Per Table 4.1 of the CT Stormwater Quality Manual, the site is considered a redevelopment with existing DCIA of 40% or more. As such, the Required Retention Volume (RRV) is 50% of the site's Water Quality Volume (WQV). Through coordination with the town of Waterford Environmental Planner, this project occurs within the Stony Brook watershed area. Stormwater discharge from the site contributes to an intermittent watercourse and wetland system located north of the parcel. The receiving portion of Stony Brook south of Route 1 has been designated as an impaired waterbody by CTDEEP. Because of this information, the stormwater system has

been designed to retain 100% of the site WQV and exceed the RRV requirements for our redevelopment site.

Table 4.3 of the CT Stormwater Quality Manual shows the minimum average annual pollutant load reductions for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN). Per the manual, "a proposed stormwater management system meets or exceeds these average pollutant load reductions when the RRV is retained on-site using suitable stormwater retention practices. Achieving these minimum required load reductions for sediment and nutrients is assumed to provide adequate reductions of other stormwater pollutants including floatable materials." Through the use of the proposed rain garden, the stormwater system designed exceeds our RRV and will retain 100% of the WQV, thereby also exceeding the required average annual pollutant load reductions.

CONCLUSION

The proposed stormwater management system has been designed in general accordance with the 2024 CTDEEP Stormwater Quality Manual and the 2000 CTDOT Drainage Manual. It has been designed to maintain existing site hydrology to the maximum extent practicable with attenuated peak flows and multiple water quality improvements.

This Langan report shows that the proposed stormwater management system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed development. Please refer to the Drawings for additional drainage information.

Sincerely,
Langan CT, Inc.

Brian Phillips, P.E.
Senior Project Manager

7 January 2025

Jonathan Mullen
Planning Director
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385

RE: Stormwater Management Report
Oswegatchie Fire Station
441 Boston Post Road
Waterford, Connecticut
Langan Project No.: 140286501

Dear Mr. Mullen,

This report provides an analysis of the proposed peak runoff discharges and the engineering design for the proposed stormwater conveyance system at 441 Boston Post Road.

PROJECT DESPCRIPTION

Existing Conditions

The project site is located at 441 Boston Post Road in Waterford CT; see Figure 1. The overall approximately 2.0-acre parcel is currently occupied by the existing Oswegatchie Fire Station, including impervious and grass areas. The parcel is located within the Niantic River sub regional drainage basin. The parcel area does not contain any known locations of State and Federal Listed Species and Critical Habitats per the CT Natural Diversity Data Base Areas map of Waterford, CT dated June 2024. The project site is located on the western part of the parcel within the limits of the existing fire station site. To the west the project site is bordered by a garden shop. To the south, the project site is bordered by Boston Post Road. To the east the project site is bordered by residential properties on Boston Post Road. To the north the site is bordered by lightly wooded wetland areas. The existing project site is mostly impervious areas with the majority of stormwater running overland towards the wetlands in the north.

Based upon a topographic survey prepared by Langan, dated June 28, 2024, the site grades slope downward from the southern corner of the property towards the northern property line, with elevations ranging from approximately 35 feet to about 30 feet.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Study of the town of Waterford, Connecticut map number 09011C0481J with an effective date of August 5, 2013, the proposed development is located within Zone X (Unshaded). Zone X (Unshaded) is considered a Low-Risk Area and described by FEMA as areas outside the 0.2-percent-annual-chance chance flood. No base flood elevations or base flood depths are shown within these zones.

According to the USDA Natural Resources Conservation Service Web Soil Survey, the site's soil type varies throughout. The site is mostly classified as Hinckley Loamy Sand with an A hydrologic rating and slopes between 3 and 15 percent. Additionally, the eastern corner of the site is classified as Walpole Sandy Loam with a D hydrologic rating and slopes between 0 and 3 percent.

There are wetland areas to the east and north of the site. While some of the site work is proposed within the 100-foot upland review area, no direct wetland impacts are proposed.

Proposed Project

The proposed project consists of the demolition of the existing fire station and the construction of a new fire station building with new landscaped areas, driveways, and parking areas. Additional improvements include new stormwater and utility infrastructure. A summary of the change in impervious is shown below.

Project Site Impervious Cover [SF]

Existing Conditions	Proposed Conditions	Net Decrease
±52,200	±31,500	±20,700

The proposed stormwater system has been designed to maintain existing site hydrology to the maximum extent practicable. The majority of runoff from the new development will be conveyed to various stormwater management systems before discharging to either the existing stormwater network in Boston Post Road or overland towards the existing offsite wetlands. Water quality improvements include yard drains with sumps, a pretreatment swale and a rain garden. These water quality improvements have been designed to retain 100% of the proposed project's water quality volume onsite. This achieves the average annual pollutant load reduction requirements as per the recommendations of the 2024 CT Stormwater Quality Manual.

Details of the size and location of the stormwater network can be found on the Grading &

Drainage Plans, detail sheets and supporting calculations in the appendices of this report.

PEAK RUNOFF ANALYSIS (See Appendices A & B)

The stormwater management system is designed to control the rate of runoff from the site's watersheds to be equal or less than existing conditions up to, and including, a 100-year design storm event.

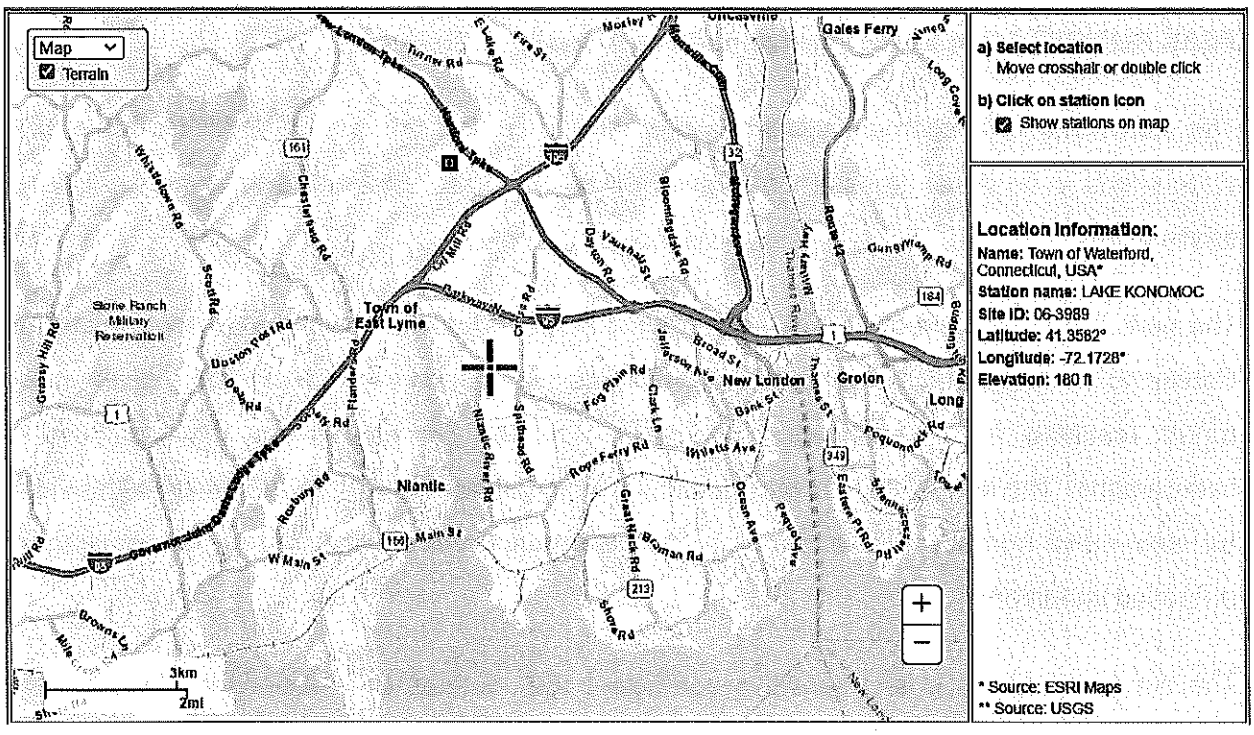
The peak runoff discharges for the existing and proposed conditions were analyzed using Soil Conservation Service (SCS) methodology which outlines procedures for calculating peak rates of runoff resulting from precipitation events as well as procedures for developing runoff hydrographs. The entire site was included in the analysis; see Figures EXWS and PRWS. Values for area, curve number (CN), and a time of concentration were calculated for the existing and proposed conditions.

The curve number is a land sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. The soils within the watershed are divided into hydrologic soil groups (A, B, C, and D). The SCS classification system evaluates the runoff potential of a soil according to its infiltration and transmission rates. "A" soils have the lowest runoff potential, while "D" soils have the greatest runoff potential.

The time of concentration (Tc) is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods outlined in TR-55.

For this study, a 24-hour SCS Type III standard rainfall distribution was used to determine the peak flow rate and volume to all points of discharge from the site. Precipitation data used for the various storm events is based on the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for Lake Konomoc Station. Lake Konomoc Station was chosen for rainfall data because it is the station located within the closest proximity of the project location as shown in Graphic 1. A summary of all rainfall data utilized in the analysis for this site is provided below and a complete compilation of data provided by NOAA for this location is included in Appendix C.

Graphic 1. NOAA Rainfall Data Location Map



NOAA Precipitation Depth per Average Recurrence Interval [in]

Duration	2-Year	10-Year	25-Year	100-Year
24-hour	3.45	5.13	6.17	7.79

Existing Condition (See Appendix A)

The project area's existing drainage conditions were analyzed as Watersheds A, B, and C (See Drawing EXWS).

Existing Watershed A is approximately 0.26 acres and comprises grassy areas, driveway aprons onto the site and the southwestern portion of the existing building. Stormwater runoff from this watershed either flows into the existing storm drainage network or overland and offsite towards Boston Post Road.

Existing Watershed B is approximately 0.08 acres and consists of grass and brush areas at the east of the site. Stormwater runoff from this watershed flows overland to the wetlands #2 to the east of the site.

Existing Watershed C is about 1.27 acres and consists of the existing building and parking areas along with grassy and brush areas. Stormwater runoff from this watershed flows overland to the wetlands #1 offsite to the north.

Proposed Condition (See Appendix B)

In the proposed condition, site hydrology attempts to mimic existing conditions and all watershed outlets remain the same.

Proposed Watershed A is about 0.37 acres and consists of grassy areas and the proposed driveway aprons. Stormwater will continue to flow overland to Boston Post Road. The proposed site within this watershed has been designed to significantly reduce impervious area as compared with the existing condition.

Proposed Watershed B is about 0.09 acres and includes grass and brush areas to the east of the site. This watershed will remain generally unchanged, and stormwater collected within this watershed will flow overland to the wetlands #2 offside to the east.

Proposed Watershed C is divided into two sub-watersheds: Sub-watershed C1 and Sub-watershed C2. Sub-watershed C1 is about 1.04 acres and consists of the proposed building and parking areas along with grassy areas; stormwater within this watershed will flow either through a pretreatment swale conveyance feature or directly into a rain garden before flowing to the wetlands #2 offsite to the north. Sub-watershed C2 is about 0.12 acres and consists of grassy and brush areas; stormwater within this watershed will continue to flow overland to the wetlands #2 offsite to the north.

Details of the sizes and locations of the stormwater collection systems can be found on drawings CG101. A conservative design infiltration rate for the rain garden is 1 inch per hour. The design infiltration rate will be confirmed with on-site testing prior to construction. Please refer to Appendix F for boring log data within the vicinity of the proposed rain garden. This testing was performed by Barton & Loguidice as a part of a Limited Phase II Environmental Site Assessment report, dated 08/27/2024. According to the boring log data, groundwater was encountered between 6' and 13' below existing grade, and existing site soils within the rain gardens consist of a mainly sandy material.

Site Discharge Peak Flow Comparison for WS-A (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	0.37	0.09	-0.28	75.68%
10-Year	0.77	0.44	-0.33	42.86%
25-Year	1.04	0.71	-0.33	31.73%
100-Year	1.46	1.20	-0.26	17.81%

Site Discharge Peak Flow Comparison for WS-B (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	0.02	0.01	-0.01	50.00%
10-Year	0.09	0.09	0.00	0.00%
25-Year	0.15	0.19	0.00	0.00%
100-Year	0.26	0.26	0.00	0.00%

Site Discharge Peak Flow Comparison for WS-C (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	3.77	0.32	-3.45	91.51%
10-Year	5.91	2.04	-3.87	65.48%
25-Year	7.22	3.73	-3.49	48.34%
100-Year	9.24	5.62	-3.62	39.18%

Site Discharge Peak Flow Comparison for Total Site (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	4.15	0.38	-3.77	90.84%
10-Year	6.76	2.39	-4.37	64.65%
25-Year	8.39	4.44	-3.95	47.08%
100-Year	10.95	6.93	-4.02	36.71%

As can be seen from the tables above, runoff from each watershed and the total site will be attenuated for the storms up to and including the 100-year storm. Additionally, per the 2024 CT Stormwater Quality Manual requirements, runoff from each watershed that includes proposed site development will be attenuated by 50% for the 2-year storm event.

STORMWATER CONVEYANCE SYSTEM (See Appendix D)

The stormwater conveyance system was sized using the Rational Method for the 10-year storm event as per the CTDEEP Stormwater Quality Manual. Values for area, runoff coefficient, C, and

a time of concentration were calculated for each drainage area. The average runoff coefficient was calculated based upon the following cover types:

Cover	C
Grass/Pervious	0.3
Roof/Pavement/Impervious	0.9

Rainfall intensities were taken from the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for Lake Konomoc. Stormwater pipes were then sized based upon the Manning's Equation for full flow pipe capacity and solving for the hydraulic grade line. The computer program Hydraflow Storm Sewers 2011 by Intellisolve was used in the analysis.

Each proposed storm sewer system has been analyzed sing a starting HGL elevation equal to the outlet pipe's crown elevation. This mimics a tailwater elevation equal to the outlet pipe's diameter or a scenario where a proposed pipe is entering an existing pipe flow at full capacity.

STORMWATER QUALITY (See Appendix E)

The proposed stormwater management system has been designed to incorporate stormwater quality measures including a significant decrease in site imperviousness, yard drains with sumps, a pretreatment swale conveyance feature, and a rain garden. These measures will be implemented to increase water quality and minimize the passage of pollutants to the existing stormwater systems as compared to current conditions.

Under current conditions, the entirety of the site impervious cover (±52,200 SF) is considered directly connected impervious area (DCIA). This project proposes to decrease DCIA by over 90%, which will decrease surface runoff and increase infiltration of rainfall into the soil.

Per Table 4.1 of the CT Stormwater Quality Manual, the site is considered a redevelopment with existing DCIA of 40% or more. As such, the Required Retention Volume (RRV) is 50% of the site's Water Quality Volume (WQV). Through coordination with the town of Waterford Environmental Planner, this project occurs within the Stony Brook watershed area. Stormwater discharge from the site contributes to an intermittent watercourse and wetland system located north of the parcel. The receiving portion of Stony Brook south of Route 1 has been designated as an impaired waterbody by CTDEEP. Because of this information, the stormwater system has

been designed to retain 100% of the site WQV and exceed the RRV requirements for our redevelopment site.

Table 4.3 of the CT Stormwater Quality Manual shows the minimum average annual pollutant load reductions for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN). Per the manual, "a proposed stormwater management system meets or exceeds these average pollutant load reductions when the RRV is retained on-site using suitable stormwater retention practices. Achieving these minimum required load reductions for sediment and nutrients is assumed to provide adequate reductions of other stormwater pollutants including floatable materials." Through the use of the proposed rain garden, the stormwater system designed exceeds our RRV and will retain 100% of the WQV, thereby also exceeding the required average annual pollutant load reductions.

CONCLUSION

The proposed stormwater management system has been designed in general accordance with the 2024 CTDEEP Stormwater Quality Manual and the 2000 CTDOT Drainage Manual. It has been designed to maintain existing site hydrology to the maximum extent practicable with attenuated peak flows and multiple water quality improvements.

This Langan report shows that the proposed stormwater management system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed development. Please refer to the Drawings for additional drainage information.

Sincerely,
Langan CT, Inc.

Brian Phillips, P.E.
Senior Project Manager

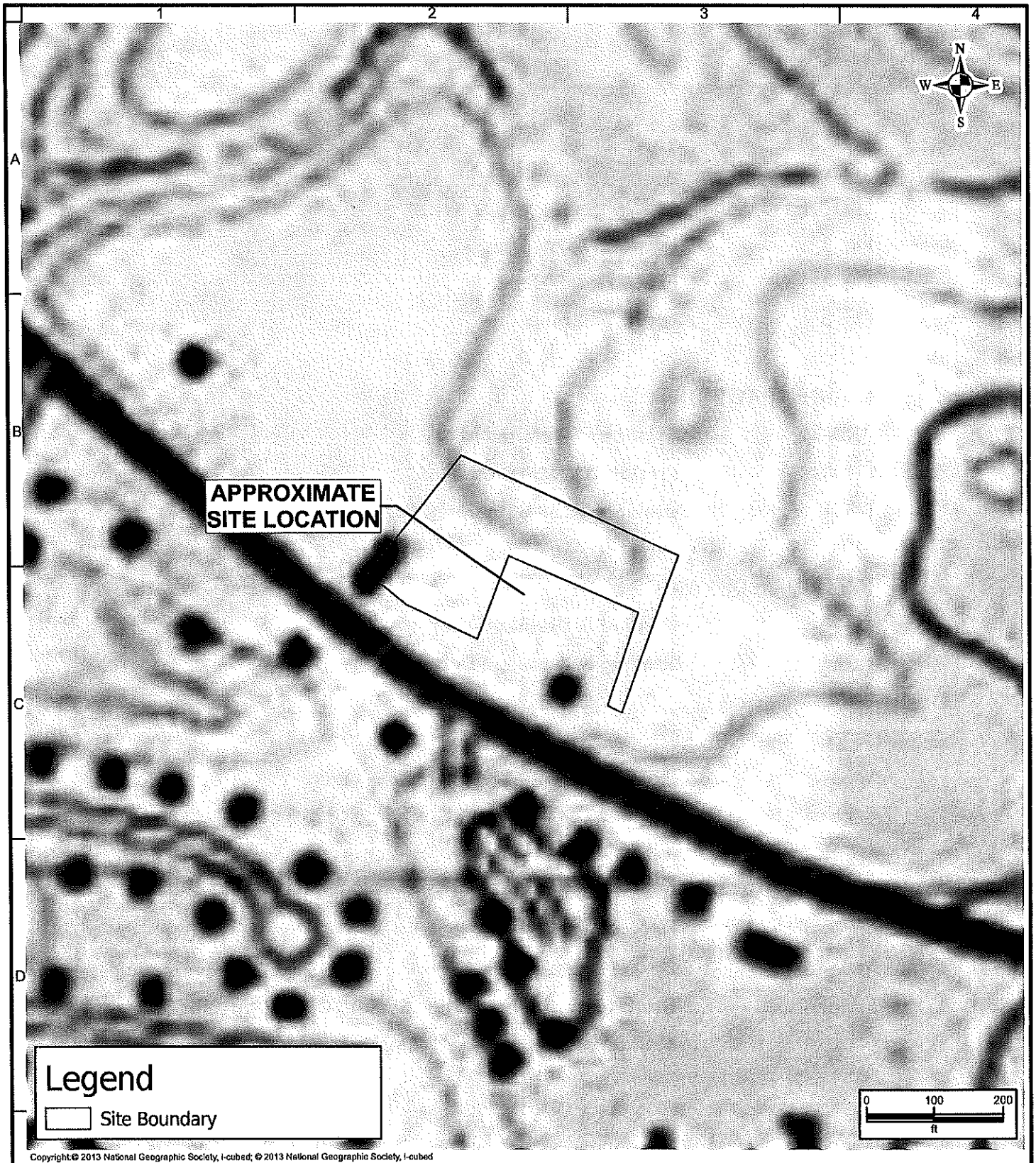
\\langan.com\data\NHV\data5\140286501\Project Data_Discipline\Site Civil\Reports\Stormwater\Oswegatchie Fire Station Stormwater Report.docx

LIST OF FIGURES

LIST OF DRAWINGS

REFERENCE DRAWINGS

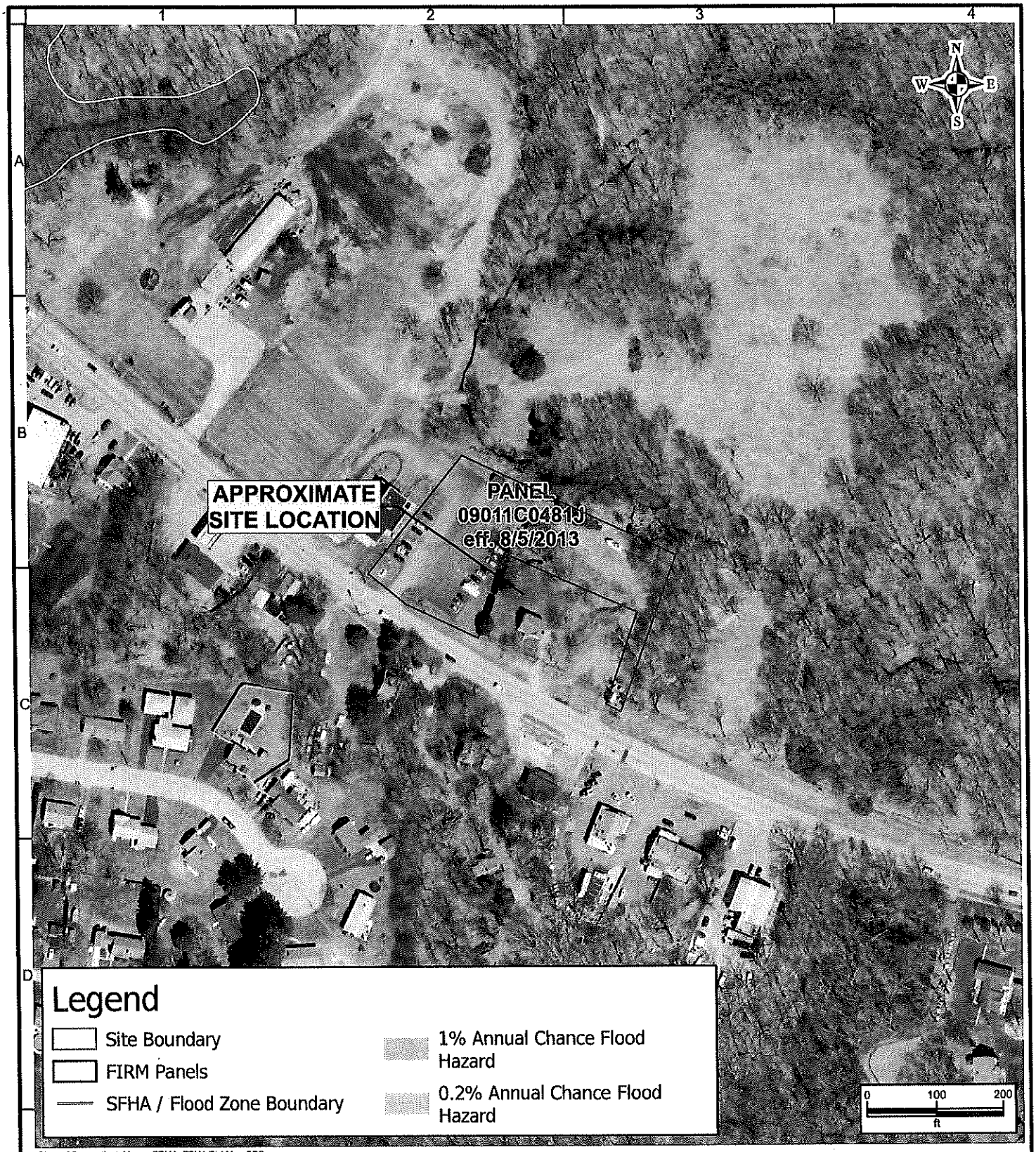
LIST OF APPENDICES



LANGAN
300 Kimball Drive 4th Floor
Parsippany NJ 07054-2172
T: 973-560-4900 F: 973-560-4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project	Oswegatchie Fire Station
	WATERFORD
	CONNECTICUT
	SOUTHEASTERN CT
Drawing Title	SITE LOCATION
Project No.	140286501
Date	1/3/2025
Scale	1:200
Drawn By	Site Analyzer
Submission Date	1/3/2025
Figure	1
	Sheet 1 of 2

Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet



State of Connecticut, Maxar; FEMA, FEMA RiskMap CDS

LANGAN

300 Kimball Drive 4th Floor
Parsippany NJ 07054-2172
T: 973-560-4900 F: 973-560-4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project	**Oswegatchie Fire Station** WATERFORD CONNECTICUT SOUTHEASTERN CT
Drawing Title	**EFFECTIVE FEMA FIRM**
Project No.	140286501
Date	1/3/2025
Scale	1:200
Drawn By	Site Analyzer
Submission Date	1/3/2025
Figure	2
	Sheet 2 of 2

Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet

200 0 100 200

SCALE: 1 INCH = 200 FEET

SOIL TYPE LEGEND

SYMBOL	NAME	GROUP
13	WALPOLE SANDY LOAM, 0 TO 3 PERCENT SLOPES	B/D
38C	HINCKLEY LOAMY SAND, 3 TO 15 PERCENT SLOPES	A

REFERENCE: WEB SOIL SURVEY BY THE UNITED STATES DEPARTMENT OF AGRICULTURAL AND NATURAL RESOURCES CONSERVATION SERVICE.

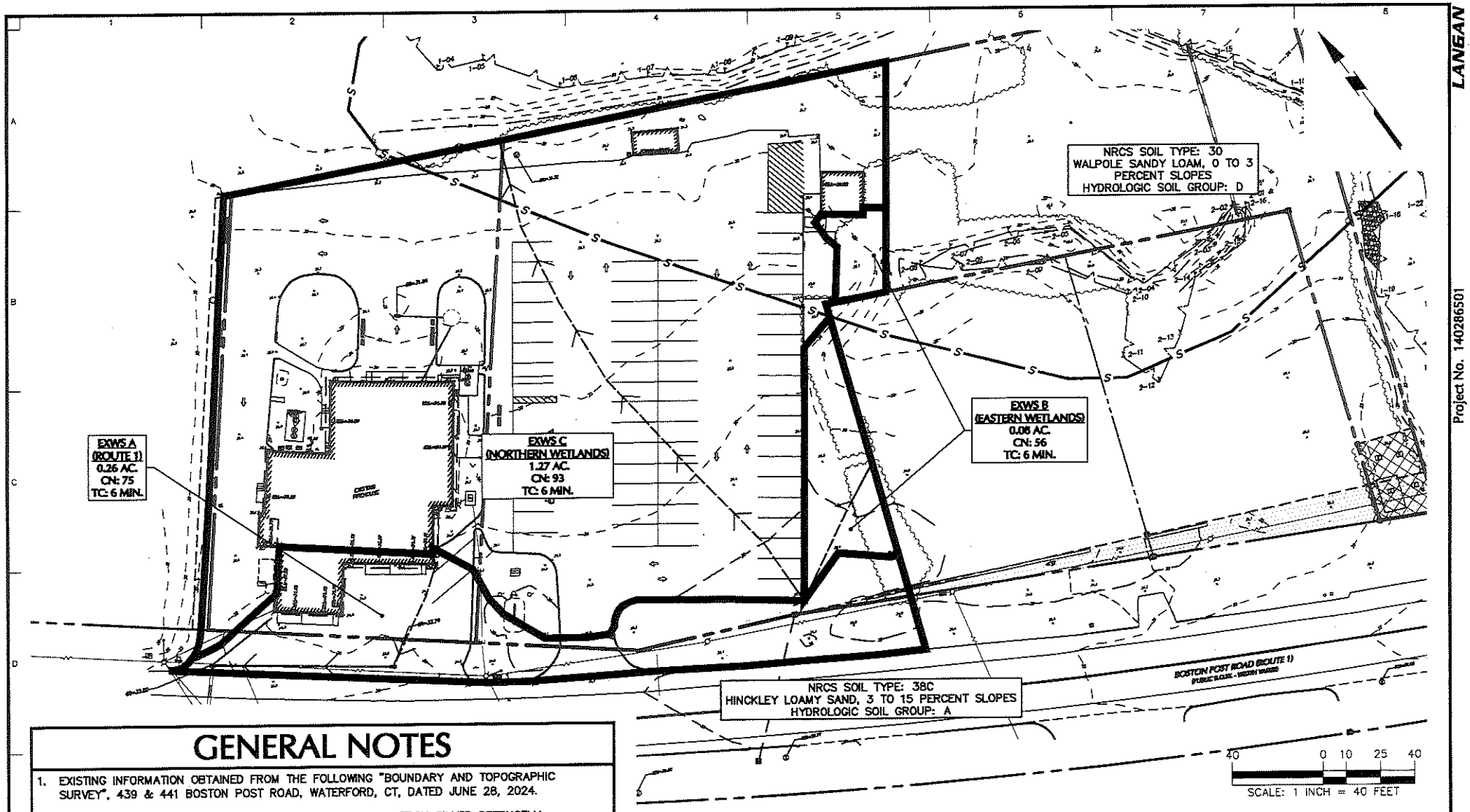
LANGAN
Langan CT, Inc.
555 Long Wharf Drive, 9th Floor
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project: OSWEGATCHIE FIRE STATION
WATERFORD CONNECTICUT

Drawing Title: NRCS SOILS MAP

Project No. 140286501
Date 1/7/2025
Drawn By APF
Checked By BP

Drawing No. 3
Sheet 3 of 1



GENERAL NOTES

1. EXISTING INFORMATION OBTAINED FROM THE FOLLOWING "BOUNDARY AND TOPOGRAPHIC SURVEY", 439 & 441 BOSTON POST ROAD, WATERFORD, CT, DATED JUNE 28, 2024.
2. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI ARCHITECTURE IN DECEMBER 2024.
3. THE SITE IS LOCATED WITHIN ZONE X OF FEMA FIRM MAP 09011C0481J, EFFECTIVE AUGUST 5, 2013. ZONE X IS AN AREA OF MINIMAL FLOOD HAZARD WITH NO BASE FLOOD ELEVATIONS.

LANGAN
Langan CT, Inc.
555 Long Wharf Drive, 9th Floor
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project: Oswegatchie Fire Station
WATERFORD CONNECTICUT

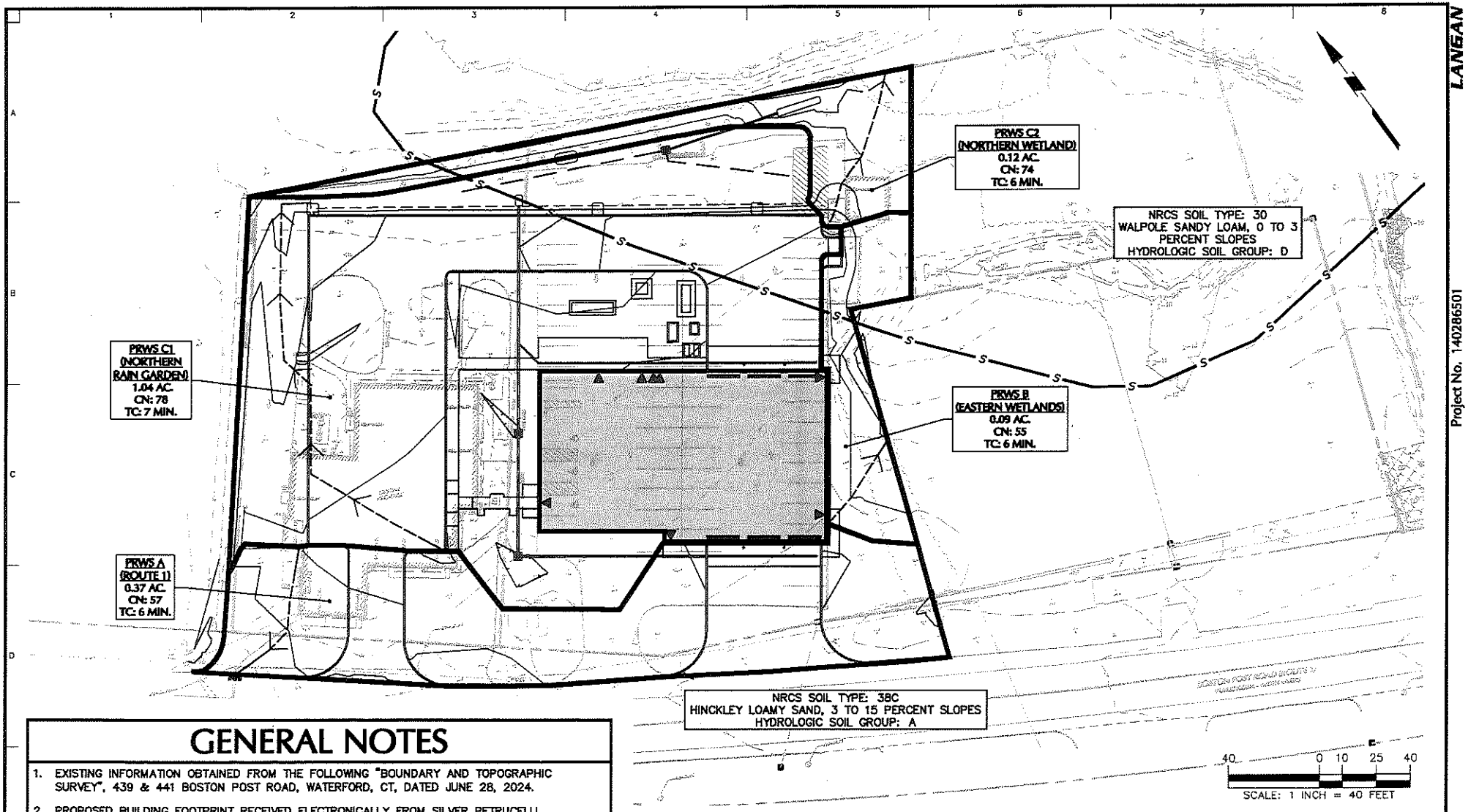
Drawing Title: EXISTING WATERSHED MAP

Project No. 140286501
Date 1/7/2025
Drawn By APF
Checked By BP

Drawing No. EXWS
Sheet 1 of 3

Project No. 140286501

Date: 1/3/2025 Time: 10:06 User: afay Style Table: Langan.stb Layout: Layout1 Document Code: 140286501-0201-CG103-0101



GENERAL NOTES

1. EXISTING INFORMATION OBTAINED FROM THE FOLLOWING "BOUNDARY AND TOPOGRAPHIC SURVEY", 439 & 441 BOSTON POST ROAD, WATERFORD, CT, DATED JUNE 28, 2024.
2. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI ARCHITECTURE IN DECEMBER 2024.
3. THE SITE IS LOCATED WITHIN ZONE X OF FEMA FIRM MAP 09011C0481J, EFFECTIVE AUGUST 5, 2013. ZONE X IS AN AREA OF MINIMAL FLOOD HAZARD WITH NO BASE FLOOD ELEVATIONS.

LANGAN
Langan CT, Inc.
555 Long Wharf Drive, 8th Floor
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project: Oswegatchie Fire Station
WATERFORD CONNECTICUT

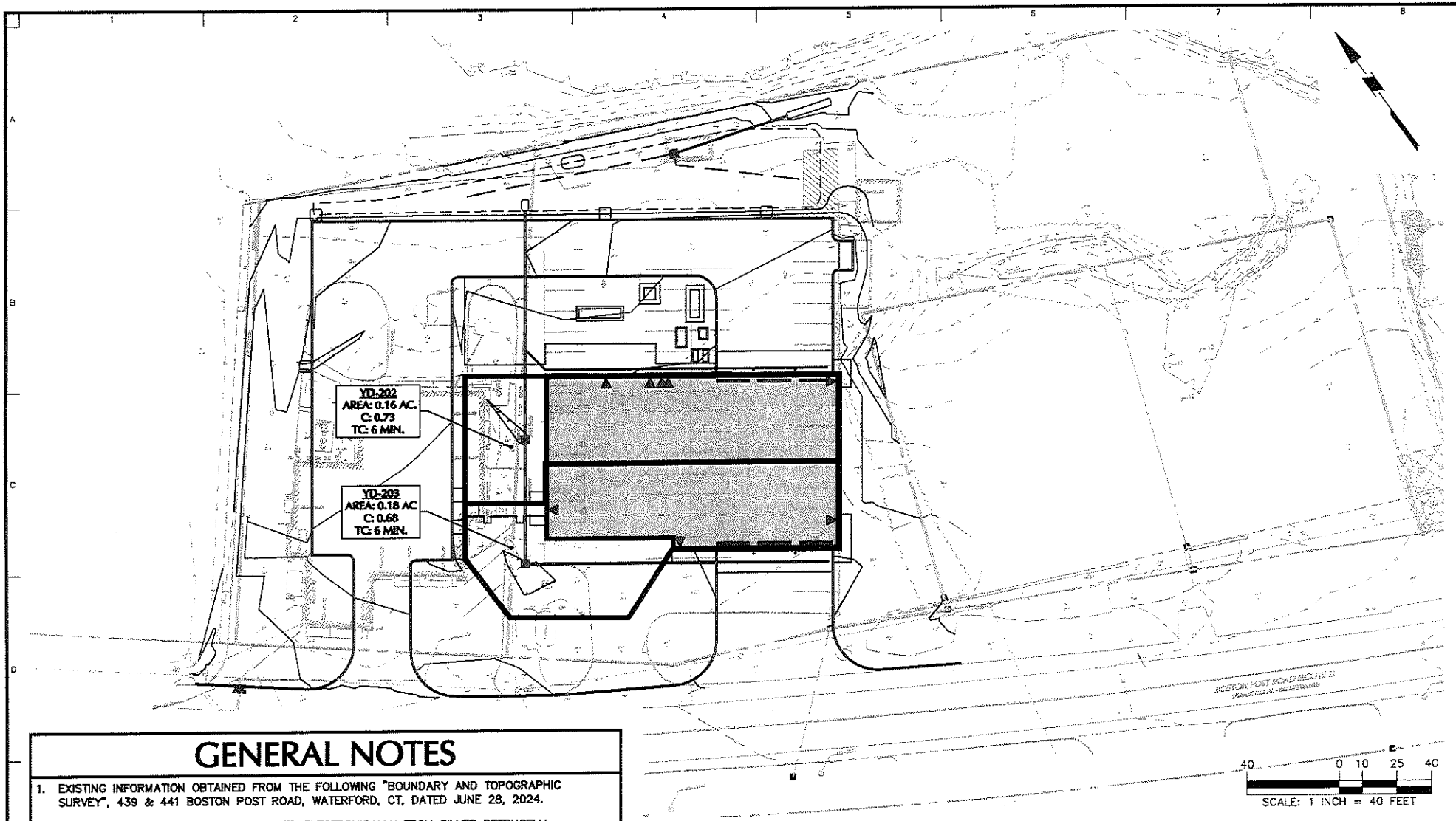
Drawing Title: PROPOSED WATERSHED MAP

Project No. 140286501
Date 1/7/2025
Drawn By APF
Checked By RP

Drawing No. PRWS
Sheet 2 of 9

Project No. 140286501

Date: 1/3/2025 Time: 10:05 User: afay Style Table: Langan.stb Layout: Layout1 Document Code: 140286501-0201-CG104-0101



GENERAL NOTES

1. EXISTING INFORMATION OBTAINED FROM THE FOLLOWING "BOUNDARY AND TOPOGRAPHIC SURVEY", 439 & 441 BOSTON POST ROAD, WATERFORD, CT, DATED JUNE 28, 2024.
2. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI ARCHITECTURE IN DECEMBER 2024.
3. THE SITE IS LOCATED WITHIN ZONE X OF FEMA FIRM MAP 09011C0481J, EFFECTIVE AUGUST 5, 2013. ZONE X IS AN AREA OF MINIMAL FLOOD HAZARD WITH NO BASE FLOOD ELEVATIONS.

LANGAN
Langan CT, Inc.
555 Long Wharf Drive, 9th Floor
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project: Oswegatchie Fire Station
WATERFORD CONNECTICUT

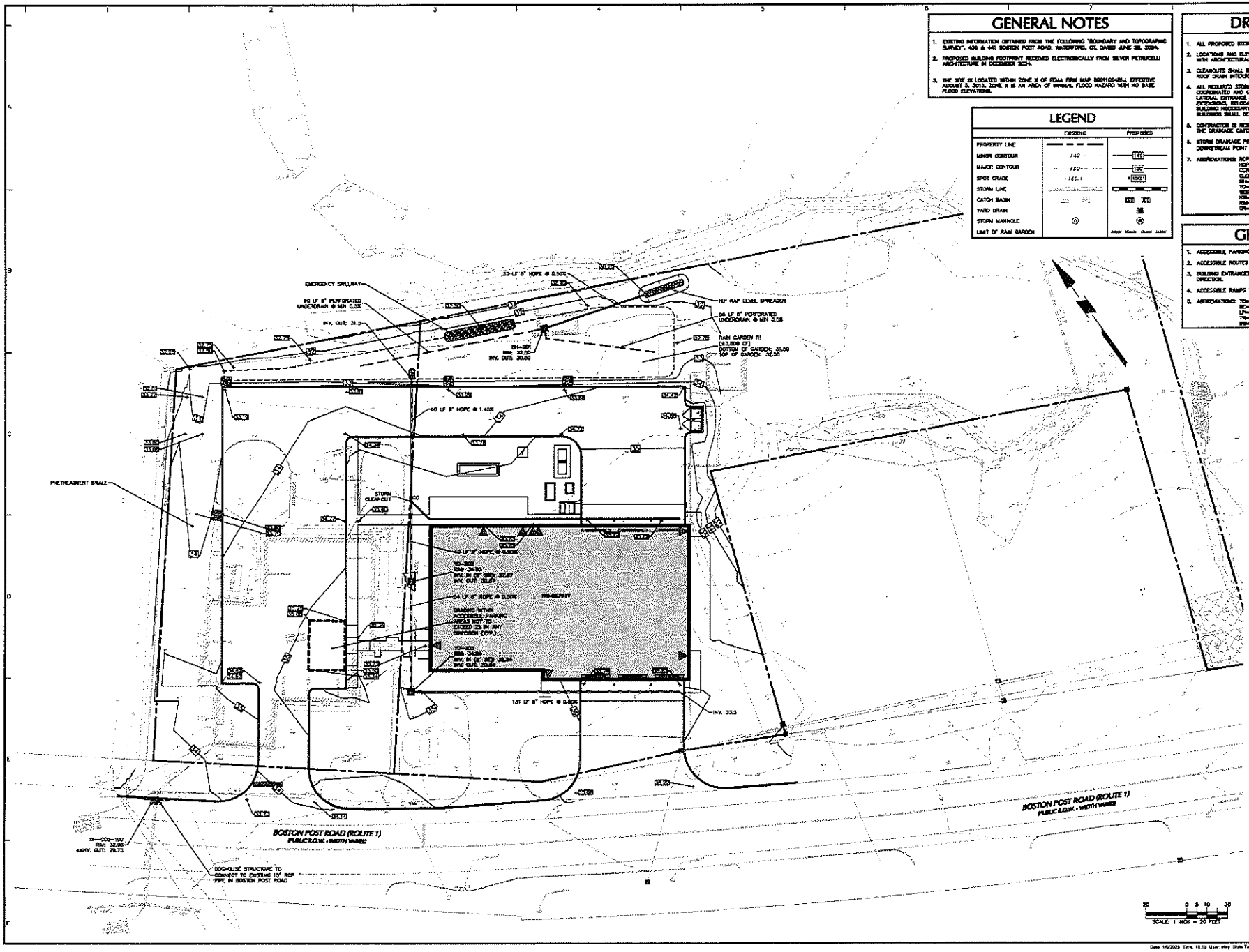
Drawing Title: DRAINAGE AREA CATCHMENT BASIN MAP

Project No.	140286501
Date	1/7/2024
Drawn By	APF
Checked By	BP

Drawing No.: DACB
Sheet 3 of 3

LANGAN
Project No. 140286501

Date: 1/3/2025 Time: 10:12 User: afay Style Table: Langan.stb Layout: Layout1 Document Code: 140286501-0201-CG102-0101



GENERAL NOTES

1. EXISTING INFORMATION OBTAINED FROM THE FOLLOWING "BOUNDARY AND TOPOGRAPHIC SURVEY", 436 & 441 BOSTON POST ROAD, WATERFORD, CT, DATED JUNE 28, 2024.
2. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI ARCHITECTURE IN DECEMBER 2024.
3. THE SITE IS LOCATED WITHIN ZONE X OF FEMA FIRM MAP 09011C0481J, EFFECTIVE AUGUST 3, 2013. ZONE X IS AN AREA OF MINIMAL FLOOD HAZARD WITH NO BASE FLOOD ELEVATIONS.

LEGEND

	EXISTING	PROPOSED
PROPERTY LINE		
MINOR CONTOUR	140	140
MAJOR CONTOUR	150	150
SPOT GRADE	+150.1	+105.1
STORM LINE		
CATCH BASIN		
YARD DRAIN		
STORM MANHOLE		
LIMIT OF RAIN GARDEN		

DRAINAGE NOTES

1. ALL PROPOSED STORM DRAINAGE PIPING TO UTILIZE WATER-TIGHT JOINTS.
2. LOCATIONS AND ELEVATIONS OF ROOF LEADERS SHOULD BE COORDINATED WITH ARCHITECTURAL DRAWINGS PRIOR TO CONSTRUCTION.
3. CLEANOUTS SHALL BE PROVIDED FLUSH TO GRADE AT ALL LOCATIONS OF ROOF DRAIN INTERSECTIONS, BENDS AND UPSTREAM ENDS.
4. ALL REQUIRED STORM LATERALS SERVICING THE BUILDING SHALL BE COORDINATED AND CONSTRUCTED TO WITHIN FIVE FEET OF EACH BUILDING LATERAL ENTRANCE LOCATION AT THE INVERTS NOTED. ANY NECESSARY EXTENSIONS, RELOCATIONS, OR CONNECTIONS WITHIN FIVE FEET OF THE BUILDING NECESSARY TO COMPLETE CONNECTION OF LATERALS TO THE BUILDINGS SHALL BE MADE BY THE BUILDING CONTRACTOR.
5. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE APPROPRIATE SIZES OF THE DRAINAGE CATCH BASINS AND MANHOLES TO RECEIVE PIPING SHOWN.
6. STORM DRAINAGE PIPING INSTALLATION SHALL COMMENCE AT THE FURTHEST DOWNSTREAM POINT AND PROCEED UPSTREAM "IN THE DRY".
7. ABBREVIATIONS: RCP=REINFORCED CONCRETE PIPE
   HDPE=HIGH DENSITY POLYETHYLENE PIPE
   CCB=CURBED CATCH BASIN
   CLCB=CURBLESS CATCH BASIN
   MH=MANHOLE
   YD=YARD DRAIN
   WQU=WATER QUALITY UNIT
   HW=HEADWALL
   RIM=TOP OF RIM ELEVATION
   GR=TOP OF GRATE ELEVATION

GRADING NOTES

1. ACCESSIBLE PARKING AREAS NOT TO EXCEED 2% IN ANY DIRECTION.
2. ACCESSIBLE ROUTES NOT TO EXCEED 5% RUNNING SLOPE OR 2% CROSS-SLOPE.
3. BUILDING ENTRANCES AND RAMP LANDINGS NOT TO EXCEED 2% IN ANY DIRECTION.
4. ACCESSIBLE RAMPS TO BE CONSTRUCTED PER ADA REQUIREMENTS
5. ABBREVIATIONS: TC=TOP OF CURB
   BC=BOTTOM OF CURB
   LP=LOW POINT
   TW=TOP OF WALL
   BW=BOTTOM OF WALL

No.	Description	Date
	Revisions	

LANGAN

Langan CT, Inc.
555 Long Wharf Drive, 9th Floor
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project

OSWEGATCHIE FIRE STATION

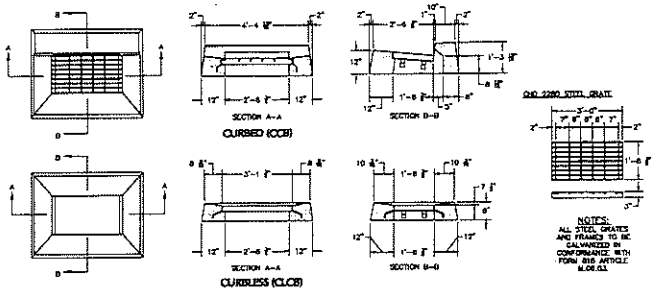
WATERFORD CONNECTICUT

Drawing Title

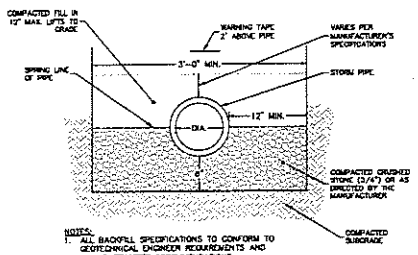
GRADING & DRAINAGE PLAN

Project No.	140286901
Date	1/7/2025
Drawn By	APF
Checked By	BF
Drawing No.	CG101
Sheet	4 of 13

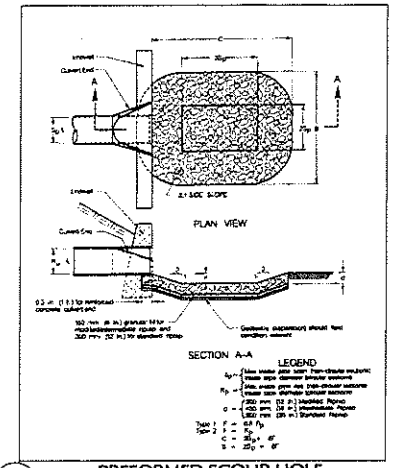
Date: 1/6/2025 Time: 10:19 User: afay Style Table: Langan.stb Layout: Layout1 Document Code: 140286901-0602-CG101-01.dwg



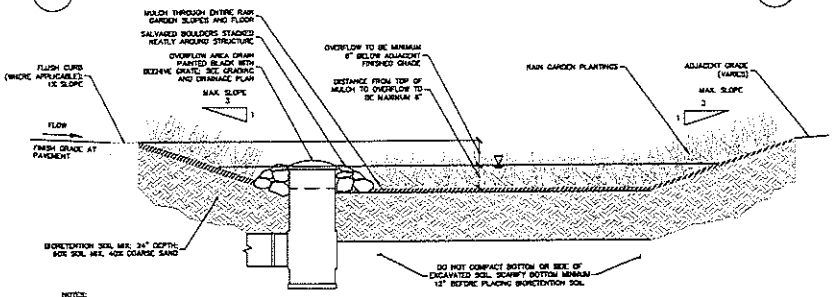
1 CATCH BASIN TOP
N.T.S



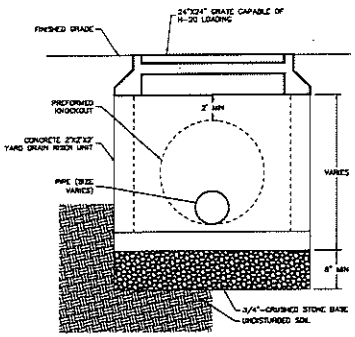
2 STORM PIPE BEDDING
N.T.S



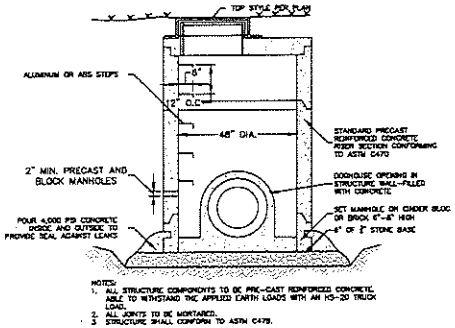
3 PREFORMED SCOUR HOLE
N.T.S



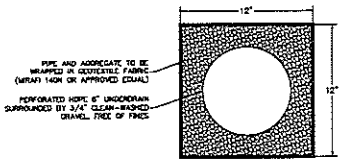
4 RAIN GARDEN
N.T.S



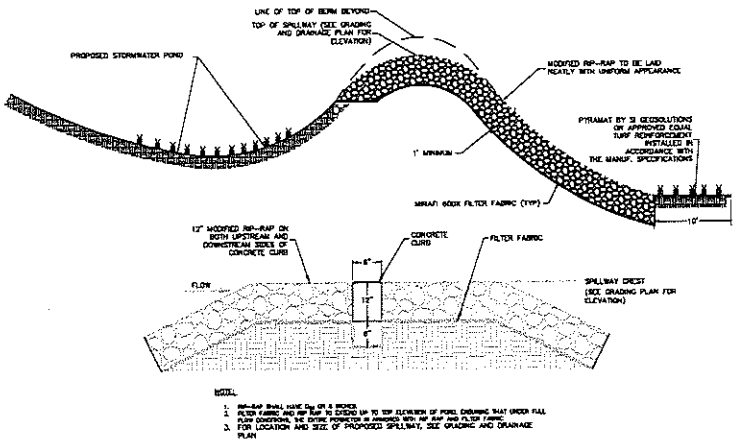
5 YARD DRAIN
N.T.S



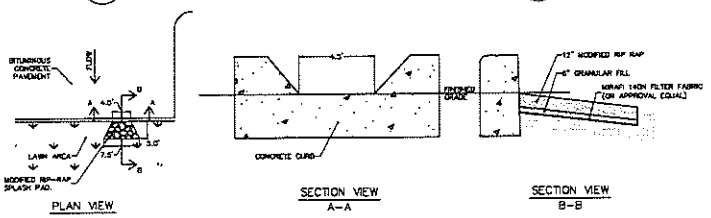
7 DOGHOUSE STRUCTURE
N.T.S



6 RAIN GARDEN UNDERDRAIN
N.T.S



8 EMERGENCY SPILLWAY
N.T.S



9 CURB LEAK OFF
N.T.S

Date	Description	No.
Revisions		

LANGAN
Langan CT, Inc.
555 Long Wharf Drive, 9th Floor
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

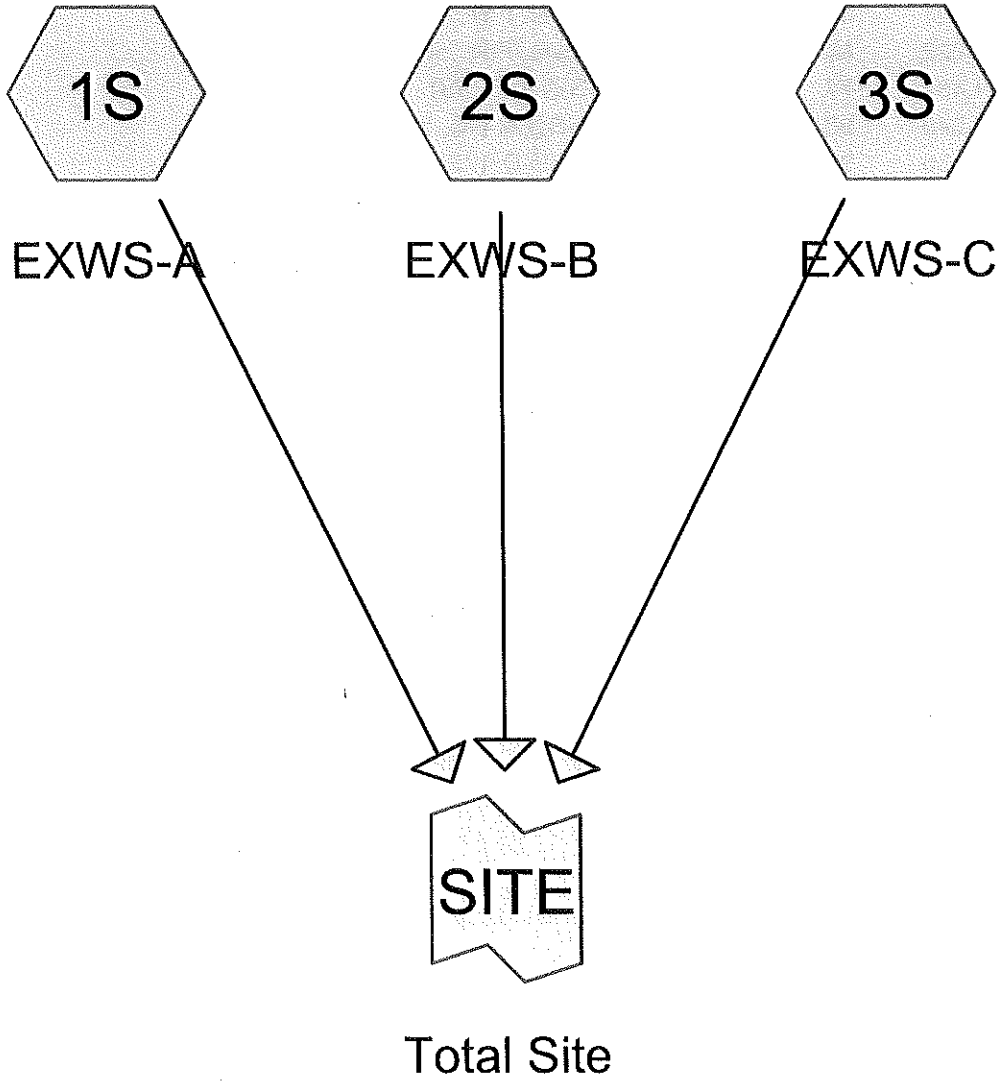
Project
OSWEGATCHIE FIRE STATION
WATERFORD CONNECTICUT

Drawing Title
GRADING AND DRAINAGE DETAILS

Project No. 140286901	Drawing No. CG501
Date 1/7/2025	
Drawn By APF	
Checked By BP	Sheet 5 of 15

APPENDIX A

Existing Stormwater Discharge Calculations



Total Site

Subcat Reach Pond Link

Routing Diagram for EX Hydro
Prepared by Langan Engineering, Printed 11/12/2024
HydroCAD® 10.20-3f s/n 08223 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
13,021	49	50-75% Grass cover, Fair, HSG A (1S, 2S, 3S)
4,022	84	50-75% Grass cover, Fair, HSG D (2S, 3S)
1,432	77	Brush, Fair, HSG D (2S, 3S)
52,049	98	Paved parking, HSG A (1S, 3S)
36	98	Paved parking, HSG D (2S)
70,560	**88**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXWS-A Runoff Area=11,475 sf 52.74% Impervious Runoff Depth=1.27"
Flow Length=137' Tc=6.0 min CN=75 Runoff=0.37 cfs 1,211 cf

Subcatchment 2S: EXWS-B Runoff Area=3,749 sf 0.96% Impervious Runoff Depth=0.36"
Flow Length=68' Slope=0.0250 '/' Tc=6.4 min CN=56 Runoff=0.02 cfs 113 cf

Subcatchment 3S: EXWS-C Runoff Area=55,336 sf 83.12% Impervious Runoff Depth=2.69"
Flow Length=248' Slope=0.0200 '/' Tc=6.0 min CN=93 Runoff=3.77 cfs 12,389 cf

Link SITE: Total Site Inflow=4.15 cfs 13,713 cf
Primary=4.15 cfs 13,713 cf

Total Runoff Area = 70,560 sf Runoff Volume = 13,713 cf Average Runoff Depth = 2.33"
26.18% Pervious = 18,475 sf 73.82% Impervious = 52,085 sf

Summary for Subcatchment 1S: EXWS-A

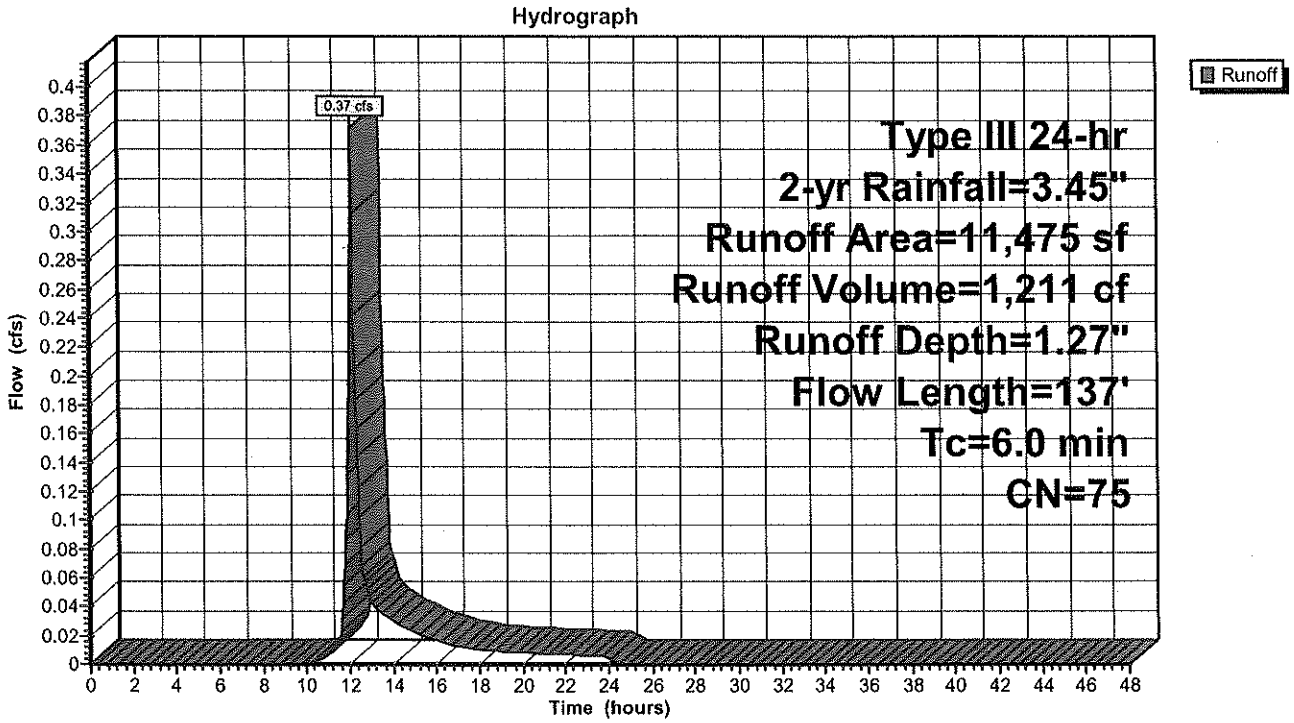
Runoff = 0.37 cfs @ 12.10 hrs, Volume= 1,211 cf, Depth= 1.27"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.45"

Area (sf)	CN	Description
5,423	49	50-75% Grass cover, Fair, HSG A
6,052	98	Paved parking, HSG A
11,475	75	Weighted Average
5,423		47.26% Pervious Area
6,052		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	54	0.0075	0.85		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.3	83	0.0100	4.50	1.57	**Pipe Channel, Segment 2** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.010
1.4	137	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: EXWS-A



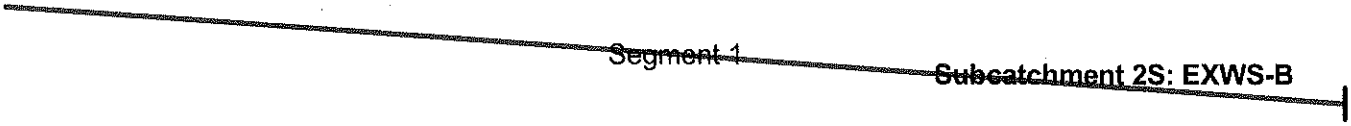
Summary for Subcatchment 2S: EXWS-B

Runoff = 0.02 cfs @ 12.15 hrs, Volume= 113 cf, Depth= 0.36"
Routed to Link SITE : Total Site

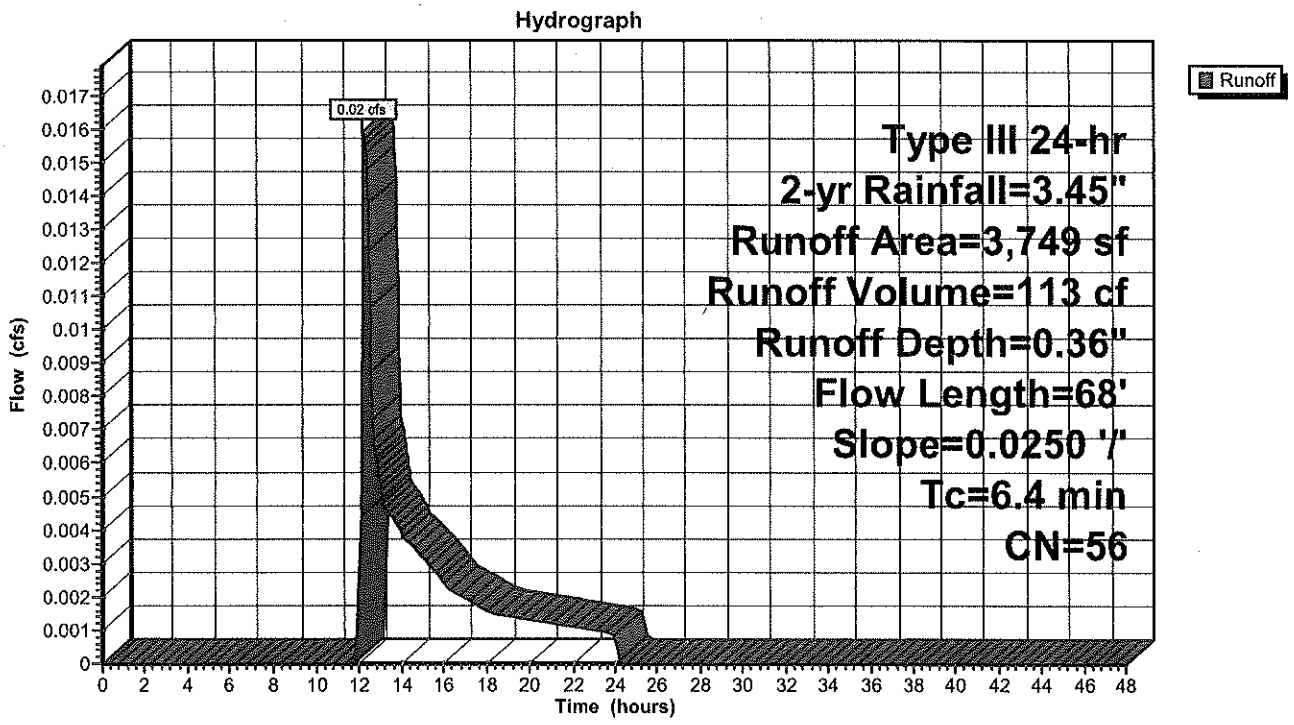
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.45"

Area (sf)	CN	Description
2,844	49	50-75% Grass cover, Fair, HSG A
770	77	Brush, Fair, HSG D
99	84	50-75% Grass cover, Fair, HSG D
36	98	Paved parking, HSG D
3,749	56	Weighted Average
3,713		99.04% Pervious Area
36		0.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	68	0.0250	0.18		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"



Subcatchment 2S: EXWS-B



Summary for Subcatchment 3S: EXWS-C

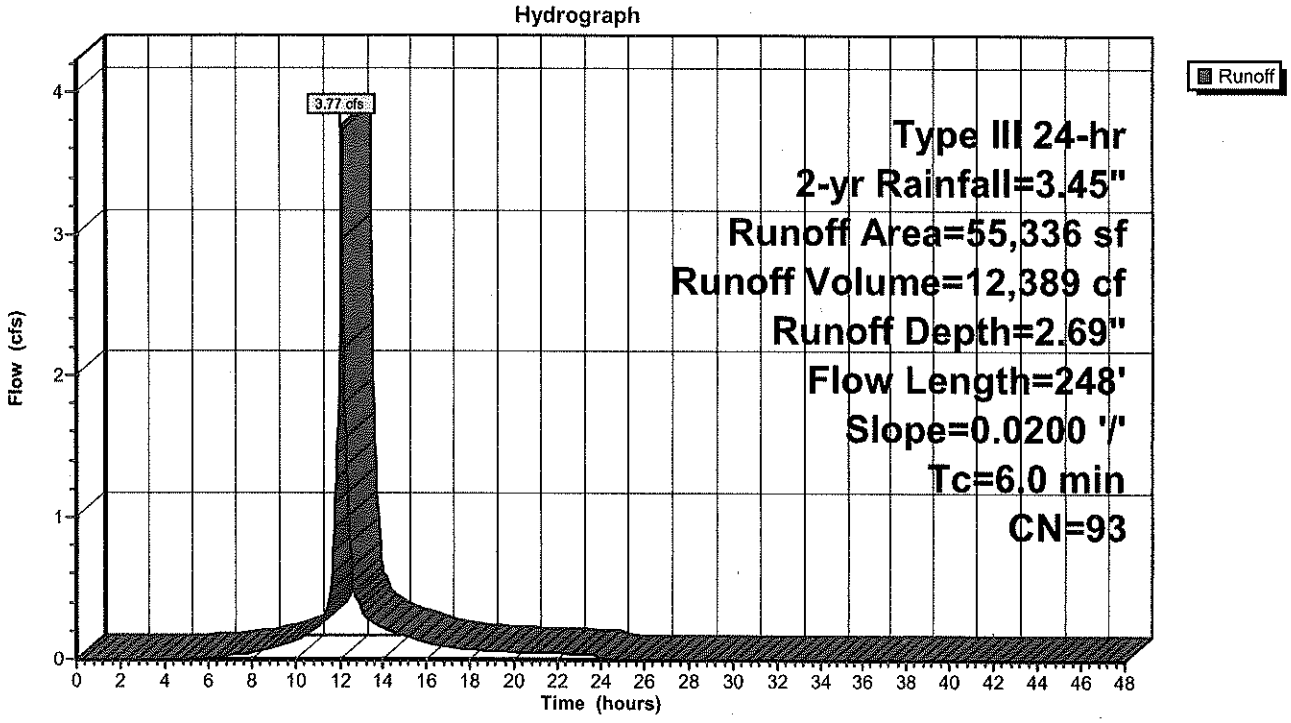
Runoff = 3.77 cfs @ 12.09 hrs, Volume= 12,389 cf, Depth= 2.69"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.45"

Area (sf)	CN	Description
4,754	49	50-75% Grass cover, Fair, HSG A
3,923	84	50-75% Grass cover, Fair, HSG D
662	77	Brush, Fair, HSG D
45,997	98	Paved parking, HSG A
55,336	93	Weighted Average
9,339		16.88% Pervious Area
45,997		83.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	150	0.0200	1.54		**Sheet Flow, Segtment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.5	86	0.0200	2.87		**Shallow Concentrated Flow, Segment 2** Paved Kv= 20.3 fps
0.1	12	0.0200	2.12		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
2.2	248	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: EXWS-C

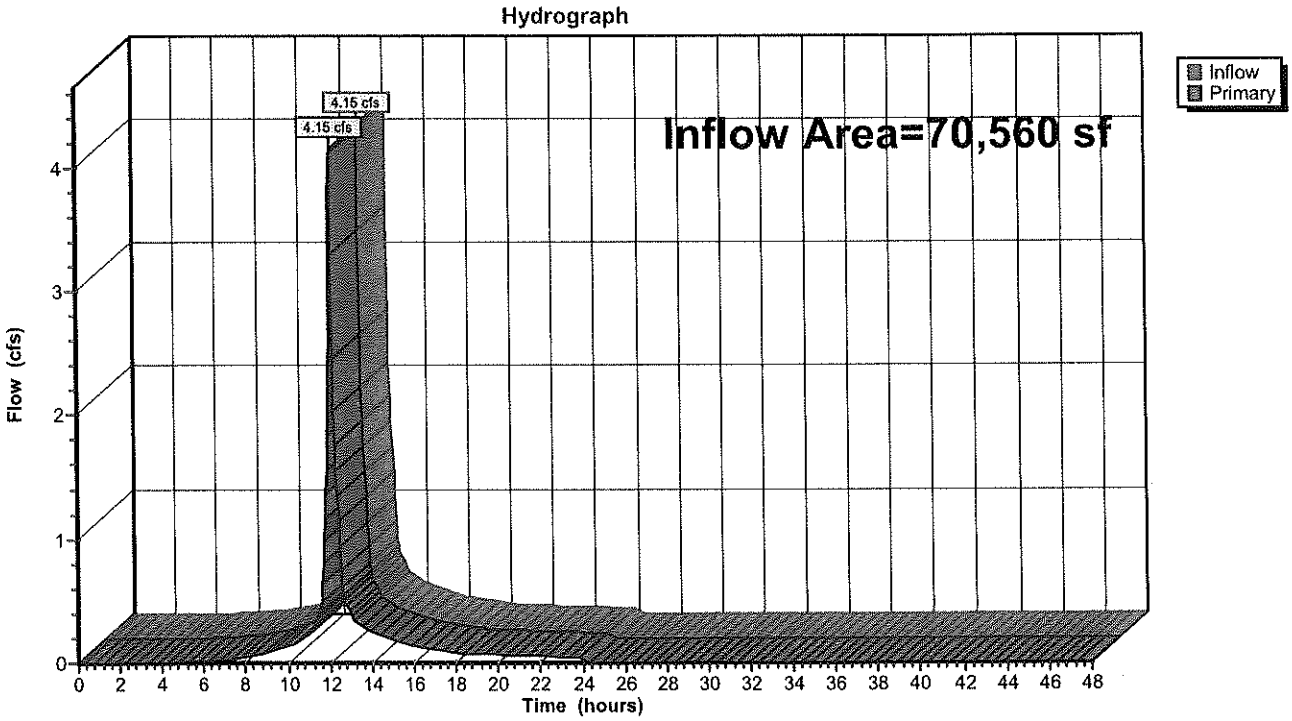


Summary for Link SITE: Total Site

Inflow Area = 70,560 sf, 73.82% Impervious, Inflow Depth = 2.33" for 2-yr event
Inflow = 4.15 cfs @ 12.09 hrs, Volume= 13,713 cf
Primary = 4.15 cfs @ 12.09 hrs, Volume= 13,713 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link SITE: Total Site



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXWS-A Runoff Area=11,475 sf 52.74% Impervious Runoff Depth=2.56"
Flow Length=137' Tc=6.0 min CN=75 Runoff=0.77 cfs 2,443 cf

Subcatchment 2S: EXWS-B Runoff Area=3,749 sf 0.96% Impervious Runoff Depth=1.11"
Flow Length=68' Slope=0.0250 '/' Tc=6.4 min CN=56 Runoff=0.09 cfs 347 cf

Subcatchment 3S: EXWS-C Runoff Area=55,336 sf 83.12% Impervious Runoff Depth=4.33"
Flow Length=248' Slope=0.0200 '/' Tc=6.0 min CN=93 Runoff=5.91 cfs 19,947 cf

Link SITE: Total Site Inflow=6.76 cfs 22,737 cf
Primary=6.76 cfs 22,737 cf

Total Runoff Area = 70,560 sf Runoff Volume = 22,737 cf Average Runoff Depth = 3.87"
26.18% Pervious = 18,475 sf 73.82% Impervious = 52,085 sf

Summary for Subcatchment 1S: EXWS-A

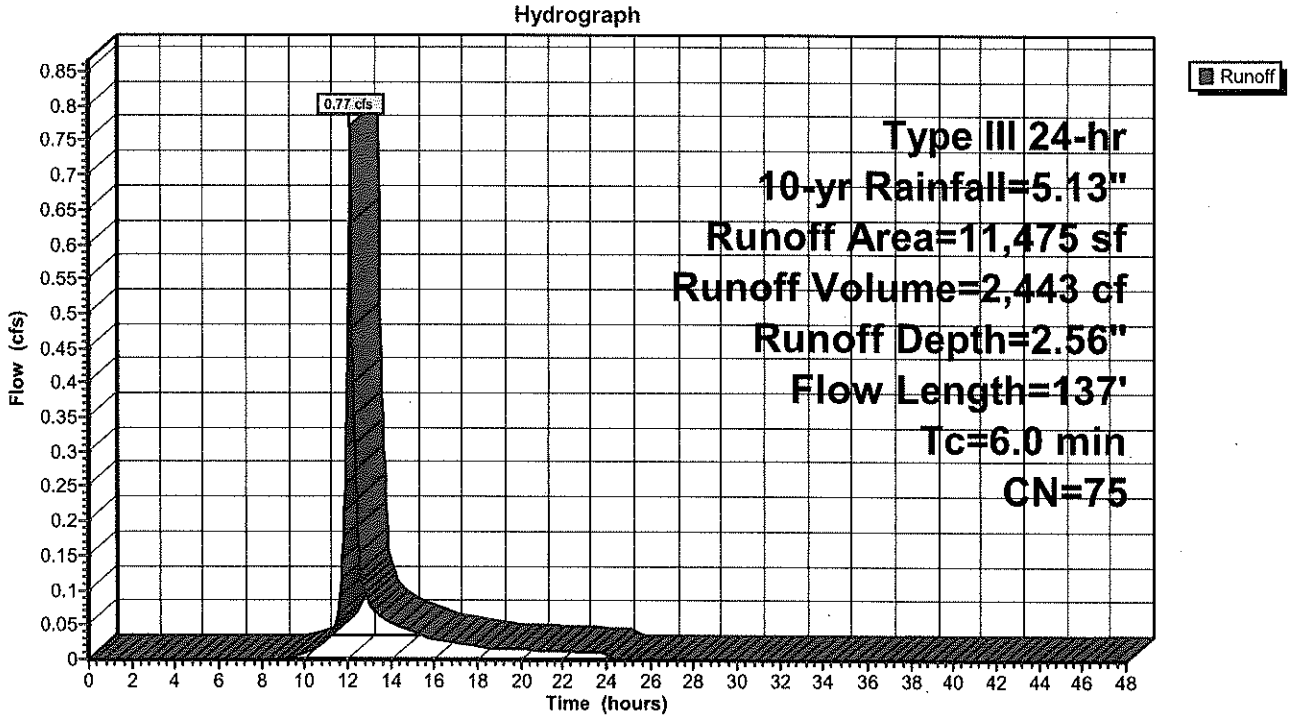
Runoff = 0.77 cfs @ 12.09 hrs, Volume= 2,443 cf, Depth= 2.56"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.13"

Area (sf)	CN	Description
5,423	49	50-75% Grass cover, Fair, HSG A
6,052	98	Paved parking, HSG A
11,475	75	Weighted Average
5,423		47.26% Pervious Area
6,052		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	54	0.0075	0.85		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.3	83	0.0100	4.50	1.57	**Pipe Channel, Segment 2** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.010
1.4	137	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: EXWS-A



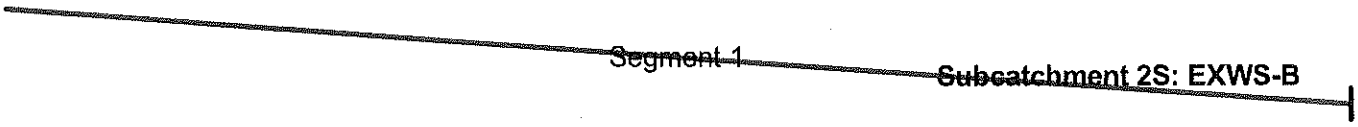
Summary for Subcatchment 2S: EXWS-B

Runoff = 0.09 cfs @ 12.11 hrs, Volume= 347 cf, Depth= 1.11"
Routed to Link SITE : Total Site

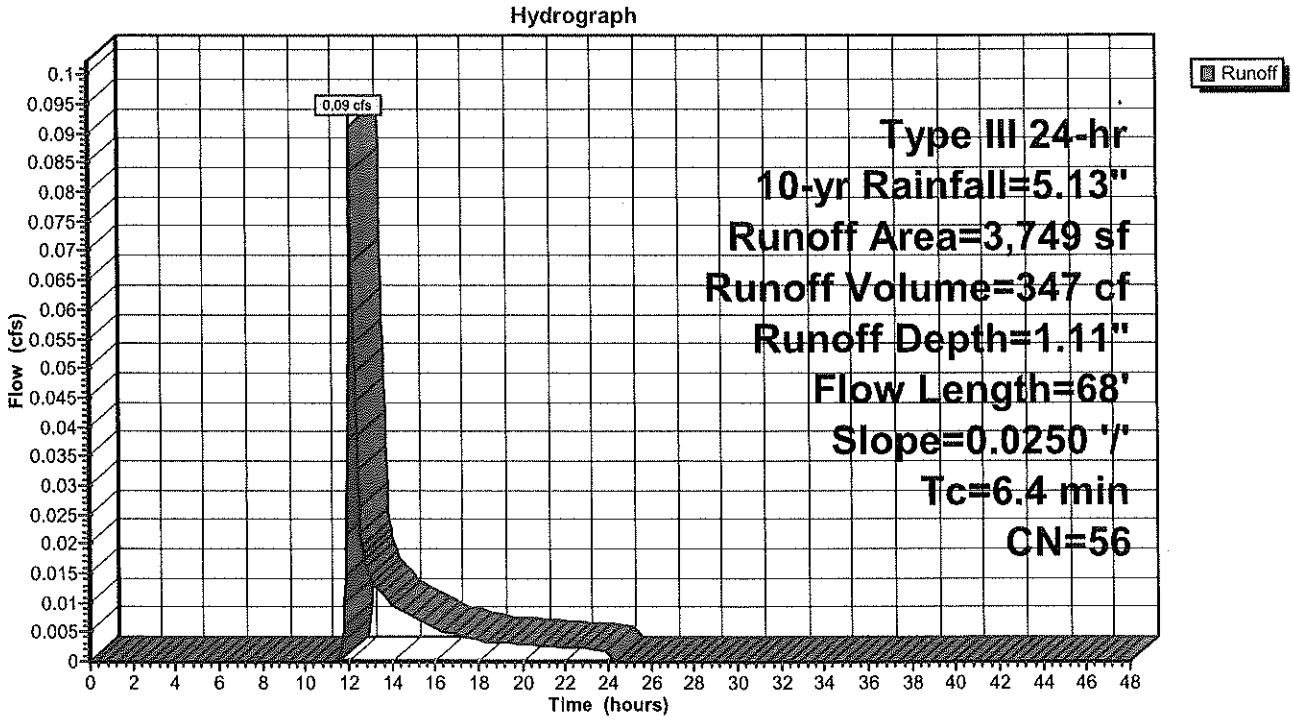
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.13"

Area (sf)	CN	Description
2,844	49	50-75% Grass cover, Fair, HSG A
770	77	Brush, Fair, HSG D
99	84	50-75% Grass cover, Fair, HSG D
36	98	Paved parking, HSG D
3,749	56	Weighted Average
3,713		99.04% Pervious Area
36		0.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	68	0.0250	0.18		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"



Subcatchment 2S: EXWS-B



Summary for Subcatchment 3S: EXWS-C

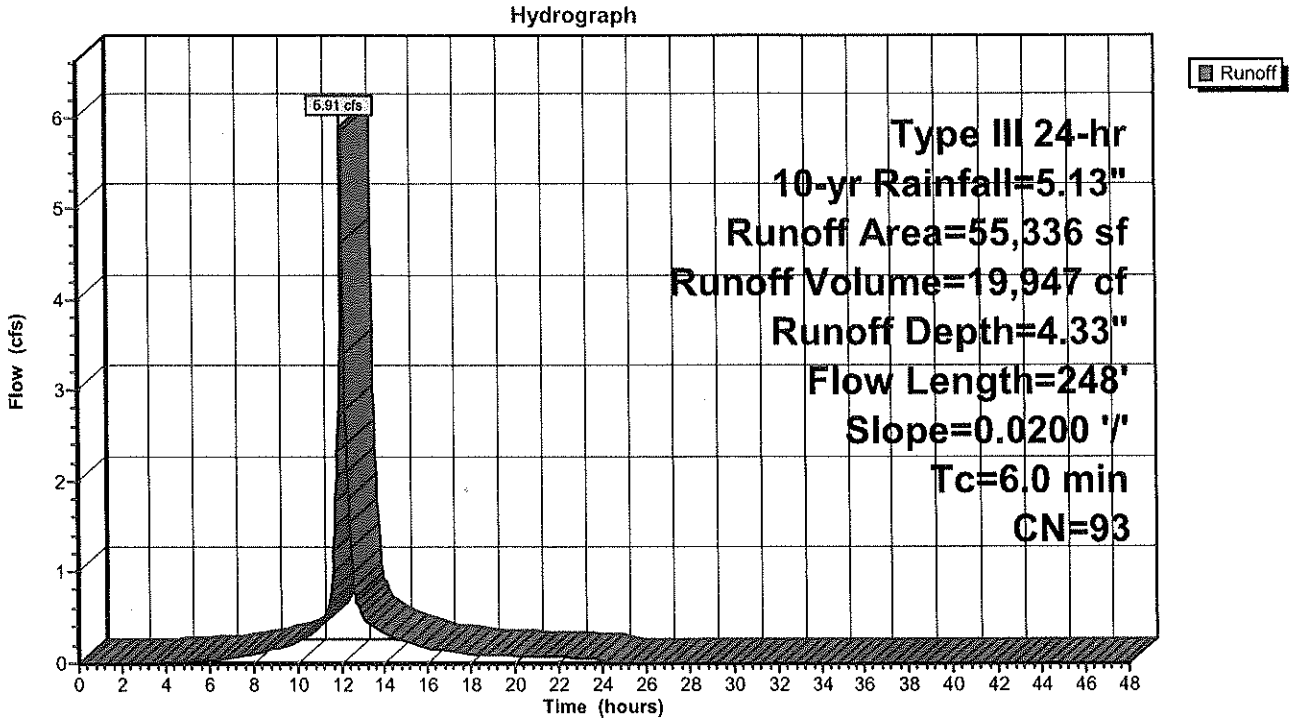
Runoff = 5.91 cfs @ 12.09 hrs, Volume= 19,947 cf, Depth= 4.33"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.13"

Area (sf)	CN	Description
4,754	49	50-75% Grass cover, Fair, HSG A
3,923	84	50-75% Grass cover, Fair, HSG D
662	77	Brush, Fair, HSG D
45,997	98	Paved parking, HSG A
55,336	93	Weighted Average
9,339		16.88% Pervious Area
45,997		83.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	150	0.0200	1.54		**Sheet Flow, Segtment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.5	86	0.0200	2.87		**Shallow Concentrated Flow, Segment 2** Paved Kv= 20.3 fps
0.1	12	0.0200	2.12		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
2.2	248	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: EXWS-C

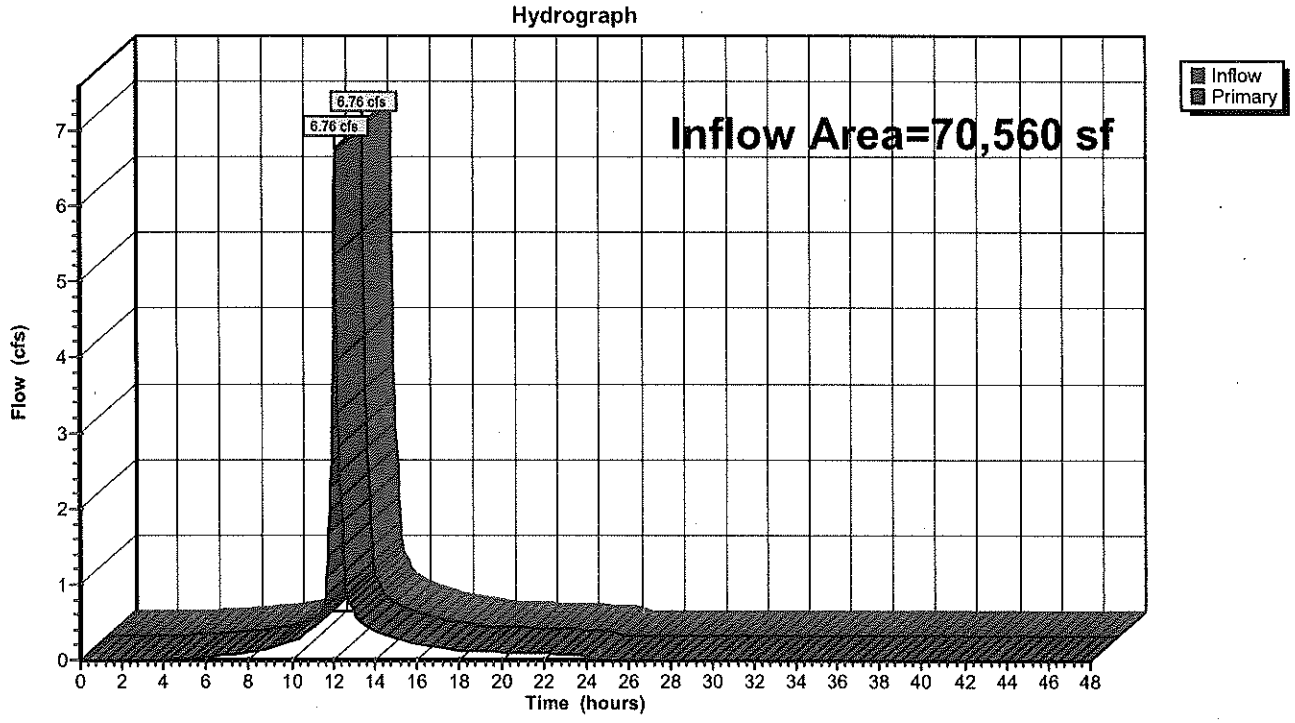


Summary for Link SITE: Total Site

Inflow Area = 70,560 sf, 73.82% Impervious, Inflow Depth = 3.87" for 10-yr event
Inflow = 6.76 cfs @ 12.09 hrs, Volume= 22,737 cf
Primary = 6.76 cfs @ 12.09 hrs, Volume= 22,737 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link SITE: Total Site



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXWS-A Runoff Area=11,475 sf 52.74% Impervious Runoff Depth=3.43"
Flow Length=137' Tc=6.0 min CN=75 Runoff=1.04 cfs 3,277 cf

Subcatchment 2S: EXWS-B Runoff Area=3,749 sf 0.96% Impervious Runoff Depth=1.70"
Flow Length=68' Slope=0.0250 '/' Tc=6.4 min CN=56 Runoff=0.15 cfs 530 cf

Subcatchment 3S: EXWS-C Runoff Area=55,336 sf 83.12% Impervious Runoff Depth=5.35"
Flow Length=248' Slope=0.0200 '/' Tc=6.0 min CN=93 Runoff=7.22 cfs 24,673 cf

Link SITE: Total Site Inflow=8.40 cfs 28,480 cf
Primary=8.40 cfs 28,480 cf

Total Runoff Area = 70,560 sf Runoff Volume = 28,480 cf Average Runoff Depth = 4.84"
26.18% Pervious = 18,475 sf 73.82% Impervious = 52,085 sf

Summary for Subcatchment 1S: EXWS-A

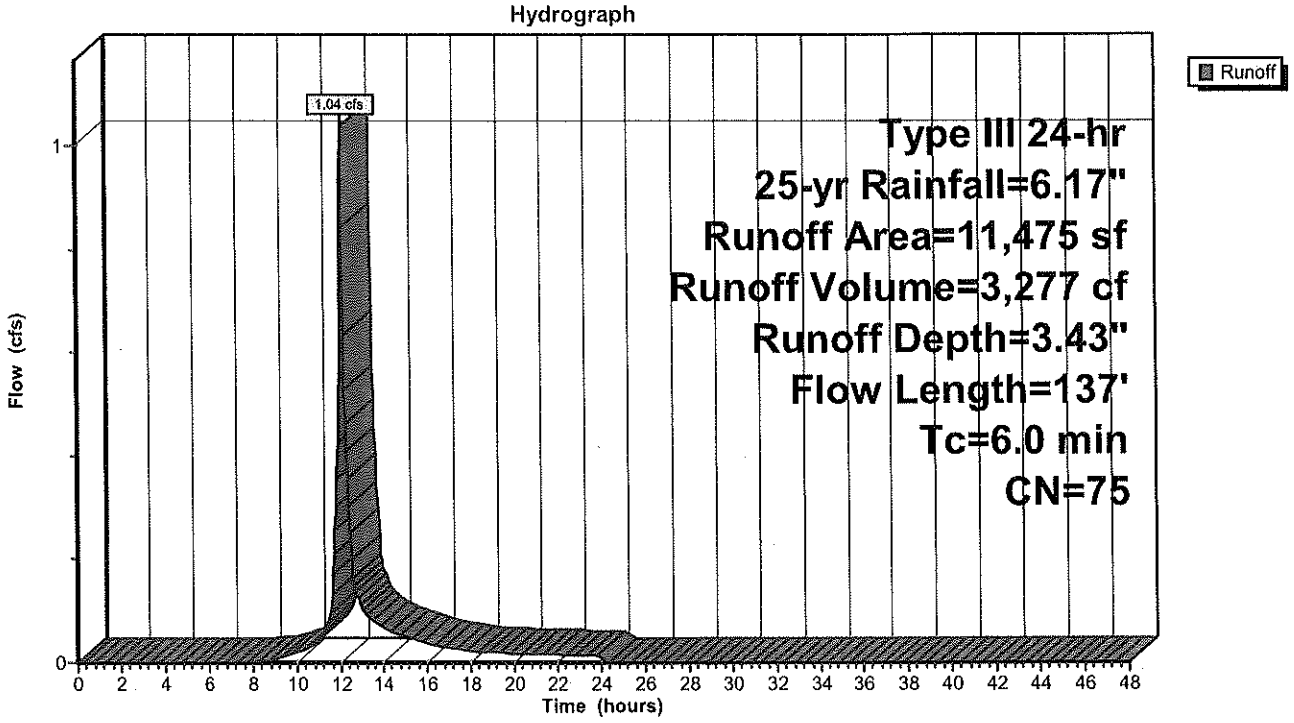
Runoff = 1.04 cfs @ 12.09 hrs, Volume= 3,277 cf, Depth= 3.43"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.17"

Area (sf)	CN	Description
5,423	49	50-75% Grass cover, Fair, HSG A
6,052	98	Paved parking, HSG A
11,475	75	Weighted Average
5,423		47.26% Pervious Area
6,052		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	54	0.0075	0.85		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.3	83	0.0100	4.50	1.57	**Pipe Channel, Segment 2** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.010
1.4	137	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: EXWS-A



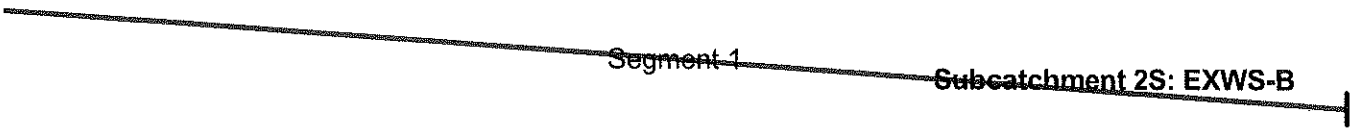
Summary for Subcatchment 2S: EXWS-B

Runoff = 0.15 cfs @ 12.11 hrs, Volume= 530 cf, Depth= 1.70"
Routed to Link SITE : Total Site

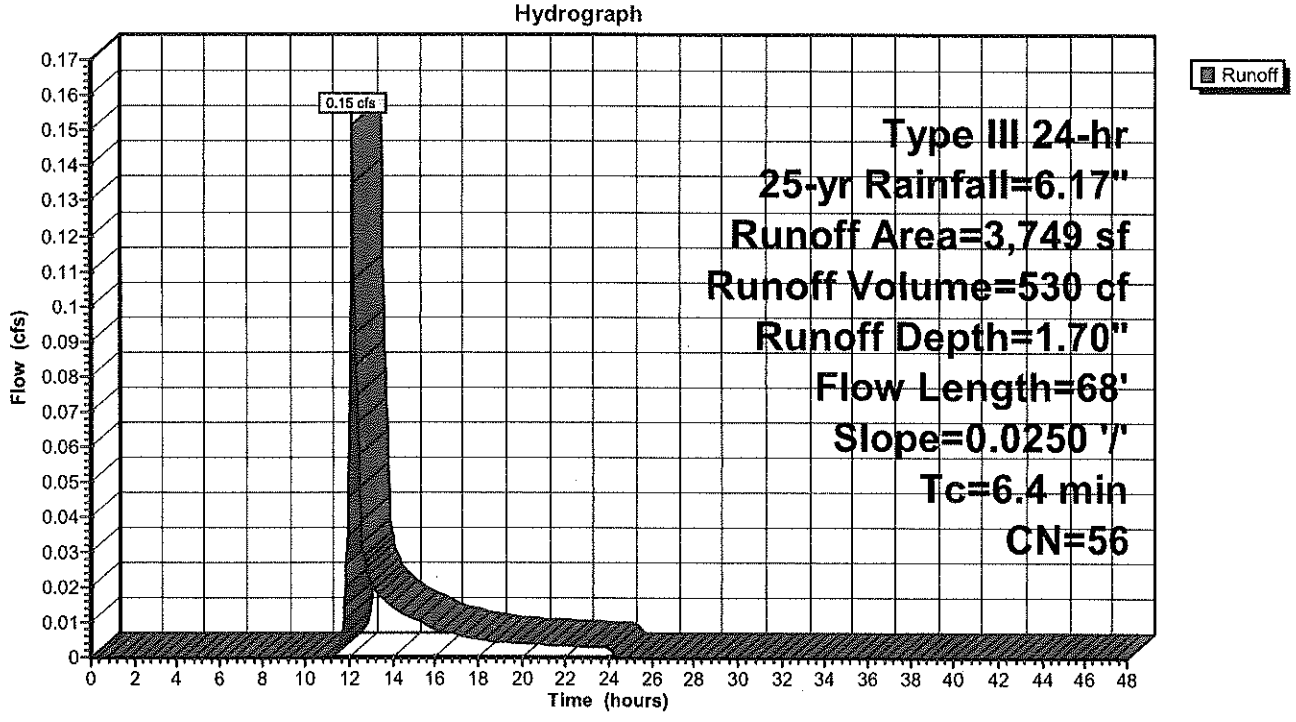
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.17"

Area (sf)	CN	Description
2,844	49	50-75% Grass cover, Fair, HSG A
770	77	Brush, Fair, HSG D
99	84	50-75% Grass cover, Fair, HSG D
36	98	Paved parking, HSG D
3,749	56	Weighted Average
3,713		99.04% Pervious Area
36		0.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	68	0.0250	0.18		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"



Subcatchment 2S: EXWS-B



Summary for Subcatchment 3S: EXWS-C

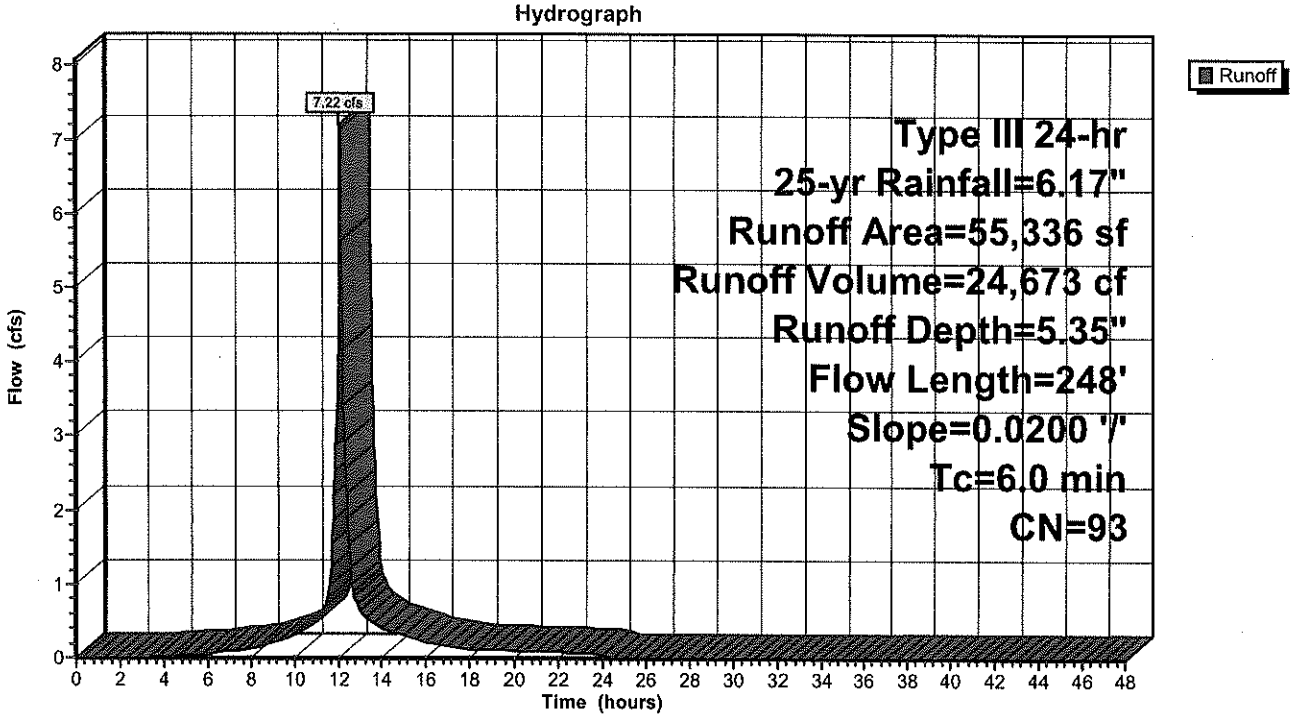
Runoff = 7.22 cfs @ 12.09 hrs, Volume= 24,673 cf, Depth= 5.35"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.17"

Area (sf)	CN	Description
4,754	49	50-75% Grass cover, Fair, HSG A
3,923	84	50-75% Grass cover, Fair, HSG D
662	77	Brush, Fair, HSG D
45,997	98	Paved parking, HSG A
55,336	93	Weighted Average
9,339		16.88% Pervious Area
45,997		83.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	150	0.0200	1.54		**Sheet Flow, Segtment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.5	86	0.0200	2.87		**Shallow Concentrated Flow, Segment 2** Paved Kv= 20.3 fps
0.1	12	0.0200	2.12		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
2.2	248	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: EXWS-C

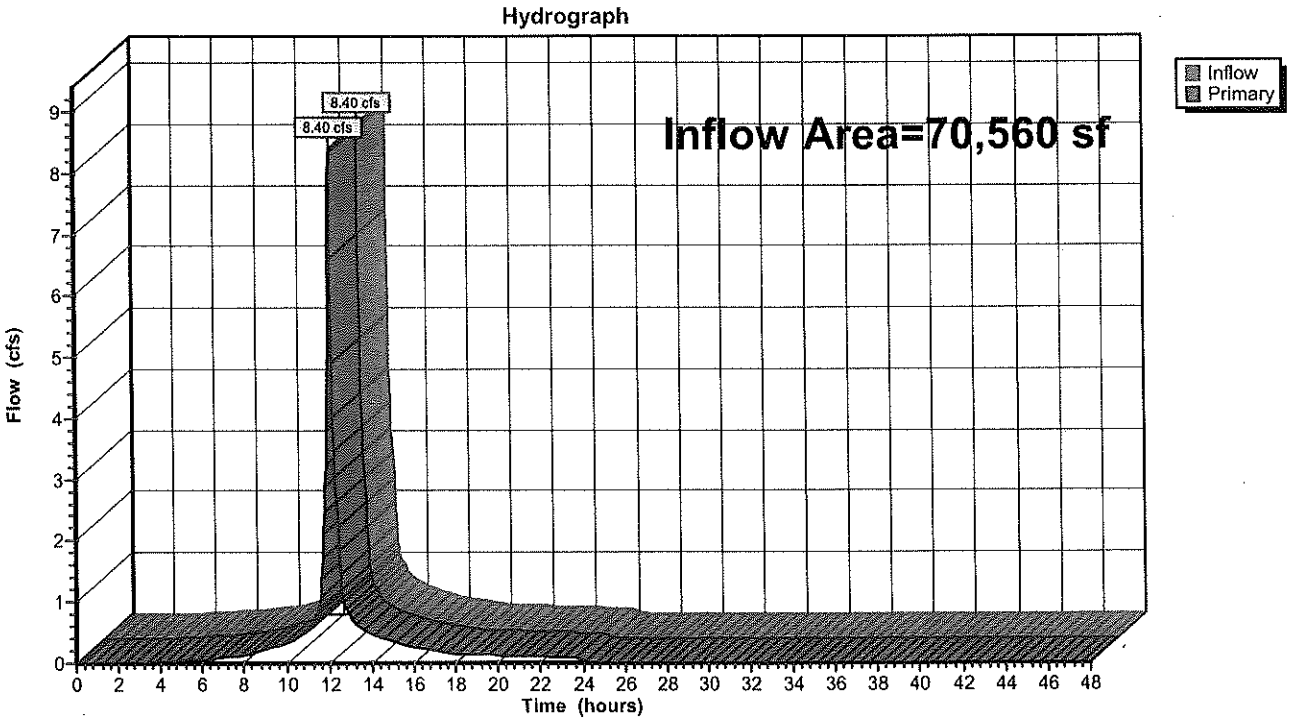


Summary for Link SITE: Total Site

Inflow Area = 70,560 sf, 73.82% Impervious, Inflow Depth = 4.84" for 25-yr event
Inflow = 8.40 cfs @ 12.09 hrs, Volume= 28,480 cf
Primary = 8.40 cfs @ 12.09 hrs, Volume= 28,480 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link SITE: Total Site



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXWS-A Runoff Area=11,475 sf 52.74% Impervious Runoff Depth=4.85"
Flow Length=137' Tc=6.0 min CN=75 Runoff=1.46 cfs 4,640 cf

Subcatchment 2S: EXWS-B Runoff Area=3,749 sf 0.96% Impervious Runoff Depth=2.75"
Flow Length=68' Slope=0.0250 '/' Tc=6.4 min CN=56 Runoff=0.26 cfs 858 cf

Subcatchment 3S: EXWS-C Runoff Area=55,336 sf 83.12% Impervious Runoff Depth=6.95"
Flow Length=248' Slope=0.0200 '/' Tc=6.0 min CN=93 Runoff=9.24 cfs 32,069 cf

Link SITE: Total Site Inflow=10.96 cfs 37,567 cf
Primary=10.96 cfs 37,567 cf

Total Runoff Area = 70,560 sf Runoff Volume = 37,567 cf Average Runoff Depth = 6.39"
26.18% Pervious = 18,475 sf 73.82% Impervious = 52,085 sf

Summary for Subcatchment 1S: EXWS-A

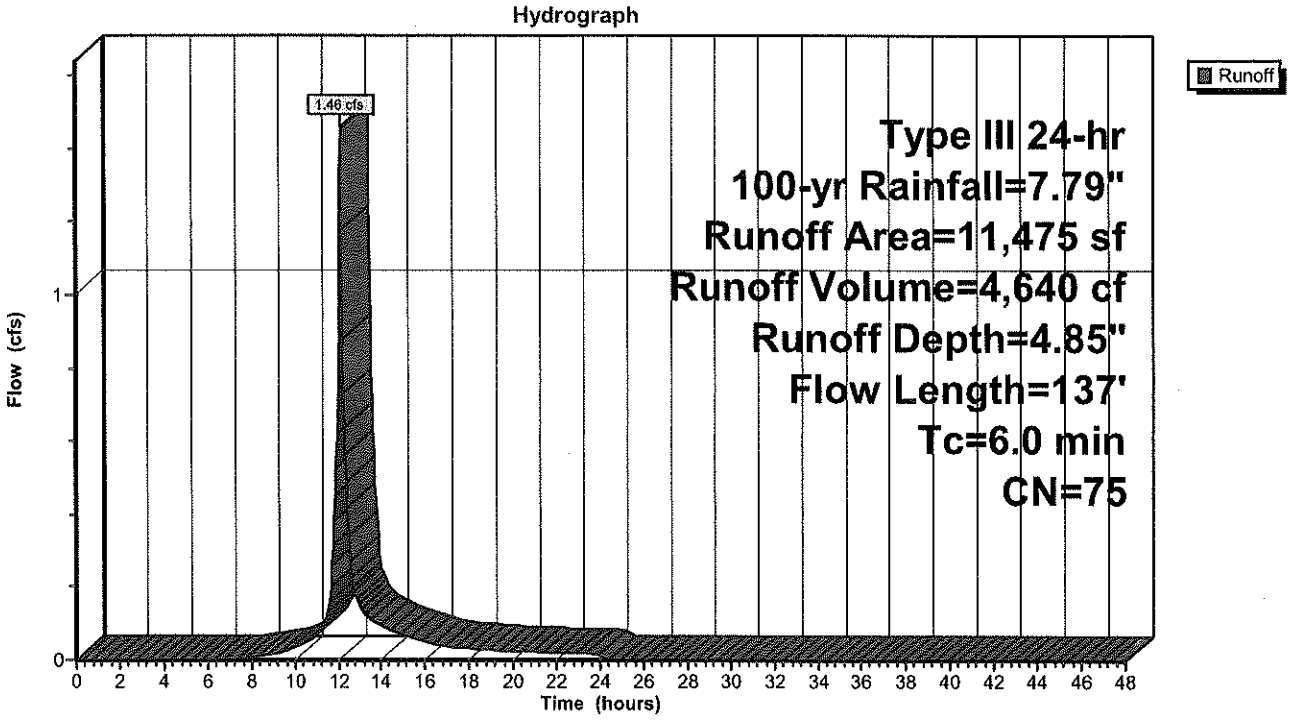
Runoff = 1.46 cfs @ 12.09 hrs, Volume= 4,640 cf, Depth= 4.85"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.79"

Area (sf)	CN	Description
5,423	49	50-75% Grass cover, Fair, HSG A
6,052	98	Paved parking, HSG A
11,475	75	Weighted Average
5,423		47.26% Pervious Area
6,052		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	54	0.0075	0.85		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.3	83	0.0100	4.50	1.57	**Pipe Channel, Segment 2** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.010
1.4	137	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: EXWS-A



Summary for Subcatchment 2S: EXWS-B

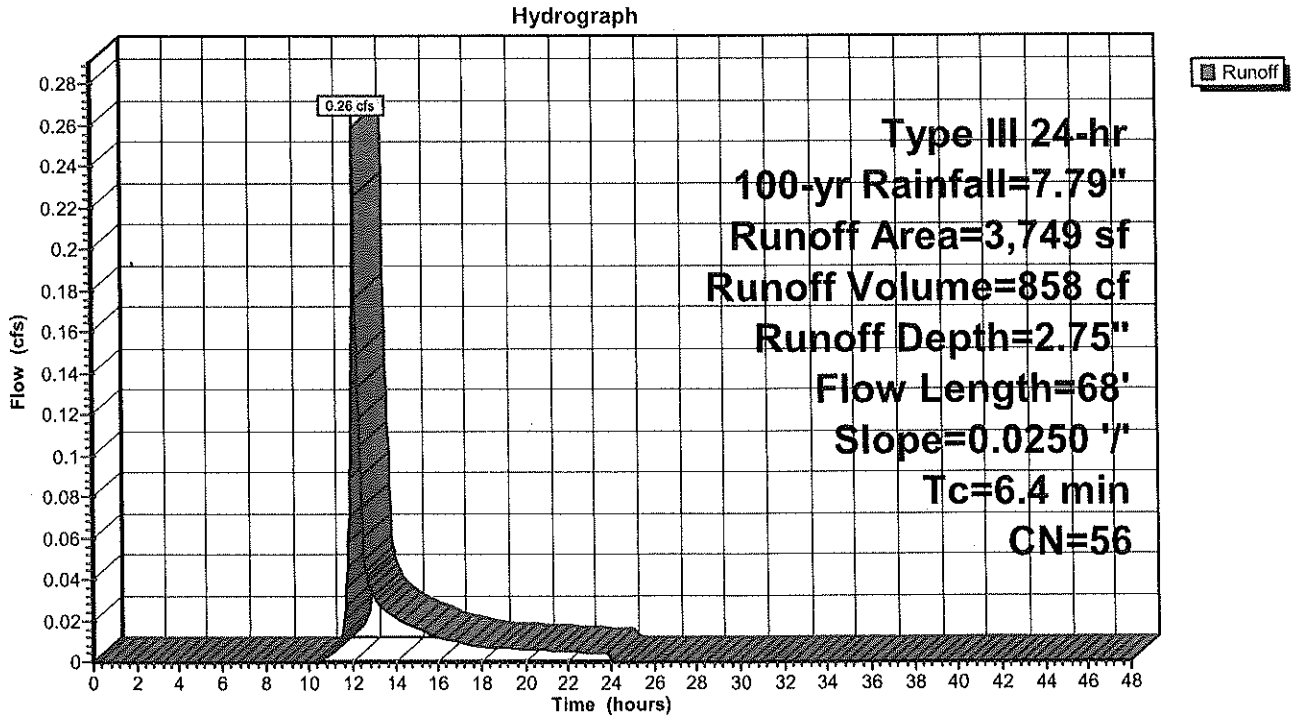
Runoff = 0.26 cfs @ 12.10 hrs, Volume= 858 cf, Depth= 2.75"
Routed to Link SITE : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.79"

Area (sf)	CN	Description
2,844	49	50-75% Grass cover, Fair, HSG A
770	77	Brush, Fair, HSG D
99	84	50-75% Grass cover, Fair, HSG D
36	98	Paved parking, HSG D
3,749	56	Weighted Average
3,713		99.04% Pervious Area
36		0.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	68	0.0250	0.18		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"

Subcatchment 2S: EXWS-B



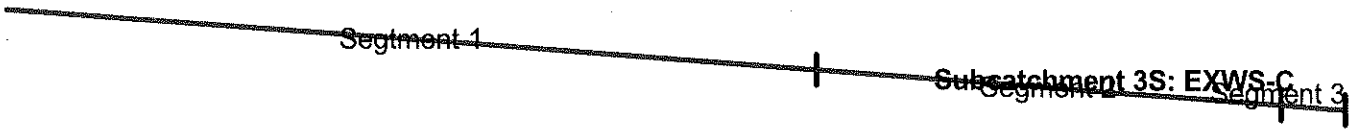
Summary for Subcatchment 3S: EXWS-C

Runoff = 9.24 cfs @ 12.09 hrs, Volume= 32,069 cf, Depth= 6.95"
Routed to Link SITE : Total Site

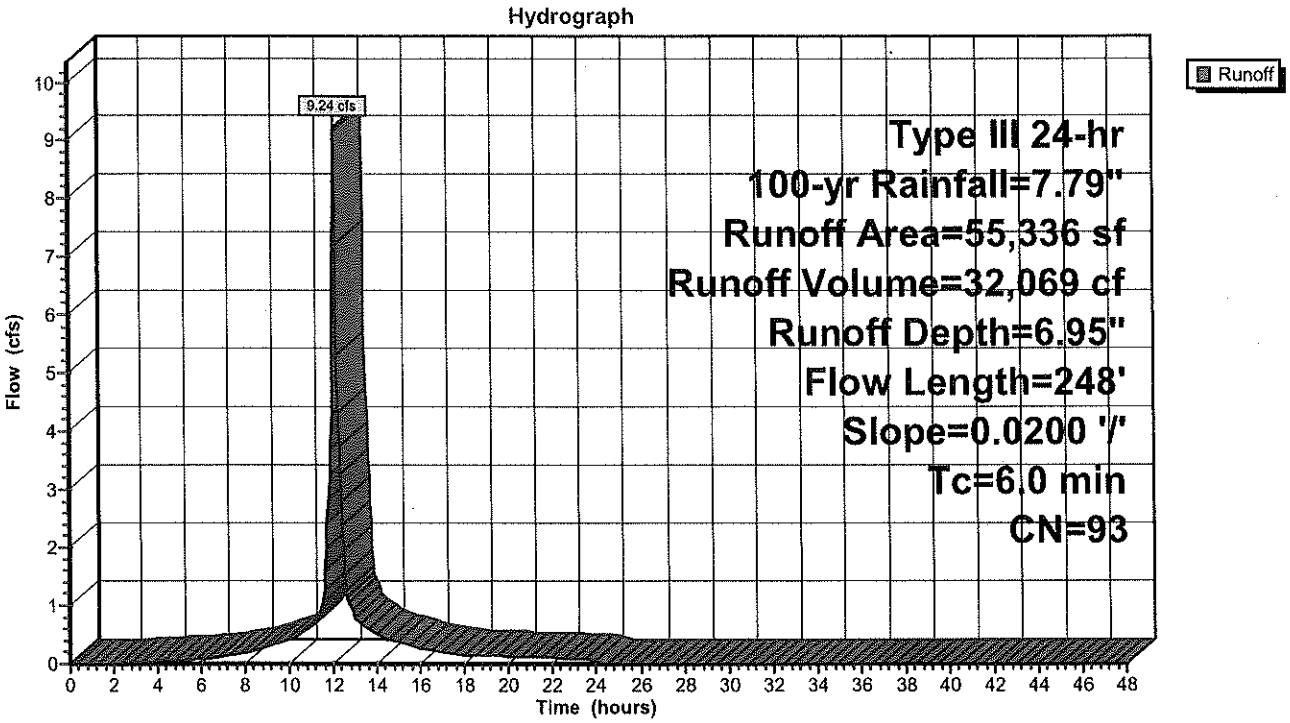
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.79"

Area (sf)	CN	Description
4,754	49	50-75% Grass cover, Fair, HSG A
3,923	84	50-75% Grass cover, Fair, HSG D
662	77	Brush, Fair, HSG D
45,997	98	Paved parking, HSG A
55,336	93	Weighted Average
9,339		16.88% Pervious Area
45,997		83.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	150	0.0200	1.54		**Sheet Flow, Segtment 1** Smooth surfaces n= 0.011 P2= 3.43"
0.5	86	0.0200	2.87		**Shallow Concentrated Flow, Segment 2** Paved Kv= 20.3 fps
0.1	12	0.0200	2.12		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
2.2	248	Total, Increased to minimum Tc = 6.0 min			



Subcatchment 3S: EXWS-C

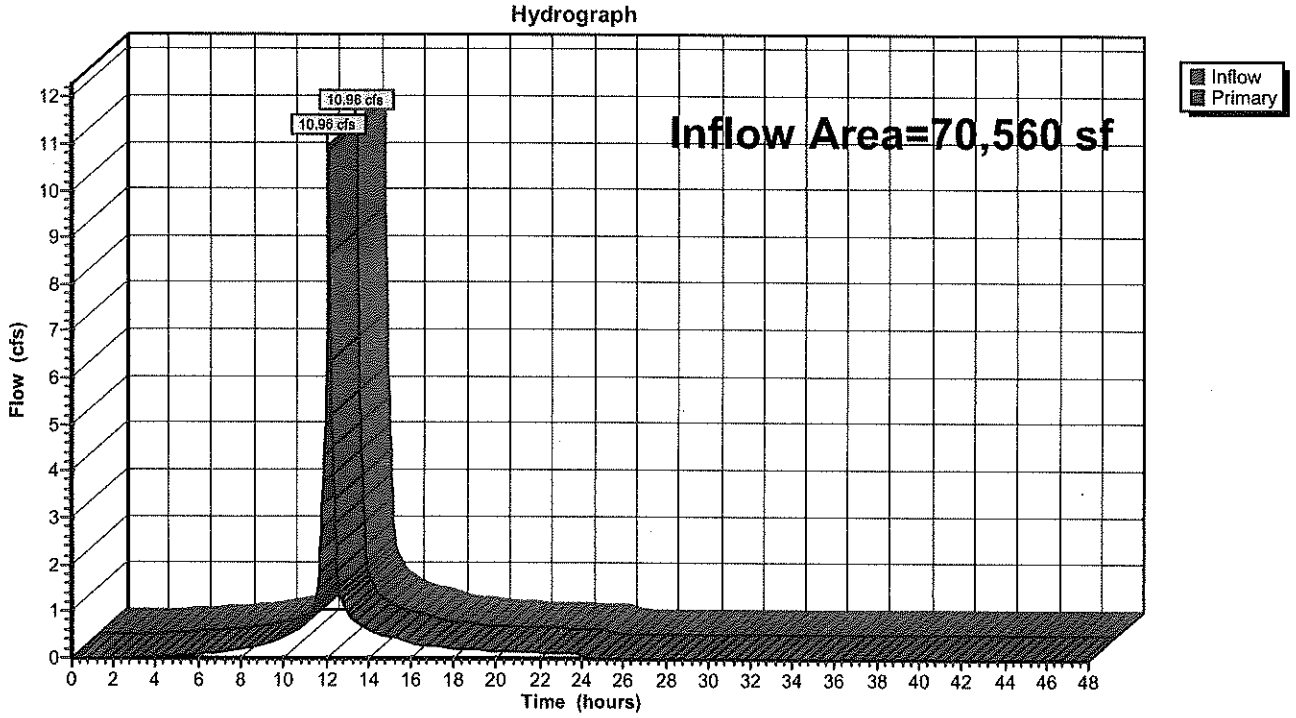


Summary for Link SITE: Total Site

Inflow Area = 70,560 sf, 73.82% Impervious, Inflow Depth = 6.39" for 100-yr event
Inflow = 10.96 cfs @ 12.09 hrs, Volume= 37,567 cf
Primary = 10.96 cfs @ 12.09 hrs, Volume= 37,567 cf, Atten= 0%, Lag= 0.0 min

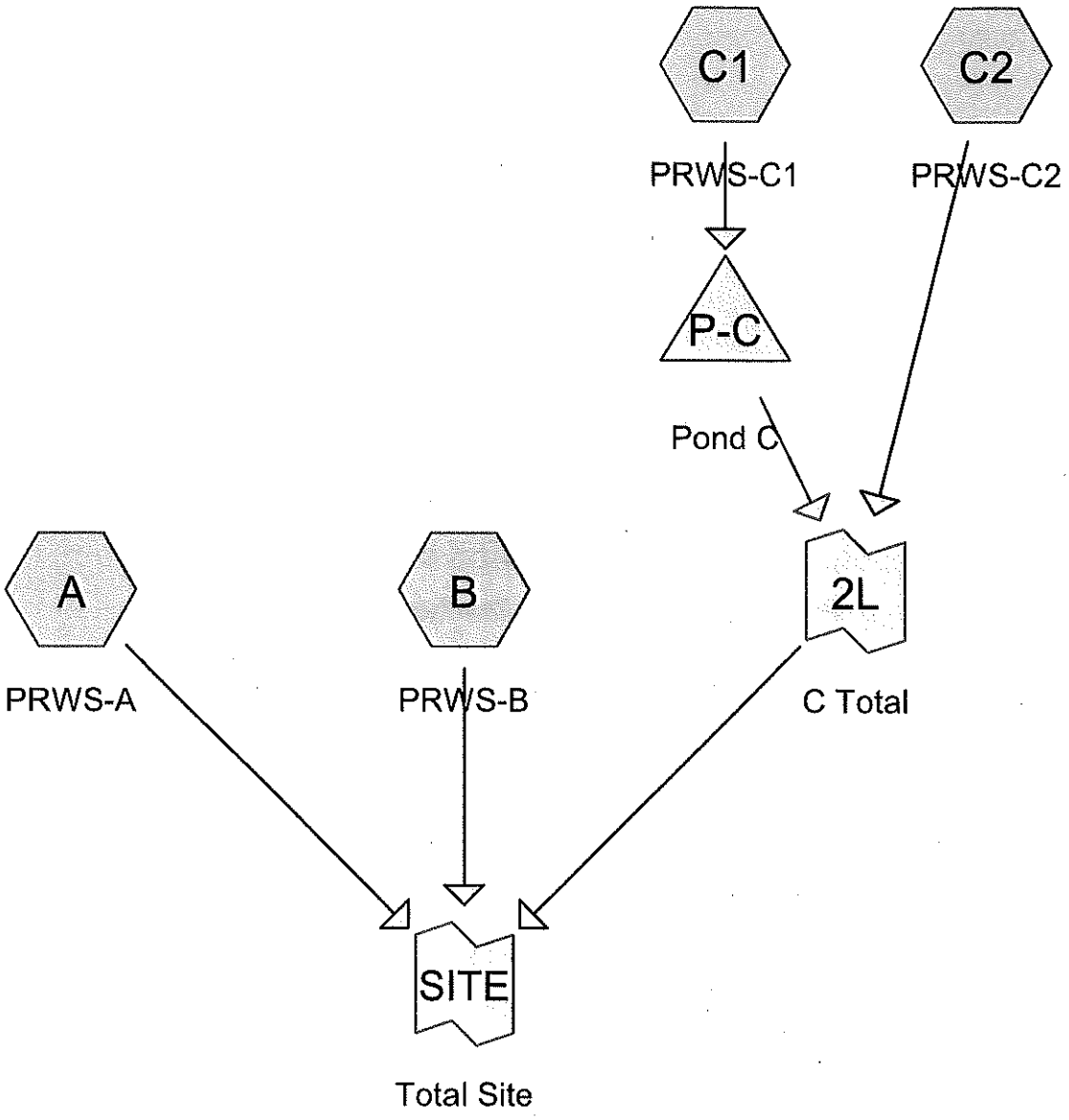
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link SITE: Total Site



APPENDIX B

Proposed Stormwater Discharge Calculations



Subcat Reach Pond Link

Routing Diagram for PR Hydro
Prepared by Langan Engineering, Printed 1/3/2025

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.652	39	>75% Grass cover, Good, HSG A (A, B, C1, C2)
0.206	80	>75% Grass cover, Good, HSG D (B, C1, C2)
0.018	77	Brush, Fair, HSG D (B)
0.013	73	Brush, Good, HSG D (C2)
0.114	98	Paved parking, HSG A (A, B)
0.617	98	Paved parking, HSG D (C1)
1.620	**72**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.03 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: PRWS-A Runoff Area=16,220 sf 29.90% Impervious Runoff Depth=0.40"
Flow Length=68' Slope=0.0440 '/' Tc=6.0 min CN=57 Runoff=0.09 cfs 0.012 af

Subcatchment B: PRWS-B Runoff Area=3,874 sf 3.02% Impervious Runoff Depth=0.33"
Flow Length=45' Slope=0.0389 '/' Tc=6.0 min CN=55 Runoff=0.01 cfs 0.002 af

Subcatchment C1: PRWS-C1 Runoff Area=45,321 sf 59.33% Impervious Runoff Depth=1.46"
Flow Length=205' Tc=6.8 min CN=78 Runoff=1.70 cfs 0.127 af

Subcatchment C2: PRWS-C2 Runoff Area=5,156 sf 0.00% Impervious Runoff Depth=1.21"
Flow Length=74' Slope=0.0610 '/' Tc=6.0 min CN=74 Runoff=0.16 cfs 0.012 af

Pond P-C: Pond C Peak Elev=32.09' Storage=2,079 cf Inflow=1.70 cfs 0.127 af
Discarded=0.09 cfs 0.102 af Primary=0.29 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=0.38 cfs 0.127 af

Link 2L: C Total Inflow=0.32 cfs 0.037 af
Primary=0.32 cfs 0.037 af

Link SITE: Total Site Inflow=0.38 cfs 0.052 af
Primary=0.38 cfs 0.052 af

Total Runoff Area = 1.620 ac Runoff Volume = 0.153 af Average Runoff Depth = 1.13"
54.86% Pervious = 0.889 ac 45.14% Impervious = 0.731 ac

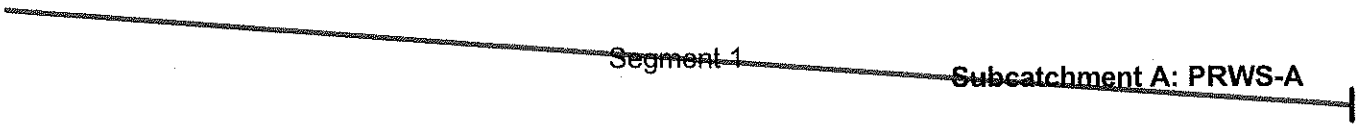
Summary for Subcatchment A: PRWS-A

Runoff = 0.09 cfs @ 12.14 hrs, Volume= 0.012 af, Depth= 0.40"
Routed to Link SITE : Total Site

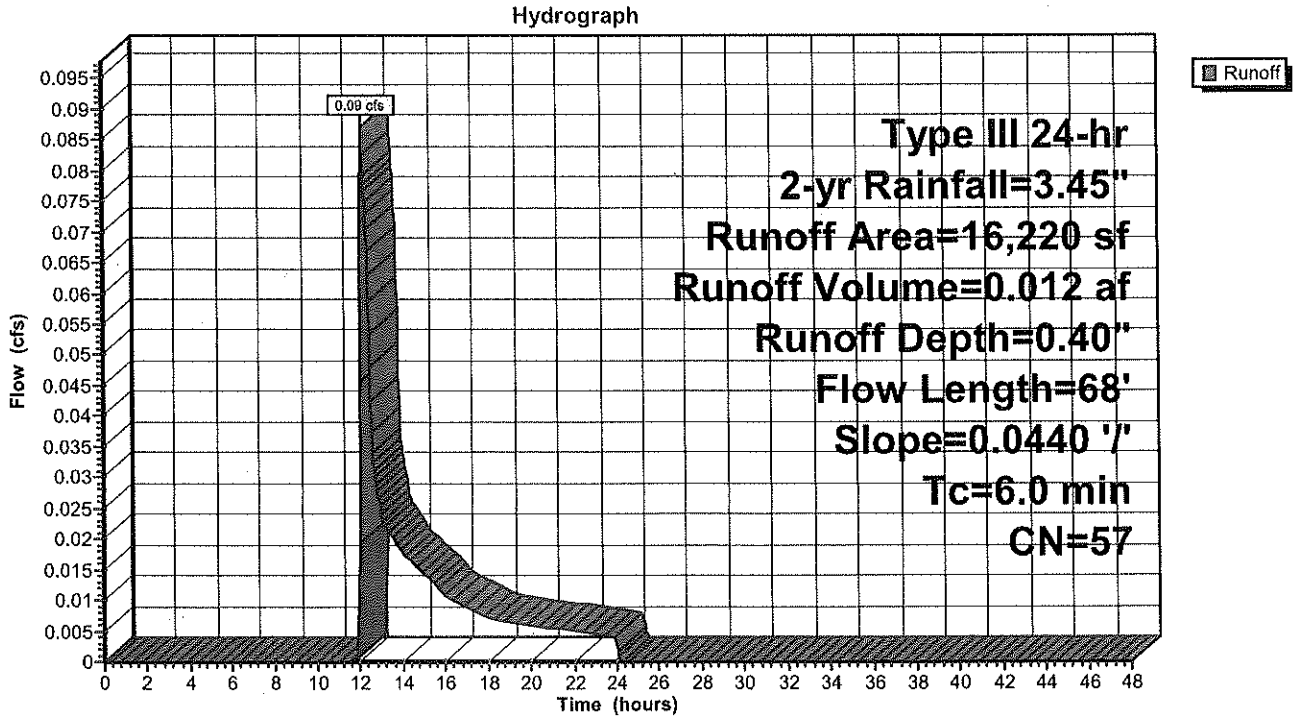
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-yr Rainfall=3.45"

Area (sf)	CN	Description
11,370	39	>75% Grass cover, Good, HSG A
4,850	98	Paved parking, HSG A
16,220	57	Weighted Average
11,370		70.10% Pervious Area
4,850		29.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	68	0.0440	0.22		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
5.1	68	Total, Increased to minimum Tc = 6.0 min			



Subcatchment A: PRWS-A



Summary for Subcatchment B: PRWS-B

Runoff = 0.01 cfs @ 12.28 hrs, Volume= 0.002 af, Depth= 0.33"
Routed to Link SITE : Total Site

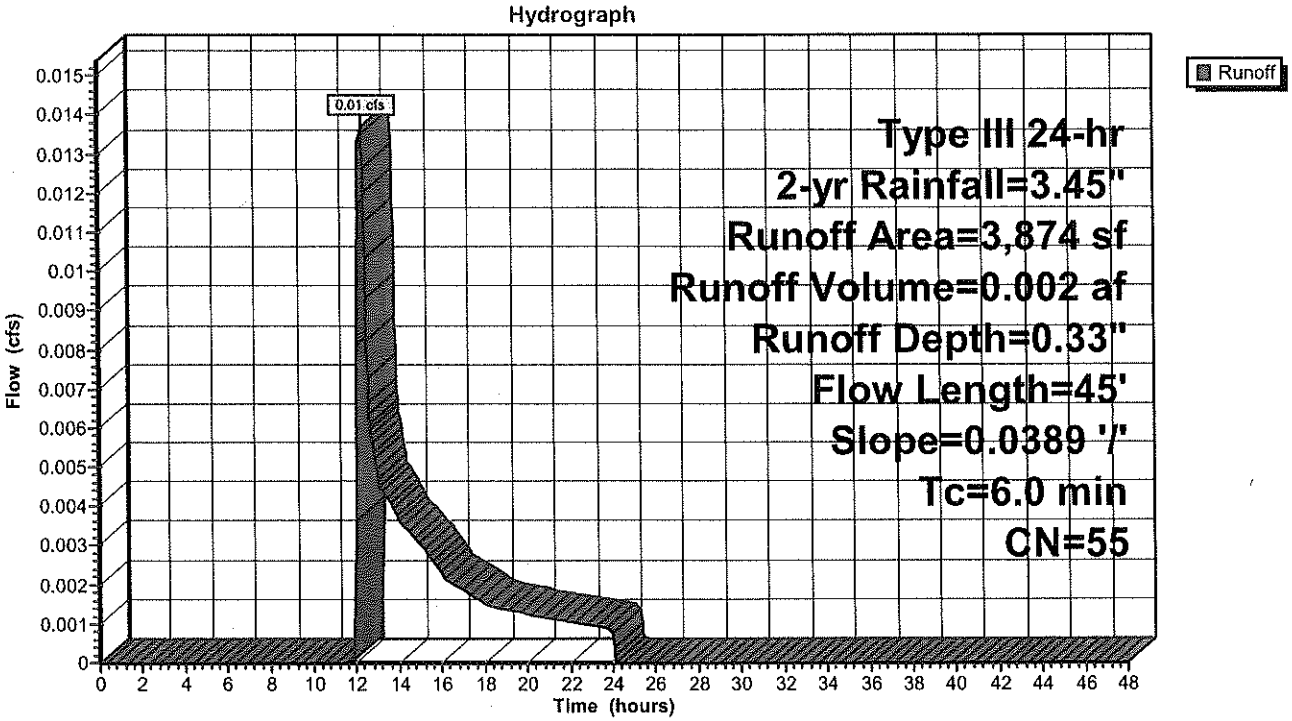
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-yr Rainfall=3.45"

Area (sf)	CN	Description
2,337	39	>75% Grass cover, Good, HSG A
648	80	>75% Grass cover, Good, HSG D
772	77	Brush, Fair, HSG D
117	98	Paved parking, HSG A
3,874	55	Weighted Average
3,757		96.98% Pervious Area
117		3.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	45	0.0389	0.20		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
3.8	45	Total, Increased to minimum Tc = 6.0 min			

Segment 1 **Subcatchment B: PRWS-B**

Subcatchment B: PRWS-B



Summary for Subcatchment C1: PRWS-C1

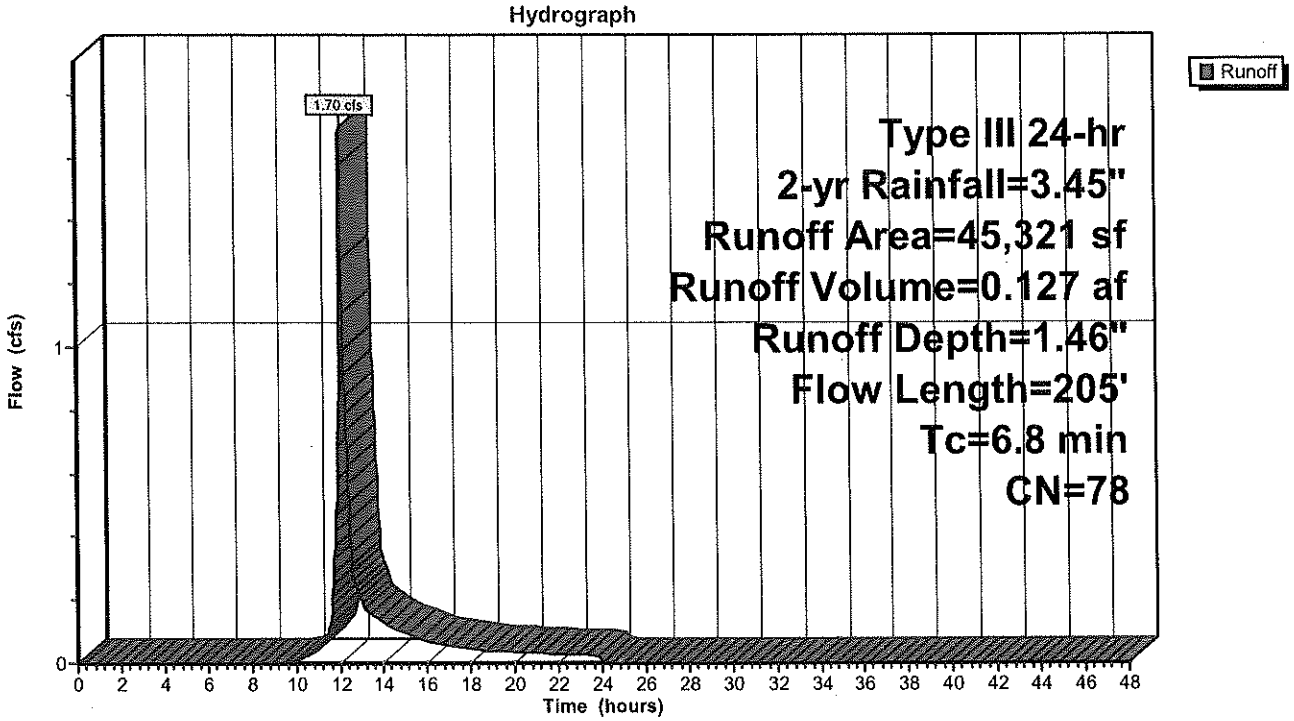
Runoff = 1.70 cfs @ 12.10 hrs, Volume= 0.127 af, Depth= 1.46"
Routed to Pond P-C : Pond C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-yr Rainfall=3.45"

Area (sf)	CN	Description
4,355	80	>75% Grass cover, Good, HSG D
14,079	39	>75% Grass cover, Good, HSG A
26,887	98	Paved parking, HSG D
45,321	78	Weighted Average
18,434		40.67% Pervious Area
26,887		59.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	109	0.0250	1.58		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
5.2	41	0.0150	0.13		**Sheet Flow, Seegment 2** Grass: Short n= 0.150 P2= 3.43"
0.5	55	0.0150	1.84		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
6.8	205	Total			

Subcatchment C1: PRWS-C1



Summary for Subcatchment C2: PRWS-C2

Runoff = 0.16 cfs @ 12.10 hrs, Volume= 0.012 af, Depth= 1.21"
Routed to Link 2L : C Total

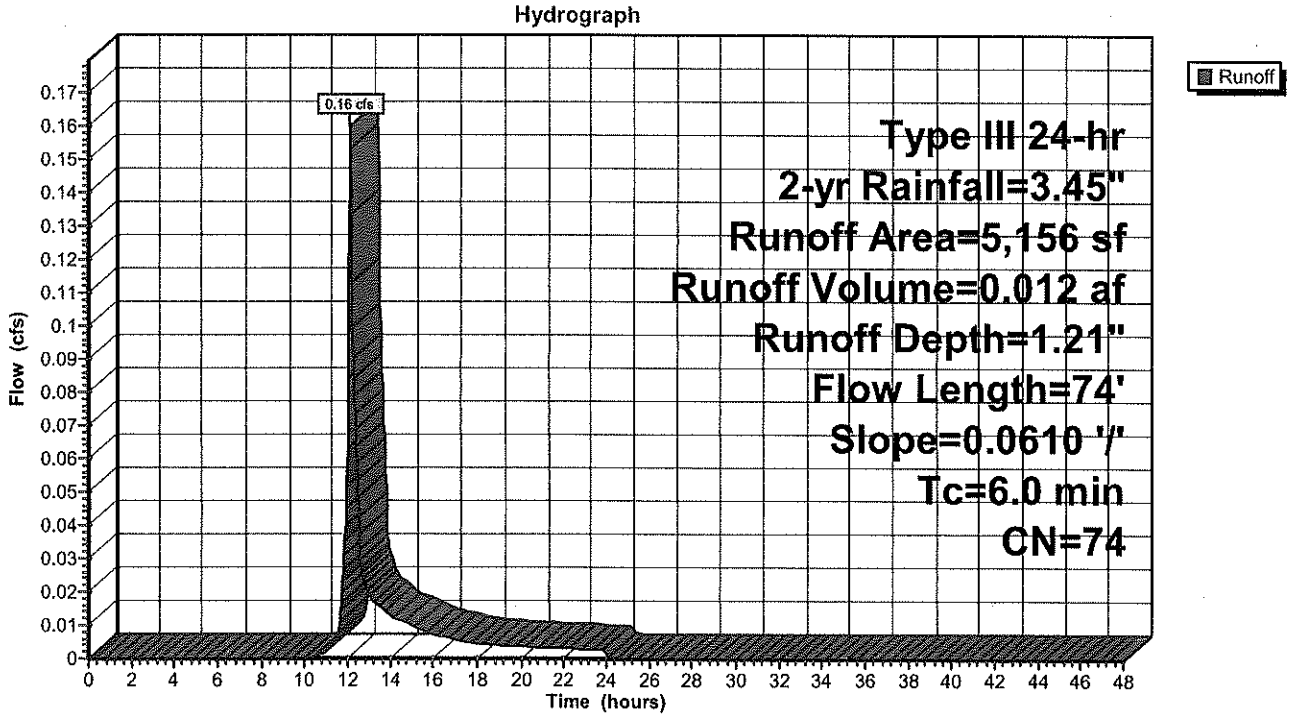
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-yr Rainfall=3.45"

Area (sf)	CN	Description
557	73	Brush, Good, HSG D
3,991	80	>75% Grass cover, Good, HSG D
608	39	>75% Grass cover, Good, HSG A
5,156	74	Weighted Average
5,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	74	0.0610	0.26		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
4.8	74	Total, Increased to minimum Tc = 6.0 min			

Segment 1 Subcatchment C2: PRWS-C2

Subcatchment C2: PRWS-C2



Summary for Pond P-C: Pond C

Inflow Area = 1.040 ac, 59.33% Impervious, Inflow Depth = 1.46" for 2-yr event
Inflow = 1.70 cfs @ 12.10 hrs, Volume= 0.127 af
Outflow = 0.38 cfs @ 12.56 hrs, Volume= 0.127 af, Atten= 78%, Lag= 27.2 min
Discarded = 0.09 cfs @ 12.56 hrs, Volume= 0.102 af
Primary = 0.29 cfs @ 12.56 hrs, Volume= 0.025 af
Routed to Link 2L : C Total
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 2L : C Total

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Peak Elev= 32.09' @ 12.56 hrs Surf.Area= 3,914 sf Storage= 2,079 cf

Plug-Flow detention time= 185.8 min calculated for 0.126 af (100% of inflow)
Center-of-Mass det. time= 185.7 min (1,031.6 - 845.9)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	6,050 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

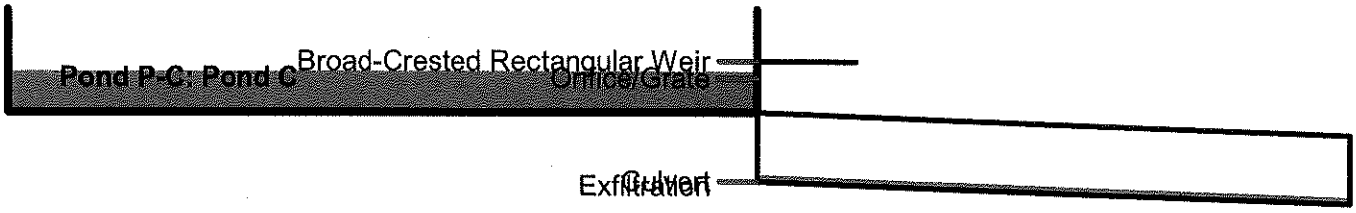
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
31.50	3,128	0	0	3,128
32.50	4,507	3,797	3,797	4,524
33.00	4,507	2,254	6,050	4,643

Device	Routing	Invert	Outlet Devices
#1	Discarded	31.50'	**1.000 in/hr Exfiltration over Wetted area**
#2	Primary	30.50'	**12.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 30.50' / 30.20' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#3	Device 2	32.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	32.25'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

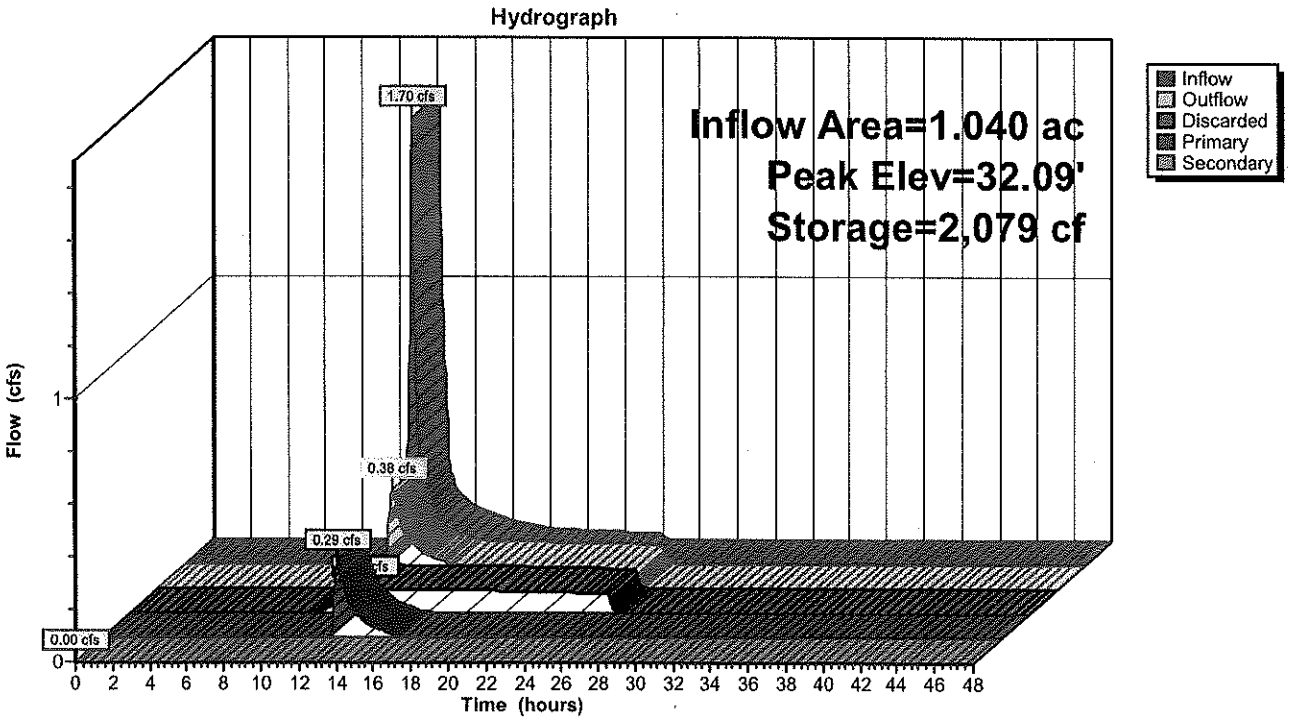
Discarded OutFlow Max=0.09 cfs @ 12.56 hrs HW=32.09' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.28 cfs @ 12.56 hrs HW=32.09' (Free Discharge)
└**2=Culvert** (Passes 0.28 cfs of 3.12 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.28 cfs @ 0.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.50' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Pond P-C: Pond C



Stage-Discharge for Pond P-C: Pond C

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
31.50	0.00	0.00	0.00	0.00
31.55	0.07	0.07	0.00	0.00
31.60	0.08	0.08	0.00	0.00
31.65	0.08	0.08	0.00	0.00
31.70	0.08	0.08	0.00	0.00
31.75	0.08	0.08	0.00	0.00
31.80	0.08	0.08	0.00	0.00
31.85	0.08	0.08	0.00	0.00
31.90	0.08	0.08	0.00	0.00
31.95	0.09	0.09	0.00	0.00
32.00	0.09	0.09	0.00	0.00
32.05	0.20	0.09	0.11	0.00
32.10	0.42	0.09	0.32	0.00
32.15	0.69	0.09	0.60	0.00
32.20	1.01	0.09	0.92	0.00
32.25	1.38	0.10	1.28	0.00
32.30	2.05	0.10	1.69	0.26
32.35	2.97	0.10	2.13	0.74
32.40	3.85	0.10	2.39	1.36
32.45	4.73	0.10	2.54	2.09
32.50	5.75	0.10	2.67	2.97
32.55	6.89	0.11	2.80	3.98
32.60	8.13	0.11	2.93	5.09
32.65	9.48	0.11	3.05	6.32
32.70	10.97	0.11	3.16	7.70
32.75	12.57	0.11	3.28	9.19
32.80	14.30	0.11	3.38	10.81
32.85	16.14	0.11	3.49	12.55
32.90	17.82	0.11	3.59	14.12
32.95	19.55	0.11	3.69	15.75
33.00	**21.33**	**0.11**	**3.78**	**17.44**

Stage-Area-Storage for Pond P-C: Pond C

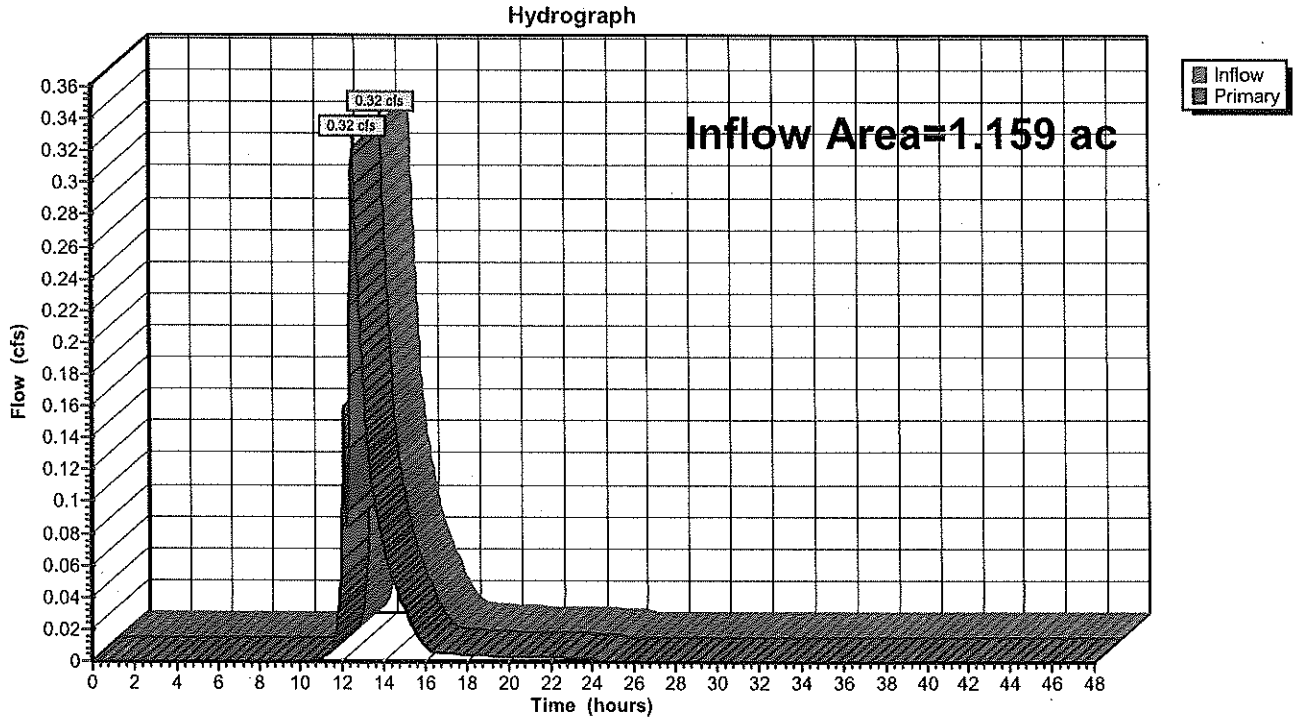
Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
31.50	3,128	3,128	0
31.55	3,191	3,192	158
31.60	3,255	3,256	319
31.65	3,319	3,321	483
31.70	3,384	3,387	651
31.75	3,449	3,453	822
31.80	3,515	3,520	996
31.85	3,582	3,588	1,173
31.90	3,649	3,656	1,354
31.95	3,717	3,725	1,538
32.00	3,786	3,794	1,726
32.05	3,855	3,864	1,917
32.10	3,925	3,935	2,111
32.15	3,996	4,007	2,309
32.20	4,067	4,079	2,511
32.25	4,139	4,151	2,716
32.30	4,211	4,225	2,925
32.35	4,284	4,299	3,137
32.40	4,358	4,373	3,353
32.45	4,432	4,448	3,573
32.50	**4,507**	4,524	3,797
32.55	4,507	4,536	4,022
32.60	4,507	4,548	4,247
32.65	4,507	4,560	4,473
32.70	4,507	4,572	4,698
32.75	4,507	4,584	4,923
32.80	4,507	4,596	5,149
32.85	4,507	4,607	5,374
32.90	4,507	4,619	5,599
32.95	4,507	4,631	5,825
33.00	4,507	**4,643**	**6,050**

Summary for Link 2L: C Total

Inflow Area = 1.159 ac, 53.27% Impervious, Inflow Depth = 0.38" for 2-yr event
Inflow = 0.32 cfs @ 12.53 hrs, Volume= 0.037 af
Primary = 0.32 cfs @ 12.53 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Link SITE : Total Site

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link 2L: C Total

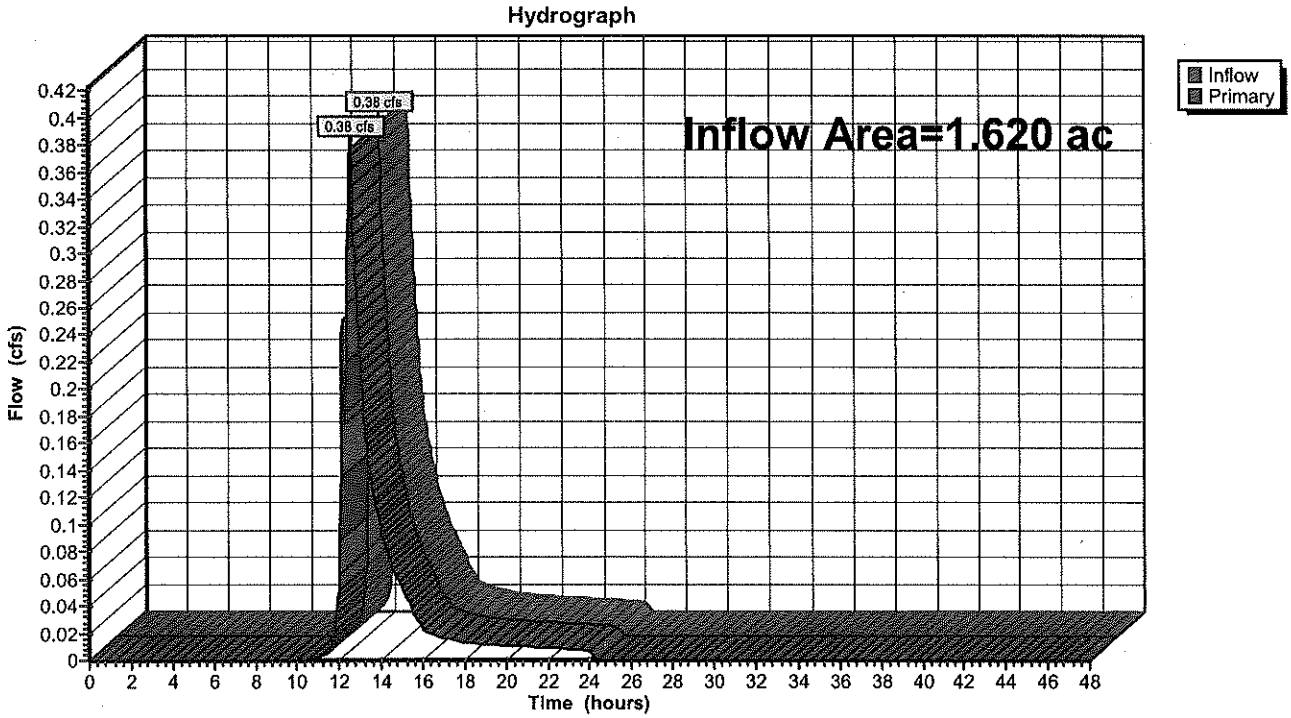


Summary for Link SITE: Total Site

Inflow Area = 1.620 ac, 45.14% Impervious, Inflow Depth = 0.38" for 2-yr event
Inflow = 0.38 cfs @ 12.51 hrs, Volume= 0.052 af
Primary = 0.38 cfs @ 12.51 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link SITE: Total Site



Time span=0.00-48.00 hrs, dt=0.03 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: PRWS-A Runoff Area=16,220 sf 29.90% Impervious Runoff Depth=1.17"
Flow Length=68' Slope=0.0440 '/' Tc=6.0 min CN=57 Runoff=0.44 cfs 0.036 af

Subcatchment B: PRWS-B Runoff Area=3,874 sf 3.02% Impervious Runoff Depth=1.05"
Flow Length=45' Slope=0.0389 '/' Tc=6.0 min CN=55 Runoff=0.09 cfs 0.008 af

Subcatchment C1: PRWS-C1 Runoff Area=45,321 sf 59.33% Impervious Runoff Depth=2.82"
Flow Length=205' Tc=6.8 min CN=78 Runoff=3.33 cfs 0.245 af

Subcatchment C2: PRWS-C2 Runoff Area=5,156 sf 0.00% Impervious Runoff Depth=2.47"
Flow Length=74' Slope=0.0610 '/' Tc=6.0 min CN=74 Runoff=0.34 cfs 0.024 af

Pond P-C: Pond C Peak Elev=32.29' Storage=2,897 cf Inflow=3.33 cfs 0.245 af
Discarded=0.10 cfs 0.127 af Primary=1.63 cfs 0.115 af Secondary=0.21 cfs 0.003 af Outflow=1.94 cfs 0.245 af

Link 2L: C Total Inflow=2.04 cfs 0.142 af
Primary=2.04 cfs 0.142 af

Link SITE: Total Site Inflow=2.39 cfs 0.186 af
Primary=2.39 cfs 0.186 af

Total Runoff Area = 1.620 ac Runoff Volume = 0.313 af Average Runoff Depth = 2.32"
54.86% Pervious = 0.889 ac 45.14% Impervious = 0.731 ac

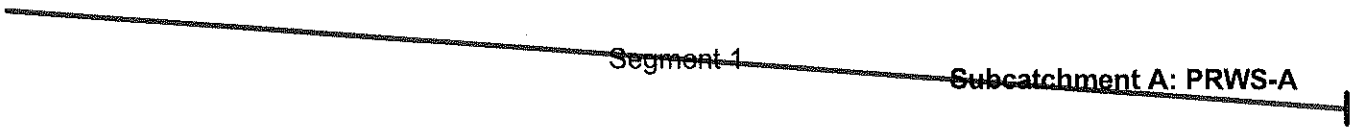
Summary for Subcatchment A: PRWS-A

Runoff = 0.44 cfs @ 12.10 hrs, Volume= 0.036 af, Depth= 1.17"
Routed to Link SITE : Total Site

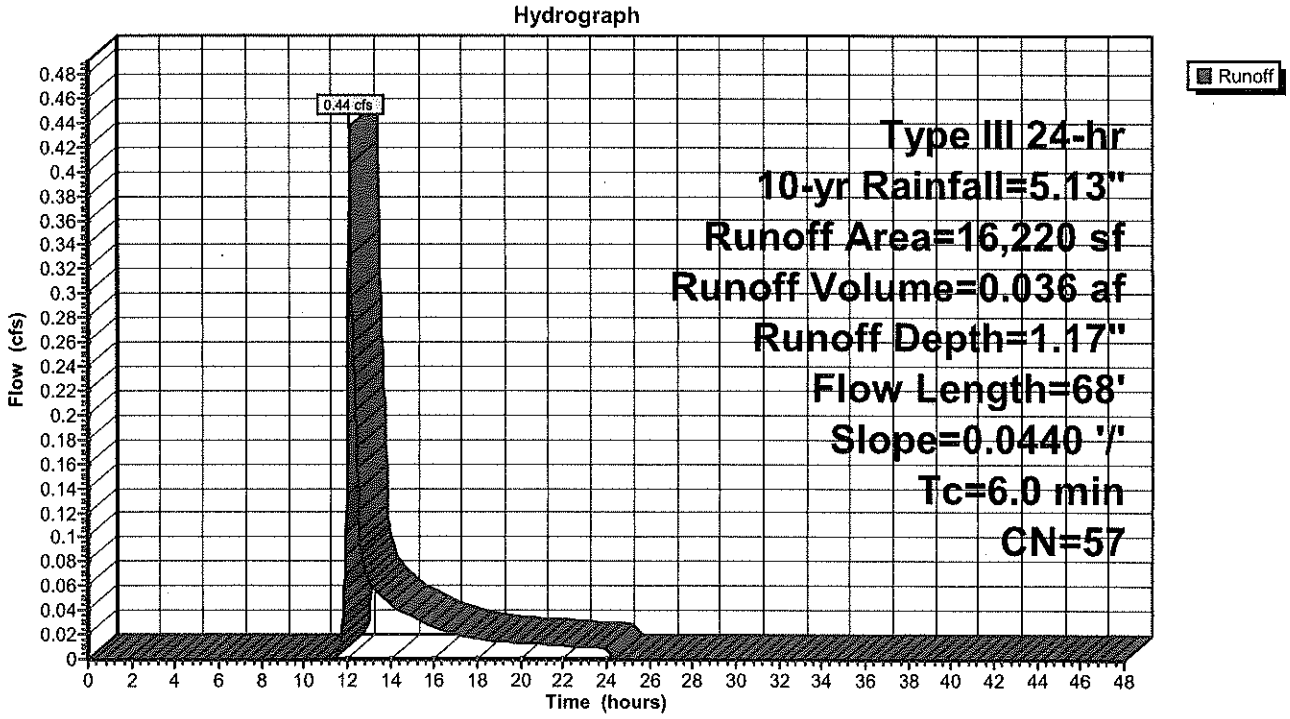
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-yr Rainfall=5.13"

Area (sf)	CN	Description
11,370	39	>75% Grass cover, Good, HSG A
4,850	98	Paved parking, HSG A
16,220	57	Weighted Average
11,370		70.10% Pervious Area
4,850		29.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	68	0.0440	0.22		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
5.1	68	Total, Increased to minimum Tc = 6.0 min			



Subcatchment A: PRWS-A



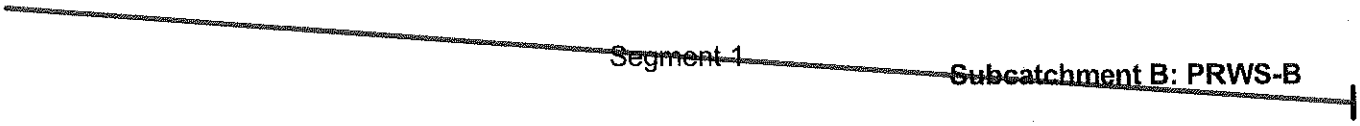
Summary for Subcatchment B: PRWS-B

Runoff = 0.09 cfs @ 12.11 hrs, Volume= 0.008 af, Depth= 1.05"
Routed to Link SITE : Total Site

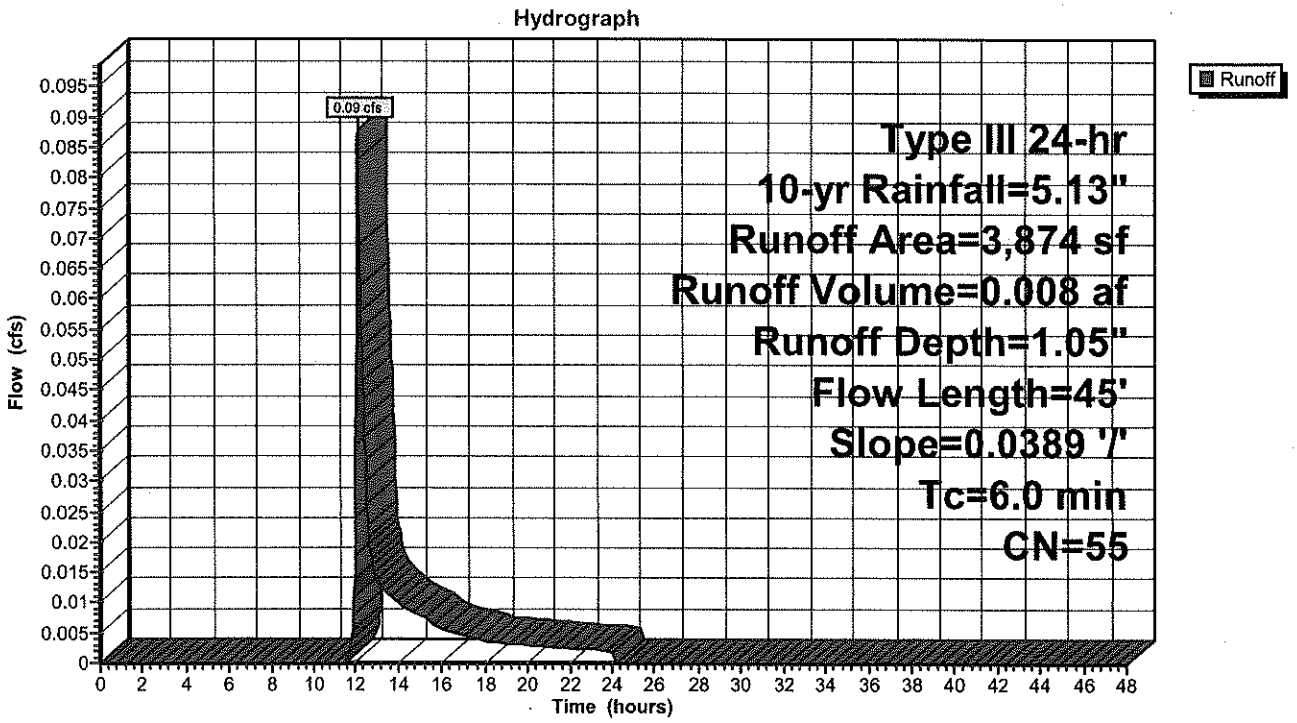
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-yr Rainfall=5.13"

Area (sf)	CN	Description
2,337	39	>75% Grass cover, Good, HSG A
648	80	>75% Grass cover, Good, HSG D
772	77	Brush, Fair, HSG D
117	98	Paved parking, HSG A
3,874	55	Weighted Average
3,757		96.98% Pervious Area
117		3.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	45	0.0389	0.20		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
3.8	45	Total, Increased to minimum Tc = 6.0 min			



Subcatchment B: PRWS-B



Summary for Subcatchment C1: PRWS-C1

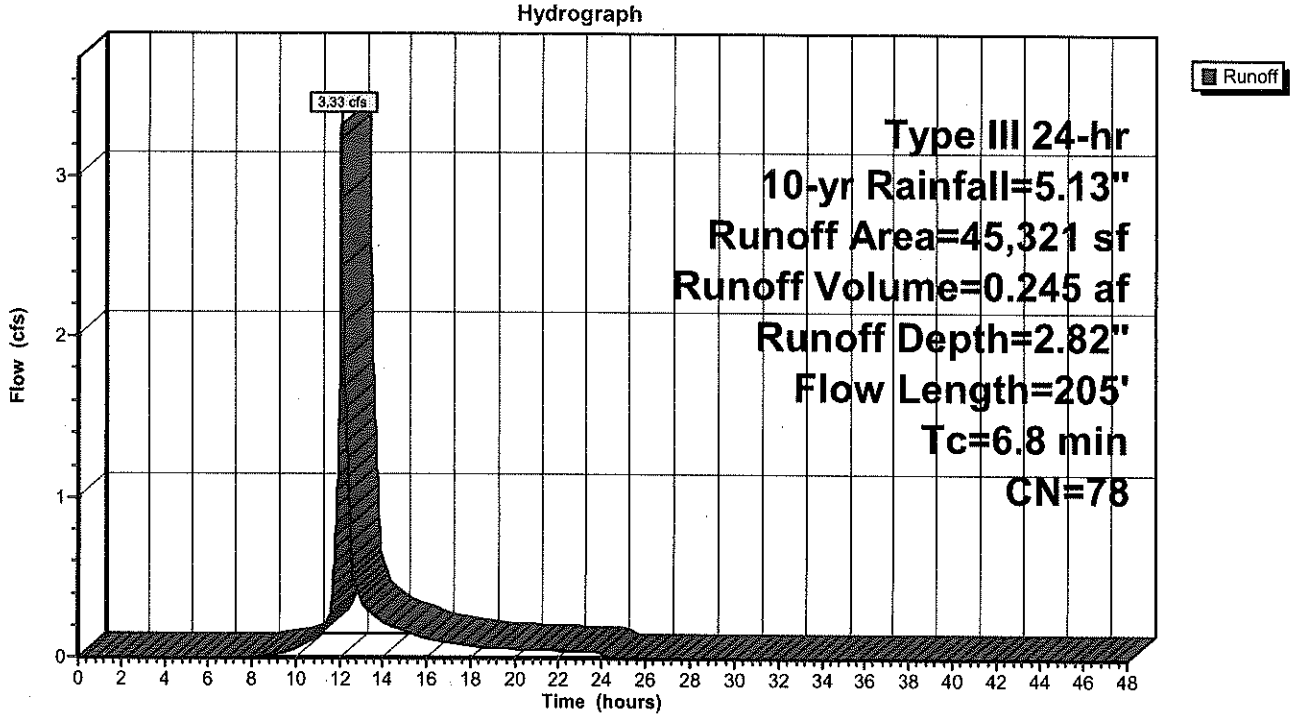
Runoff = 3.33 cfs @ 12.10 hrs, Volume= 0.245 af, Depth= 2.82"
Routed to Pond P-C : Pond C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-yr Rainfall=5.13"

Area (sf)	CN	Description
4,355	80	>75% Grass cover, Good, HSG D
14,079	39	>75% Grass cover, Good, HSG A
26,887	98	Paved parking, HSG D
45,321	78	Weighted Average
18,434		40.67% Pervious Area
26,887		59.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	109	0.0250	1.58		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
5.2	41	0.0150	0.13		**Sheet Flow, Seegment 2** Grass: Short n= 0.150 P2= 3.43"
0.5	55	0.0150	1.84		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
6.8	205	Total			

Subcatchment C1: PRWS-C1



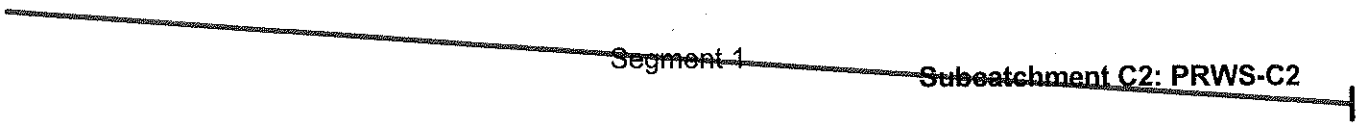
Summary for Subcatchment C2: PRWS-C2

Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.024 af, Depth= 2.47"
Routed to Link 2L : C Total

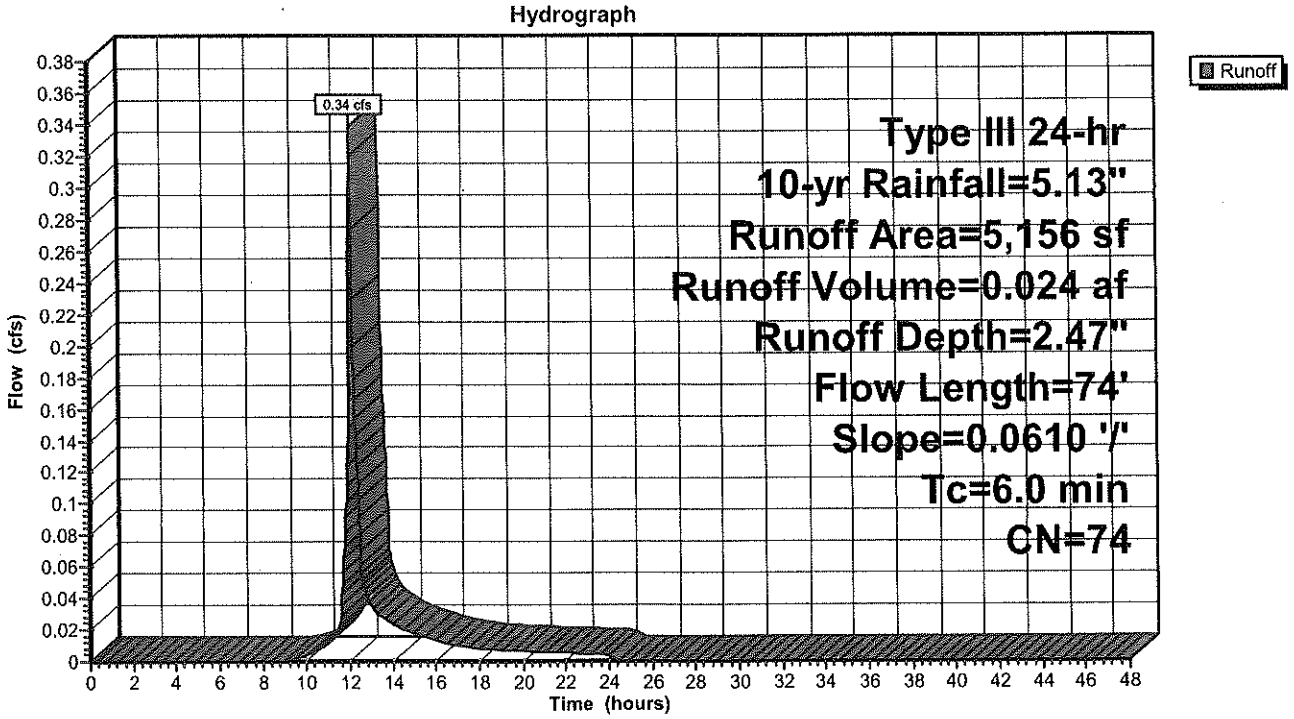
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-yr Rainfall=5.13"

Area (sf)	CN	Description
557	73	Brush, Good, HSG D
3,991	80	>75% Grass cover, Good, HSG D
608	39	>75% Grass cover, Good, HSG A
5,156	74	Weighted Average
5,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	74	0.0610	0.26		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
4.8	74	Total, Increased to minimum Tc = 6.0 min			



Subcatchment C2: PRWS-C2



Summary for Pond P-C: Pond C

Inflow Area = 1.040 ac, 59.33% Impervious, Inflow Depth = 2.82" for 10-yr event
Inflow = 3.33 cfs @ 12.10 hrs, Volume= 0.245 af
Outflow = 1.94 cfs @ 12.23 hrs, Volume= 0.245 af, Atten= 42%, Lag= 8.0 min
Discarded = 0.10 cfs @ 12.23 hrs, Volume= 0.127 af
Primary = 1.63 cfs @ 12.23 hrs, Volume= 0.115 af
Routed to Link 2L : C Total
Secondary = 0.21 cfs @ 12.23 hrs, Volume= 0.003 af
Routed to Link 2L : C Total

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Peak Elev= 32.29' @ 12.23 hrs Surf.Area= 4,201 sf Storage= 2,897 cf

Plug-Flow detention time= 131.0 min calculated for 0.245 af (100% of inflow)
Center-of-Mass det. time= 130.9 min (957.6 - 826.7)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	6,050 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

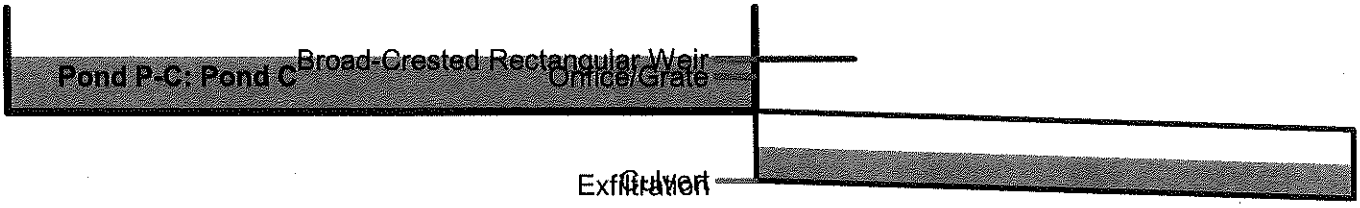
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
31.50	3,128	0	0	3,128
32.50	4,507	3,797	3,797	4,524
33.00	4,507	2,254	6,050	4,643

Device	Routing	Invert	Outlet Devices
#1	Discarded	31.50'	**1.000 in/hr Exfiltration over Wetted area**
#2	Primary	30.50'	**12.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 30.50' / 30.20' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#3	Device 2	32.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	32.25'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

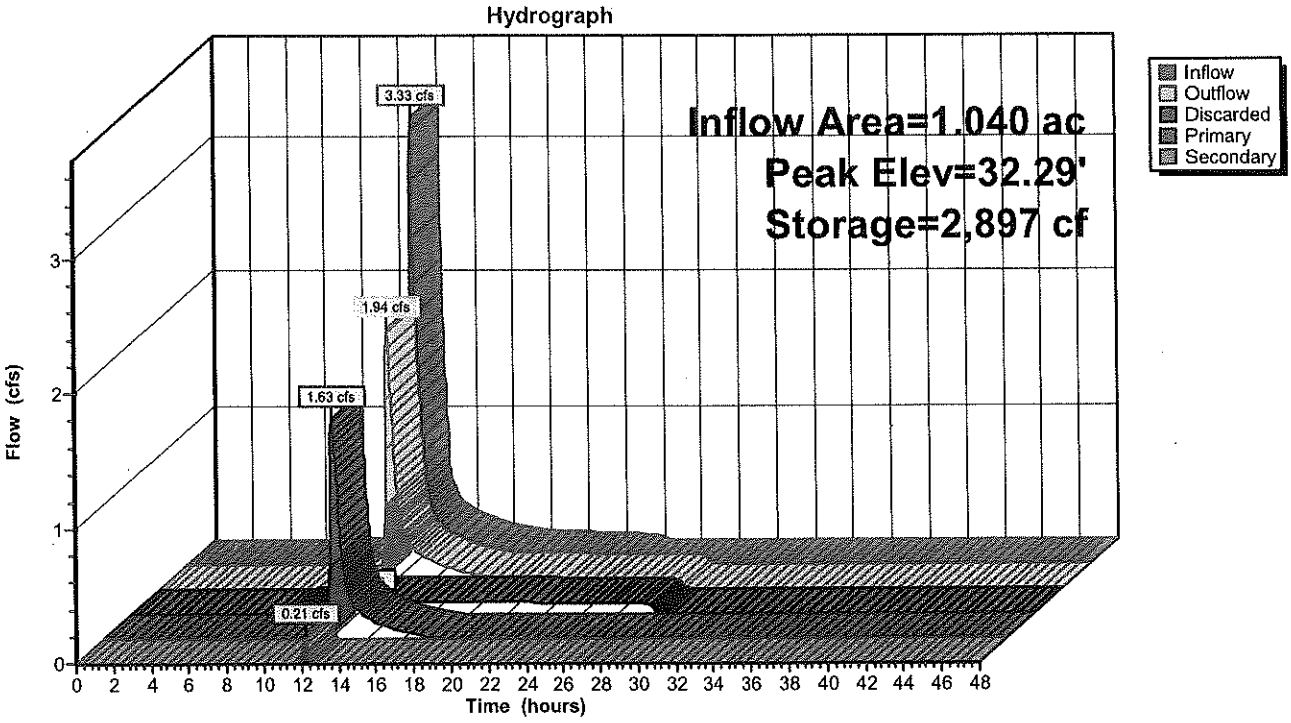
Discarded OutFlow Max=0.10 cfs @ 12.23 hrs HW=32.29' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=1.63 cfs @ 12.23 hrs HW=32.29' (Free Discharge)
↑**2=Culvert** (Passes 1.63 cfs of 3.39 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 1.63 cfs @ 1.77 fps)

Secondary OutFlow Max=0.21 cfs @ 12.23 hrs HW=32.29' (Free Discharge)
↑**4=Broad-Crested Rectangular Weir** (Weir Controls 0.21 cfs @ 0.48 fps)



Pond P-C: Pond C



Stage-Discharge for Pond P-C: Pond C

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
31.50	0.00	0.00	0.00	0.00
31.55	0.07	0.07	0.00	0.00
31.60	0.08	0.08	0.00	0.00
31.65	0.08	0.08	0.00	0.00
31.70	0.08	0.08	0.00	0.00
31.75	0.08	0.08	0.00	0.00
31.80	0.08	0.08	0.00	0.00
31.85	0.08	0.08	0.00	0.00
31.90	0.08	0.08	0.00	0.00
31.95	0.09	0.09	0.00	0.00
32.00	0.09	0.09	0.00	0.00
32.05	0.20	0.09	0.11	0.00
32.10	0.42	0.09	0.32	0.00
32.15	0.69	0.09	0.60	0.00
32.20	1.01	0.09	0.92	0.00
32.25	1.38	0.10	1.28	0.00
32.30	2.05	0.10	1.69	0.26
32.35	2.97	0.10	2.13	0.74
32.40	3.85	0.10	2.39	1.36
32.45	4.73	0.10	2.54	2.09
32.50	5.75	0.10	2.67	2.97
32.55	6.89	0.11	2.80	3.98
32.60	8.13	0.11	2.93	5.09
32.65	9.48	0.11	3.05	6.32
32.70	10.97	0.11	3.16	7.70
32.75	12.57	0.11	3.28	9.19
32.80	14.30	0.11	3.38	10.81
32.85	16.14	0.11	3.49	12.55
32.90	17.82	0.11	3.59	14.12
32.95	19.55	0.11	3.69	15.75
33.00	**21.33**	**0.11**	**3.78**	**17.44**

Stage-Area-Storage for Pond P-C: Pond C

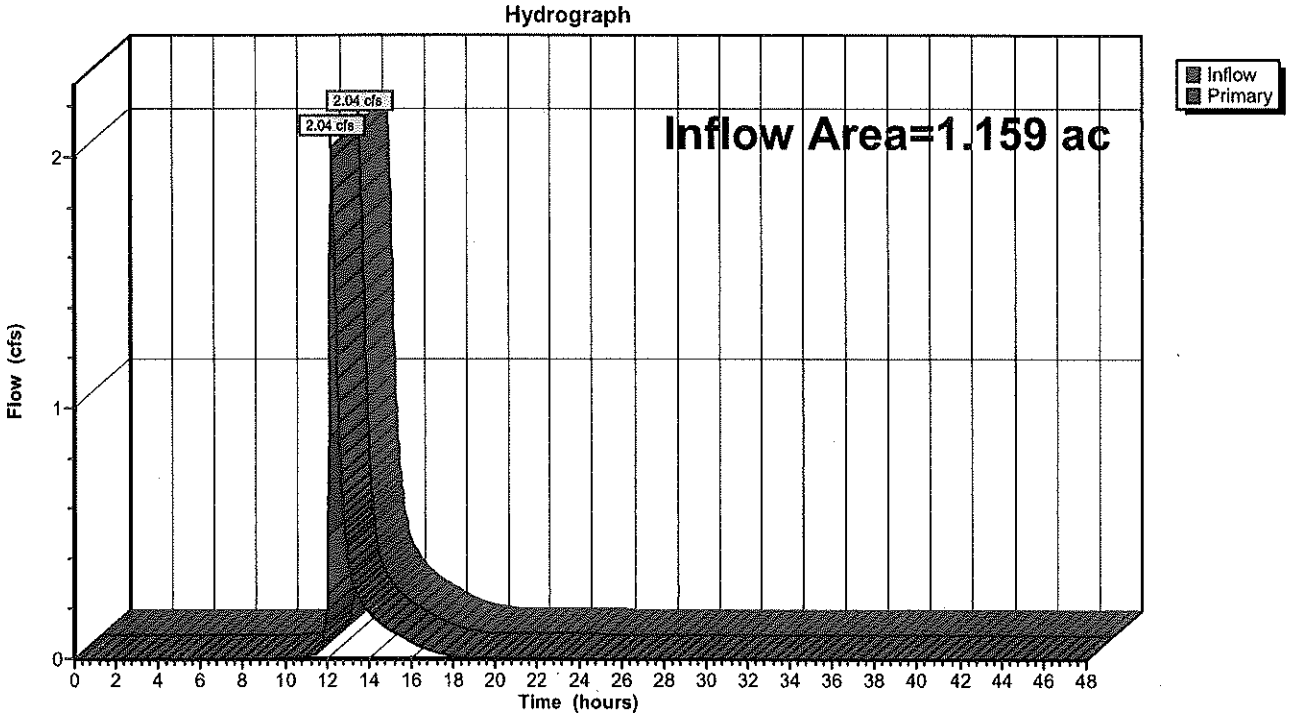
Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
31.50	3,128	3,128	0
31.55	3,191	3,192	158
31.60	3,255	3,256	319
31.65	3,319	3,321	483
31.70	3,384	3,387	651
31.75	3,449	3,453	822
31.80	3,515	3,520	996
31.85	3,582	3,588	1,173
31.90	3,649	3,656	1,354
31.95	3,717	3,725	1,538
32.00	3,786	3,794	1,726
32.05	3,855	3,864	1,917
32.10	3,925	3,935	2,111
32.15	3,996	4,007	2,309
32.20	4,067	4,079	2,511
32.25	4,139	4,151	2,716
32.30	4,211	4,225	2,925
32.35	4,284	4,299	3,137
32.40	4,358	4,373	3,353
32.45	4,432	4,448	3,573
32.50	**4,507**	4,524	3,797
32.55	4,507	4,536	4,022
32.60	4,507	4,548	4,247
32.65	4,507	4,560	4,473
32.70	4,507	4,572	4,698
32.75	4,507	4,584	4,923
32.80	4,507	4,596	5,149
32.85	4,507	4,607	5,374
32.90	4,507	4,619	5,599
32.95	4,507	4,631	5,825
33.00	4,507	**4,643**	**6,050**

Summary for Link 2L: C Total

Inflow Area = 1.159 ac, 53.27% Impervious, Inflow Depth = 1.47" for 10-yr event
Inflow = 2.04 cfs @ 12.22 hrs, Volume= 0.142 af
Primary = 2.04 cfs @ 12.22 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min
Routed to Link SITE : Total Site

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link 2L: C Total

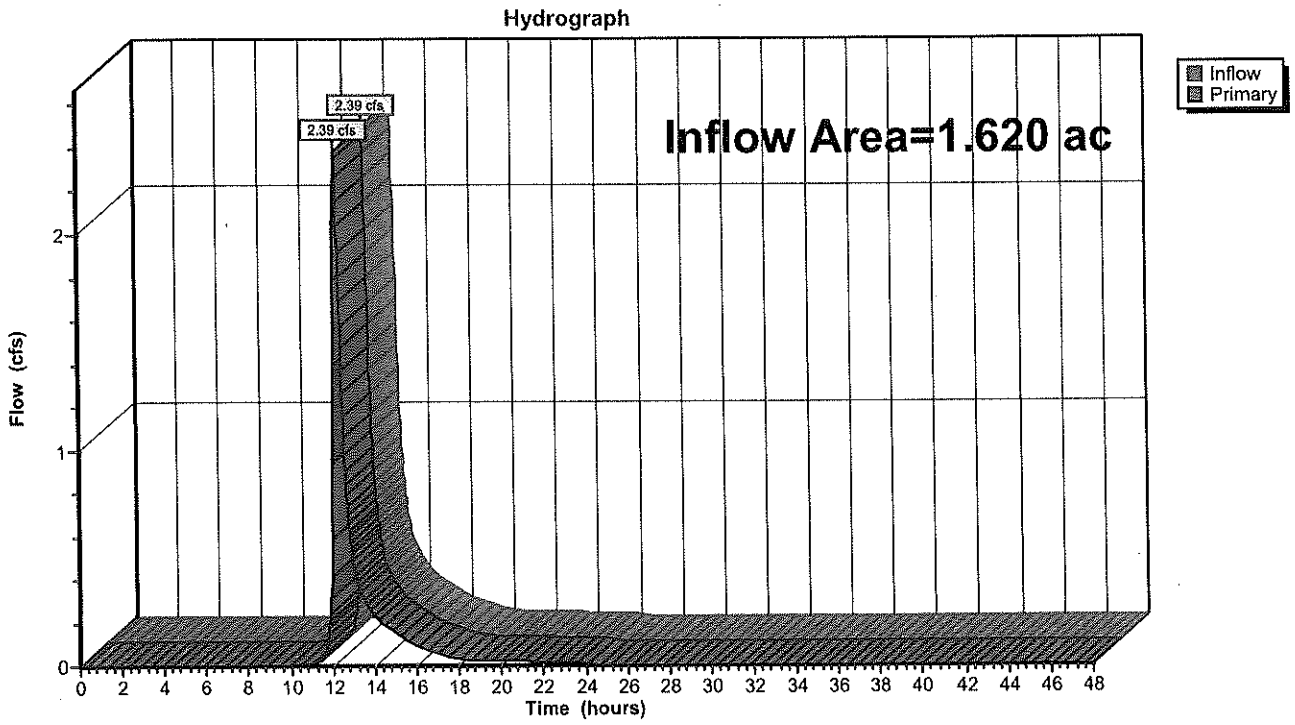


Summary for Link SITE: Total Site

Inflow Area = 1.620 ac, 45.14% Impervious, Inflow Depth = 1.38" for 10-yr event
Inflow = 2.39 cfs @ 12.22 hrs, Volume= 0.186 af
Primary = 2.39 cfs @ 12.22 hrs, Volume= 0.186 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link SITE: Total Site



Time span=0.00-48.00 hrs, dt=0.03 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: PRWS-A Runoff Area=16,220 sf 29.90% Impervious Runoff Depth=1.78"
Flow Length=68' Slope=0.0440 '/' Tc=6.0 min CN=57 Runoff=0.71 cfs 0.055 af

Subcatchment B: PRWS-B Runoff Area=3,874 sf 3.02% Impervious Runoff Depth=1.62"
Flow Length=45' Slope=0.0389 '/' Tc=6.0 min CN=55 Runoff=0.15 cfs 0.012 af

Subcatchment C1: PRWS-C1 Runoff Area=45,321 sf 59.33% Impervious Runoff Depth=3.73"
Flow Length=205' Tc=6.8 min CN=78 Runoff=4.40 cfs 0.323 af

Subcatchment C2: PRWS-C2 Runoff Area=5,156 sf 0.00% Impervious Runoff Depth=3.33"
Flow Length=74' Slope=0.0610 '/' Tc=6.0 min CN=74 Runoff=0.46 cfs 0.033 af

Pond P-C: Pond C Peak Elev=32.38' Storage=3,249 cf Inflow=4.40 cfs 0.323 af
Discarded=0.10 cfs 0.139 af Primary=2.32 cfs 0.166 af Secondary=1.05 cfs 0.018 af Outflow=3.47 cfs 0.323 af

Link 2L: C Total Inflow=3.73 cfs 0.217 af
Primary=3.73 cfs 0.217 af

Link SITE: Total Site Inflow=4.44 cfs 0.284 af
Primary=4.44 cfs 0.284 af

Total Runoff Area = 1.620 ac Runoff Volume = 0.423 af Average Runoff Depth = 3.14"
54.86% Pervious = 0.889 ac 45.14% Impervious = 0.731 ac

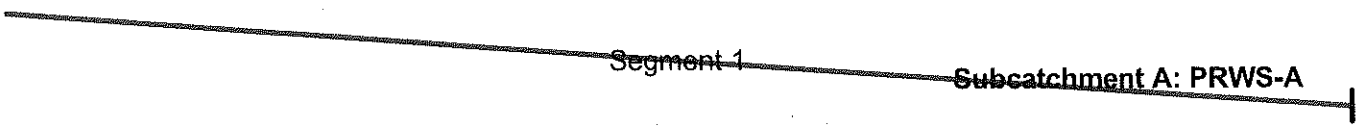
Summary for Subcatchment A: PRWS-A

Runoff = 0.71 cfs @ 12.10 hrs, Volume= 0.055 af, Depth= 1.78"
Routed to Link SITE : Total Site

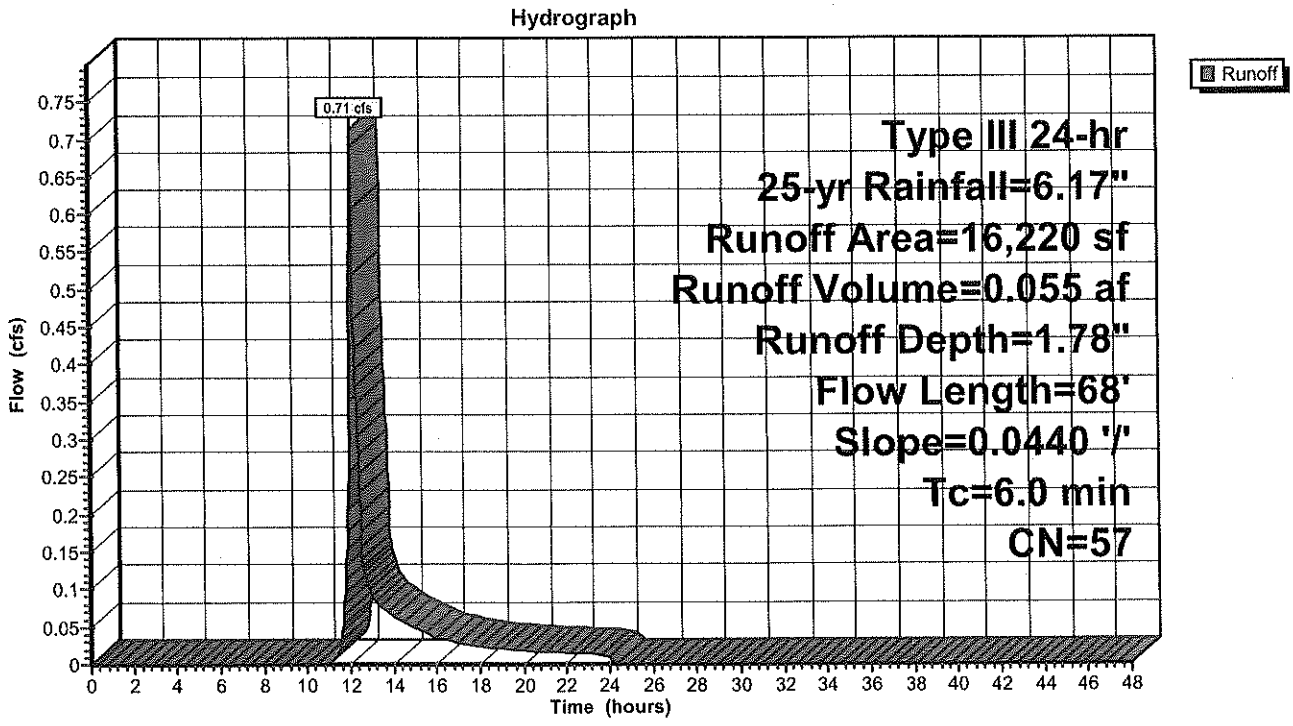
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-yr Rainfall=6.17"

Area (sf)	CN	Description
11,370	39	>75% Grass cover, Good, HSG A
4,850	98	Paved parking, HSG A
16,220	57	Weighted Average
11,370		70.10% Pervious Area
4,850		29.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	68	0.0440	0.22		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
5.1	68	Total, Increased to minimum Tc = 6.0 min			



Subcatchment A: PRWS-A



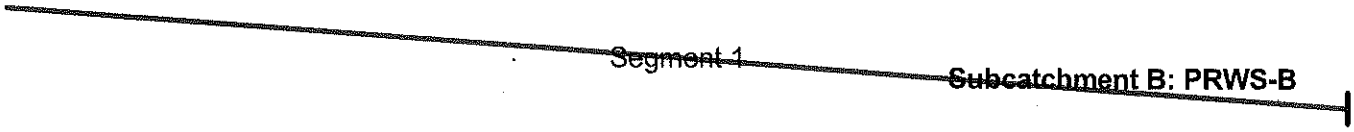
Summary for Subcatchment B: PRWS-B

Runoff = 0.15 cfs @ 12.10 hrs, Volume= 0.012 af, Depth= 1.62"
Routed to Link SITE : Total Site

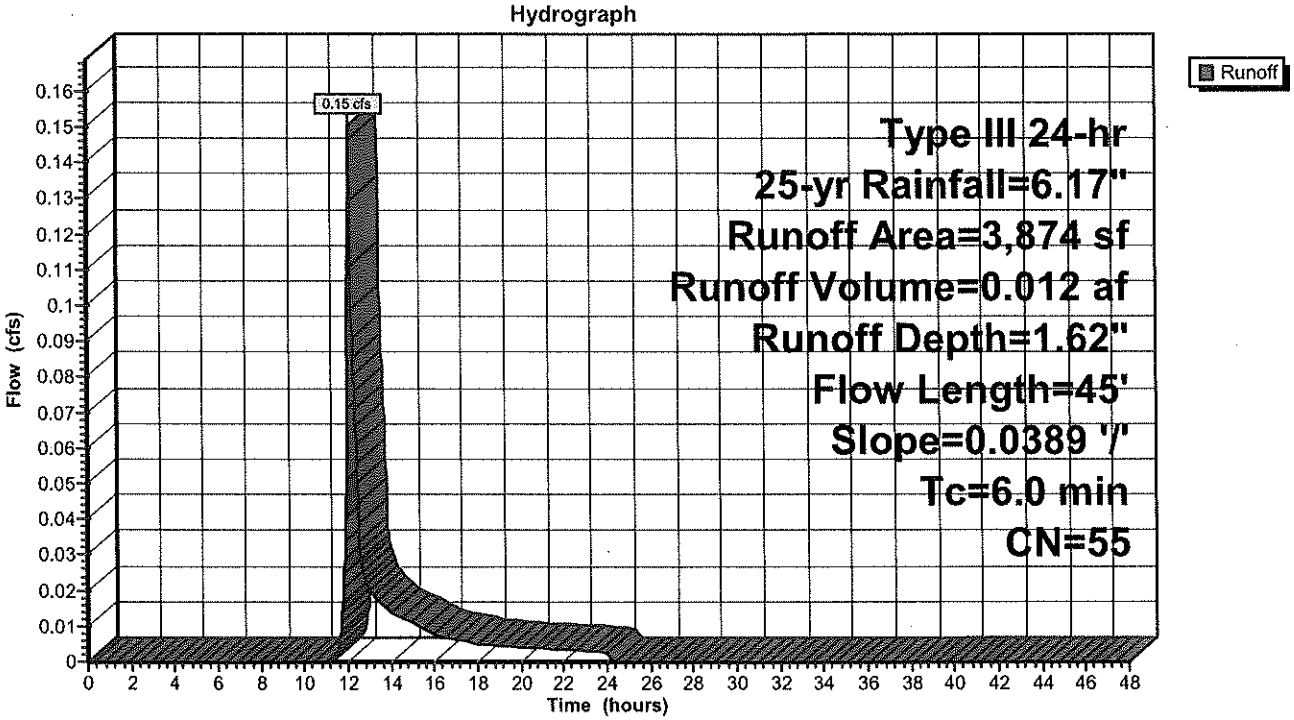
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-yr Rainfall=6.17"

Area (sf)	CN	Description
2,337	39	>75% Grass cover, Good, HSG A
648	80	>75% Grass cover, Good, HSG D
772	77	Brush, Fair, HSG D
117	98	Paved parking, HSG A
3,874	55	Weighted Average
3,757		96.98% Pervious Area
117		3.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	45	0.0389	0.20		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
3.8	45	Total, Increased to minimum Tc = 6.0 min			



Subcatchment B: PRWS-B



Summary for Subcatchment C1: PRWS-C1

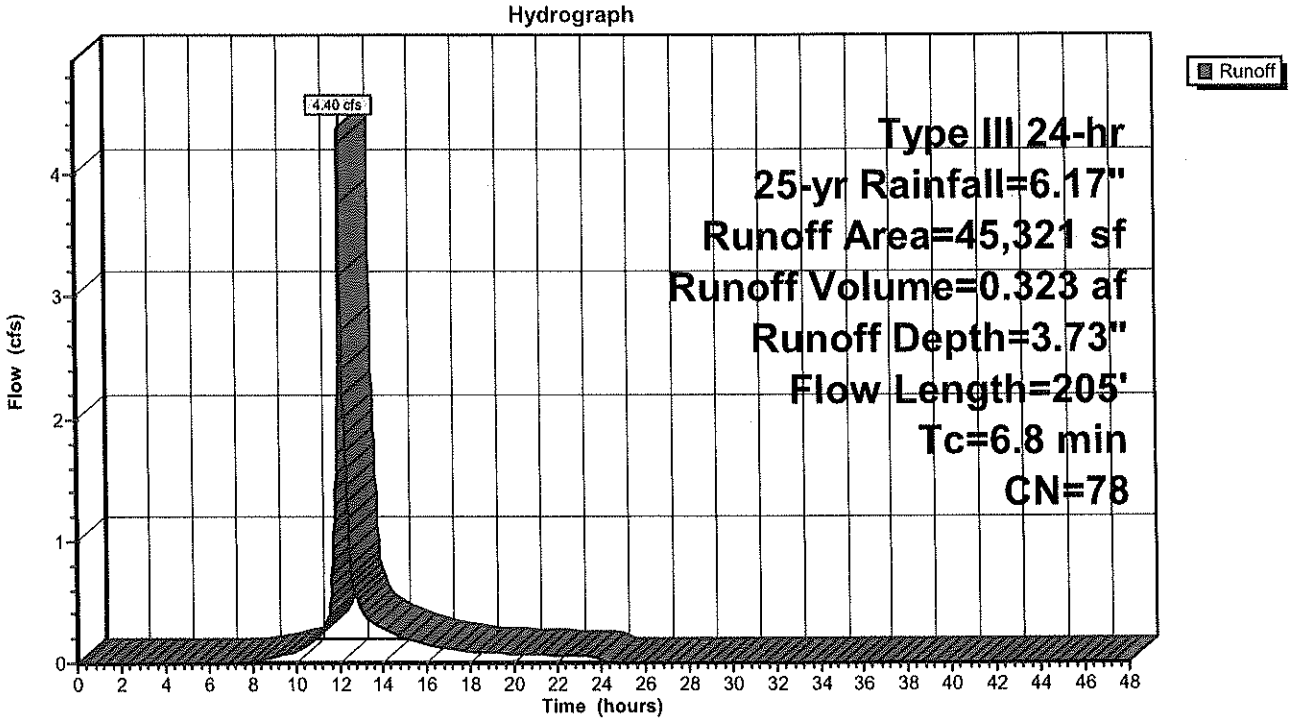
Runoff = 4.40 cfs @ 12.10 hrs, Volume= 0.323 af, Depth= 3.73"
Routed to Pond P-C : Pond C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-yr Rainfall=6.17"

Area (sf)	CN	Description
4,355	80	>75% Grass cover, Good, HSG D
14,079	39	>75% Grass cover, Good, HSG A
26,887	98	Paved parking, HSG D
45,321	78	Weighted Average
18,434		40.67% Pervious Area
26,887		59.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	109	0.0250	1.58		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
5.2	41	0.0150	0.13		**Sheet Flow, Seegment 2** Grass: Short n= 0.150 P2= 3.43"
0.5	55	0.0150	1.84		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
6.8	205	Total			

Subcatchment C1: PRWS-C1



Summary for Subcatchment C2: PRWS-C2

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.033 af, Depth= 3.33"
Routed to Link 2L : C Total

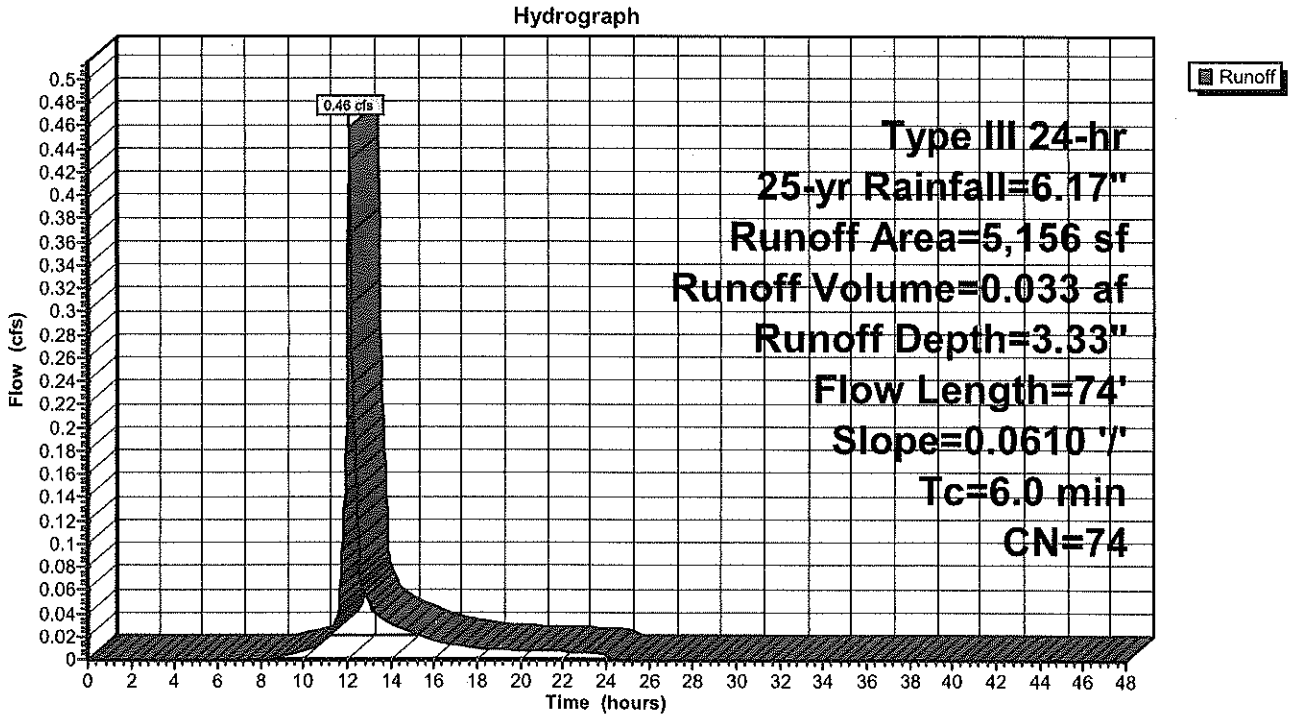
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-yr Rainfall=6.17"

Area (sf)	CN	Description
557	73	Brush, Good, HSG D
3,991	80	>75% Grass cover, Good, HSG D
608	39	>75% Grass cover, Good, HSG A
5,156	74	Weighted Average
5,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	74	0.0610	0.26		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
4.8	74	Total, Increased to minimum Tc = 6.0 min			

Segment 1 Subcatchment C2: PRWS-C2

Subcatchment C2: PRWS-C2



Summary for Pond P-C: Pond C

Inflow Area = 1.040 ac, 59.33% Impervious, Inflow Depth = 3.73" for 25-yr event
Inflow = 4.40 cfs @ 12.10 hrs, Volume= 0.323 af
Outflow = 3.47 cfs @ 12.17 hrs, Volume= 0.323 af, Atten= 21%, Lag= 4.1 min
Discarded = 0.10 cfs @ 12.17 hrs, Volume= 0.139 af
Primary = 2.32 cfs @ 12.17 hrs, Volume= 0.166 af
Routed to Link 2L : C Total
Secondary = 1.05 cfs @ 12.17 hrs, Volume= 0.018 af
Routed to Link 2L : C Total

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Peak Elev= 32.38' @ 12.17 hrs Surf.Area= 4,322 sf Storage= 3,249 cf

Plug-Flow detention time= 112.2 min calculated for 0.323 af (100% of inflow)
Center-of-Mass det. time= 112.3 min (931.1 - 818.7)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	6,050 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

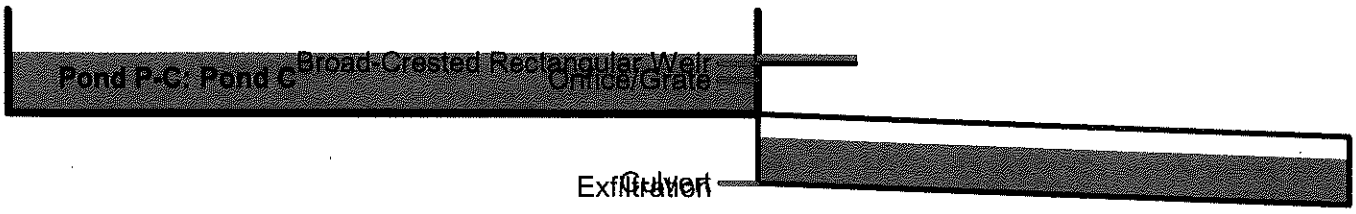
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
31.50	3,128	0	0	3,128
32.50	4,507	3,797	3,797	4,524
33.00	4,507	2,254	6,050	4,643

Device	Routing	Invert	Outlet Devices
#1	Discarded	31.50'	**1.000 in/hr Exfiltration over Wetted area**
#2	Primary	30.50'	**12.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 30.50' / 30.20' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#3	Device 2	32.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	32.25'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

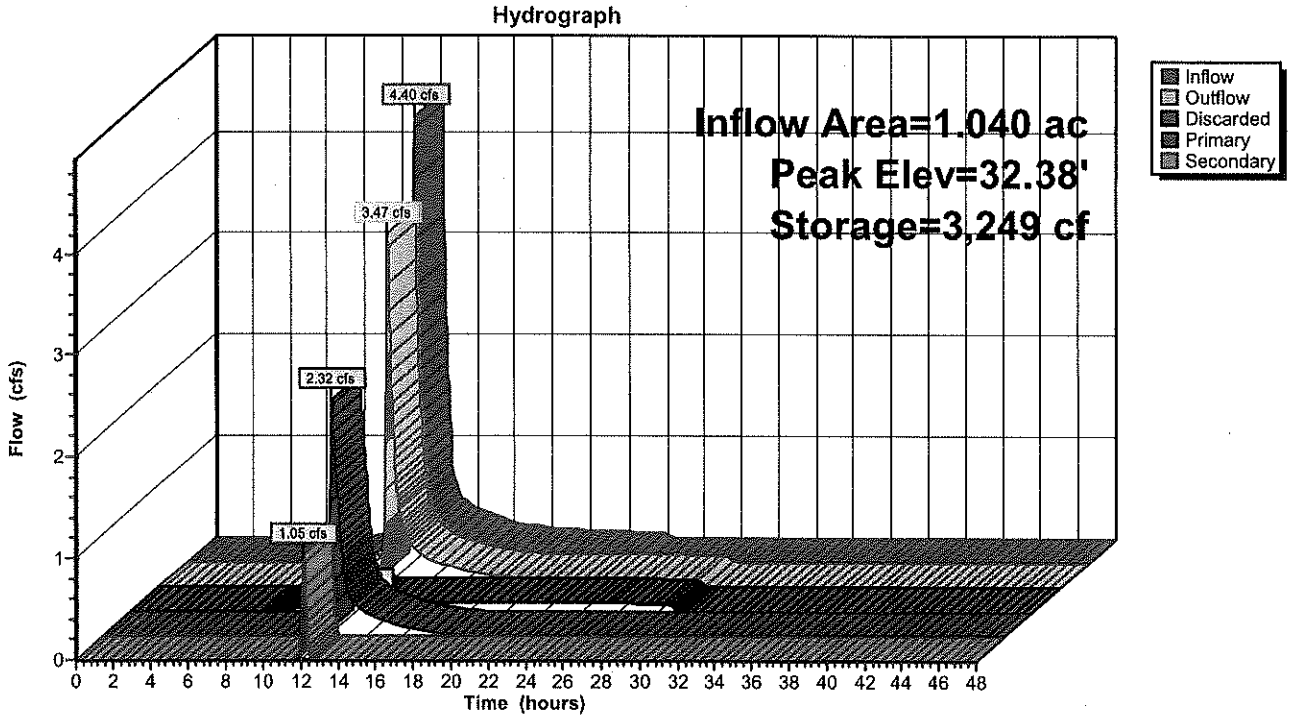
Discarded OutFlow Max=0.10 cfs @ 12.17 hrs HW=32.37' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=2.31 cfs @ 12.17 hrs HW=32.37' (Free Discharge)
└**2=Culvert** (Passes 2.31 cfs of 3.50 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 2.31 cfs @ 2.95 fps)

Secondary OutFlow Max=1.03 cfs @ 12.17 hrs HW=32.37' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 1.03 cfs @ 0.83 fps)



Pond P-C: Pond C



Stage-Discharge for Pond P-C: Pond C

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
31.50	0.00	0.00	0.00	0.00
31.55	0.07	0.07	0.00	0.00
31.60	0.08	0.08	0.00	0.00
31.65	0.08	0.08	0.00	0.00
31.70	0.08	0.08	0.00	0.00
31.75	0.08	0.08	0.00	0.00
31.80	0.08	0.08	0.00	0.00
31.85	0.08	0.08	0.00	0.00
31.90	0.08	0.08	0.00	0.00
31.95	0.09	0.09	0.00	0.00
32.00	0.09	0.09	0.00	0.00
32.05	0.20	0.09	0.11	0.00
32.10	0.42	0.09	0.32	0.00
32.15	0.69	0.09	0.60	0.00
32.20	1.01	0.09	0.92	0.00
32.25	1.38	0.10	1.28	0.00
32.30	2.05	0.10	1.69	0.26
32.35	2.97	0.10	2.13	0.74
32.40	3.85	0.10	2.39	1.36
32.45	4.73	0.10	2.54	2.09
32.50	5.75	0.10	2.67	2.97
32.55	6.89	0.11	2.80	3.98
32.60	8.13	0.11	2.93	5.09
32.65	9.48	0.11	3.05	6.32
32.70	10.97	0.11	3.16	7.70
32.75	12.57	0.11	3.28	9.19
32.80	14.30	0.11	3.38	10.81
32.85	16.14	0.11	3.49	12.55
32.90	17.82	0.11	3.59	14.12
32.95	19.55	0.11	3.69	15.75
33.00	**21.33**	**0.11**	**3.78**	**17.44**

Stage-Area-Storage for Pond P-C: Pond C

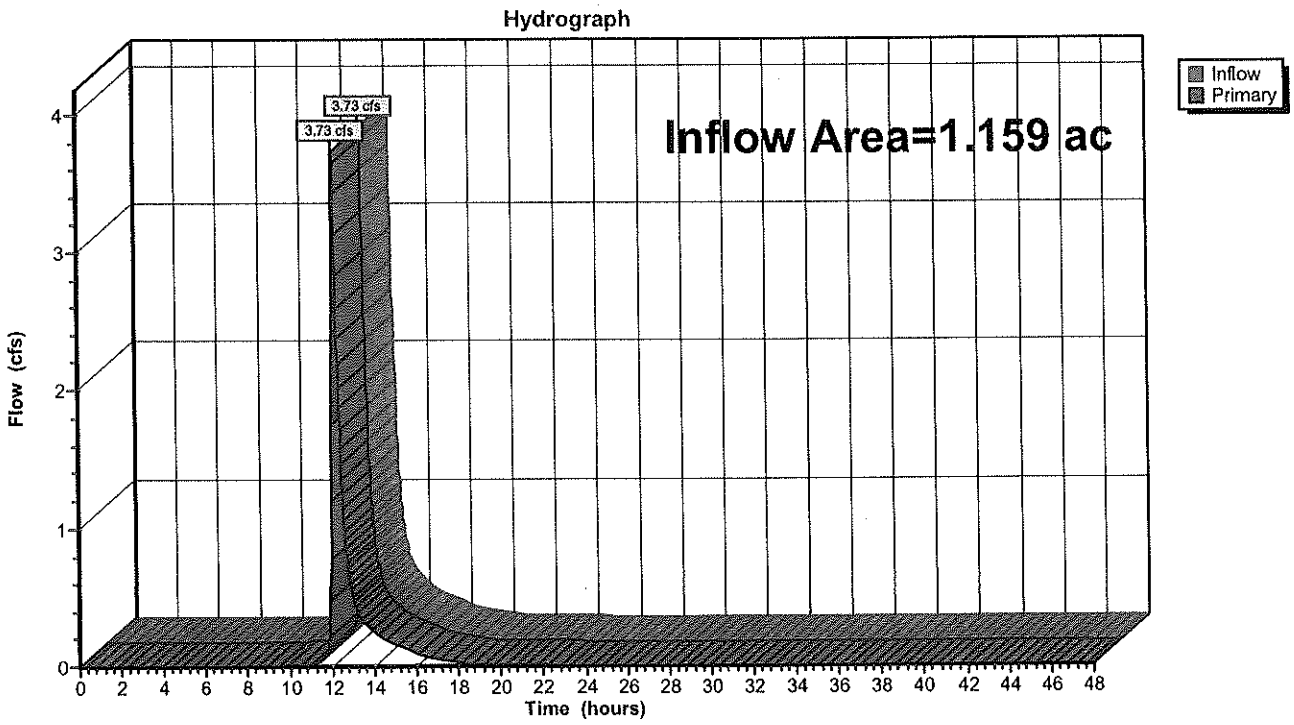
Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
31.50	3,128	3,128	0
31.55	3,191	3,192	158
31.60	3,255	3,256	319
31.65	3,319	3,321	483
31.70	3,384	3,387	651
31.75	3,449	3,453	822
31.80	3,515	3,520	996
31.85	3,582	3,588	1,173
31.90	3,649	3,656	1,354
31.95	3,717	3,725	1,538
32.00	3,786	3,794	1,726
32.05	3,855	3,864	1,917
32.10	3,925	3,935	2,111
32.15	3,996	4,007	2,309
32.20	4,067	4,079	2,511
32.25	4,139	4,151	2,716
32.30	4,211	4,225	2,925
32.35	4,284	4,299	3,137
32.40	4,358	4,373	3,353
32.45	4,432	4,448	3,573
32.50	**4,507**	4,524	3,797
32.55	4,507	4,536	4,022
32.60	4,507	4,548	4,247
32.65	4,507	4,560	4,473
32.70	4,507	4,572	4,698
32.75	4,507	4,584	4,923
32.80	4,507	4,596	5,149
32.85	4,507	4,607	5,374
32.90	4,507	4,619	5,599
32.95	4,507	4,631	5,825
33.00	4,507	**4,643**	**6,050**

Summary for Link 2L: C Total

Inflow Area = 1.159 ac, 53.27% Impervious, Inflow Depth = 2.25" for 25-yr event
Inflow = 3.73 cfs @ 12.16 hrs, Volume= 0.217 af
Primary = 3.73 cfs @ 12.16 hrs, Volume= 0.217 af, Atten= 0%, Lag= 0.0 min
Routed to Link SITE : Total Site

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link 2L: C Total

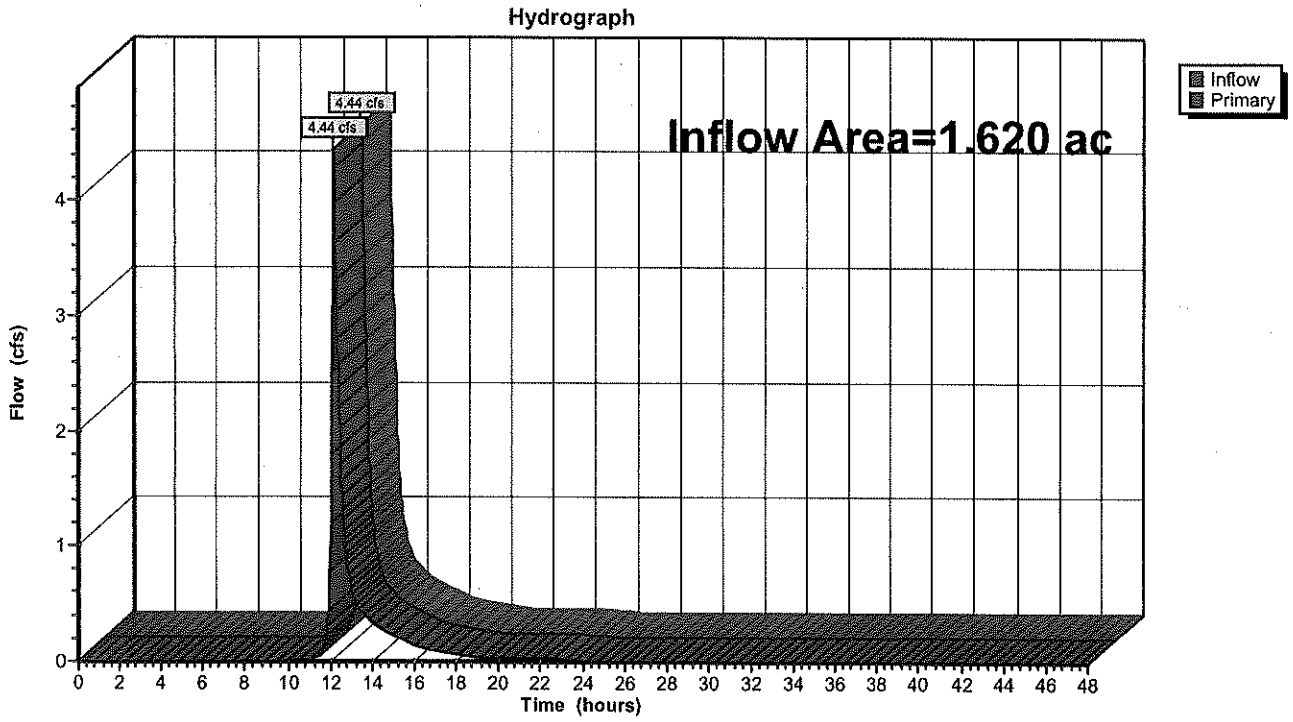


Summary for Link SITE: Total Site

Inflow Area = 1.620 ac, 45.14% Impervious, Inflow Depth = 2.10" for 25-yr event
Inflow = 4.44 cfs @ 12.15 hrs, Volume= 0.284 af
Primary = 4.44 cfs @ 12.15 hrs, Volume= 0.284 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link SITE: Total Site



Time span=0.00-48.00 hrs, dt=0.03 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: PRWS-A Runoff Area=16,220 sf 29.90% Impervious Runoff Depth=2.85"
Flow Length=68' Slope=0.0440 '/' Tc=6.0 min CN=57 Runoff=1.20 cfs 0.089 af

Subcatchment B: PRWS-B Runoff Area=3,874 sf 3.02% Impervious Runoff Depth=2.64"
Flow Length=45' Slope=0.0389 '/' Tc=6.0 min CN=55 Runoff=0.26 cfs 0.020 af

Subcatchment C1: PRWS-C1 Runoff Area=45,321 sf 59.33% Impervious Runoff Depth=5.20"
Flow Length=205' Tc=6.8 min CN=78 Runoff=6.08 cfs 0.451 af

Subcatchment C2: PRWS-C2 Runoff Area=5,156 sf 0.00% Impervious Runoff Depth=4.74"
Flow Length=74' Slope=0.0610 '/' Tc=6.0 min CN=74 Runoff=0.65 cfs 0.047 af

Pond P-C: Pond C Peak Elev=32.47' Storage=3,678 cf Inflow=6.08 cfs 0.451 af
Discarded=0.10 cfs 0.153 af Primary=2.60 cfs 0.246 af Secondary=2.49 cfs 0.052 af Outflow=5.20 cfs 0.451 af

Link 2L: C Total Inflow=5.62 cfs 0.345 af
Primary=5.62 cfs 0.345 af

Link SITE: Total Site Inflow=6.93 cfs 0.453 af
Primary=6.93 cfs 0.453 af

Total Runoff Area = 1.620 ac Runoff Volume = 0.605 af Average Runoff Depth = 4.48"
54.86% Pervious = 0.889 ac 45.14% Impervious = 0.731 ac

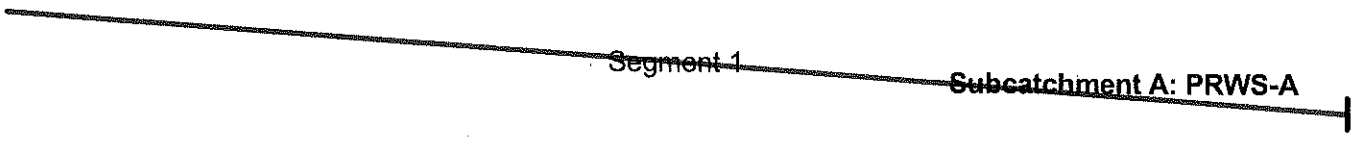
Summary for Subcatchment A: PRWS-A

Runoff = 1.20 cfs @ 12.09 hrs, Volume= 0.089 af, Depth= 2.85"
Routed to Link SITE : Total Site

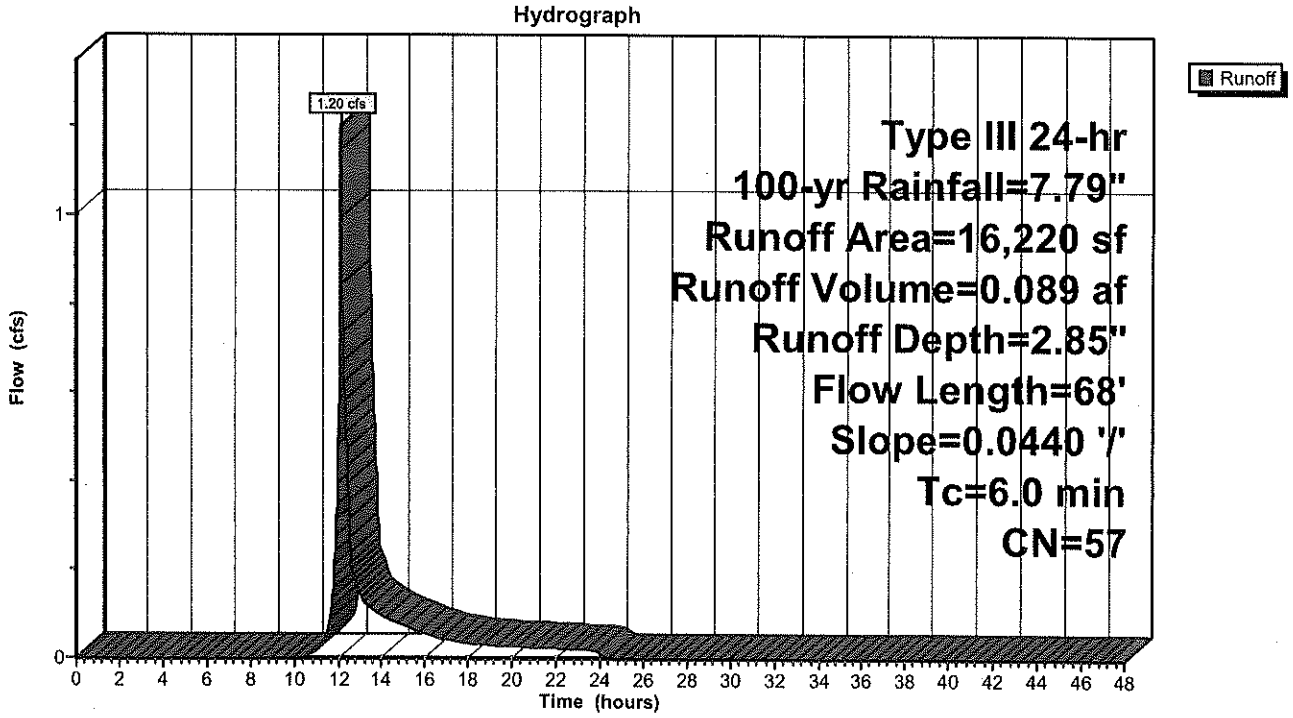
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-yr Rainfall=7.79"

Area (sf)	CN	Description
11,370	39	>75% Grass cover, Good, HSG A
4,850	98	Paved parking, HSG A
16,220	57	Weighted Average
11,370		70.10% Pervious Area
4,850		29.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	68	0.0440	0.22		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
5.1	68	Total, Increased to minimum Tc = 6.0 min			



Subcatchment A: PRWS-A



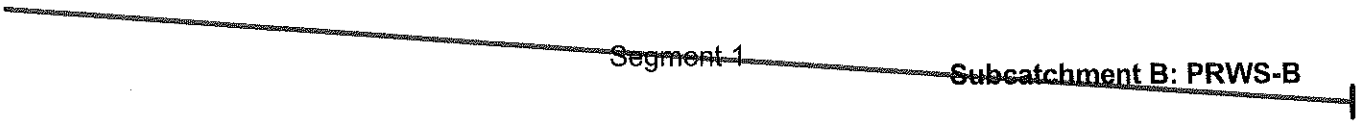
Summary for Subcatchment B: PRWS-B

Runoff = 0.26 cfs @ 12.10 hrs, Volume= 0.020 af, Depth= 2.64"
Routed to Link SITE : Total Site

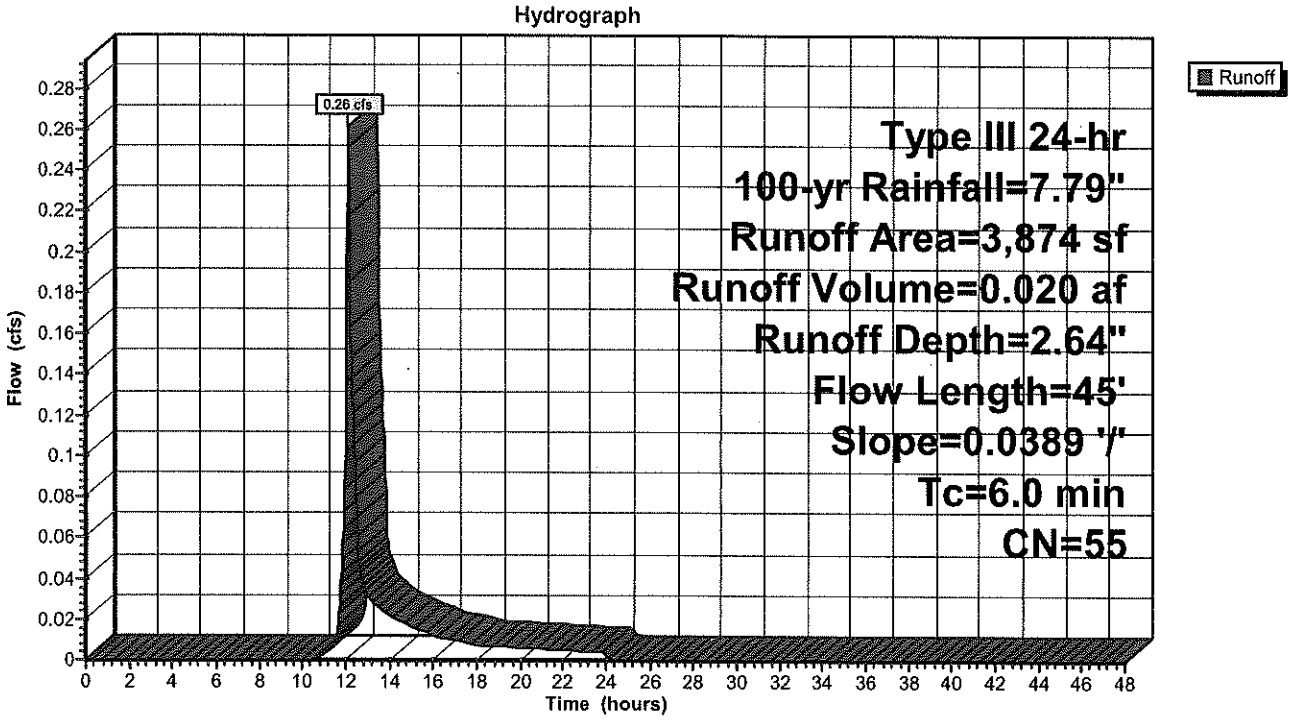
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-yr Rainfall=7.79"

Area (sf)	CN	Description
2,337	39	>75% Grass cover, Good, HSG A
648	80	>75% Grass cover, Good, HSG D
772	77	Brush, Fair, HSG D
117	98	Paved parking, HSG A
3,874	55	Weighted Average
3,757		96.98% Pervious Area
117		3.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	45	0.0389	0.20		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
3.8	45	Total, Increased to minimum Tc = 6.0 min			



Subcatchment B: PRWS-B



Summary for Subcatchment C1: PRWS-C1

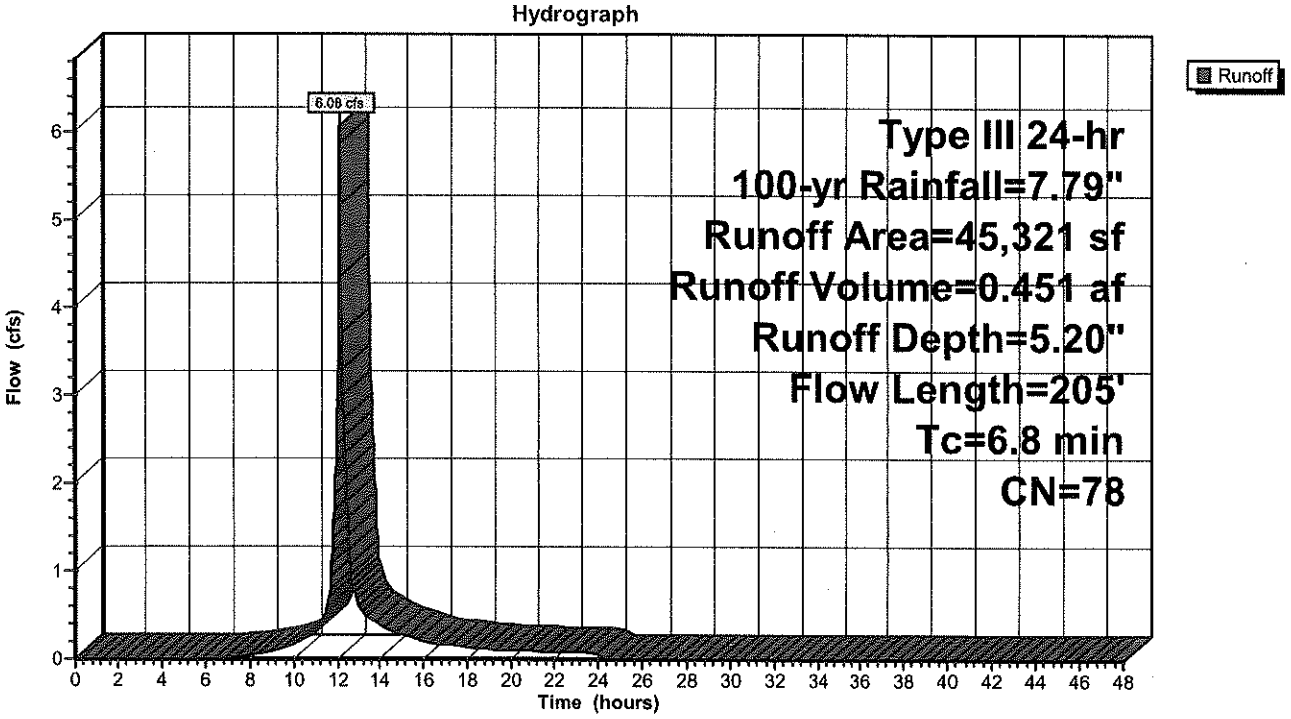
Runoff = 6.08 cfs @ 12.10 hrs, Volume= 0.451 af, Depth= 5.20"
Routed to Pond P-C : Pond C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-yr Rainfall=7.79"

Area (sf)	CN	Description
4,355	80	>75% Grass cover, Good, HSG D
14,079	39	>75% Grass cover, Good, HSG A
26,887	98	Paved parking, HSG D
45,321	78	Weighted Average
18,434		40.67% Pervious Area
26,887		59.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	109	0.0250	1.58		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.43"
5.2	41	0.0150	0.13		**Sheet Flow, Seegment 2** Grass: Short n= 0.150 P2= 3.43"
0.5	55	0.0150	1.84		**Shallow Concentrated Flow, Segment 3** Grassed Waterway Kv= 15.0 fps
6.8	205	Total			

Subcatchment C1: PRWS-C1



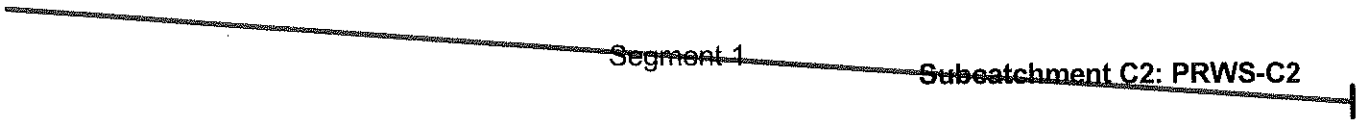
Summary for Subcatchment C2: PRWS-C2

Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.047 af, Depth= 4.74"
Routed to Link 2L : C Total

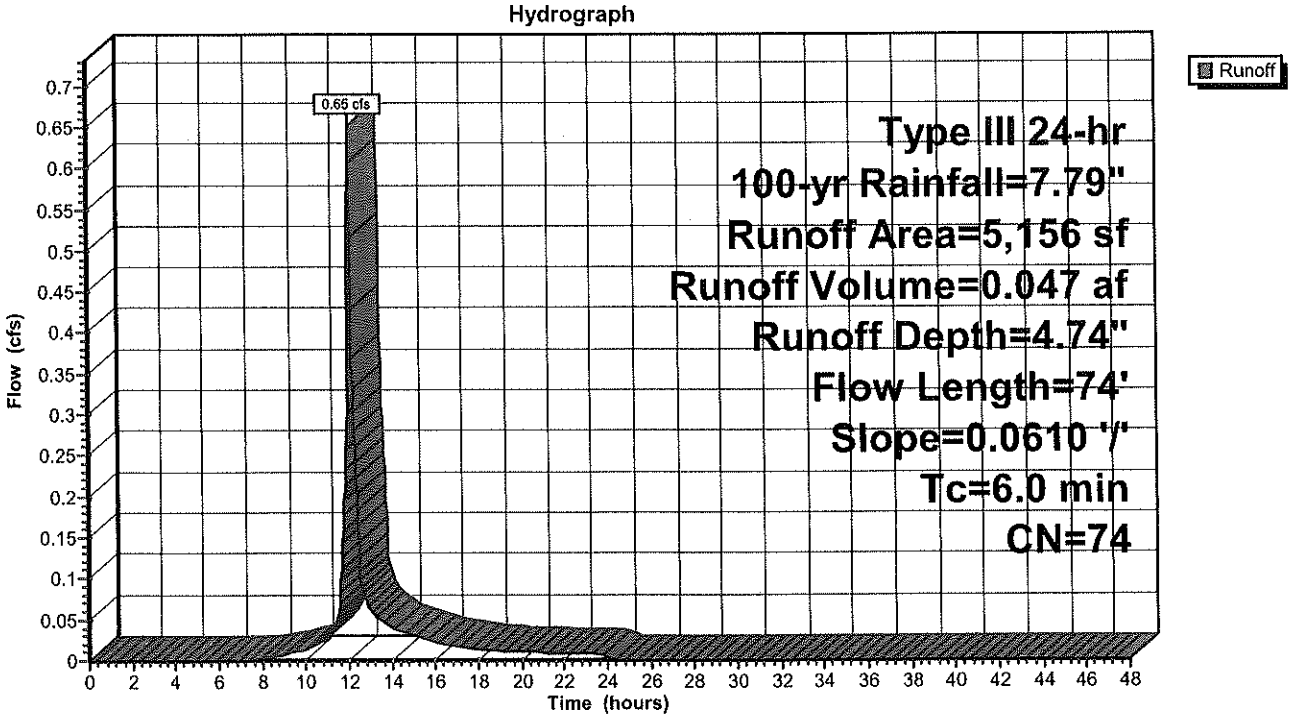
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-yr Rainfall=7.79"

Area (sf)	CN	Description
557	73	Brush, Good, HSG D
3,991	80	>75% Grass cover, Good, HSG D
608	39	>75% Grass cover, Good, HSG A
5,156	74	Weighted Average
5,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	74	0.0610	0.26		**Sheet Flow, Segment 1** Grass: Short n= 0.150 P2= 3.43"
4.8	74	Total, Increased to minimum Tc = 6.0 min			



Subcatchment C2: PRWS-C2



Summary for Pond P-C: Pond C

Inflow Area = 1.040 ac, 59.33% Impervious, Inflow Depth = 5.20" for 100-yr event
Inflow = 6.08 cfs @ 12.10 hrs, Volume= 0.451 af
Outflow = 5.20 cfs @ 12.15 hrs, Volume= 0.451 af, Atten= 15%, Lag= 3.2 min
Discarded = 0.10 cfs @ 12.15 hrs, Volume= 0.153 af
Primary = 2.60 cfs @ 12.15 hrs, Volume= 0.246 af
Routed to Link 2L : C Total
Secondary = 2.49 cfs @ 12.15 hrs, Volume= 0.052 af
Routed to Link 2L : C Total

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Peak Elev= 32.47' @ 12.15 hrs Surf.Area= 4,467 sf Storage= 3,678 cf

Plug-Flow detention time= 92.1 min calculated for 0.450 af (100% of inflow)
Center-of-Mass det. time= 92.3 min (901.5 - 809.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	6,050 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

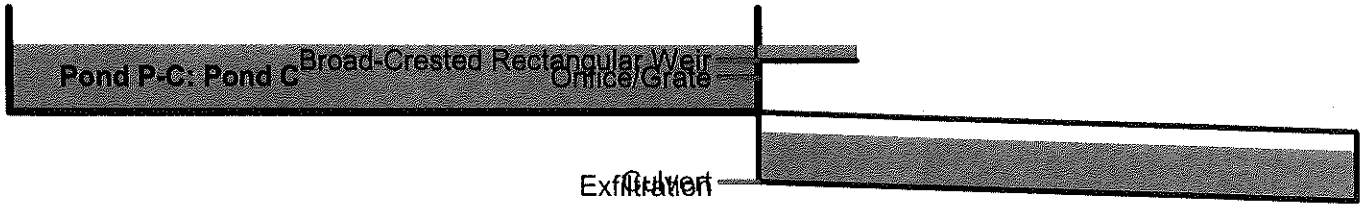
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
31.50	3,128	0	0	3,128
32.50	4,507	3,797	3,797	4,524
33.00	4,507	2,254	6,050	4,643

Device	Routing	Invert	Outlet Devices
#1	Discarded	31.50'	**1.000 in/hr Exfiltration over Wetted area**
#2	Primary	30.50'	**12.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 30.50' / 30.20' S= 0.0100 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#3	Device 2	32.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	32.25'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

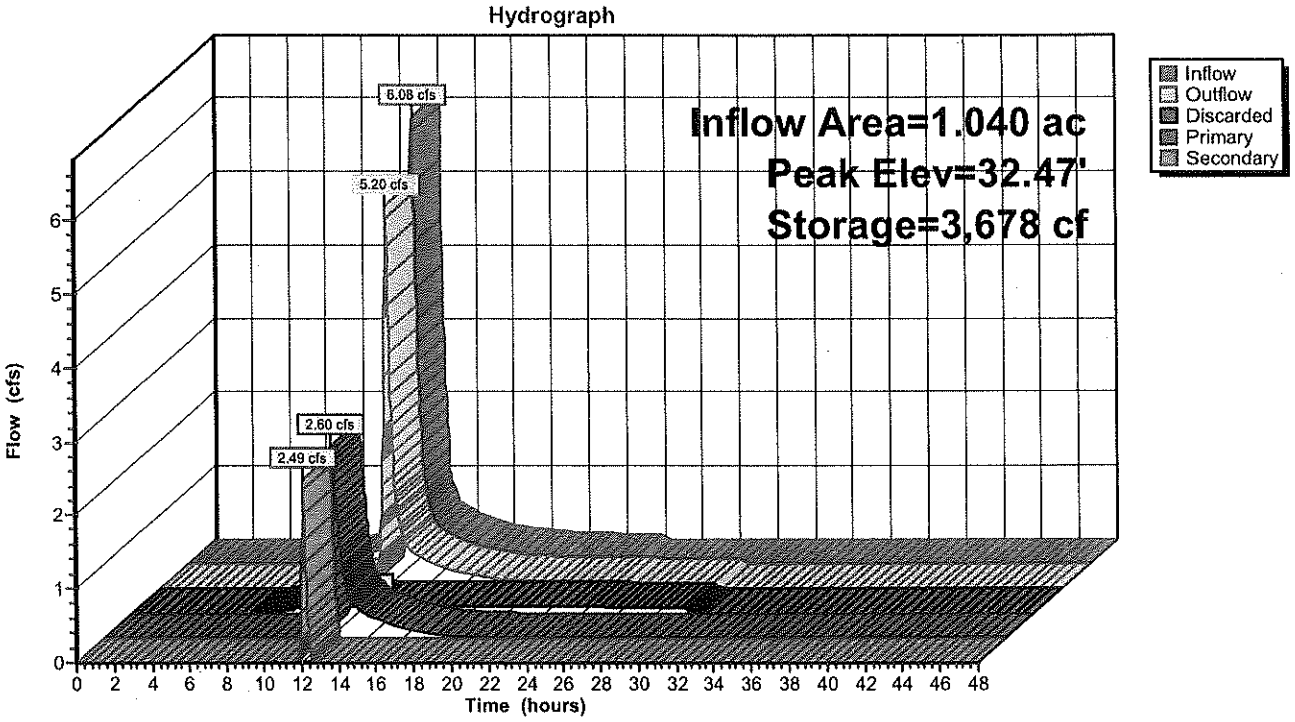
Discarded OutFlow Max=0.10 cfs @ 12.15 hrs HW=32.47' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=2.60 cfs @ 12.15 hrs HW=32.47' (Free Discharge)
↑—**2=Culvert** (Passes 2.60 cfs of 3.62 cfs potential flow)
↑—**3=Orifice/Grate** (Orifice Controls 2.60 cfs @ 3.31 fps)

Secondary OutFlow Max=2.49 cfs @ 12.15 hrs HW=32.47' (Free Discharge)
↑—**4=Broad-Crested Rectangular Weir** (Weir Controls 2.49 cfs @ 1.11 fps)



Pond P-C: Pond C



Stage-Discharge for Pond P-C: Pond C

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
31.50	0.00	0.00	0.00	0.00
31.55	0.07	0.07	0.00	0.00
31.60	0.08	0.08	0.00	0.00
31.65	0.08	0.08	0.00	0.00
31.70	0.08	0.08	0.00	0.00
31.75	0.08	0.08	0.00	0.00
31.80	0.08	0.08	0.00	0.00
31.85	0.08	0.08	0.00	0.00
31.90	0.08	0.08	0.00	0.00
31.95	0.09	0.09	0.00	0.00
32.00	0.09	0.09	0.00	0.00
32.05	0.20	0.09	0.11	0.00
32.10	0.42	0.09	0.32	0.00
32.15	0.69	0.09	0.60	0.00
32.20	1.01	0.09	0.92	0.00
32.25	1.38	0.10	1.28	0.00
32.30	2.05	0.10	1.69	0.26
32.35	2.97	0.10	2.13	0.74
32.40	3.85	0.10	2.39	1.36
32.45	4.73	0.10	2.54	2.09
32.50	5.75	0.10	2.67	2.97
32.55	6.89	0.11	2.80	3.98
32.60	8.13	0.11	2.93	5.09
32.65	9.48	0.11	3.05	6.32
32.70	10.97	0.11	3.16	7.70
32.75	12.57	0.11	3.28	9.19
32.80	14.30	0.11	3.38	10.81
32.85	16.14	0.11	3.49	12.55
32.90	17.82	0.11	3.59	14.12
32.95	19.55	0.11	3.69	15.75
33.00	**21.33**	**0.11**	**3.78**	**17.44**

Stage-Area-Storage for Pond P-C: Pond C

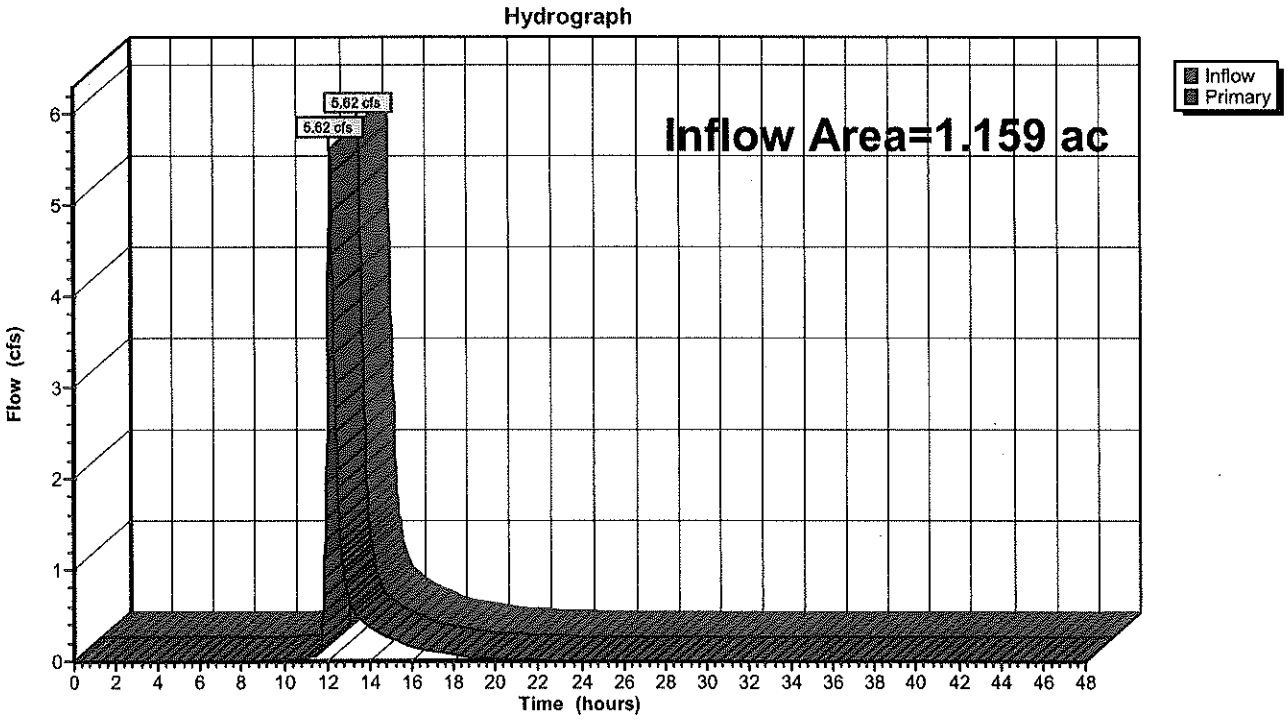
Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
31.50	3,128	3,128	0
31.55	3,191	3,192	158
31.60	3,255	3,256	319
31.65	3,319	3,321	483
31.70	3,384	3,387	651
31.75	3,449	3,453	822
31.80	3,515	3,520	996
31.85	3,582	3,588	1,173
31.90	3,649	3,656	1,354
31.95	3,717	3,725	1,538
32.00	3,786	3,794	1,726
32.05	3,855	3,864	1,917
32.10	3,925	3,935	2,111
32.15	3,996	4,007	2,309
32.20	4,067	4,079	2,511
32.25	4,139	4,151	2,716
32.30	4,211	4,225	2,925
32.35	4,284	4,299	3,137
32.40	4,358	4,373	3,353
32.45	4,432	4,448	3,573
32.50	**4,507**	4,524	3,797
32.55	4,507	4,536	4,022
32.60	4,507	4,548	4,247
32.65	4,507	4,560	4,473
32.70	4,507	4,572	4,698
32.75	4,507	4,584	4,923
32.80	4,507	4,596	5,149
32.85	4,507	4,607	5,374
32.90	4,507	4,619	5,599
32.95	4,507	4,631	5,825
33.00	4,507	**4,643**	**6,050**

Summary for Link 2L: C Total

Inflow Area = 1.159 ac, 53.27% Impervious, Inflow Depth = 3.57" for 100-yr event
Inflow = 5.62 cfs @ 12.14 hrs, Volume= 0.345 af
Primary = 5.62 cfs @ 12.14 hrs, Volume= 0.345 af, Atten= 0%, Lag= 0.0 min
Routed to Link SITE : Total Site

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link 2L: C Total

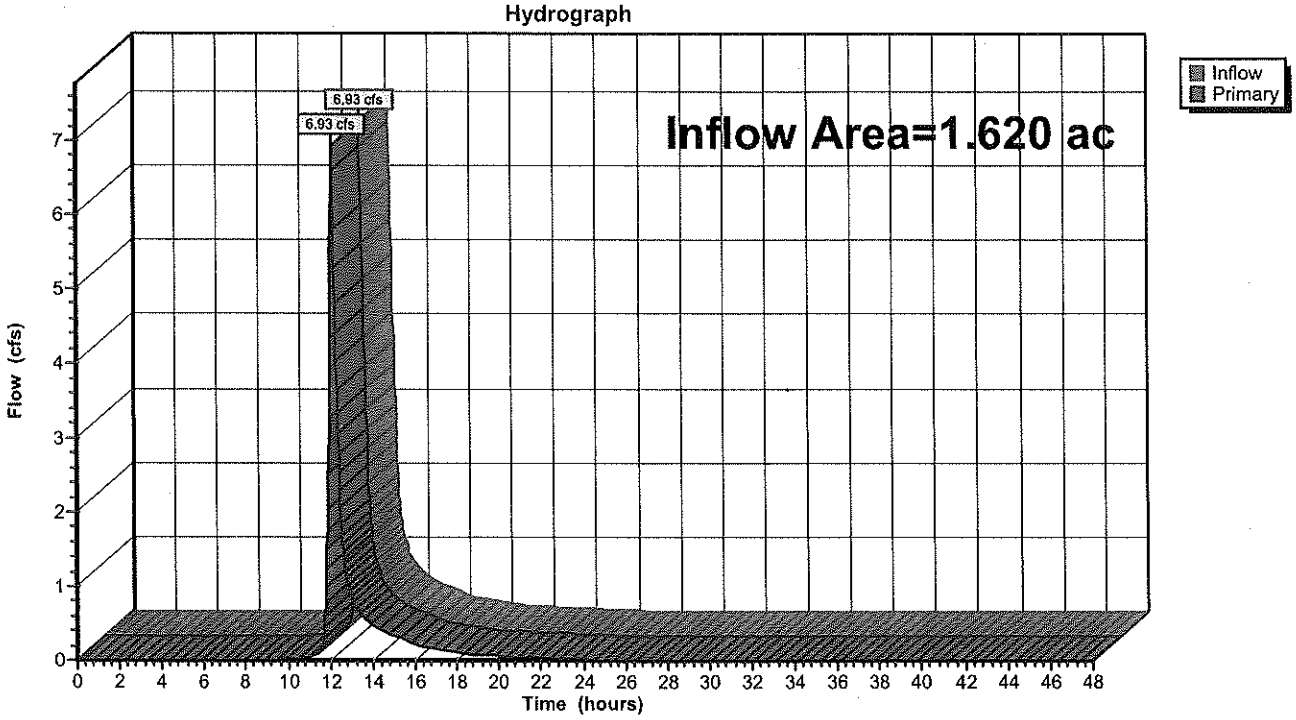


Summary for Link SITE: Total Site

Inflow Area = 1.620 ac, 45.14% Impervious, Inflow Depth = 3.35" for 100-yr event
Inflow = 6.93 cfs @ 12.13 hrs, Volume= 0.453 af
Primary = 6.93 cfs @ 12.13 hrs, Volume= 0.453 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs

Link SITE: Total Site



APPENDIX C

NOAA Rainfall Data

NOAA Atlas 14, Volume 10, Version 3 LAKE
KONOMOC
Station ID: 06-3989
Location name: Waterford, Connecticut, USA*
Latitude: 41.4°, Longitude: -72.1833°
Elevation:
Elevation (station metadata): 180 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

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	0.337 (0.263-0.419)	0.403 (0.315-0.501)	0.511 (0.397-0.637)	0.601 (0.464-0.752)	0.724 (0.542-0.943)	0.816 (0.599-1.08)	0.914 (0.652-1.25)	1.03 (0.692-1.43)	1.19 (0.771-1.71)	1.32 (0.838-1.93)
10-min	0.478 (0.373-0.593)	0.571 (0.446-0.710)	0.724 (0.563-0.903)	0.851 (0.658-1.07)	1.03 (0.768-1.34)	1.16 (0.848-1.53)	1.30 (0.924-1.78)	1.45 (0.979-2.02)	1.68 (1.09-2.41)	1.88 (1.19-2.74)
15-min	0.562 (0.439-0.698)	0.672 (0.524-0.835)	0.852 (0.662-1.06)	1.00 (0.774-1.25)	1.21 (0.904-1.57)	1.36 (0.999-1.81)	1.52 (1.09-2.09)	1.71 (1.15-2.38)	1.98 (1.28-2.84)	2.21 (1.40-3.22)
30-min	0.795 (0.620-0.986)	0.950 (0.741-1.18)	1.20 (0.936-1.50)	1.42 (1.09-1.77)	1.70 (1.28-2.22)	1.92 (1.41-2.55)	2.15 (1.53-2.95)	2.41 (1.63-3.36)	2.79 (1.81-4.00)	3.11 (1.97-4.53)
60-min	1.03 (0.802-1.27)	1.23 (0.957-1.52)	1.56 (1.21-1.94)	1.83 (1.41-2.29)	2.20 (1.65-2.87)	2.48 (1.82-3.29)	2.78 (1.98-3.81)	3.12 (2.10-4.34)	3.60 (2.34-5.17)	4.01 (2.54-5.85)
2-hr	1.35 (1.06-1.67)	1.61 (1.27-1.99)	2.04 (1.60-2.53)	2.40 (1.87-2.98)	2.89 (2.18-3.73)	3.25 (2.41-4.29)	3.64 (2.62-4.96)	4.10 (2.77-5.65)	4.76 (3.10-6.77)	5.32 (3.38-7.69)
3-hr	1.57 (1.24-1.93)	1.87 (1.48-2.30)	2.37 (1.86-2.92)	2.78 (2.17-3.44)	3.34 (2.53-4.30)	3.76 (2.80-4.94)	4.21 (3.04-5.72)	4.74 (3.22-6.50)	5.52 (3.60-7.80)	6.18 (3.94-8.87)
6-hr	2.00 (1.59-2.44)	2.38 (1.89-2.90)	2.99 (2.38-3.66)	3.51 (2.76-4.31)	4.21 (3.22-5.38)	4.74 (3.54-6.16)	5.30 (3.85-7.12)	5.96 (4.07-8.09)	6.93 (4.54-9.68)	7.75 (4.96-11.0)
12-hr	2.47 (1.99-2.99)	2.93 (2.35-3.56)	3.69 (2.95-4.48)	4.31 (3.43-5.27)	5.18 (3.98-6.56)	5.82 (4.38-7.50)	6.51 (4.75-8.65)	7.30 (5.01-9.82)	8.46 (5.58-11.7)	9.44 (6.06-13.3)
24-hr	2.89 (2.35-3.48)	3.45 (2.80-4.16)	4.37 (3.52-5.28)	5.13 (4.11-6.22)	6.17 (4.78-7.76)	6.95 (5.27-8.90)	7.79 (5.72-10.3)	8.76 (6.04-11.7)	10.2 (6.74-13.9)	11.4 (7.35-15.8)
2-day	3.24 (2.65-3.87)	3.91 (3.19-4.67)	5.00 (4.07-5.99)	5.90 (4.77-7.11)	7.15 (5.59-8.94)	8.08 (6.18-10.3)	9.08 (6.74-11.9)	10.3 (7.12-13.6)	12.1 (8.02-16.4)	13.6 (8.82-18.7)
3-day	3.51 (2.89-4.18)	4.24 (3.48-5.05)	5.42 (4.43-6.47)	6.40 (5.20-7.67)	7.75 (6.08-9.64)	8.75 (6.72-11.1)	9.83 (7.33-12.9)	11.1 (7.74-14.6)	13.1 (8.72-17.6)	14.8 (9.59-20.2)
4-day	3.77 (3.11-4.48)	4.53 (3.73-5.38)	5.77 (4.73-6.87)	6.80 (5.54-8.12)	8.21 (6.47-10.2)	9.26 (7.14-11.7)	10.4 (7.77-13.5)	11.8 (8.20-15.4)	13.8 (9.22-18.5)	15.6 (10.1-21.2)
7-day	4.50 (3.73-5.31)	5.32 (4.41-6.29)	6.67 (5.51-7.90)	7.79 (6.39-9.26)	9.34 (7.39-11.5)	10.5 (8.11-13.1)	11.7 (8.77-15.1)	13.2 (9.22-17.1)	15.3 (10.3-20.4)	17.2 (11.2-23.1)
10-day	5.21 (4.34-6.13)	6.07 (5.06-7.15)	7.48 (6.21-8.83)	8.66 (7.13-10.3)	10.3 (8.15-12.6)	11.5 (8.90-14.2)	12.8 (9.56-16.3)	14.2 (10.0-18.3)	16.4 (11.0-21.6)	18.2 (11.9-24.3)
20-day	7.40 (6.23-8.65)	8.33 (7.00-9.73)	9.83 (8.23-11.5)	11.1 (9.21-13.0)	12.8 (10.2-15.4)	14.1 (11.0-17.2)	15.5 (11.6-19.3)	16.9 (11.9-21.5)	18.8 (12.7-24.5)	20.3 (13.3-26.9)
30-day	9.24 (7.81-10.7)	10.2 (8.61-11.9)	11.8 (9.89-13.7)	13.1 (10.9-15.3)	14.8 (11.9-17.8)	16.2 (12.7-19.6)	17.6 (13.1-21.7)	18.9 (13.5-24.0)	20.7 (14.0-26.8)	22.0 (14.4-28.8)
45-day	11.5 (9.78-13.3)	12.5 (10.6-14.5)	14.2 (12.0-16.4)	15.5 (13.0-18.1)	17.4 (14.0-20.7)	18.9 (14.8-22.7)	20.3 (15.2-24.8)	21.6 (15.4-27.1)	23.1 (15.8-29.7)	24.2 (15.9-31.5)
60-day	13.4 (11.4-15.5)	14.4 (12.3-16.7)	16.2 (13.7-18.7)	17.6 (14.8-20.5)	19.6 (15.8-23.1)	21.2 (16.6-25.3)	22.6 (16.9-27.4)	23.9 (17.1-29.8)	25.3 (17.3-32.4)	26.2 (17.4-34.1)

[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.

Back to Top

PF graphical

NOAA Atlas 14, Volume 10, Version 3
Location name: Waterford, Connecticut, USA*
Latitude: 41.4°, Longitude: -72.1833°
Elevation: 254 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

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/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.04 (3.16-5.03)	4.84 (3.78-6.01)	6.13 (4.76-7.64)	7.21 (5.57-9.02)	8.69 (6.50-11.3)	9.79 (7.19-13.0)	11.0 (7.82-15.0)	12.3 (8.30-17.1)	14.3 (9.25-20.5)	15.9 (10.1-23.2)
10-min	2.87 (2.24-3.56)	3.43 (2.68-4.26)	4.34 (3.38-5.42)	5.11 (3.95-6.40)	6.16 (4.61-8.01)	6.94 (5.09-9.20)	7.77 (5.54-10.7)	8.72 (5.87-12.1)	10.1 (6.55-14.5)	11.2 (7.12-16.4)
15-min	2.25 (1.76-2.79)	2.69 (2.10-3.34)	3.41 (2.65-4.25)	4.00 (3.10-5.01)	4.83 (3.62-6.28)	5.44 (4.00-7.22)	6.10 (4.35-8.36)	6.84 (4.61-9.52)	7.92 (5.14-11.4)	8.82 (5.58-12.9)
30-min	1.59 (1.24-1.97)	1.90 (1.48-2.36)	2.41 (1.87-3.00)	2.83 (2.19-3.54)	3.41 (2.55-4.44)	3.85 (2.82-5.10)	4.30 (3.07-5.90)	4.83 (3.25-6.72)	5.59 (3.62-8.01)	6.21 (3.93-9.07)
60-min	1.03 (0.802-1.27)	1.23 (0.957-1.52)	1.56 (1.21-1.94)	1.83 (1.41-2.29)	2.20 (1.65-2.87)	2.48 (1.82-3.29)	2.78 (1.98-3.81)	3.12 (2.10-4.34)	3.60 (2.34-5.17)	4.01 (2.54-5.85)
2-hr	0.675 (0.532-0.833)	0.807 (0.634-0.995)	1.02 (0.800-1.26)	1.20 (0.934-1.49)	1.44 (1.09-1.87)	1.63 (1.20-2.14)	1.82 (1.31-2.48)	2.05 (1.39-2.82)	2.38 (1.55-3.38)	2.66 (1.69-3.84)
3-hr	0.523 (0.413-0.642)	0.623 (0.492-0.766)	0.788 (0.620-0.971)	0.925 (0.723-1.14)	1.11 (0.843-1.43)	1.25 (0.930-1.64)	1.40 (1.01-1.90)	1.58 (1.07-2.16)	1.84 (1.20-2.60)	2.06 (1.31-2.95)
6-hr	0.333 (0.265-0.406)	0.396 (0.315-0.484)	0.499 (0.396-0.612)	0.585 (0.461-0.719)	0.703 (0.536-0.898)	0.791 (0.591-1.03)	0.885 (0.642-1.19)	0.994 (0.679-1.35)	1.16 (0.759-1.62)	1.29 (0.827-1.84)
12-hr	0.205 (0.164-0.248)	0.243 (0.195-0.295)	0.306 (0.244-0.372)	0.358 (0.284-0.437)	0.429 (0.330-0.544)	0.483 (0.363-0.622)	0.540 (0.394-0.718)	0.605 (0.415-0.814)	0.702 (0.462-0.971)	0.783 (0.502-1.10)
24-hr	0.120 (0.097-0.145)	0.143 (0.116-0.173)	0.182 (0.146-0.219)	0.213 (0.171-0.259)	0.257 (0.199-0.323)	0.289 (0.219-0.370)	0.324 (0.238-0.428)	0.364 (0.251-0.486)	0.424 (0.280-0.580)	0.474 (0.306-0.659)
2-day	0.067 (0.055-0.080)	0.081 (0.066-0.097)	0.104 (0.084-0.124)	0.123 (0.099-0.148)	0.148 (0.116-0.186)	0.168 (0.128-0.214)	0.189 (0.140-0.248)	0.214 (0.148-0.282)	0.251 (0.167-0.340)	0.283 (0.183-0.389)
3-day	0.048 (0.040-0.058)	0.058 (0.048-0.070)	0.075 (0.061-0.089)	0.088 (0.072-0.106)	0.107 (0.084-0.133)	0.121 (0.093-0.153)	0.136 (0.101-0.178)	0.154 (0.107-0.202)	0.181 (0.121-0.244)	0.205 (0.133-0.280)
4-day	0.039 (0.032-0.046)	0.047 (0.038-0.056)	0.060 (0.049-0.071)	0.070 (0.057-0.084)	0.085 (0.067-0.106)	0.096 (0.074-0.121)	0.108 (0.080-0.141)	0.122 (0.085-0.160)	0.143 (0.096-0.192)	0.162 (0.105-0.220)
7-day	0.026 (0.022-0.031)	0.031 (0.026-0.037)	0.039 (0.032-0.047)	0.046 (0.038-0.055)	0.055 (0.043-0.068)	0.062 (0.048-0.077)	0.069 (0.052-0.089)	0.078 (0.054-0.101)	0.091 (0.061-0.121)	0.102 (0.066-0.137)
10-day	0.021 (0.018-0.025)	0.025 (0.021-0.029)	0.031 (0.025-0.036)	0.036 (0.029-0.042)	0.042 (0.033-0.052)	0.047 (0.037-0.059)	0.053 (0.039-0.067)	0.059 (0.041-0.076)	0.068 (0.045-0.090)	0.075 (0.049-0.101)
20-day	0.015 (0.012-0.018)	0.017 (0.014-0.020)	0.020 (0.017-0.023)	0.023 (0.019-0.027)	0.026 (0.021-0.032)	0.029 (0.022-0.035)	0.032 (0.024-0.040)	0.035 (0.024-0.044)	0.039 (0.026-0.051)	0.042 (0.027-0.055)
30-day	0.012 (0.010-0.014)	0.014 (0.011-0.016)	0.016 (0.013-0.019)	0.018 (0.015-0.021)	0.020 (0.016-0.024)	0.022 (0.017-0.027)	0.024 (0.018-0.030)	0.026 (0.018-0.033)	0.028 (0.019-0.037)	0.030 (0.020-0.040)
45-day	0.010 (0.009-0.012)	0.011 (0.009-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.016)	0.016 (0.012-0.019)	0.017 (0.013-0.020)	0.018 (0.014-0.022)	0.019 (0.014-0.025)	0.021 (0.014-0.027)	0.022 (0.014-0.029)
60-day	0.009 (0.007-0.010)	0.010 (0.008-0.011)	0.011 (0.009-0.013)	0.012 (0.010-0.014)	0.013 (0.010-0.016)	0.014 (0.011-0.017)	0.015 (0.011-0.019)	0.016 (0.011-0.020)	0.017 (0.012-0.022)	0.018 (0.012-0.023)

[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.

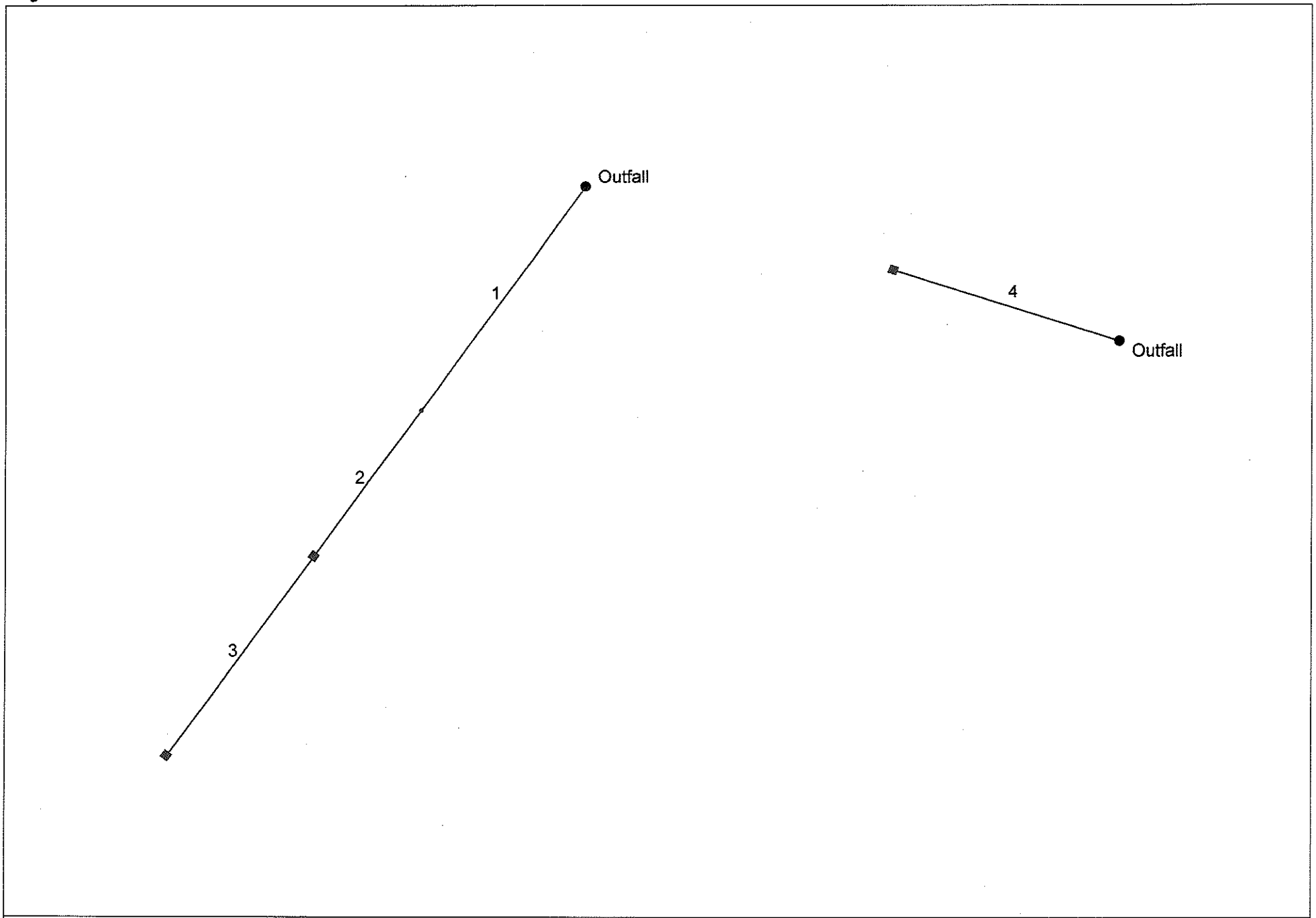
Back to Top

PF graphical

APPENDIX D

Stormwater Collection System Calculations

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



Project File: 2025-01-03 Stormsewers.stm	Number of lines: 4	Date: 1/5/2025

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	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	60.389	0.00	0.34	0.00	0.00	0.24	0.0	6.5	6.5	1.56	1.58	4.83	8	1.46	31.50	32.38	32.08	32.96	32.64	35.52	CO-RG
2	1	39.504	0.16	0.34	0.73	0.12	0.24	6.0	6.4	6.6	1.57	0.91	4.51	8	0.48	32.38	32.57	33.05	33.62	35.52	34.93	YD202-CO
3	2	54.194	0.18	0.18	0.68	0.12	0.12	6.0	6.0	6.8	0.83	0.92	2.37	8	0.50	32.57	32.84	33.78	33.99	34.93	34.94	YD203-YD202
4	End	51.616	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.32	0.93	6.68	8	0.50	30.24	30.50	30.88	32.42	30.81	32.50	BH201-OUTFALL

Project File: 2025-01-03 Stormsewers.stm

Number of lines: 4

Run Date: 1/5/2025

NOTES:Intensity = 29.47 / (Inlet time + 3.10) ^ 0.67; Return period =Yrs. 10 ; c = cir e = ellip b = box

APPENDIX E

Supporting Calculations

$$WQV = \frac{(P)(R)(A)}{12}$$

where:

WQV = water quality volume (cubic feet)
P = 1.3 inches (90th percentile rainfall event)
R = volumetric runoff coefficient = 0.05+0.009(I)
I = post- development impervious area (percent) after application of non-structural LID site planning and design strategies and before application of structural stormwater BMPs
A = post-development total drainage area of site or design point (square feet)

Project	**140286501 - Oswegatchie Fire Station**	Date	**12/27/2024**
Location	**Waterford, CT**	By	**APF**

PRWS-C

Area (SF)	45,321
Impervious (SF)	26,887
I	0.59
R	0.5839
WQV (CF)	**2,867**

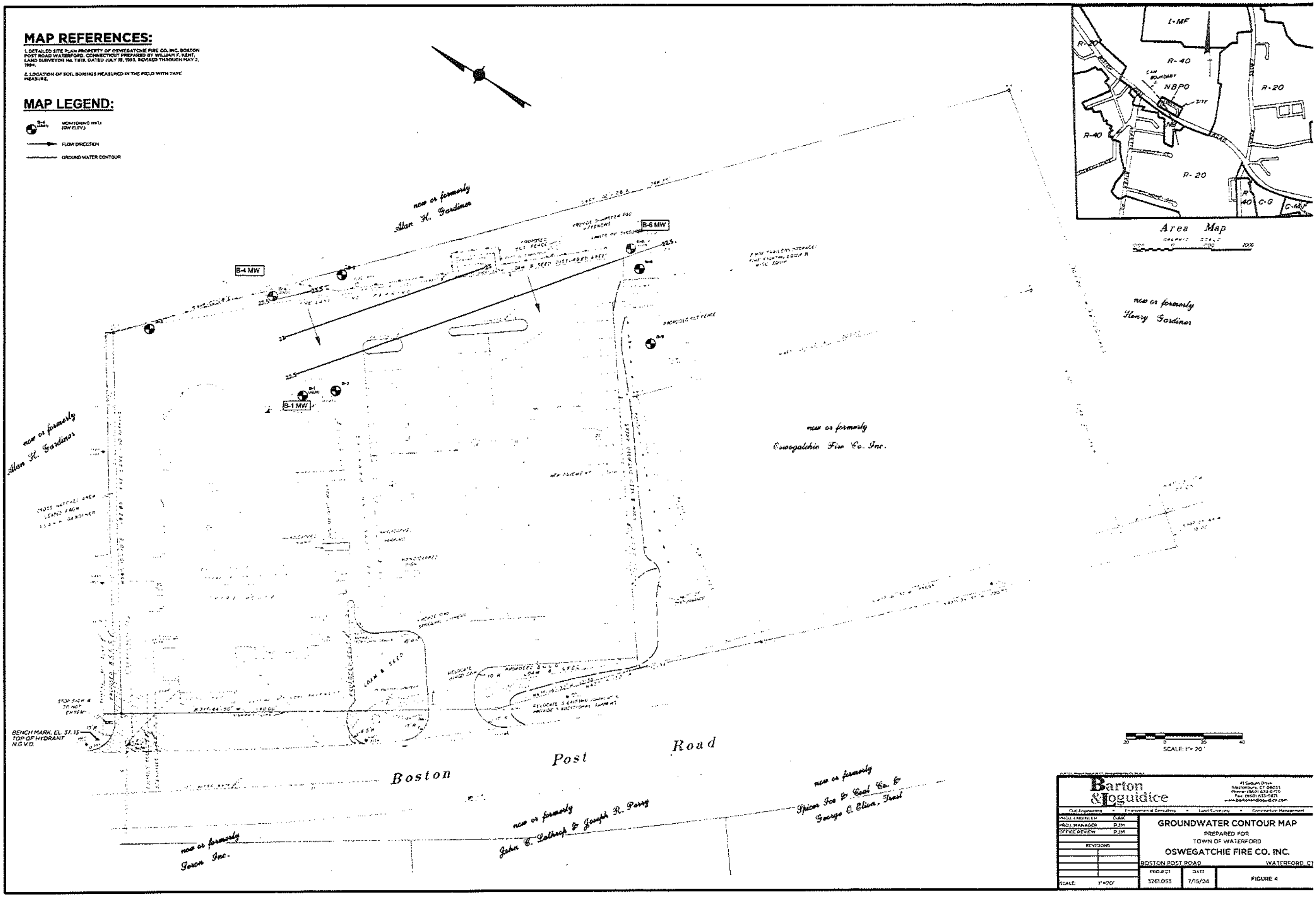
Project	Oswegatchie Fire Station	By	APF	Date	1/7/2024
Location	Waterford, CT	Checked	BP	Date	1/7/2024
Circle one:	Present (Developed)	Job No.	140281101		

1. Rational 'C' Runoff Coefficient & Area Calculations

Catchment Area	Total Area		Impervious (C=.9)		Pervious (C=0.3)		Percent Impervious	C
	SF	AC	SF	AC	SF	AC		
YD-202	6,880	0.16	4,967	0.11	1,913	0.04	72%	0.73
YD-203	7,666	0.18	4,869	0.11	2,797	0.06	64%	0.68

APPENDIX F

Boring Logs (by others)


MAP REFERENCES:
1. DETAILED SITE PLAN PROPERTY OF OSWEGATCHIE FIRE CO. INC. BOSTON POST ROAD WATERFORD, CONNECTICUT PREPARED BY WILLIAM F. KENT, LAND SURVEYOR No. 11619, DATED JULY 19, 1993, REVISED THROUGH MAY 2, 1994.
2. LOCATION OF SOIL BORINGS MEASURED IN THE FIELD WITH TAPE MEASURE.
MAP LEGEND:
MONITORING WELL (GW ELEV.)
FLOW DIRECTION
GROUND WATER CONTOUR
B-4 MW
B-1 MW
B-6 MW
22.5
23
now or formerly Alan H. Gardiner
now or formerly Henry Gardiner
now or formerly Oswegatchie Fire Co. Inc.
now or formerly Goson Inc.
now or formerly John C. Lathrop & Joseph R. Perry
now or formerly Spicer Ice & Coal Co. & George O. Elion, Trust
Boston Post Road
BENCH MARK EL. 37.15 TOP OF HYDRANT N.G.V.D.
LOAM & SEED
Area Map
R-40
R-20
I-MF
NBPO
C-G
SCALE: 1"= 20'
Barton & Loguidice
Civil Engineering • Environmental Consulting • Land Surveying • Construction Management
PROJ. ENGINEER GAK
PROJ. MANAGER PJM
OFFICE REVIEW PJM
REVISIONS
SCALE: 1"=20'
GROUNDWATER CONTOUR MAP
PREPARED FOR
TOWN OF WATERFORD
OSWEGATCHIE FIRE CO. INC.
BOSTON POST ROAD
WATERFORD, CT
PROJECT 3261.053
DATE 7/15/24
FIGURE 4

BORING LOGS

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: 3261,053,001 Sheet #: 1 of 1
Project: Oswegatchie Fire House Phase II
Location: Water ford CT
Boring #: B-1

B&L Personnel: PJM, CED	Drilling Rig: AMS 9520	Date Started: 6/20/24	Surface Elevation:
Drilling Contractor: Ground H2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: Mark Lacabie	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at _____ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0			5/34"	0-17" SAND, fine trace med sand trace coarse sand trace gravel, trace organics brown no staining no odor, 17"-34" SAND fine, trace silt, trace clay trace med sand trace coarse sand, trace gravel, light brown no staining init PID = 0.0 Hspace PID = 0.0 no odor	0-5' sampled @848
5					
			5/43"	0-43" SAND medium trace fine sand, trace coarse sand trace gravel, trace cobble light brown, no staining no odor init PID = 0.0 Hspace PID = 0.0	
10					
			5/5'	0-5' SAND, fine, trace silt trace med sand trace coarse sand trace gravel, trace cobble, light brown, w/ some orange and black mottling no staining no odor saturated @ ~ 13' BGS init PID = 0.0 Hspace PID = 0.0	
15					
				end of boring	
20					
25					
30					

REMARKS: located near generator UST

Proportions Used		Cohesionless Density	Cohesive Consistency
Trace	0 to 10%	0 - 10 Loose	0 - 4 Soft
Little	10 to 20%	10 - 30 Med. Dense	4 - 8 Mod. Stiff
Some	20 to 35%	30 - 50 Dense	8 - 15 Stiff
And	35 to 50%	50+ Very Dense	15 - 30 Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: 3261.053.001 Sheet #: 1 of 1
Project: Oswegatchie Fire House
Phase #
Location: Waterford CT
Boring #: B-2

B&L Personnel: PJM CED	Drilling Rig: AMS 9520	Date Started: 6/20/24	Surface Elevation:
Drilling Contractor: Ground H2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: ML	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at _____ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0			5'/4.3'	0-4.3" SAND, fine, trace med, trace coarse, trace gravel/ trace cobble, light brown no staining no odor	Sample 0-5' @0934
5			1/1'	init PID=0.0 Hspace PID=0.0	
			5'/5'	0-5' SAND fine some medium, trace coarse sand, trace gravel, trace cobble light brown no staining no odor,	
10				init PID=0.0 Hspace PID=0.0	
			5'/5'	0-5' SAND, fine, trace med sand, trace s/lt, trace coarse sand trace gravel, trace cobble, light brown, little orange mottling no staining no odor water @ ~13'BGS	
15				init PID=0.0 Hspace PID=0.0 end of boring	
20					
25					
30					

REMARKS: moved over ~3' from initial boring due to driller hitting steel - boring downgradient of generator VS.

Proportions Used		Cohesionless Density	Cohesive Consistency
Trace	0 to 10%	0 - 10 Loose	0 - 4 Soft
Little	10 to 20%	10 - 30 Med. Dense	4 - 8 Mod. Stiff
Some	20 to 35%	30 - 50 Dense	8 - 15 Stiff
And	35 to 50%	50+ Very Dense	15 - 30 Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: 3261,053,001 Sheet #: 1 of 1
Project: Oswegatchie Fire House
Location: Phase II Waterford CT
Boring #: B-3

B&L Personnel: PSM CED	Drilling Rig: AMS @520	Date Started: 6/20/24	Surface Elevation:
Drilling Contractor: Ground H2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: Mark Laraple	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at ____ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0			5'/32"	0-6" SAND fine trace med sand trace coarse sand trace organics dark brown	
				6"-2'6" GRAVEL, little fine sand, trace med sand trace coarse sand trace gravel light brown no staining no odor sample 0-5' collected @1007	
5				Init PID = 0.0 Hspace PID = 0.0	
			5'/54"	0-32" SAND, medium, trace fine sand, trace coarse sand, trace gravel, trace cobble, light brown some orange mottling	
				32"-54" SAND, fine, trace medium sand trace coarse sand, trace gravel light brown no staining no odor init PID=0.0 Hspace PID=0.0	
10					
			5'/42"	0-8" SAND, fine, trace med sand trace coarse sand light brown	
				8"-42" SAND, medium, some coarse sand, trace fine, trace gravel/ trace cobble, light brown no staining no odor	
15				init PID=0.0 Hspace PID=0.0 water @ 13' BGS end of boring	
20					
25					
30					

REMARKS: Northern corner of site off edge of driveway

Proportions Used		Cohesionless Density	Cohesive Consistency
Trace	0 to 10%	0 - 10 Loose	0 - 4 Soft
Little	10 to 20%	10 - 30 Med. Dense	4 - 8 Mod. Stiff
Some	20 to 35%	30 - 50 Dense	8 - 15 Stiff
And	35 to 50%	50+ Very Dense	15 - 30 Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: Quaker Hill Firehouse I PL11
Sheet #: 1 of 1
Project: 3261.053.001
Boring #: B-4
Location: Waterford CT

B&L Personnel: PJM / CED	Drilling Rig: AMS 9520	Date Started: 6/20/24	Surface Elevation:
Drilling Contractor: Ground H_2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: Mark Laraine	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at ____ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0			5'/32"	1-11" Sand, fine trace medium sand, trace coarse sand, trace organics, trace gravel, dark brown. 11-32 Sand fine-medium, trace coarse, trace gravel, trace cobble, dark brown, little white, no odor. Initial PID: 0.0 Headspace: 0.0	sample @ 1113 0-5'
5			2'/18"	Sand, coarse, trace medium sand, trace fine sand, trace gravel light brown with orange + black mottling	
			3'/12"	- concrete, ~2-3" medium-coarse sand, trace gravel, light brown. Initial PID: 0.0 Headspace: 0.0	moist at ~9 ft
10			5'/44"	- Sand fine-medium, trace coarse sand, trace gravel, trace cobble, light brown with red orange mottle, saturated, no odor, no obvious stain. Initial PID: 0.0 Headspace: 0.0 end of boring	
15					
20					
25					
30					

REMARKS- located @ UST grave along eastern edge of site concrete @ ~7-8' BGS (possible deadman)

Proportions Used	
Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35 to 50%

Cohesionless Density	
0 - 10	Loose
10 - 30	Med. Dense
30 - 50	Dense
50+	Very Dense

Cohesive Consistency	
0 - 4	Soft
4 - 8	Mod. Stiff
8 - 15	Stiff
15 - 30	Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: 3261.053.001 Sheet #: 1 of 1
Project: Omegalake Fire House Phase II
Location: Waterford CT
Boring #: B-5 / B-7

B&L Personnel: PJM / CED	Drilling Rig: AMS 9520	Date Started: 6/30/24	Surface Elevation:
Drilling Contractor: Geoguard H2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: Marques Larabie	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at ____ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0			5"/38"	1-9" top soil, fine sand, trace medium-coarse, trace gravel, trace organics, dark brown, moistening no odor	B-5 Sample @ 11:47
				7-38" fine sand, trace clay, trace silt, trace medium sand, trace coarse sand, trace gravel, dark brown, moist, no odor	B-7 Sample @ 11:49
5				Initial PID: 0.0 Headspace: 0.0	
			5"/46"	0-46" Sand fine, trace coarse + medium sand, light brown, orange + red mottling	
				water ~7ft BGS	
10				Initial PID: 0.0 Headspace: 0.0	
			5'/5'	0-40" medium sand, trace fine + coarse sand, trace gravel, trace silt, trace clay, light brown	
				40-60" fine sand, trace medium + coarse sand, trace cobble Saturated	
15				initial PID: 0.0 Headspace: 0.0	
20					
25					
30					

REMARKS:
boring near concrete structures on eastern boundary

Proportions Used		Cohesionless Density	Cohesive Consistency
Trace	0 to 10%	0 - 10 Loose	0 - 4 Soft
Little	10 to 20%	10 - 30 Med. Dense	4 - 8 Mod. Stiff
Some	20 to 35%	30 - 50 Dense	8 - 15 Stiff
And	35 to 50%	50+ Very Dense	15 - 30 Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: 3261.053 Sheet #: 1 of 1
Project: Oswegatchie Firehouse Ph II Boring #: B-6
Location: Waterford, CT

B&L Personnel: PJM / CED	Drilling Rig:	Date Started: 6/20/24	Surface Elevation:
Drilling Contractor: Ground H_2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: Lambie	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at ______ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0–5			5'/34"	0-3" brown topsoil, fine sand, trace medium/coarse sand, trace organics CED 3"-8" gravel + cobble, 8"-34" fine sand, trace silt, trace silt, trace medium/coarse sand, trace gravel, no odor, no staining, moist ~ 4' 8" Initial 0.0 Headspace: 0.0	Sample @ 12:18 trace bituminous
5–10			5'/31"	0-12 fine sand, trace medium/coarse, trace gravel, trace cobble, dark brown/gray saturated 12"-31" saturated, black, clay/organics, peat odor	
10–15			5'/42"	gray, silt + some clay, trace cobble, trace fine sand, saturated Initial: 0.0 Headspace: 0.0 End of boring	
15–20					
20–25					
25–30					

REMARKS:
East of shed corner, temp well

Proportions Used		**Cohesionless Density**	**Cohesive Consistency**
Trace	0 to 10%	0 - 10 Loose	0 - 4 Soft
Little	10 to 20%	10 - 30 Med. Dense	4 - 8 Mod. Stiff
Some	20 to 35%	30 - 50 Dense	8 - 15 Stiff
And	35 to 50%	50+ Very Dense	15 - 30 Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: 3261053.001 Sheet #: 1 of 1
Project: Oswegatchie Fire House Phase II
Location: Waterford CT
Boring #: B-8

B&L Personnel: PJM/CED	Drilling Rig: ASM 9520	Date Started: 6/20/24	Surface Elevation:
Drilling Contractor: Ground H_2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: Marques Larabie	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at _____ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0			5'/31"	0-7" SAND fine trace med sand trace coarse sand trace organics, dark brown	
				7"-31" SAND fine trace med sand trace coarse sand trace gravel trace cobble brown no staining no odor	
5				init PID=0.0 Hspace PID=0.0 sample 0-5' collected @ 1254	
			1.5'/17"	0-17" SAND fine trace med sand trace coarse sand trace gravel, dark grey, saturated no staining no odor init PID=0.0 Hspace PID=0.0	
10				refusal @ ~6.5' BGS end of boring	
15					
20					
25					
30					

REMARKS: located on eastern side of detached garage near drum

Proportions Used		Cohesionless Density	Cohesive Consistency
Trace	0 to 10%	0 - 10 Loose	0 - 4 Soft
Little	10 to 20%	10 - 30 Med. Dense	4 - 8 Mod. Stiff
Some	20 to 35%	30 - 50 Dense	8 - 15 Stiff
And	35 to 50%	50+ Very Dense	15 - 30 Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.

Barton & Loguidice, LLC
41 Sequin Drive
Glastonbury, CT 06033
Tel. (860) 633-8770 Fax (860) 633-5971

Project #: 3261.053
Sheet #: 1 of 1
Project: Ownegetchie Fire House
Location: Waterford LF Ph II
Boring #: B-9

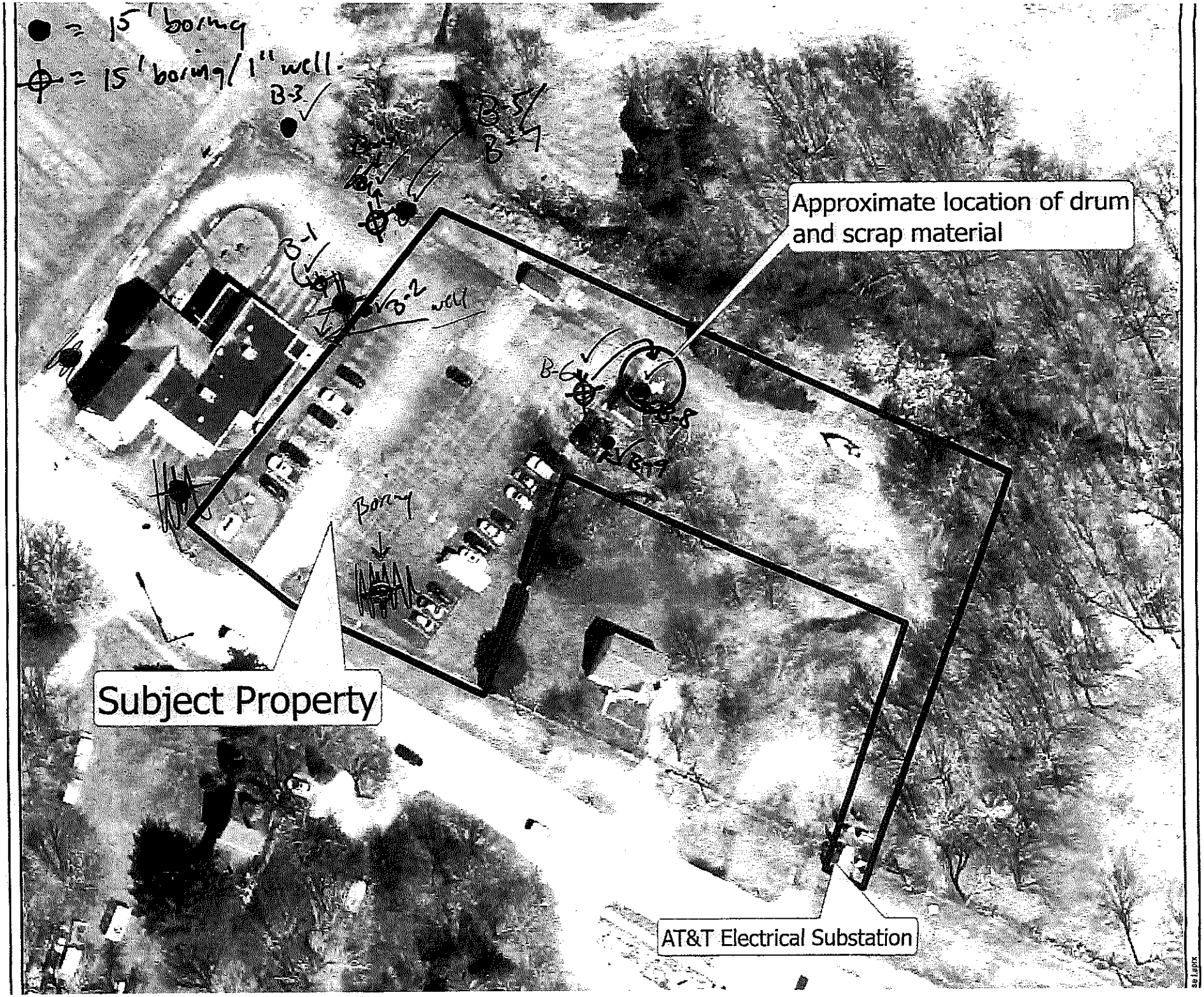
B&L Personnel: PJM / CED	Drilling Rig:	Date Started: 6/20/24	Surface Elevation:
Drilling Contractor: Ground H2O	Auger/Core Diameter:	Date Completed:	Groundwater Depth at 0 Hours:
On-Site Drillers: Larabie	Hammer Wt. & Fall:	Sampling Method:	Groundwater Depth at ____ Hours:

Depth	Sample #	# of Blow Counts	Penetration/ Recovery	Sample Description	Sample Number
0–5			5'/25"	0-6" dark brown topsoil, fine sand, trace medium/coarse, trace organics 6"-21" fine sand, trace medium/coarse sand, trace gravel, light brown, dry 4'-5' Concrete per driller — 21"-25" Initial PID: 0.0 Headspace.	Sample taken at 13:22
5–10			1.5'/14"	0-14" fine sand, trace medium/coarse, trace cobble, light brown, no stain, no odor Initial PID: 0.0 Headspace: 0.0 refusal at ~6.5' End of boring	
10–15					
15–20					
20–25					
25–30					

REMARKS:
West of shed + South of Concrete dumpster pad

Proportions Used		Cohesionless Density	Cohesive Consistency
Trace	0 to 10%	0 - 10 Loose	0 - 4 Soft
Little	10 to 20%	10 - 30 Med. Dense	4 - 8 Mod. Stiff
Some	20 to 35%	30 - 50 Dense	8 - 15 Stiff
And	35 to 50%	50+ Very Dense	15 - 30 Very Stiff

NOTES:
Water Readings Represent Direct Observations at the Times Noted Above.
Samples will be Retained for 90 Days Unless Otherwise Requested.


● = 15' boring
⊕ = 15' boring/1" well
B-3
B-5
B-1
B-2 well
B-6
B-4
Boring
Approximate location of drum and scrap material
Subject Property
AT&T Electrical Substation

TEMPORARY MONITORING WELL FIELD DATA SHEETS

Monitoring Well Field Data Sheet

B-1

Client/Project Name:	Location: Oswegatchie Firehouse	Project:
Sample #:		Well #: MW-DW

Water Level Data

Date: 7/15/24
Weather: Sunny 80s
Well Diameter: ___ in.

	Measured Depth
Depth to Bottom	19.55
Depth to Water	13.77
Water Column Height:	

Water Column Height: ___
Correction Factor: x ___
Volume to Purge: ___ gal

Diam. (in)	Corr. Factor
1.5	0.3
2	0.5
4	2.0
6	4.4

Measuring Device: Tape / Elec. Tape / Other ___
Measuring Point: PVC / Top of Steel / Other ___
Comments:

Well Condition

General Condition: (Good) / Fair / Requires Repair
Protective Casing: Steel / (PVC) / Other
Casing Condition: (Good) / Rusty / Bent / Requires Repair
Concrete Collar: Good / Cracked / (None) / Requires Maintenance
Comments: 10:10

Ponding Near Well: Yes / (No)
Holes Observed Near Well: Yes / (No)
Water Between PVC and Casing: Yes / (No)
Lockable Cap: Yes / (No)
Lock Present: Yes / (No)

Purge Data

Start Time: ___
Finish Time: ___
Pump Rate: ___ mL/pm (if appl.)
Elapsed Time: ___ min
Volume Purged: ___ gal
Comments:

Purge Device: Bailer / Peristaltic Pump / Bladder Pump / Waterra ___
Bailer Type: Stainless Steel / Teflon / PVC / ___
Bailer Size: 2" / 1.05" / N/A
Equipment Decon: Office / Dedicated / Designated / Field
Well Recharge: Good / Moderate / Low Dry @ ___ gal

Sample Data

Date: ___ Time: ___
Sampler: ___ Weather: ___
Sampling Device: Bailer / Pump / Other ___
Filtering Required: Yes / No Field Filtered: Yes / No
Filter Type: Pneumatic / Syringe / Other / N/A ___
Filter Field Decontaminated: Yes / No

Additional Comments:

Field Parameters

Time	Rate/Unit (mL/min)	pH (std)	Conductance (µmhos)	Temp (°C)	Turbidity (ntu)	D.O. (mg/L-ppm)	eH/ORP (mV)	DTW (ft)

Sample Appearance / Description / Odor:

Monitoring Well Field Data Sheet

B-4 or B-5

Client/Project Name:	Location: Oswegatchie Emhorn	Project:
Sample #:		Well #: MW-Tree

Water Level Data

Date: 7/15/24
Weather: Sunny 80's
Well Diameter: in.

	Measured Depth
Depth to Bottom	16.38
Depth to Water	10.37
Water Column Height:	

Water Column Height: ______
Correction Factor: x ______
Volume to Purge: ______ gal

Diam. (in)	Corr. Factor
1.5	0.3
2	0.5
4	2.0
6	4.4

Measuring Device: Tape / Elec. Tape / Other
Measuring Point: PVC / Top of Steel / Other
Comments:

Well Condition

General Condition: (Good) / Fair / Requires Repair
Protective Casing: Steel / (PVC) / Other
Casing Condition: (Good) / Rusty / Bent / Requires Repair
Concrete Collar: Good / Cracked / (None) / Requires Maintenance
Comments: 10:00

Ponding Near Well: Yes / (No)
Holes Observed Near Well: Yes / (No)
Water Between PVC and Casing: Yes / (No)
Lockable Cap: Yes / (No)
Lock Present: Yes / (No)

Purge Data

Start Time: ______
Finish Time: ______
Pump Rate: ______ mL/pm (if appl.)
Elapsed Time: ______ min
Volume Purged: ______ gal
Comments:

Purge Device: Bailer / Peristaltic Pump / Bladder Pump / Waterra ______
Bailer Type: Stainless Steel / Teflon / PVC / ______
Bailer Size: 2" / 1.05" / N/A
Equipment Decon: Office / Dedicated / Designated / Field
Well Recharge: Good / Moderate / Low Dry @ ______ gal

Sample Data

Date: ______ Time: ______
Sampler: ______ Weather: ______
Sampling Device: Bailer / Pump / Other ______
Filtering Required: Yes / No Field Filtered: Yes / No
Filter Type: Pneumatic / Syringe / Other / N/A ______
Filter Field Decontaminated: Yes / No

Additional Comments:

Field Parameters

Time	Rate/Unit (mL/min)	pH (std)	Conductance (μmhos)	Temp (°c)	Turbidity (ntu)	D.O. (mg/L-ppm)	eH/ORP (mV)	DTW (ft)

Sample Appearance / Description / Odor:

Monitoring Well Field Data Sheet

B-6

Client/Project Name:	Location: Owego Itchie Firehouse	Project:
Sample #:		Well #: MW-Shed

Water Level Data

Date: 7/15/24
Weather: Sunny 80's
Well Diameter: ✓ in.

	Measured Depth
Depth to Bottom	13.02
Depth to Water	6.11
Water Column Height:	

Water Column Height: ____
Correction Factor: x ____
Volume to Purge: ____ gal

Diam. (in)	Corr. Factor
1.5	0.3
2	0.5
4	2.0
6	4.4

Measuring Device: Tape / Elec. Tape / Other ____
Measuring Point: PVC / Top of Steel / Other ____
Comments:

Well Condition

General Condition: (Good) / Fair / Requires Repair
Protective Casing: Steel / (PVC) / Other
Casing Condition: (Good) / Rusty / Bent / Requires Repair
Concrete Collar: Good / Cracked / (None) / Requires Maintenance
Comments: 10:15

Ponding Near Well: Yes / (No)
Holes Observed Near Well: Yes / (No)
Water Between PVC and Casing: Yes / (No)
Lockable Cap: Yes / (No)
Lock Present: Yes / (No)

Purge Data

Start Time: ____
Finish Time: ____
Pump Rate: ____ mL/pm (if appl.)
Elapsed Time: ____ min
Volume Purged: ____ gal
Comments:

Purge Device: Bailer / Peristaltic Pump / Bladder Pump / Waterra ____
Bailer Type: Stainless Steel / Teflon / PVC / ____
Bailer Size: 2" / 1.05" / N/A
Equipment Decon: Office / Dedicated / Designated / Field
Well Recharge: Good / Moderate / Low Dry @ ____ gal

Sample Data

Date: ____ Time: ____
Sampler: ____ Weather: ____
Sampling Device: Bailer / Pump / Other ____
Filtering Required: Yes / No Field Filtered: Yes / No
Filter Type: Pneumatic / Syringe / Other / N/A ____
Filter Field Decontaminated: Yes / No

Additional Comments:

Field Parameters

Time	Rate/Unit (mL/min)	pH (std)	Conductance (µmhos)	Temp (°C)	Turbidity (ntu)	D.O. (mg/L-ppm)	eH/ORP (mV)	DTW (ft)

Sample Appearance / Description / Odor:

APPENDIX G

Stormwater Management System Operation and Maintenance Plan

Operations and Maintenance Plan

Oswegatchie Fire Station
Waterford, CT

Scope:

The purpose of the Operations and Maintenance Plan is to ensure that the existing and proposed stormwater components installed at 441 Boston Post Road in Waterford, CT are maintained in operational condition throughout the life of the project. The service procedures associated with this plan shall be performed as required by the parties legally responsible for their maintenance.

Recommended Frequency of Service:

As further defined below, all stormwater components should be checked on a periodic basis and kept in full working order. Ultimately, the required frequency of inspection and service will depend on runoff quantities, pollutant loading, and clogging due to debris. At a minimum, we recommend that all stormwater components be inspected and serviced twice per year, once before winter begins and once during spring cleanup.

Qualified Inspector:

The inspections must be completed by an individual experienced in the construction and maintenance of stormwater drainage systems. If required by the town, the inspections must be completed by a professional engineer.

Service Procedures:

1. Catch Basins & Drainage Inlets:

    a. Catch basins and drainage inlets shall be completely cleaned of accumulated debris and sediments at the completion of construction.
    b. For the first year, catch basins and drainage inlets shall be inspected on a quarterly basis.
    c. Any accumulated debris within the catch basins/inlets shall be removed and any repairs as required.
    d. From the second year onward, visual inspections shall occur twice per year, once in the spring and once in the fall, after fall cleanup of leaves has occurred.
    e. Accumulated debris within the catch basins/inlets shall be removed and repairs made as required.
    f. Accumulated sediments shall be removed at which time they are within 12 inches of the invert of the outlet pipe.
    g. Any additional maintenance required per the manufacturer's specifications shall also be completed.

2. Storm Drainage Piping and Cleanouts:

    a. All storm drainage piping shall be completely flushed of debris and accumulated sediment at the completion of construction.
    b. Cleanouts shall be inspected and repaired on an annual basis.
    c. Unless system performance indicates degradation of piping, comprehensive video inspection of storm drainage piping shall occur once every ten years.
    d. Any additional maintenance required per the manufacturer's specifications shall also be completed.

3. Rain Gardens:

    a. Rain gardens shall be inspected annually. Inspect after every major storm (1 inch or more of precipitation) during the first three months of operation.
    b. Remove trash and organic debris in the Spring and Fall.
    c. Remove sediment from the rain garden when the sediment accumulation exceeds 1 inch or more when drawdown exceeds 48 hours after the end of a storm event.
    d. Periodically remove grass clippings to prevent clogging of the surface of the rain garden.

4. Drainage Swales:

    a. All drainage swales shall be completely cleaned of accumulated debris and sediments at the completion of construction.
    b. Spring through fall, mow grass to between 4 to 6 inches, remove grass clippings.
    c. Accumulated debris shall be removed and repairs made as required.
    d. Reseed any bare areas as needed.
    e. Inspect level spreaders twice per year and remove sediment as necessary.

Disposal of Debris and Sediment:

All debris and sediment removed from the stormwater structures and rain gardens shall be disposed of legally. There shall be no dumping of silt or debris into or in proximity to any inland or tidal wetlands.

Maintenance Records:

The Owners(s) must maintain all records (logs, invoices, reports, data, etc.) and have them readily available for inspection at all times.

Operations and Maintenance Log (Page 1 of 2)

Oswegatchie Fire Station
Waterford, CT

Type of Inspection: ☐ Spring ☐ Fall ☐ Other

Inspector's Name:_____ Date of Inspection:_____

Affiliation:_____ Phone #:_____

Catch Basins & Drainage Inlets:

- Has accumulated debris been removed from grates? ☐ Yes ☐ No ☐ N/A
- Do any basins require additional repair? (identify below): ☐ Yes ☐ No ☐ N/A
- Have sumps been cleaned of sediment? ☐ Yes ☐ No ☐ N/A

Notes:

Storm Drainage Piping and Cleanouts:

- Has accumulated debris been removed? ☐ Yes ☐ No ☐ N/A
- Do any cleanouts require additional repair? (identify below): ☐ Yes ☐ No ☐ N/A
- Is there any evidence of stormwater piping failure? ☐ Yes ☐ No ☐ N/A
- Has a comprehensive video inspection been completed? ☐ Yes ☐ No ☐ N/A

Notes:

Operations and Maintenance Log (Page 2 of 2)

Oswegatchie Fire Station
Waterford, CT

Rain Gardens:

- Has accumulated debris or sediment been removed? ☐ Yes ☐ No ☐ N/A
- Are any repairs required? (identify below): ☐ Yes ☐ No ☐ N/A
- Has accumulated grass clippings been removed? ☐ Yes ☐ No ☐ N/A

Notes:

Drainage Swales:

- Has accumulated debris been removed? ☐ Yes ☐ No ☐ N/A
- Do any swales require repair? (identify below): ☐ Yes ☐ No ☐ N/A
- Do swales need to be mowed? (spring through fall only) ☐ Yes ☐ No ☐ N/A
- Are there any bare areas? ☐ Yes ☐ No ☐ N/A

Notes:

Signature of Inspector: **Date:**